



**ULTRACARE**

*At the Cutting Edge of Industry*

**XJ220**

**THROUGH FEED FOUR  
SIDE PLANING MACHINE  
and MOULDER**

INSTRUCTION MANUAL EDITION 2



**XJ220**

**THROUGH FEED FOUR  
SIDE PLANING MACHINE  
and MOULDER**

|                     |  |
|---------------------|--|
| MACHINE No.         |  |
| TEST No.            |  |
| YEAR OF MANUFACTURE |  |

# **THROUGH FEED FOUR SIDE PLANING MACHINE and MOULDER**

## **MODEL: XJ220**

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# PREFACE

## IMPORTANT

IT IS OUR POLICY AND THAT OF OUR SUPPLIERS TO CONSTANTLY REVIEW THE DESIGN AND CAPACITY OF OUR PRODUCTS. WITH THIS IN MIND WE WOULD REMIND OUR CUSTOMERS THAT WHILE THE DIMENSIONS AND PERFORMANCE DATA CONTAINED HEREIN ARE CURRENT AT THE TIME OF GOING TO PRESS, IT IS POSSIBLE THAT DUE TO THE INCORPORATION OF THE LATEST DEVELOPMENTS TO ENHANCE PERFORMANCE, DIMENSIONS AND SUPPLIERS MAY VARY FROM THOSE ILLUSTRATED

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INSTRUCTION MANUAL  
WADKIN  
THROUGH FEED FOUR SIDE  
PLANING MACHINE AND MOULDER

MODEL XJ

PREFACE

**Health and Safety  
Safeguarding machines**

[www.DaltonsWadkin.com](http://www.DaltonsWadkin.com)

EDITION 1 OCT 1985  
EDITION 2 OCT 1990  
EDITION 3 OCT 1990

## HEALTH AND SAFETY

This machine is designed and constructed using the principles of safeguarding and practical guidance contained in the British Standard Codes of Practice BS5304: 1988 "Safeguard of machinery", BS6854: 1987 "Safeguard woodworking machines" and current guidance issued by the Health and Safety Executive.

The Health & Safety at Work etc Act 1974 places duties in designers, manufacturers and suppliers to ensure that:-

- (1) Articles supplied for use at work are, so far as is reasonably practicable, safe and without risks to health during setting, use, cleaning and maintenance.
- (2) Persons supplied with the articles are provided with adequate information about the use for which they are designed, and about conditions necessary to ensure that they will be safe and without risks to health.

These duties are transferred to you if you re-supply the machine by way of sale, lease, hire or hire-purchase.

Persons who install this machine for use at work have a duty under the Health and Safety at Work etc Act 1974, to ensure so far as is reasonably practicable, that nothing about the way in which it is installed makes it unsafe or a risk to health. This includes such aspects as correct assembly, electrical installation, construction of enclosures, fitting of guards and exhaust ventilation equipment. When installing the machine, consideration must be given to the provision of adequate lighting and working space.

The legal duties of designers, manufacturers, importers, suppliers, erectors and installers are explained in the free Health and Safety Executive leaflet IND(G) 1(L) 1987.

The machine is supplied complete with all necessary safeguards to enable the user to comply with the Woodworking Machines Regulations 1974. Details of correct installation and use, together with guidance on fitting and proper adjustment of guards are described in Sections 1 to 4 of this manual.

You are reminded that the Woodworking Machines Regulations place absolute legal duties on employers and employees to ensure that guards and any other safety devices are securely fitted, correctly adjusted and properly maintained.

Repairs and maintenance must only be undertaken by suitably qualified and competent technicians. Ensure that all power supplies are isolated before any maintenance work commences. Instructions for routine maintenance are given in Section 4 of this manual.

Machine operators must have received sufficient training and instruction as to the dangers arising in connection with the machine, the precautions to be observed and the requirements of the Woodworking Machines Regulations which apply, except where they work under the adequate supervision of a person who has a thorough knowledge and experience of the machine and the required safeguards.

Persons under the age of 18 years must successfully complete an approved course of training before operating this machine at work, unless participating in a course of training under adequate supervision. (N.B. This paragraph is only relevant to; circular sawing machines, any sawing machine fitted with a circular blade, any planing machine for surfacing which is not mechanically fed or any vertical spindle moulding machine.)

Before commencing work, ensure that the cutters/blades are, set to cut in the correct direction, securely fitted, sharp, and are compatible with the machine and spindle speed.

### Dust

Wood dust can be harmful to health by inhalation and skin contact and concentrations of small dust particles in the air can form an explosive mixture. These concentrations usually occur in dust extraction equipment which may be destroyed unless explosion precautions have been taken in the design and installation of the equipment.

Employees have duties under the Factories Act 1961 and the Health and Safety at Work etc Act 1974 to control wood dust in the workplace and from 1st October 1989 more specific requirements will be imposed by the Control of Substances Hazardous to Health Regulations 1988.

Employers should carry out an adequate assessment of the possible risks to health associated with wood dust to enable a valid decision to be made about the measures necessary to control the dust. It may be necessary to provide effective exhaust appliances.

Prevention or control of wood dust exposure should, so far as is reasonably practicable, be achieved by measures OTHER than the provision of personal protective equipment.

Airborne dust levels should not exceed 5 mg/cub.m

Further information and reference to practical guidance are contained in the following free leaflets available from the Health and Safety Executive:-

Wood Dust: IND(S) 10(L) 1987  
 Hazards and Precautions  
 Control Hardwood Dust IND(S) 21(L) 1988

## Noise

Noise levels can vary widely from machine to machine depending on conditions of use. Persons exposed to high noise levels, even for a short time, may experience temporary partial hearing loss and continuous exposure to high levels can result in permanent hearing damage. The Woodworking Machines Regulations require employers to take reasonably practicable measures to reduce noise levels where any person is likely to be exposed to a continuous equivalent noise level of 90 dB(A) or more, over an 8 hour working day. Additionally, suitable ear protectors must be provided, maintained and worn.

An adequate assessment of likely noise exposure should be made using manufacturer's data and if necessary, a noise survey should be carried out by a competent person. It may be necessary to construct a suitable noise enclosure, in which case professional advice should be sought.

Machines identified as generating unhealthy noise levels should be appropriately marked with a warning of the need to wear hearing protection and it may be necessary to designate particular areas of the workplace as "Ear protection zones". Suitable warning signs are specified in the Safety Signs Regulations 1980.

Further information and reference are contained in the free Health and Safety Executive leaflet - Noise at Woodworking Machines IND(S) 22(L) 1988.

## SAFEGUARDING MACHINES

To comply with the Woodworking Machines Regulations 1974, operators must ensure that they fully understand the instructions given and have received sufficient training in the use of the machine and the particular safety instructions to be observed.

**NOTE:** Persons under the age of 18 years **must not** operate the machine except under supervision during a course of training.

### BEFORE OPERATING THE MACHINE ENSURE THAT:

All guards and fences are securely fitted and correctly adjusted in accordance with the Regulations. Cutters/blades are the correct type and rotate in correct direction of cut, are sharp and securely fastened.

Cutter equipment is suitable for machine spindle speed.

Loose clothing is either removed or fastened and jewellery removed.

Sufficient working space is provided and that lighting is adequate.

All dust extraction equipment is switched on, properly adjusted and working efficiently.

### DURING MACHINING:

Wear suitable protective equipment, e.g. goggles, ear defenders, and dust mask.

Stop the machine before making adjustments or cleaning chips from the work area.

Keep the floor area around the machine clean and free from wood refuse.

Do not allow the floor to become slippery with oil or grease.

Report immediately to a person in authority, any machine malfunction or operator hazard. Do not attempt to repair the machine unless qualified to do so.

Ensure all power sources are isolated before commencing any maintenance work.

**WARNING:** Failure to comply with the Regulations is a criminal offence and could result in legal proceedings.



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SECTION 5 ILLUSTRATED PARTS LIST (cont.)

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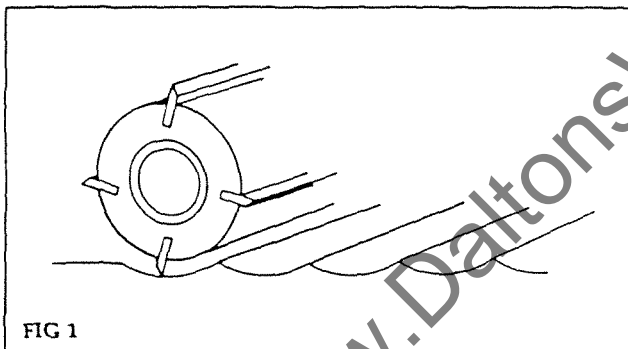
## SECTION 1 GENERAL DESCRIPTION

### OPERATING PRACTICE

#### General Notes on Wadkin Planing and Moulding Machines

A planing and moulding machine produces planed or moulded surfaces on all four sides of lengths of timber, both hard and softwood, at feed speeds determined by the cutter equipment and quality of surface finish required.

A series of 'ridges' (cutter marks) is created on the surface of the timber as it is moved past a rotating cutterblock (see Fig 1). The quality of surface finish is determined by the number of knife marks per 25mm (1") (the pitch of the cutter marks). The closer the pitch the better the quality of surface finish.

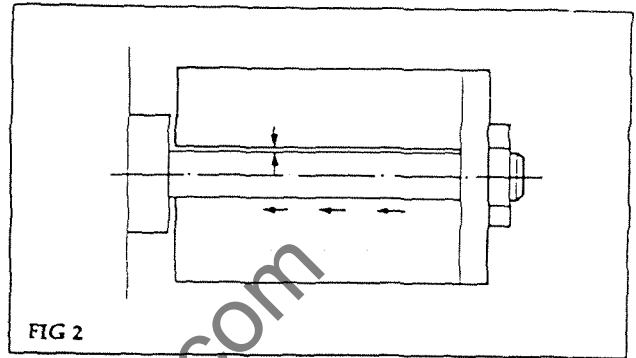


From experience a good quality surface finish has knife marks at a pitch of 1.5 to 2 mm. Reducing the pitch improves the surface finish but increases the wear on the cutters, increasing the pitch reduces the quality.

The number of cutter knives in a cutterblock will only be effective when all are rotating in precisely the same cutting circle. Two main factors influence this:

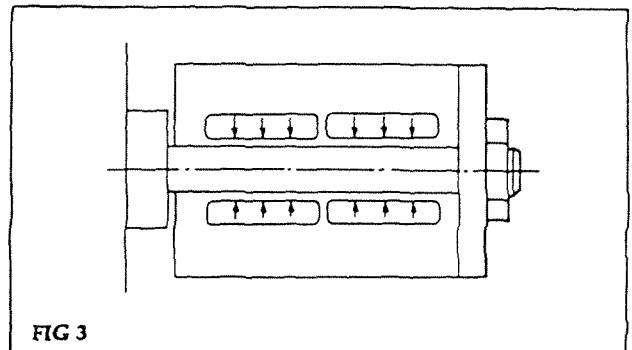
- a. The fit of the cutterblock on the spindle
- b. The concentricity of grinding.

The conventional method of mounting a cutterblock is to lock a plain bore block on to a plain ground spindle with a locknut. The tolerances in each component give a possible 0.05mm (0.002") clearance in the bore and thus eccentric running (see Fig 2).



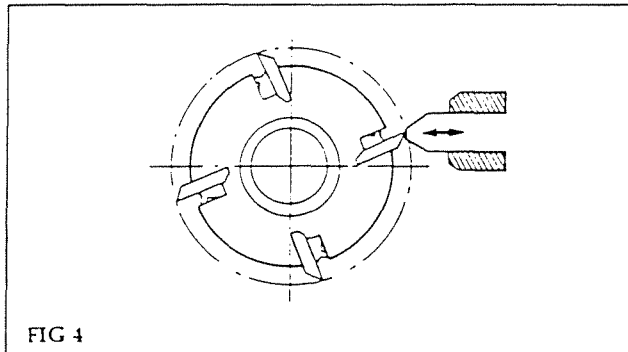
The Wadkin Hydrofix locking system eliminates this clearance by pressurising the bore of the cutterblock onto the spindle (see Fig 3).

Axial locking is not required and a simple safety collar is recommended to prevent the cutterblock moving axially, or rotating on the spindle, if the hydraulic pressure is not applied.



Because the Hydrofix locking is also used while the knives in the cutterblock are ground in the toolroom, it can be seen that the high accuracy of the grinding process is transferred directly to the planing and moulding machine. This accuracy, together with the true running of the precision spindle of the moulder, reduces the running of the knives to within 0.002 to 0.005mm of the true cutting circle. However, this minimum run-out is still such that only one knife leaves a finishing cut, no matter how many are in the block.

To ensure that all the knives in a cutterblock run in an absolutely true cutting circle, the technique of jointing is used, in which the jointing 'stone' trues all the knives while rotating at cutting speed in the planing and moulding machine (see Fig 4).



It can be seen that for a given spindle speed and quality of surface finish (pitch of knife marks), the feed speed may be increased in direct relationship to the number of knives in the cutterblock.

$$\text{Cuttermark pitch} = \frac{\text{Feedspeed in mm per min}}{\text{Block rpm} \times \text{No of Cutters}}$$

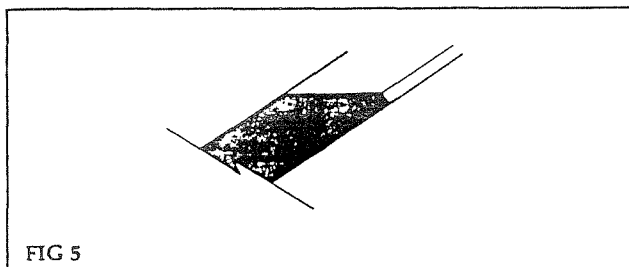
$$\text{For example } \frac{12 \times 1000}{6000 \times 1} = 2\text{m pitch}$$

for a spindle running at 6000 rpm and a feed speed of 12m/min and unjointed (1 knife finishing)

Jointing a 4 knife block and increasing the feed speed to (4 × 12) ie: 48m/min gives the same resulting pitch (finish).

Jointing can be carried out on straight planing blocks — 'straight' jointing, and on profile blocks — 'plunge' jointing.

The process of jointing, which can be repeated several times, produces a heel on the knives. In the interests of quality this must not be allowed to exceed a certain width. This is approx 0.5mm on softwood and 0.7mm on hardwood (see Fig 5).



Both high speed steel and carbide knives may be jointed but require a different composition of jointing stone.

An alternative method of increasing output is to increase the spindle speed thus permitting a faster feed speed for a given quality of surface finish. 'Wadkin' can offer alternative spindle speeds up to a maximum of 15000 rpm. This highest spindle speed, achieved with very high precision, lubricated for life bearings, permits a 2½ × (250%) increase in output without jointing.

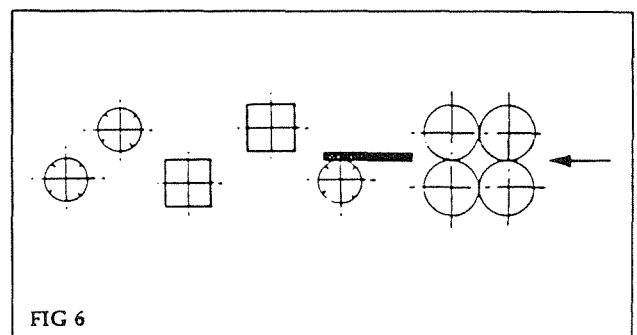
Typical surface finish pitch values for different applications are listed:

|                |               |
|----------------|---------------|
| Sawmilling     | 1.5 to 2.5 mm |
| Joinery        | 1.5 to 2 mm   |
| Strip moulding | 1.3 to 2.0 mm |
| Furniture      | 1 to 1.5 mm   |

### Machine Feed Systems

#### Push Feed (Fig 6)

This original method of feeding a planing and moulding machine is still provided, and consists of two top driven and two opposed bottom driven feed rolls at the infeed end of the machine. An idle roller and pad pressures between the cutterheads controls the timber down to the bed and across to the fence as it passes through the machine. It follows that if bowed or twisted stock is fed to the cutters, that while a perfect profile will be produced, the component will be as twisted or bowed as it entered.

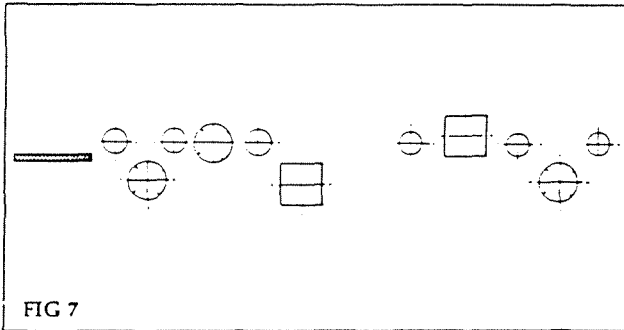


The pushfeed machine has the disadvantage that the last piece of timber is always left in the machine; traction stops as the trailing end leaves the feedworks. The last piece can only be retrieved by following with a scrap length or by reverse feeding, in which case the component is unfinished.

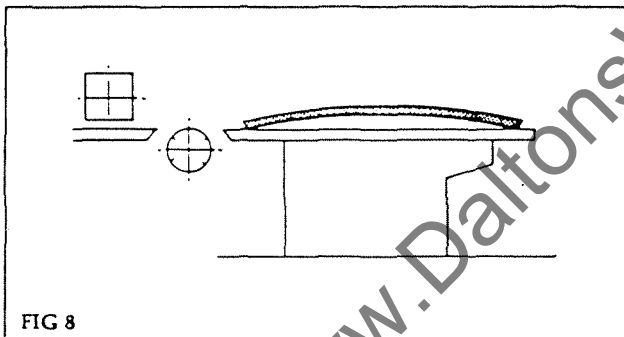
*Through feed (Fig. 7)*

Through feed was developed to overcome the handicap of the last piece remaining in cut, and to eliminate the heavy top and side pressures.

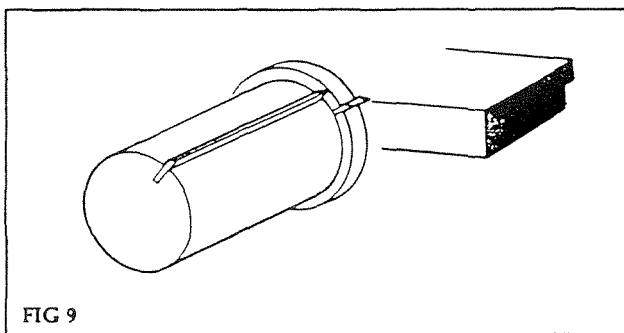
Drive rolls between each cutterhead feed the components through the machine.



A long infeed table before the first bottom head, together with the much lighter loading on the timber, enables straightening of the component i.e. the underside being straightened (surfaced) at the first bottom head, and the edge (fence side) being straightened at the first side head (see Fig 8).



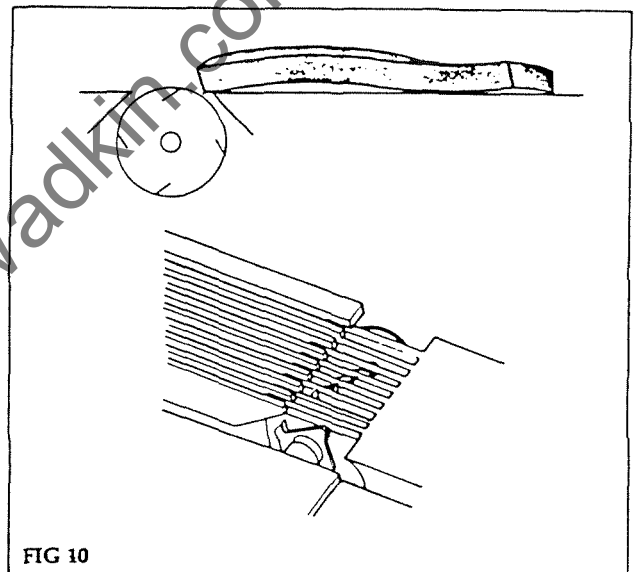
An alternative method of straightening combines underside and fence side straightening, using a single cutterblock, planing the underside in the normal way and machining a reference edge with a rebating disc on the same block (see Fig 9).



The above straightening techniques are most successful on timber which is bowed and has square ends, typical of softwood. For timber which is twisted and has out-of-square ends, typical of some hardwoods, an alternative technique is provided.

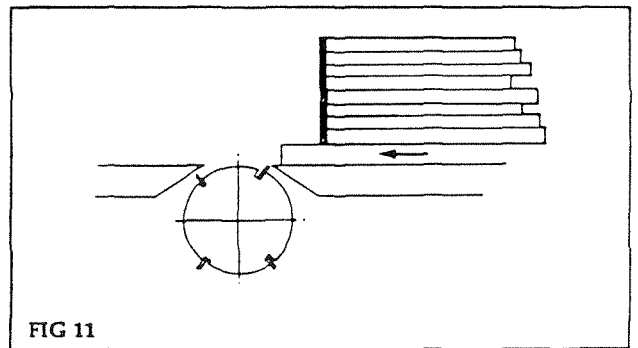
*Grooved bed straightening (Fig 10)*

In this design, grooving cutters on the first bottom head permit support in the form of rails right through the cut, thus preventing 'dipping in' of the twisted timber, or 'buckling' as out-of-square ends come into contact with each other. The grooves on the underside are subsequently machined out on a second bottom head, which is obligatory. Fitting a standard lip plate and cutterblock converts the machine to conventional use.



*Hopper Feeding (Fig 11)*

To enable the operator to feed timber at relatively fast feed speeds and still maintain butt up, (this may be difficult on short lengths), various types of hopper feed are available.



Components are stacked in a hopper at the infeed end of the machine and automatically fed one at a time from the bottom of the stack at a rate to ensure 'butt-up'. A slipping device prevents the hopper feed trying to overdrive the machine feed.

Feeding at very high feed speeds, typically on flooring, cladding etc, also presents problems to the operator, again a special feeding device. (Fast feed table, Fig 12) can be provided.

The fast feed table, in line with the machine feed, receives timber from a tilt hoist and cross chains, the driven rollers in the fast feed table and an overhead hydraulically driven nip roll ensure butt up before entry into the machine feedworks, a slipping arrangement prevents overdriving.

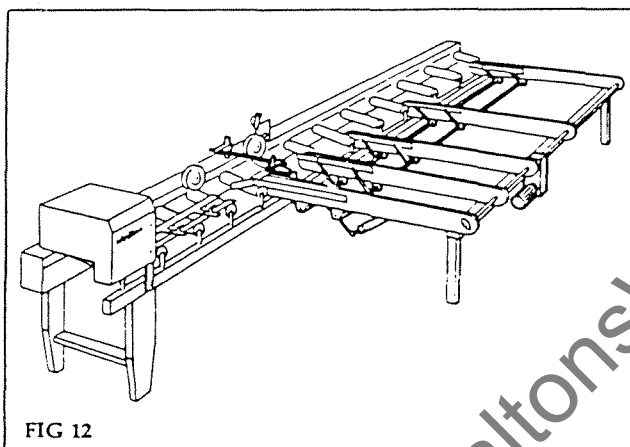


FIG 12

#### Outfeed Equipment

Generally used on high feed speed machines, this equipment can be provided at the outfeed end of 'Wadkin' moulders to transfer to another process, ie: stack, bundle, wrap, count, etc. Outfeed equipment can be provided and programmed to print on each component some identifying information. eg. Job No. Date, etc. Combinations of these facilities enable the finished components to be presented in a variety of ways at the outfeed end of the machine.

#### Extra Head Positions

Typically a planing and moulding machine has four heads to machine all four faces, these can be augmented with the addition of other heads. The most common is a second bottom head to ensure clean up on the underside. Where the amount of timber to be removed is great, or where the mould detail is complex, it

may be necessary to provide extra top side or bottom heads. These are available on both push and through feed machines.

#### Splitting (Fig 13)

Splitting is a common operation, usually done on the last bottom head, and often requiring very large horse powers. Such a head is available and may be fitted with anti kick-back fingers to prevent ejection towards the operator.

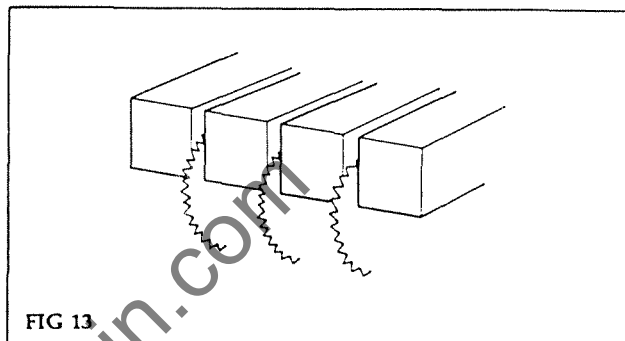


FIG 13

#### Universal Head

A universal head, either three or four position (always last head on the machine) can be provided to order, or the machine prepared to fit the head at a later date. The three position head may be used as a top head, bottom head or near side head and at any angular position in between. The four position head has the added capability of use as a fence side head.

The universal head gives greater flexibility for splitting and moulding on a conventional machine, and special pressures, chipbreakers, etc. can be provided to ensure perfect control of the workpiece.

#### Dial-a-Size Positioning (Fig 14)

On machines which are used for a large variety of small quantity batches of square dressed

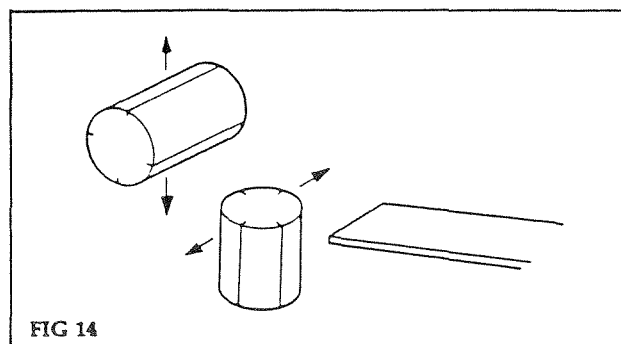


FIG 14

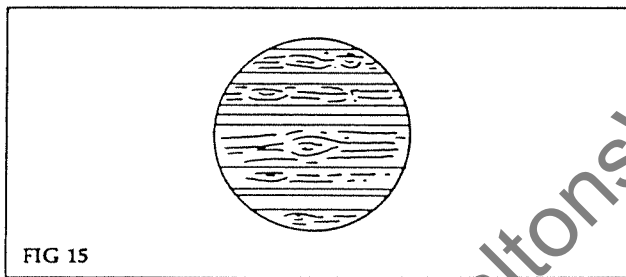


material, the set up time can be reduced by fitting Dial-a-size positioning (see Fig 17 in Operating Instructions).

The near side head horizontal adjustment is motorised and fitted with an encoder, the motorised vertical movement of the top head and feed is also fitted with an encoder.

A programmable memory stores the widths and thicknesses of the workpieces to be produced, and on command the two heads are repositioned to the preset dimensions. In a similar manner, where components of random width are machined (eg. Table tops, see Fig 15). The machine can be arranged to sense the width of the incoming pieces and automatically move the outside head to the required position.

Whilst being a slow operation, (butt feeding is not possible and the feed speed is slow), the facility does have great advantage to some users.



#### Feed Enhancement

The 'Wadkin' push feed and through feed systems are the result of years of experience in the planing and moulding industry, and for the great majority of work are exemplary. However, the great variety of timbers available, and the different conditions in which they are presented to the machine is acknowledged in the various options available to enhance feeding and minimise bed wear.

#### Bed Lubrication

A lubricant is introduced to the surface of the machine bed, from a manual or auto pump; this reduces friction, improves feeding capability and reduces bed wear.

An alternative; of introducing air between the timber and the bed of the machine, can be provided for those machines that do not have a second bottom head to machine off the small amount of oil introduced to the underside of

the timber, or where the material being machined must not in any circumstances be contaminated with oil.

A hard chrome plated bed is also available. This is usually used on high feed speed machines or where particularly abrasive timber is being machined. The reduction in bed wear is very considerable, and feeding is improved because of the low coefficient of friction of chrome plating.

The top driven feed rolls of a through feed moulder are normally spring loaded down onto the workpiece. The required amount of load can vary with the nature of the work being run, although as a general rule it must be as light as practicable, and variation in rough timber thickness will of course increase the load as the feed rolls yield more. Adjustment of the loading is done at each individual roll.

Pneumatic loading can be provided; this has a number of advantages. The loading does not vary with any variation in lift, and the amount of loading can be changed more easily.

One regulator controls the loading to rolls before the top head, and the other regulator controls the rolls after the top head.

#### Noise



Planing and moulding machines, by virtue of the number of cutter heads and the speed of the heads, produce high noise levels, typically between 95dB and 115dB when cutting.

The woodworking machine regulations require that an operator is not to be subjected to noise levels above 90 dBA for 8 hours, some precautions are therefore required.

The manufacturers can supply (or give information about suppliers) a suitable sound enclosure. It is also possible with materials generally available in a sawmill, to make an enclosure on site. It should be noted however that even with a sound enclosure, under some circumstances, because of 'break out' (at say the infeed end), the noise level at the operating positions will be above 90 dBA.

For personal safety reasons the operator should wear ear defenders.

See **WARNINGS** in Operating Instructions before operating the machine.

## Common Operating Problems

When resolving problems, always work in a systematic logical sequence. Work from the infeed end of the machine through to the outfeed end, checking for faults in a progressive manner.

In this way faults will not be overlooked and remedial action can be taken where needed.

Set (spring loaded) top/side pad pressures with minimum amount of lift. Set side guides (not spring loaded) just up to timber ie: not clear, not trapping. When feeding wide pieces, on a through feed machine it is normally better to space feed rollers than have a solid bank (see Fig 9/2).

### **FAULT Timber stops in machine**

#### **Check**

Setting of cutterblocks to table and fences.  
Amount of pressure applied to feedrolls (pneumatic or spring).  
Sharpness of cutters.  
Yield of chipbreakers and pad pressures.  
Tightness of side guides onto timber.  
Oil level of bed lubrication pump (if fitted).  
Size of joint on cutting edges (if fitted).  
Position of feedrolls on workpiece.

### **FAULT Ripples appear on surface of workpiece**

#### **Check**

Setting of cutterblocks to table or fences.  
Pressure is applied to feedrolls (pneumatic or spring)  
Sharpness of cutters.  
Chipbreakers are set correctly and have sufficient pressure to control timber.  
All locks are applied.  
All pressure pads are in contact with timber.  
Spindle speed (if two speed spindle fitted)  
Tooling is suitable for the work.

### **FAULT Bumps on infeed or outfeed end of workpieces**

#### **Check**

Setting of cutterblocks to table and fences.  
Sharpness of cutters.  
Chipbreakers are set correctly and have sufficient pressure to control timber.  
All locks are applied.  
All pressure pads are in contact with timber.  
Position of side and top pressure rollers.  
Bed and fences for build up of resin or chips.

### **FAULT Machine will not straighten timber**

#### **Check**

Setting of cutterblocks to table and fences (accurate setting of knife edge to table/fence is critical to obtain perfect straightening).  
Sharpness of cutters.  
Feed rollers and top/side pressures should not be used before the first bottom head.  
Is the amount of cut set at the infeed fence and table adequate for the amount of bow in the timber?  
Is the timber to be straightened a stable section?  
Is the workpiece within the length of the straightening table and fence?



**FAULT** Timber runs away from fence

**Check**

Position of side pressure roller before first bottom head (if fitted, and section being worked does not require straightening).  
Near side head chipbreaker is in contact with timber.  
Top idle roller pressures at side heads are parallel to fence.  
Side guides after fence sidehead are adjusted correctly.  
Mating faces of feed rolls and spacers are clean.

**Tooling**

Contrary to what would appear, it is not always wise to have the maximum number of knives in a cutterblock, particularly when running unjointed. eg: it is more expensive in horse power to run four knives than two.

When practicable, and heads are available, rough on one head and finish on another, or take part of a mould out on one head and the second part on another. Each subsequent joint on a knife increases the width of land. Overjointing (too wide a land) causes hammering, produces raised grain, and uses more power.

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## LEADING PARTICULARS

### Principal Dimensions and Capacities

|   |  |                          |
|---|--|--------------------------|
| Maximum size of timber admitted                           | 230mm X 130mm  |                          |
| Maximum size of finished work                             | 220mm X 120mm thick  |                          |
| Feed speed infinitely variable                            | 6.0 to 36 metres per min                                   |                          |
| Pressure adjustment of Feed Rolls                         | 6 bar (reduced)  |                          |
| Limit switch at the extremities of the Rise and Fall beam |  |                          |
| Feed Rolls  | 140mm dia. 2 X 20mm + 1 X 10mm wide rolls to each position |                          |
|   | STANDARD   | OPTION                   |
| Diameter of Cutter Spindles                               | 40mm   | 50mm or 1 13/16"         |
| Speed of Cutter Spindles                                  | 6000rpm  | 4500 to 9000 RPM         |
| Diameter of Cutterblocks                                  | 40mm spindle   | 50mm or 1 13/16" spindle |
| 1st Btm & unv min-max dia                                 | 125-180mm  | 140-180mm                |
| F.S & N.S.H " " "   | 125-205mm<br>(moulding)                                    | 140-205<br>(moulding)    |
| Top & 2nd Btm " " "                                       | 125-250mm<br>(saw)   | 140-250mm<br>(saw)       |
| Maximum straightening                                     | 10mm   |                          |
| Maximum cut of First Bottom - Horizontal head             | 10mm   |                          |
| Maximum cut of Fence Side - Vertical head                 | 10mm   |                          |
| Length of Infeed straightening - table                    | 2M or 2.5M   |                          |
| <b>Output of Motors</b>                                   |  |                          |
| Feed motor  | 11KW (15hp)  |                          |
| Rise and Fall motor                                       | 1.1KW (1 1/2hp)  |                          |
| <b>Spindle Motors</b>                                     |  |                          |
| Standard all heads  | 4KW (5 1/2hp)  |                          |
| Option all heads  | 5.5KW, 7.5KW, 11KW   |                          |
| Option to top and 2nd bottom heads                        | 15KW, 18.75KW  |                          |
| Option to universal head                                  | 5.5KW (7.5hp), 7.5KW (10hp), 11KW (15hp)                   |                          |

## SECTION 2 INSTALLATION

### LIFTING AND TRANSPORTATION

#### Unloading

Verify the weight of the machine (see **Installation Data**). Ensure that all lifting equipment used is capable of lifting this weight as a minimum.

To lift the machine, place two 45mm diameter steel rods 1.2 metres long in the holes provided in the machine body

Carefully place two short slings of suitable capacity on the crane hook. Keep these as wide apart as possible by inserting wooden chocks between the machine body and the slings to avoid damage. Locate the slings securely on the steel rods.

#### Moving

In the process of moving, avoid jolting or vibrating the machine. If the ground is flat the machine can be positioned on wooden plinths and moved by rollers instead of lifting.

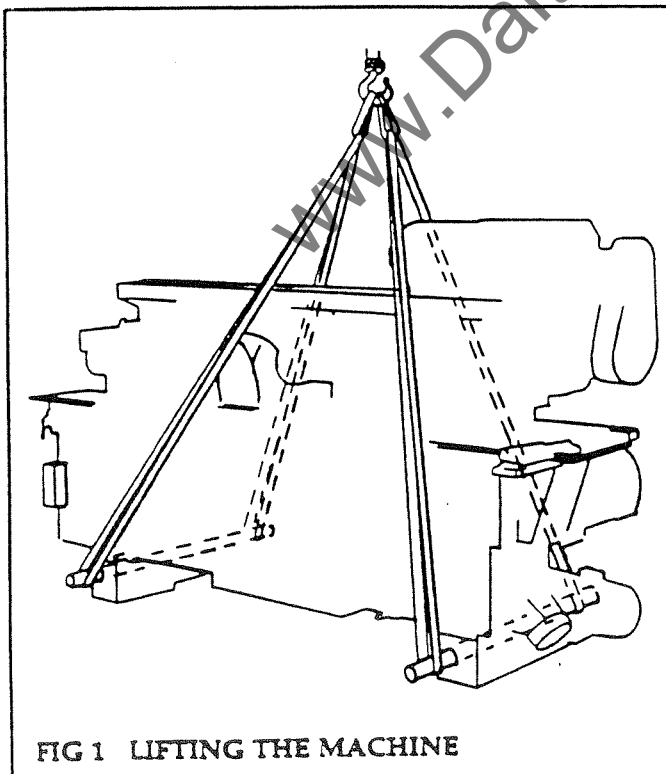


FIG 1 LIFTING THE MACHINE

**IMPORTANT:** When lifting, the machine has a tendency to tilt backwards (towards the electric motors and the motor mounting brackets). Allowance should be made for this in positioning.

#### Unpacking

Undo the packing and make sure that damage has not occurred during transit; undo the case of accessories and ascertain that the machine is complete with all fittings.

#### Cleaning

Before levelling the machine, carefully remove the anti-rust material particularly from the bright parts.

Clean the machine with paraffin or diesel and a soft rag. Do not use a substitute - it may precipitate an explosion.



## INSTALLATION DATA

### Major Dimensions and Weight

#### *Overall Dimensions and Weights:*

Due to the variety of machine layouts available, it is impossible to give specific details of each machine and the user is referred to Wadkin for this information.

### Location and Foundations

To obtain the best results from the 'Wadkin' woodworking machine it is important that the floor on which the machine is to stand has been prepared and is dry. Level the machine from the middle of the bed between the adjustable screw supports by the use of a spirit level. Place the steel plates supplied with the machine under the adjustable levelling screws.

#### *Suggested levelling aids:*

Straightedge 2 metres long  
Feelers (thickness gauges), 0.50, 0.10, 0.15 and 0.2mm  
Engineer's spirit level

#### *Levelling longitudinally*

Place the spirit level on the table and moving the level lengthwise check any variation. Adjust machine level by use of the adjustment screws in the feet of the machine. Deviation should not be more than 0.2mm.

The straightening table (ie: table before the First Bottom Head), should be in line with the table after the First Bottom Head. Maximum tolerance is 0.1mm in 1600mm.

#### *Levelling transversely*

Place the spirit level across the table at right angles to the fence and repeat this action at intervals of 800mm. Total variation at each position should not exceed 0.1mm.

#### *The foundations*

The size of the foundations depends upon the specific machine model, format of the heads

and disposition of the exhaust outlets and will be provided for individual machines.

If the floor consists of 100mm-150mm (4 to 6 inches) solid concrete, no special foundation is necessary. M12 'HILTI' type holding down bolts (not supplied with the machine) can be used to secure the machine to the floor.

**NOTE: THE MACHINE MUST BE BOLTED DOWN BEFORE USE**

See Foundation Plan for details of floor area required.

### Supplies and Services

#### *Electrical Supply*

The customer is responsible for an adequate electrical supply. Details of power requirements are provided with the machine.

The machine is delivered with its complete electrical equipment ready for connection.

The electrical connection and schematic diagram are found in the electrical control cubicle of the machine. All that is required is to connect the power supply to the disconnect (Isolator) switch at the electrical control cubicle or panel.

### POINTS TO NOTE WHEN CONNECTING THE POWER SUPPLY

Check the voltage, phase and frequency correspond with those on the machine nameplate details.

Check the main fuses are of the correct capacity in accordance with the machine nameplate details.

Connect the incoming supply leads to the appropriate terminals.

Check all connections are sound and that equipment is earthed.

Check the spindle rotation is correct. When looking from the front of the machine the feed rolls should rotate in a clockwise direction. To reverse the rotation on any drive, reverse any two of the line lead connections at the incoming supply.

**IMPORTANT: ANY ELECTRICAL MODIFICATIONS SHOULD BE CARRIED OUT BY A COMPETANT ELECTRICIAN.**

*Pneumatic pressure equipment (where fitted).*

Where the machine is equipped with pneumatic pressure operated feedrolls, the number of connections are shown on the pneumatic circuit diagram and foundation plan. To make the system operative connect up the air pipes and fittings to a suitable air supply.

The size of the air inlet connection is 1/4in. BSP female.

The size of the air pipe is 8mm O.D. x 5mm I.D.

Pressure required is 6 bar (approx. 90 psi), see **Operating Instructions** for feedroll pressures.

The air consumption is approximately 200 cu.dm/hr (7cu.feet/hr).

*Exhaust (Dust Extraction) Connections*

The size of the connections are given on the Foundation and Dust Extraction Plan.

The part of the air extraction pipe fitted to the exhaust hood should be flexible and detachable. The length of the flexible part is dependant on the way the pipe is used and the adjustment required on the work spindle. As a guide use a flexible pipe one metre long for the lower and fence side spindles and two metres for the top and near side spindles.

The flow of air to the exhaust hoods should be approximately 25 to 30 metres per second.

*Volume of Air Required*

|                                      |  |
|--------------------------------------|--|
| For Bottom Fence and Near side heads | 27-30 cu. metres/min. (953-1053 cu.ft/min)   |
| For Top heads                        | 37-40 cu. metres/min. (1305-1411 cu.ft/min.) |
| For Universal Spindle                | 17-20 cu. metres/min. (600-700 cu.ft/min.)   |

The total volume of air required for the Dust Extraction is directly related to the total number of spindles.

*Schematic Diagram for Electrical Services*

The electrical wiring and schematic diagram will be in the electrical control cubicle of the machine.

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## SECTION 3 OPERATING INSTRUCTIONS

### GENERAL INFORMATION

#### Safety

The safe operation of woodworking machinery requires constant alertness and close attention to the work in hand.

**Read this instruction manual, the Preface, and the Safety Notes carefully before operating the machine.**

Blunt cutters often contribute to accidents. An efficient machinist knows when sharpening is necessary, but if there is reluctance to spend time on grinding and resetting, the cutters may run beyond their efficient limits and instead of cutting efficiently and smoothly they will tend to chop and snatch at the workpiece. This not only increases the risk of accidents but also lowers the quality of work.

Customers are strongly advised at all times to use high tensile cutterblock bolts which should be tensioned by means of a torque spanner. When choosing cutterblocks ensure they are suitable for the minimum cutting speed of the machine.

It is recommended that personnel involved with the machine are acquainted with the Woodworking Machines Regulations 1974 and also Booklet No. 41 'Safety in the use of woodworking machines', issued by the Department of Employment and available from Her Majesty's Stationery Office. Also BSI Code of Practice 'Safeguarding Woodworking Machines' Part 1 BS 6854.

#### Safety Devices

The safety covers and dust hoods must be closed during the time the machine is running. Cover the non-used part of the cutterblocks with the guards provided.

Only remove the feed roller guard when changing rollers and with spindles switched off at the control panel.

Spindles which are run in two directions (ie:

Universal Head), should be fitted with a locking collar to prevent unforeseen unlocking on mode changeover.

Do not work spindles if the spindle nuts or intermediate collars are not securely tightened.

Only remove the cover of the drive belt housing when changing or retensioning belts. The drive spindle must be stationary before making any adjustments.

#### WARNINGS

##### Notice to Operators

Read and follow the guidelines given in **Safeguarding Machines** and **Safety Notes** which are repeated on the front of the machine.

##### Before operating the machine

Ensure that all guards and fences are securely fitted and correctly adjusted. Guards and other safety devices are NOT to be removed while the machine is in operation. They are there for **YOUR SAFETY**.

Ensure cutters/blades are the correct type and rotate in correct direction of cut, are sharp and securely fastened.

Cutter equipment is suitable for machine spindle speed.

Remove or fasten loose clothing; confine long hair and remove jewellery, etc.

Ensure sufficient working space is provided and that lighting is adequate.

Switch on all dust extraction equipment, ensure it is working correctly.



### During machining

Wear suitable protective equipment, e.g. goggles, ear defenders, dust mask.

Stop the machine before making adjustments or cleaning woodchips from the work area.

Keep the floor area around the machine clean and free from wood refuse.

Do not allow the floor to become slippery with oil or grease.

Report any machine malfunction or operator hazard to a person in authority immediately. Do not attempt to repair the machine unless qualified to do so.

Ensure all power sources are isolated before commencing any maintenance work.

Comply with the Woodworking Machines regulations. Failure to do so could result in legal proceedings.

### Machine Controls

Before starting the machine, operators should familiarise themselves with the various controls and their usage

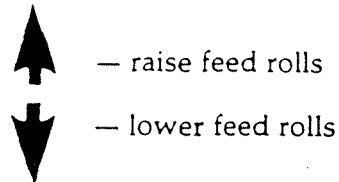
Check direction of spindle rotation, ensuring that the spindles rotate freely. Check each spindle motor separately.

Check the infeed table raise and lower operation.

The machine has continuous feedworks. When started, timber stock will be fed to the cutter heads until the pass is completed or the machine is stopped. The feed speed is variable and can be adjusted by a handwheel at the drive gearbox to give speeds throughout the machine range. **Only adjust the variable speed drive while in motion.**

The feed rolls have serrated teeth up to the top cutter head after which they are rubber covered. The serrated rolls need to be adjusted to 3mm lower than the thinnest workpiece; the rubber covered rolls should be adjusted to 1mm lower than the workpiece.

The height of the feed roll adjustment is indicated by the graduated scale on the vertical pillar adjacent to the feed table. Adjustment of the feed rolls is made by pressing the pushbuttons marked:



The pushbuttons are positioned on the Electrical Control Panel located at the infeed end of the machine and also at the control station located at the outfeed end of the machine.

The adjustment for height of the rubber covered (plain) rolls may be made independently to suit the finished workpiece.

The panel mounted control station at the infeed end of the machine contains the following features:

- START-STOP Pushbutton; with indicator light, for each spindle.
- START-STOP Feed Pushbutton; with indicator light.
- FORWARD-REVERSE (Inch) Feed Pushbuttons.
- RAISE-LOWER Pushbuttons; for beam adjustment.
- MASTER STOP (Emergency) Button.
- REVERSING switch; for Universal head operation

## MOUNTING THE CUTTERBLOCKS

### General

The XJ machine can be fitted with plain bore or Hydorgrip (hydraulic pressure) cutterblocks. Hydrogrip cutterblocks are used to provide an improved surface finish and allow higher feed speeds to be used. The method of fitting the two types differs.

When changing cutterblocks, be aware that the spindles for plain bore blocks have right or left hand threads, dependent on spindle location, and tighten accordingly.

The spindles are threaded as follows:

**Bottom Horizontal spindles - left hand thread. Near Side Vertical spindle - left hand thread**

**Top Horizontal spindles - right hand thread. Fence Side Vertical spindle - right hand thread.**

The Hydrogrip blocks are not screw fitting and require to be pressurised in position on the spindle. To protect the Hydrogrip cutterblock and the machine spindle in the event of hydraulic failure, it is necessary for safety drive collars to be used.

The consequence of not using the safety drive collars will result in the cutterblock seizing on the machine spindle in the event of either; The operator neglecting to pressurise the cutterblock and then running the spindle, or the Hydrogrip cutterblock sleeve losing pressure.

If a seizure occurs, the spindle and cutterblock must be returned to Wadkin for repair. An appropriate charge will be made for this service.

Two types of safety collar are used. These are a threaded safety collar; for use when full length tooling is in use on the machine spindle. A plain safety collar; for use when short length tooling is used on the machine spindle.

Outboard bearings are fitted to the horizontal spindles to give greater rigidity to the cutterblock; these support each spindle at its outer position.

The outboard bearing support bracket on the bottom heads is attached and locked to the support plate manually. The top heads are hydraulically locked from the control panel or side locks and are interlocked to the powered rise and fall of the spindle to ensure the plate is free to move with the spindle. The bearing plate locks must be released before making adjustments and once released the power can be isolated before commencing to change/alter cutterblocks.

The outboard bearings must be de-pressurised before removal or making lateral (horizontal) adjustments to the **bottom heads**.

### To change cutterblocks

The method of changing cutterblocks depends on the type fitted and it will be first necessary to remove any outboard bearing, locking collar, spindle nut, any spacers fitted, as applicable. Isolate machine from power source.

### Plain bore type cutterblocks

To remove cutterblocks:

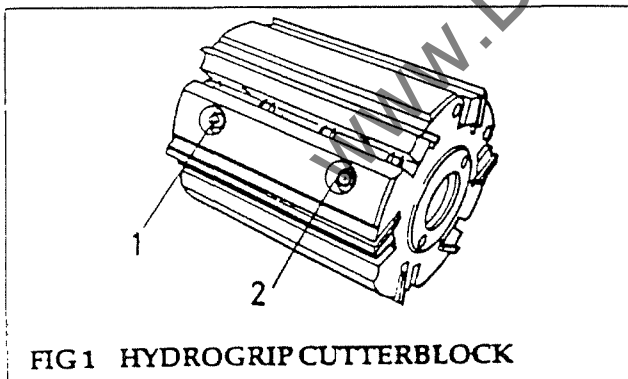
- (1) Unscrew the cutterblock nut from the spindle with the spanner/s provided. Can be right or left-hand thread (see General)
  - a. Place the spanner/s on the hexagon of the spindle and the two flat faces of the cutterblock locknut, or;
  - b. Hold the spanner (top) securing the spindle firmly in position and unscrew the cutterblock locknut from the spindle with the bottom spanner.

**NOTE:** DO NOT use any form of percussion tool or damage to spindle bearings can result. DO NOT use a box or extension spanner.

### Hydrogrip cutterblocks (fig 1)

To remove cutterblocks:

- (1) After removal of the outboard bearing release locking screw on safety collar (fig 2) and remove from spindle.



- (2) De-pressurise the hydrogrip cutterblock by turning the pressure release screw (2), located in a recess on the barrel of the cutterblock one quarter turn to release, using a 3mm A/F hexagon key.
- (3) Slide the cutterblock from the spindle.

- (4) Always leave the pressure release screw (2) undone when the cutterblock is not in use to avoid distortion to the cutterblock due to the variation in room temperatures.

To replace both types of cutterblock:

- (1) Carefully clean spindles, cutterblocks, spacers and collars before fitting new cutterblocks.
- (2) Carefully place the cutterblock on the spindle. After fitting the cutterblock, replace the outboard bearing assembly and pressurise the bearing to 500bar hydraulically. On the hydrogrip blocks tighten pressure release screw (2), and pressurise the cutterblock by applying hydraulic pressure to the pressure nipple (1) located in a recess located on the barrel of the block (see fig 1).
- (3) Fit safety collar (see fig 2) and tighten securing screw.
- (4) On plain bore cutterblocks. Tighten the block to the spindle with the spanner/s provided.
- (5) Turn the spindle slowly to ensure the cutterblock is free and replace cover.
- (6) Operate the spindle for a short period to ensure it rotates freely and without vibration.

### CAUTION

Take care not to allow the cutterblock to fall onto the spindle shoulder while fitting. This can cause damage to spindle bearings and subsequent vibration and is especially applicable to vertical spindles.

Safety Collars (fig 2)

Fitting procedure:

A. Threaded collar

- (1) Mount the cutterblock onto the machine spindle. Make sure the cutterblock fits up to the shoulder on the spindle.
- (2) Pressurise cutterblock to the correct working pressure.
- (3) Unscrew the pins in the threaded safety collar to the fullest extent, using the knurled heads.
- (4) Screw the collar onto the spindle, finger tight, against the end face of the cutterblock.
- (5) Reverse the collar on the threads, sufficient to allow the pins to be brought into line with corresponding holes in the end face of the cutterblock.
- (6) When in line, screw the pins into position, locating into the holes of the cutterblock.

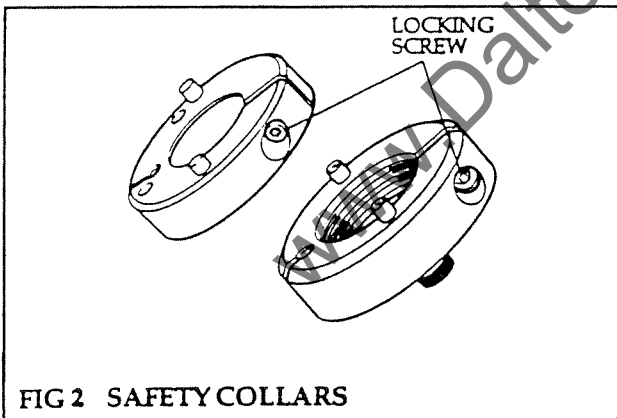


FIG 2 SAFETY COLLARS

- (7) Tighten the capscrew in the collar, using an Allen Key. This causes the collar to grip the threads on the spindle.
- (8) The collar will now maintain the drive to the cutterblock in the event of de-pressurisation.

To release; reverse the procedure.  
B. Plain collar

- (1) Mount the cutterblock onto the machine spindle, making sure it fits up to the spindle shoulder. Pressurise cutterblock to the correct working pressure.
- (2) Slide the collar with its pins facing the cutterblock along the machine spindle up to the cutterblock. Locate the pins in to the corresponding holes in the block.
- (3) Tighten up the cap screw in the collar, using an Allen Key. This causes the collar to grip the spindle.
- (4) The collar will now maintain the drive to the cutterblock in the event of depressurisation.

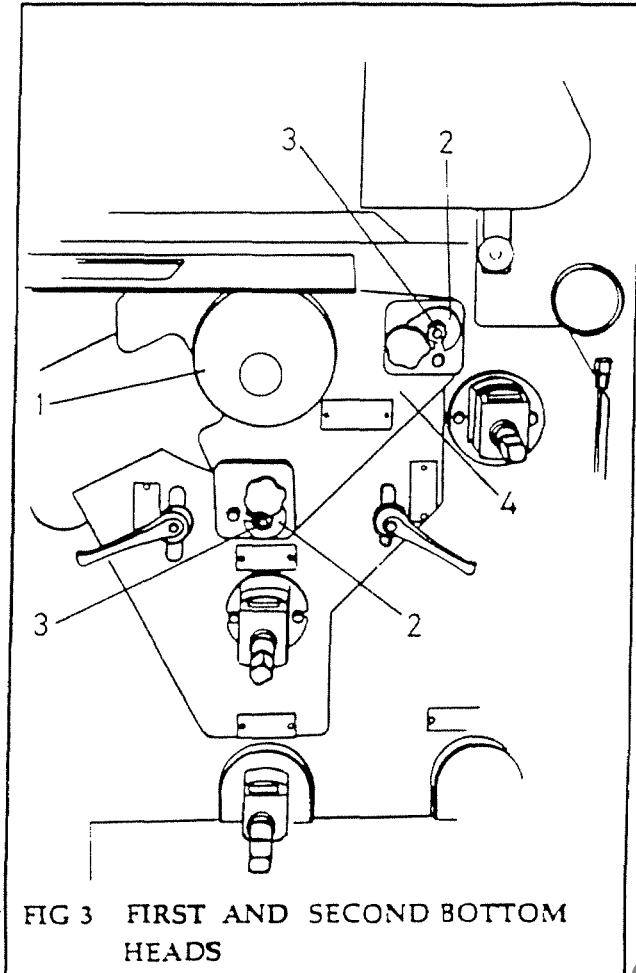
To release; reverse the procedure.

FIRST AND SECOND BOTTOM HEAD (Fig. 3)

- (1) Remove outboard bearing cover (1).
- (2) Depressurise the outboard bearing by turning the pressure release valve one quarter of a turn using a 3mm Allen Key.
- (3) Slacken off the two 12mm collar nuts (3), swing captive 'c' washers (2) clear and remove outboard bearing housing (4).

Note: This housing is spigoted and must be pulled horizontally.

- (4) Remove and replace new cutterblock as described in General section.
- (5) Replace bearing housing (4) and re-tighten captive 'c' washer (2) and collar nuts. Tighten pressure release valve and pressurise bearing to 500 bar (7250 p.s.i) by application of hydraulic pressure to the nipple in the recess on the face of the bearing. Replace outboard bearing cover.



- (3) Slacken off the two 12mm collar nuts (3), swing captive 'c' washers (4) clear and remove outboard bearing housing (5)

Note: This housing is spigoted and must be pulled horizontally.

- (4) Remove and replace new cutterblock as described in General section.
- (5) Replace bearing housing (5) and re-tighten captive 'c' washer (4) and collar nuts. Tighten pressure release valve and pressurise bearing to 500 bar (7250 p.s.i) by application of hydraulic pressure to the nipple in the recess on the face of the bearing. Replace outboard bearing cover.

#### SIDE HEADS

- (1) Remove covers, guards and extraction ducts as required to allow easy unimpeded access to cutterblock.
- (2) Remove and replace new cutterblocks as described in General section.
- (3) Replace guards ETC.

#### TOP HEADS (fig4)

- (1) Slacken off shoulder screws (1) and remove outboard bearing cover (2).
- (2) Depressurise the outboard bearing by turning the pressure release valve one quarter of a turn using a 3mm Allen Key.

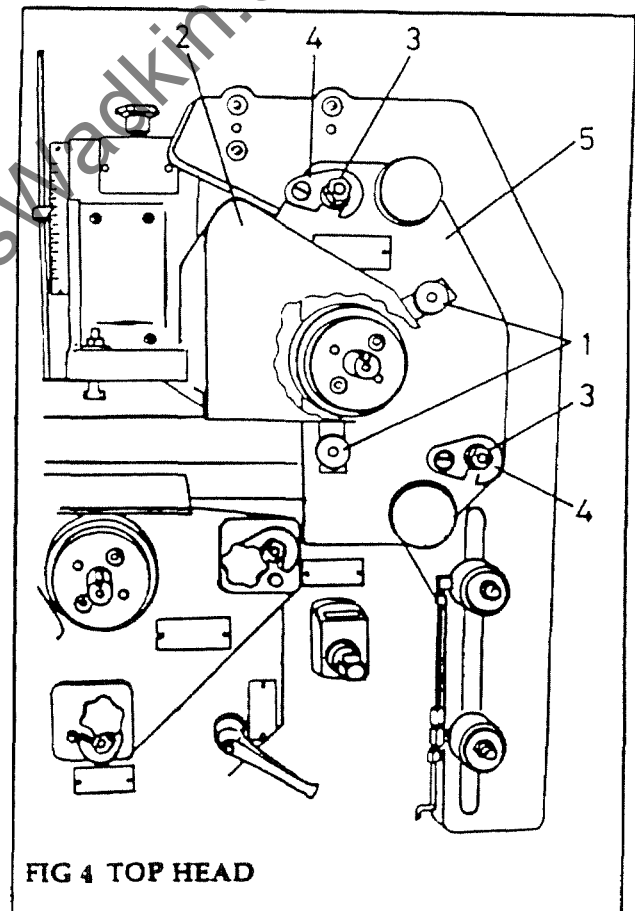


FIG 4 TOP HEAD

**UNIVERSAL HEAD (fig 5) - if fitted**

- (1) Remove guard for access, remove existing cutterblock as follows:
  - a. Release cutterblock (1) using the combination spanner provided on the spindle hexagon (2) and the two flat faces of the cutterblock locknut (3).
  - b. Withdraw cutterblock from spindle.
- (2) Check that the spindle flange and the flange end of the replacement cutterblock are clean.
- (3) Slide the new cutterblock (1) onto the spindle (4) and tighten using the combination spanner provided.

**NOTE:** Do not use excess force

- (4) Check direction of cut. Ensure the locking collar (3) is fitted.

**WARNING**

As the universal head can be run in the reverse direction of rotation, depending on position, it is essential the locking collar is always fitted.

**NOTE:** In the bottom head position always change the cutterblock from the rear of the machine. However, in the vertical mode it is possible to change the cutterblock from the nearside, using a similar procedure. (See fig 21 for Universal head modes). Fig 5 shows the head in the near side vertical (angled or canted) mode.

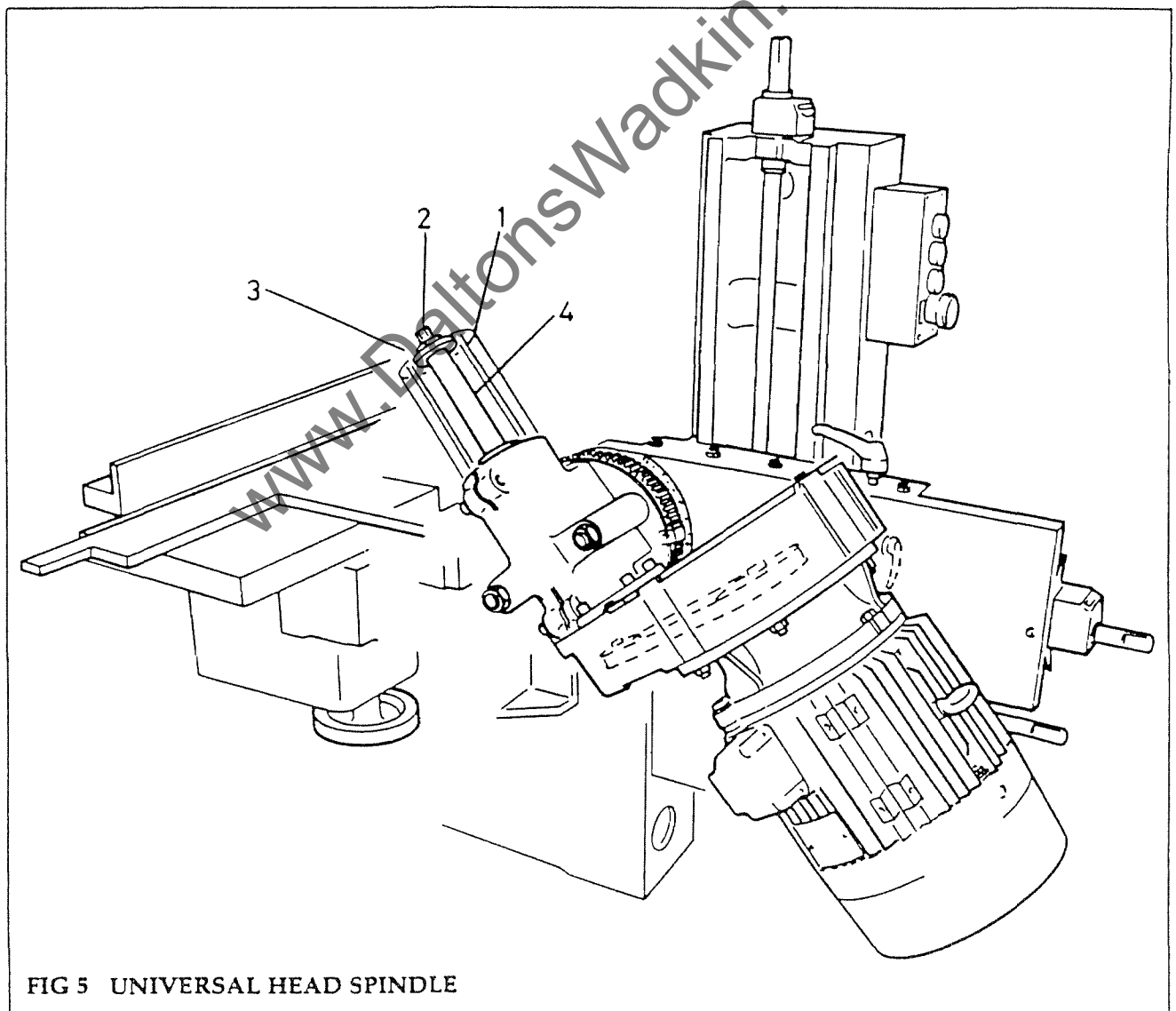


FIG 5 UNIVERSAL HEAD SPINDLE

## SETTING UP THE MACHINE

### GENERAL (Fig.1)

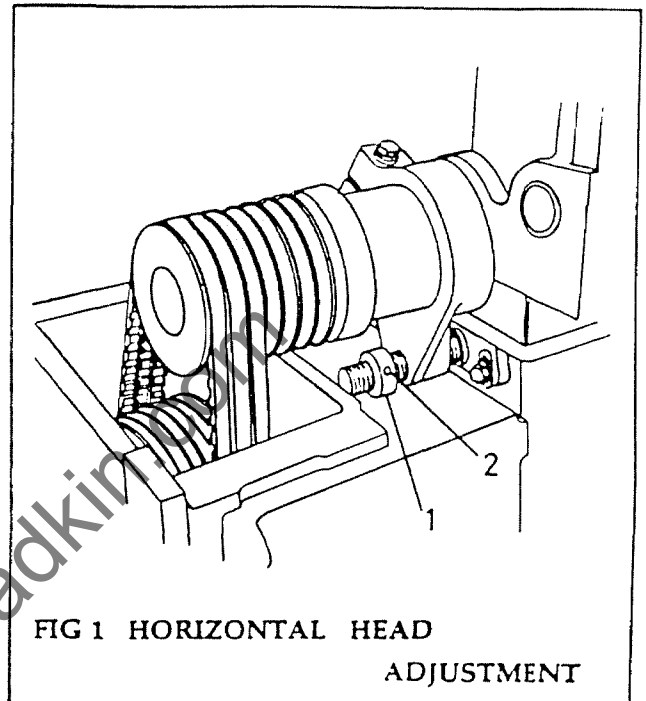
Due to modern machining techniques lateral adjustment to horizontal heads is not generally required and as such the motor and belts only move with the vertical spindles. A small amount of adjustment is catered for on the horizontal heads.

**NOTE:** The machine is factory set to give 12mm movement backwards from the datum face of the fence when it is set at ZERO.

If it should be necessary to obtain further lateral movement when at the maximum rearward position, it may be obtained by removing the pulley guard and then releasing the belt tension (Refer to Section 4 Scheduled Maintenance - V Belt Drive Tensioning). Move the belts onto the next vacant pulley groove to bring them back into line and then re-tension the belts.

Locking collars prevent the spindle movement exceeding the original factory set boundaries and therefore if the belts are repositioned, then the rear stop (1) must also be reset.

This may be done by slackening off the grub screw (2), moving the collar back a further 12mm and then retightening the grubscrew (2).



### First Bottom Head (Figs 2, 3.)

The spindle can be adjusted vertically and laterally (if fitted) from the front of the machine.

- (1) Remove guard for access.
- (2) Ensure the outfeed table is clean.
- (3) Place a straightedge on the outfeed table projecting over the bottom horizontal cutterblock (fig 2) The cutter blades should just touch the underside of the straightedge.
- (4) If necessary, reset the cutter height as follows: (Fig 3)

- a. Release locking handles(1) and adjust the cutterblock height by rotating the adjusting screw (2) clockwise to raise the spindle, or anti-clockwise to lower.

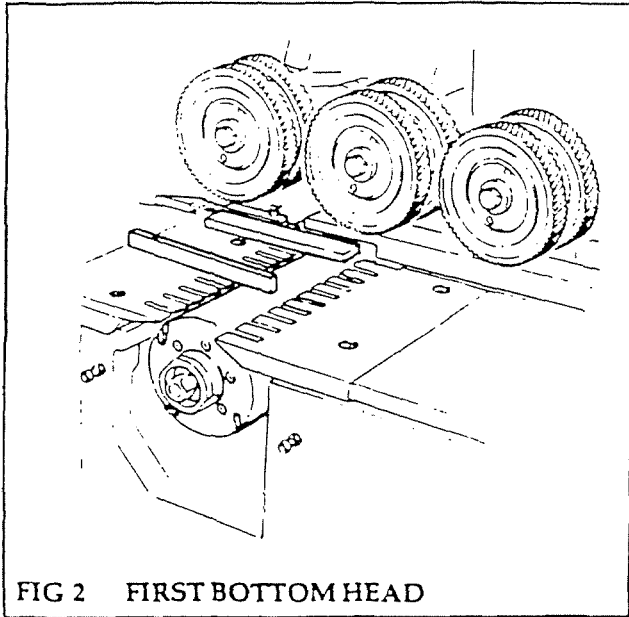
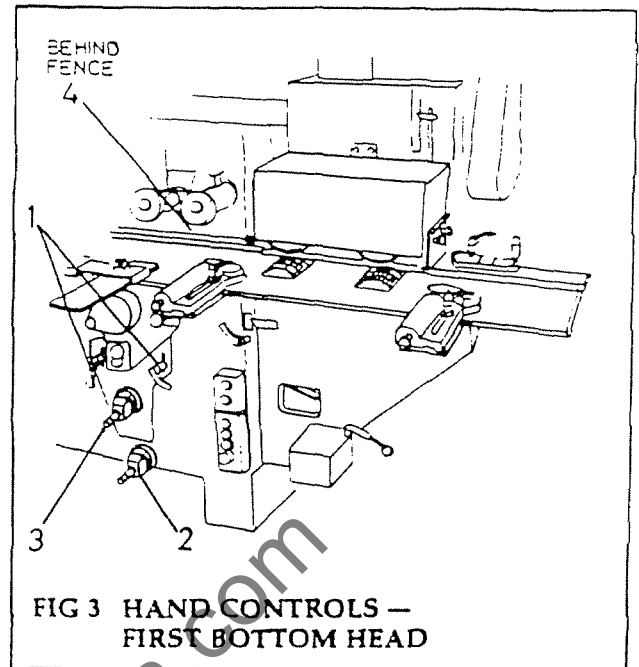


FIG 2 FIRST BOTTOM HEAD

FIG 3 HAND CONTROLS —  
FIRST BOTTOM HEAD

#### Fence Side Head (Fig 4, Fig 5)

- b. Refasten the locking handles(1).

**NOTE:** All adjusting screws are fitted with a square shaft extension. A winding handle is supplied to fit the extension.

- (5) Place a straightedge against the outfeed fence and check the fence and edge reference cutter are in line (if fitted), ie. just touching the straightedge, (fig 2). Adjust the fence. If necessary, adjust the cutter spindle laterally as follows.

- a. Release the spindle barrel lock (4) at the rear of the head. Depressurise the outboard bearing. Re-position the spindle using handscrew (3).
- b. Retighten the barrel lock (4) and re-pressurise outboard bearing.

- (1) Ensure that the machine bed is clean.
- (2) Set the fence guide (1) with a straightedge (2) against the fence guide and cutters (3) in a similar manner to that used for the First Bottom head. If necessary adjust the spindle laterally as follows:

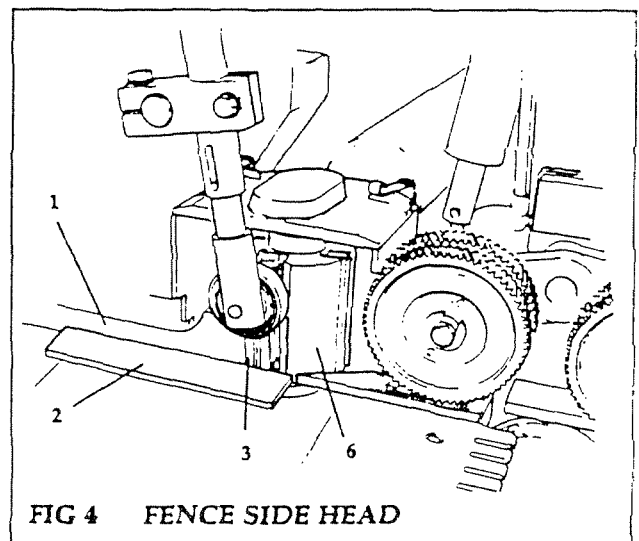


FIG 4 FENCE SIDE HEAD

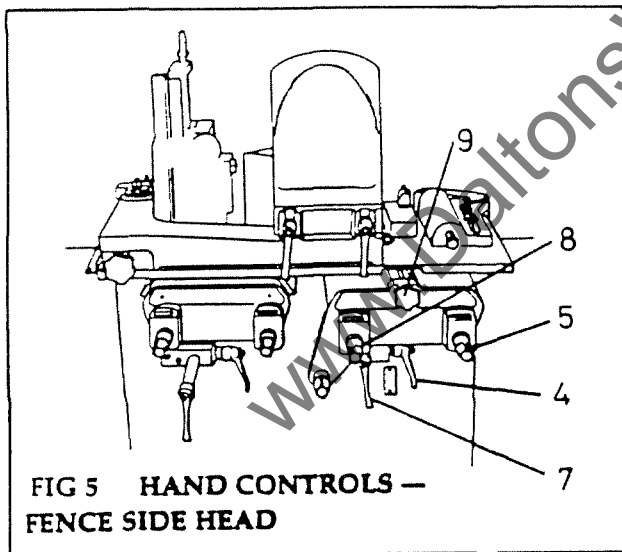


- a. Release the locking handle (4).
- b. Rotate the handscrew (5) clockwise to advance the spindle or anticlockwise to retract the spindle.
- c. Refasten the locking handle (4).

**NOTE:** Maximum lateral adjustment is 65mm.

(3) Set the axial position (height) of the cutterblock (6) as follows:

- a. Release the locking handle (4).
- b. Release the spindle clamp (7) and adjust cutter height by rotating the handscrew (8) anti-clockwise to lower or clockwise to raise the spindle.
- c. Refasten the spindle clamp (7)
- d. Refasten the locking handle (4)

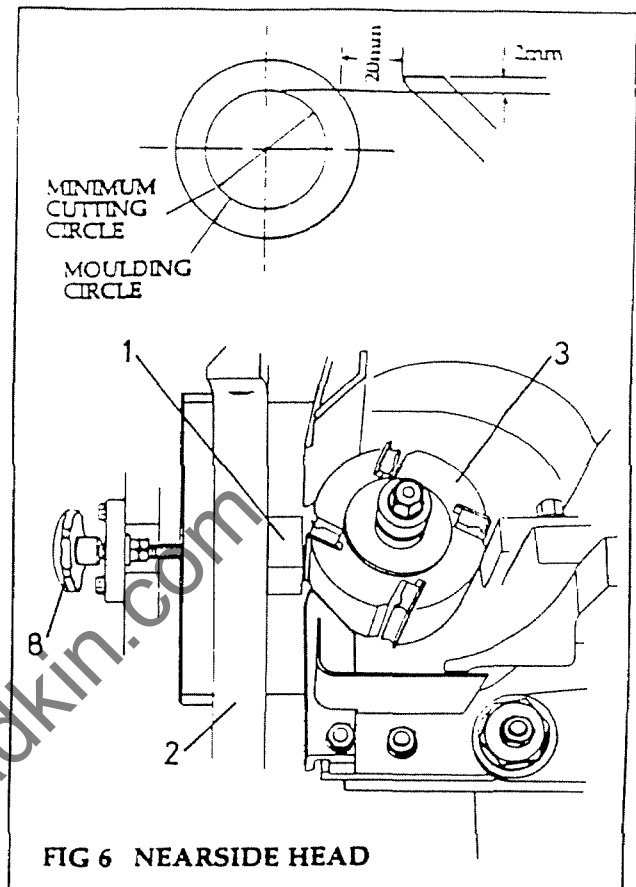


**FIG 5 HAND CONTROLS - FENCE SIDE HEAD**

(4) Set the sliding bedplate using adjusting knob (9) to within 5mm of the cutterblock.

**NEAR SIDE HEAD** (Fig 6, Fig 7)

(1) Ensure that the machine bed is clean.



**FIG 6 NEARSIDE HEAD**

(2) Check the digital readout (if fitted) using a datum block (1) of known width inserted between the fence guide (2) and cutterblock (3). The cutter blades should just touch the near side of the datum block. If necessary, reposition as follows:

- a. Release locking handle (5)
- b. Rotate handscrew (6) clockwise to advance the spindle or anti-clockwise to retract the spindle.
- c. Refasten locking handle (5)
- d. Reset digital readout, (where fitted) to the known dimension.

(3) Set the axial position (height) of the cutterblock (3) as follows:

- a. Release the locking handle (5)

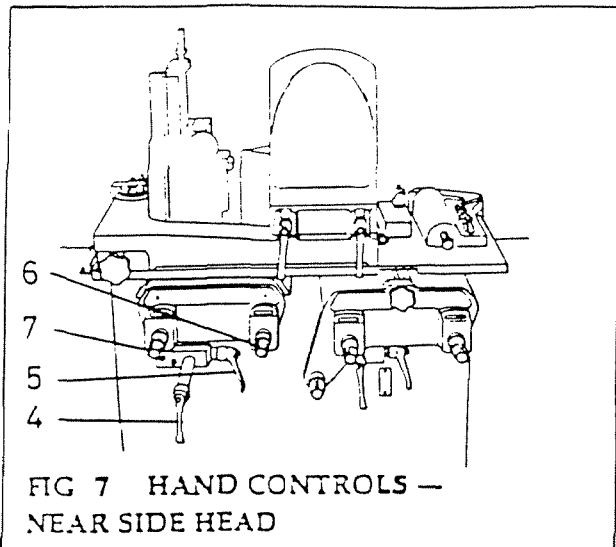


FIG 7 HAND CONTROLS -  
NEAR SIDE HEAD

- b. Release the spindle clamp (4) and adjust the cutter height by rotating the handscrew (7) anti-clockwise to lower the spindle or clockwise to raise the spindle.
  - c. Refasten the spindle clamp (4)
  - d. Refasten locking handle (5)
- (4) Set the sliding bedplate using adjusting knob (8) to within 5mm of the cutterblock.

#### NEAR SIDE HEAD CHIPBREAKER (Fig 8, Fig 9)

The relationship between the side pad pressure and chipbreaker is factory pre-set but may, if required, be adjusted as follows:

Slacken off lock nut (7) and turn screw (8) to adjust chipbreaker.

The spring tension for the chipbreaker may be varied by adjusting screw (9)

- (1) Set up as follows:
  - a. Remove dust/jointer hood (4)
  - b. Slacken off the two locking nuts (5)

- c. With a straightedge placed along the side pad pressure (1) after the near side head, position the whole radial chipbreaker unit by turning the hand wheel (2) such that the cutterblades just touch the straightedge. With this set the chipbreaker should be approximately 2mm nearer the fence than the side guide.

- (2) Tighten up locking nuts (5)
- (3) Slacken off the side pad pressure locking nut (3) and reposition the pad pressure laterally so the nose is approximately 5mm from the cutterblock.
- (4) Loosen the two nuts (6) holding the chipbreaker and reset this so that the nose is approximately 20mm from the cutterblock.
- (5) Tighten up nuts (6)

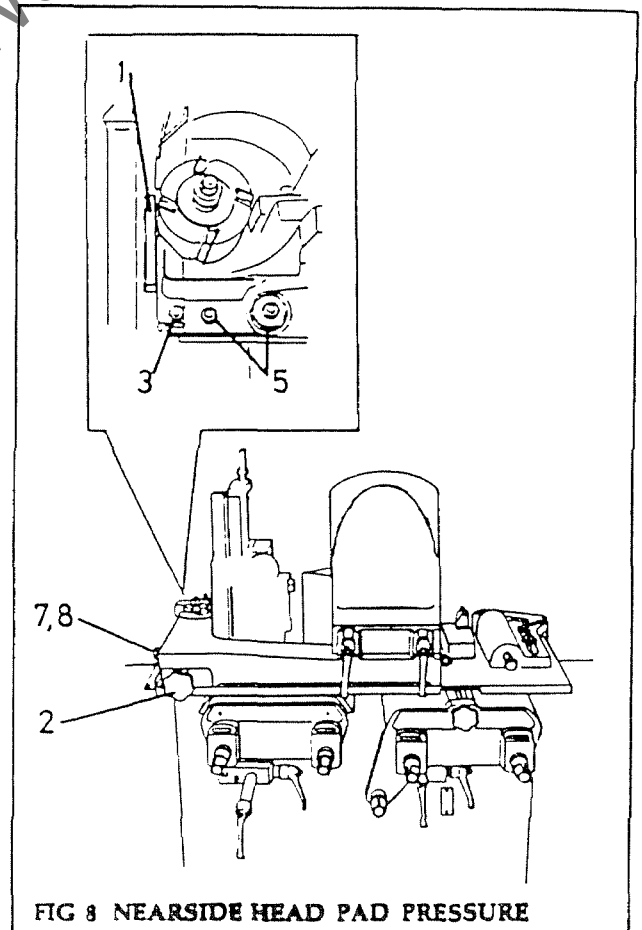
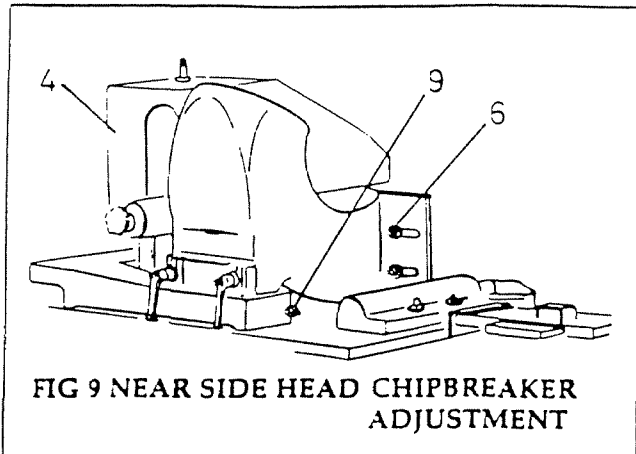


FIG 8 NEARSIDE HEAD PAD PRESSURE



- g. Refasten outboard bearing support locks
- (5) To electrically move top head with beam proceed as follows:

**TOP HEAD** (Fig 10, Fig 11)

To adjust the spindle horizontally

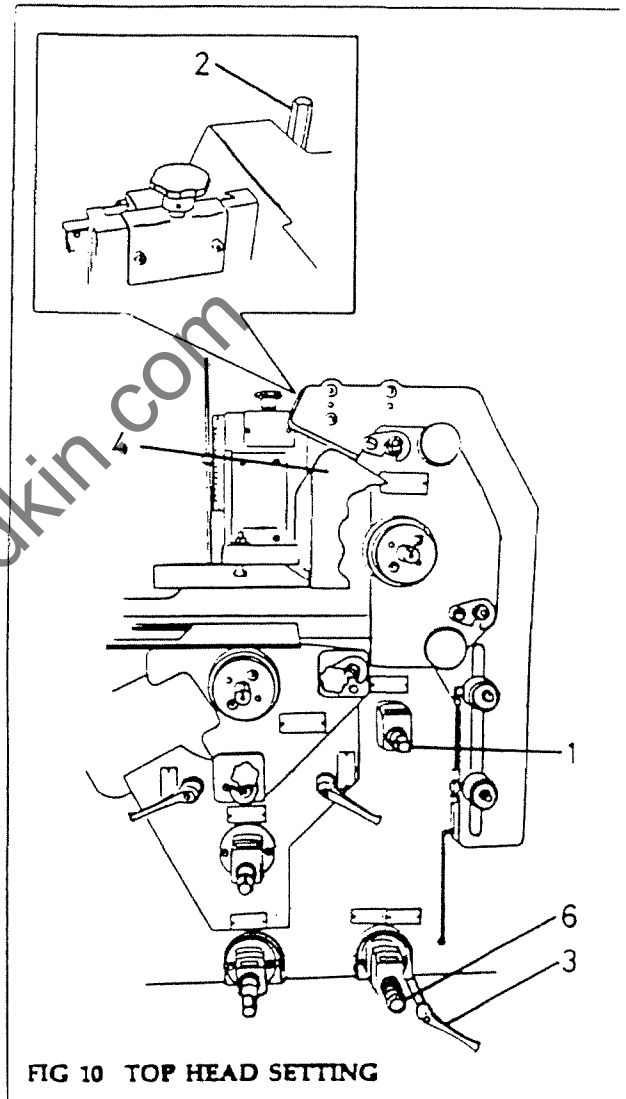
- (1) Release the spindle barrel lock (2)
- (2) Adjust using the handscrew (1)
- (3) Tighten barrel lock (2)

**CAUTION**

The outboard bearing support is hydraulically locked into position and **MUST** be released before any vertical adjustment is made. The lock and unlock control buttons are found on the main control cabinet.

- (4) To manually adjust/set the top head, proceed as follows:

- a. Release hydraulic locks
- b. Ensure bed is clean
- c. Place a datum block (5) of known thickness under the cutterblock.
- d. Rotate the hand screw (6) clockwise to lower the spindle or anti-clockwise to raise the spindle. The knives should just touch the block.
- e. Check and reset if necessary digital readout to known datum block thickness.
- f. Set head to desired position.



- a. Release outboard bearing support lock
- b. Engage clutch lever (3) if the clutch does not readily engage turn the handscrew (6) slightly to the left or right until it engages.
- c. To raise or lower the head/beam press the rise and fall button on the clutch panel.

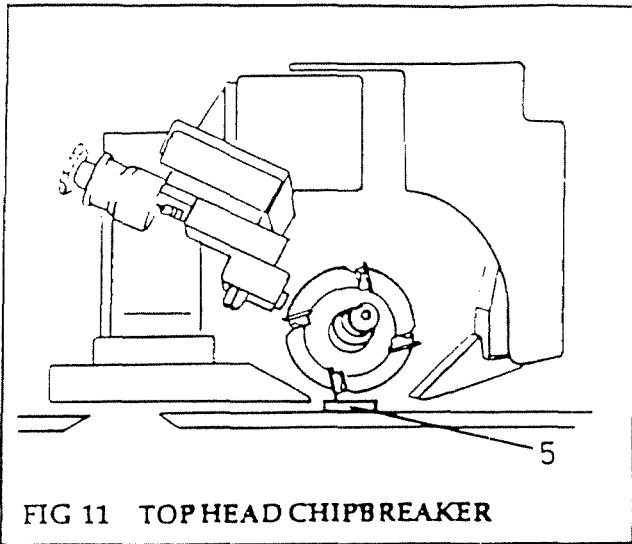


FIG 11 TOP HEAD CHIPBREAKER

**NOTE:** The powered vertical adjustment of the beam is electrically interlocked with top head and can not move until the hydraulic locks are disengaged.

d. Lock outboard supports.

**SECOND BOTTOM HEAD** (Fig 12)-if fitted

- (1) Ensure the bed is clean.
- (2) Using a straight edge (1) placed on the outfeed bed plate set the cutterblock knives to just touch the underside.

**To adjust the head Vertically**

first release the two locking handles (2) and then turn the hand screw (3) to raise or lower cutterblock.

- (3) Tighten the locking handles (2).

**To adjust the spindle horizontally**

- (4) Release the spindle barrel lock (4) at the rear of the head.
- (5) Depressurise outboard bearing.
- (6) Adjust using handscrew (5)
- (7) Retighten barrel lock (4)
- (8) Re-pressurise outboard bearing.

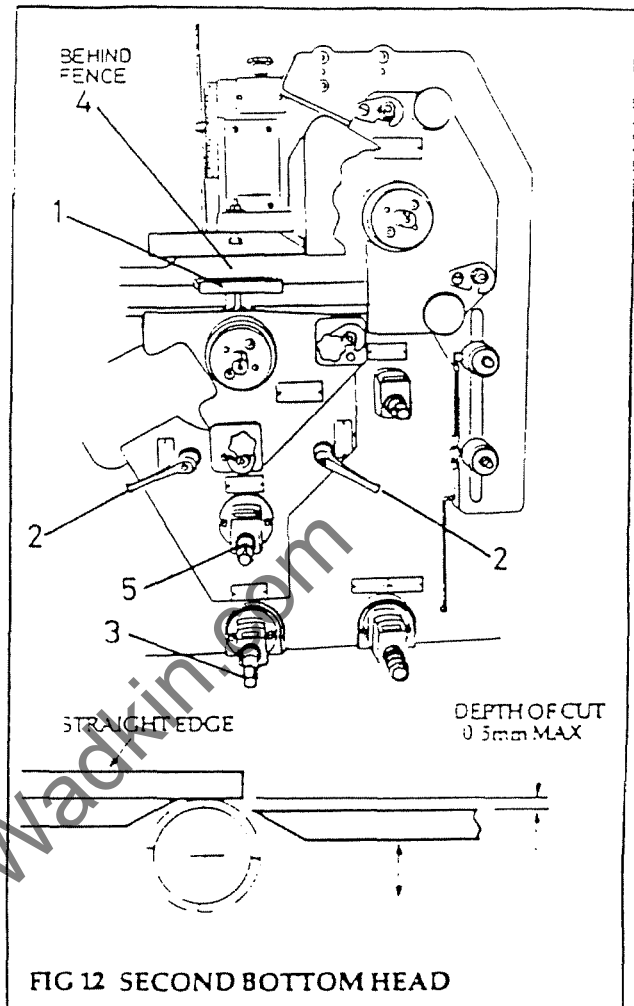


FIG 12 SECOND BOTTOM HEAD

**Top Head Chipbreaker and pad Pressure** (Fig 13)

- (1) Ensure bed is clean and cutterblock has been set up.
- (2) Place straight edge under pad pressure and adjust its height by screw (1) until in line with the base cutting circle of the cutterblock.
- (3) Slacken off pad pressure locking nuts (2) and laterally position the pad nose 5mm clear of the maximum cutting circle. Also position pad width wise to suit timber.
- (4) Retighten nuts (2)

The chipbreaker is made up of a bank of three individual units each positioned in a similar way. Set each unit as follows

(5) Slacken off the two locknuts (3)

(10) Fasten rear locknuts (5)

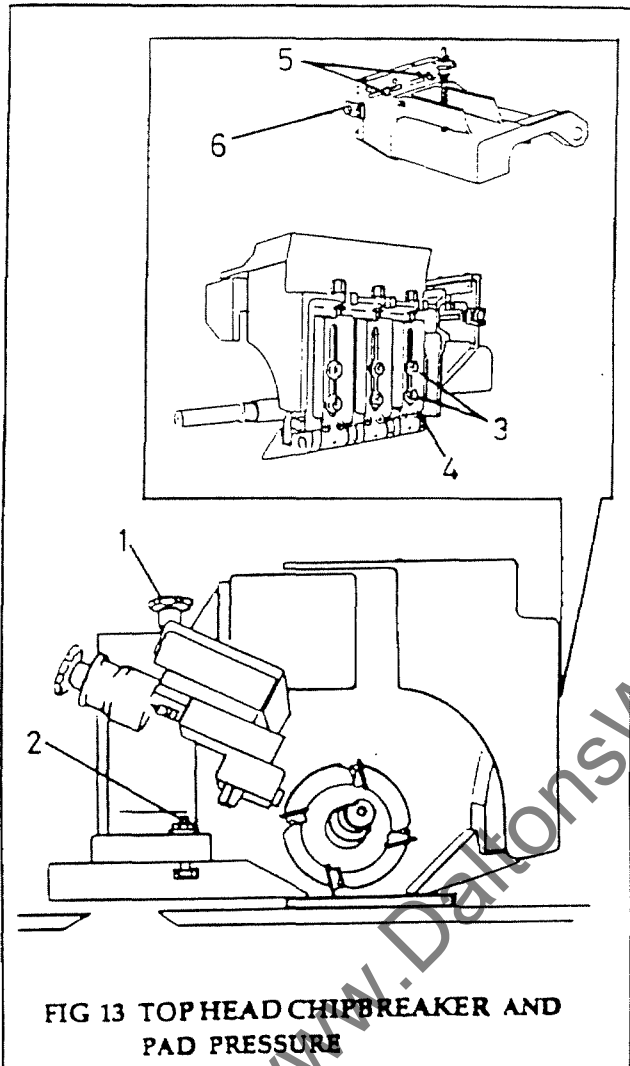


FIG 13 TOP HEAD CHIPBREAKER AND PAD PRESSURE

(6) Raise/lower the chipbreaker unit until the nose touches the straight edge placed under the pad pressure after the top head.

(7) Tighten the locknuts (3)

(8) A stop screw (4) provides for small adjustment to align all the chipbreaker nose pieces.

**Lateral adjustment**

(9) Slacken off the two locknuts (5) at the rear of the top head and turn the adjusting screw (6) until the chipbreaker nose is approximately 20mm from the cutter knives.

**Infeed (short) Table (Fig 14)**

(1) The table (1) rise and fall is adjusted by turning ratchet spanner (2). Set the height required from scale (3) moving the ratchet handle to right or left. Maximum adjustment available is 10mm.

**NOTE:** release lock (11) before adjustment, lock after

(2) Set the fence (4) adjustment with handle (5) after releasing clamps (6). Refasten clamps after adjustment. Set the amount of cut by direct reading on the scale (7).

(3) The adjustable guard (8) must be set within 5mm of the maximum timber size. Slacken starwheel (9), set guard and re-tighten starwheel.

(4) Set side pressures (10), to suit width of workpiece.

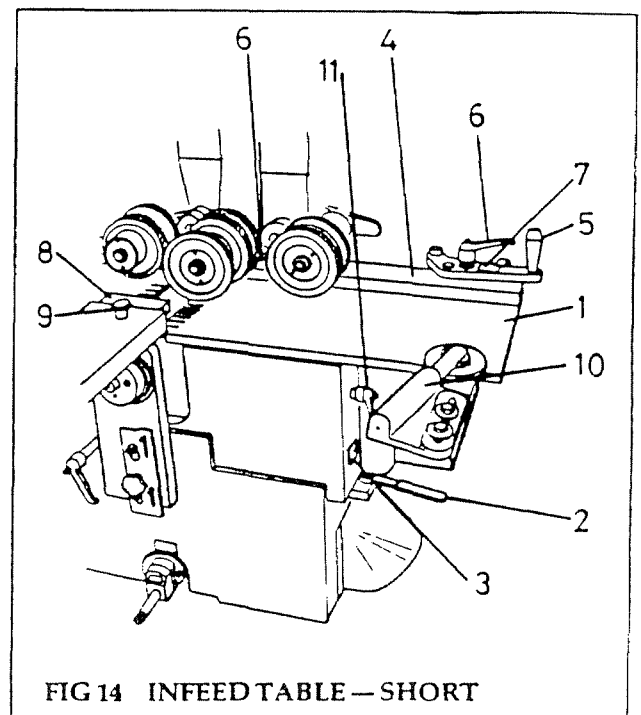
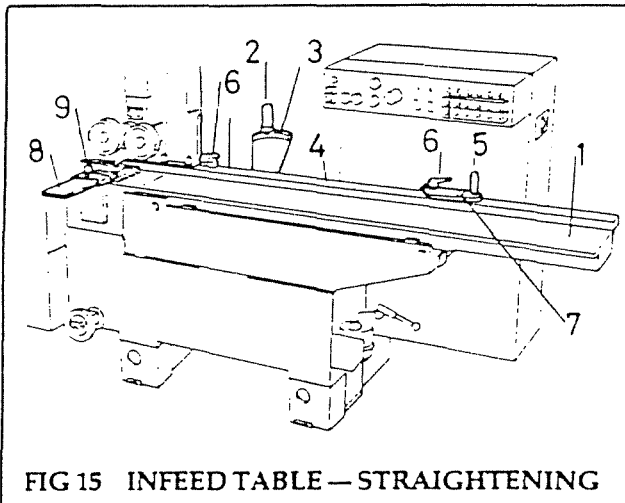


FIG 14 INFEEED TABLE - SHORT

**Infeed (straightening) Table (fig 15)**

- (1) The height of the infeed table (1) is adjusted by the handle (2). To unclamp table turn the handle anti-clockwise. Set the cut required from direct reading on the graduated scale (3) by moving handle as required. Turn handle clockwise to lock in position. The maximum adjustment available is 10mm.

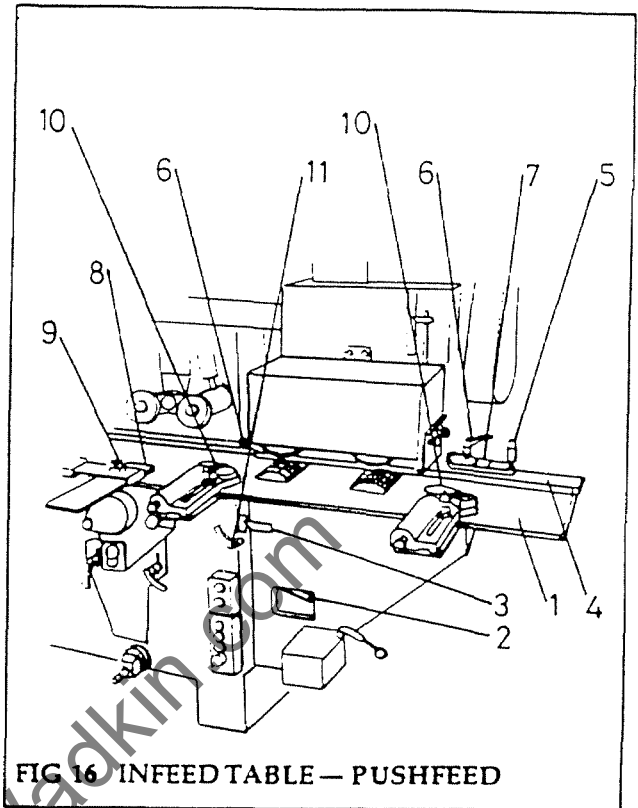
**FIG 15 INFEED TABLE—STRAIGHTENING**

- (2) Set the fence (3) adjustment with handle (5) after releasing clamps (6). Refasten clamps after adjustment. Set the amount of cut required by direct reading on the scale (7).
- (3) The adjustable guard (8) must be set to within 5mm of the maximum timber size. Slacken starwheel (9), set guard and retighten starwheel.

**Infeed (pushfeed) Table (Fig 16)**

- (1) The table (1) rise and fall is adjusted by turning ratchet spanner (2). Set the height required from scale (3) moving the ratchet handle to right or left. Maximum adjustment available is 10mm.

**NOTE:** release lock (11) before adjustment, lock after

**FIG 16 INFEED TABLE—PUSHFEED**

- (2) Set the fence (4) adjustment with handle (5) after releasing clamps (6). Refasten clamps after adjustment. Set the amount of cut by direct reading on the scale (7).
- (3) The adjustable guard (8) must be set within 5mm of the maximum timber size. Slacken starwheel (9), set guard and re-tighten starwheel.
- (4) Set side pressures (10), to suit width of workpiece.

**Check/Adjust at Fence Side Head (fig 17)**

- (1) Adjust the side shoe pressure to the timber so that moderate force is exerted on the timber:
- Adjust the side pressure (1) by unscrewing the two nuts (2) and adjusting side rollers to suit width of stock.
  - Adjust the top roller pressure to the timber as follows:

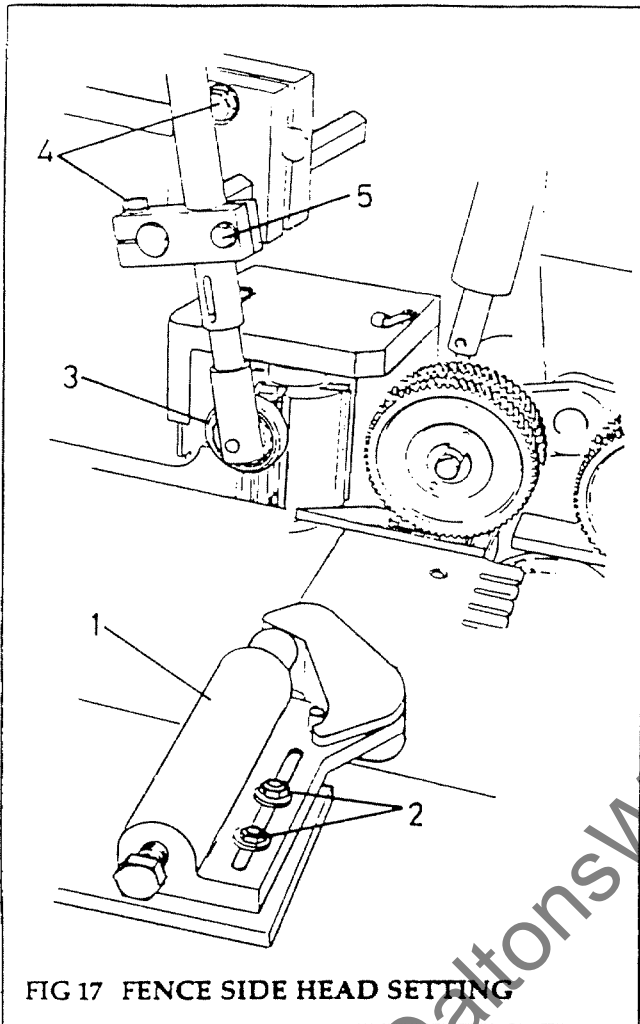


FIG 17 FENCE SIDE HEAD SETTING

- a. Adjust the top roller (3) by loosening one screw (4) for lateral adjustment and right hand screw (5) above the roller for height adjustment. Retighten screws.

**Set Feed Rolls (fig 18, fig 19)**

- (1) Set the feed rolls (1) to suit width and thickness of timber, ie: width of rolls is similar to width of timber.

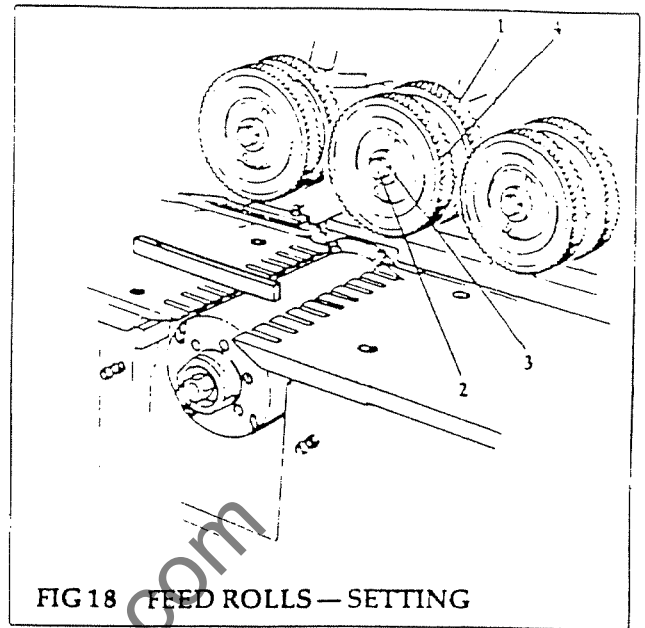


FIG 18 FEED ROLLS - SETTING

**NOTE:** To achieve maximum traction on wide timber, it is advisable to space rolls apart (fig 19), rather than having a solid bank of feed rolls. Stagger the feed rolls at different stations using the spacing collars so that each roller runs on a different area of the top surface of the timber. Use the Control Station Rise and Fall pushbuttons to set the height of the rolls.

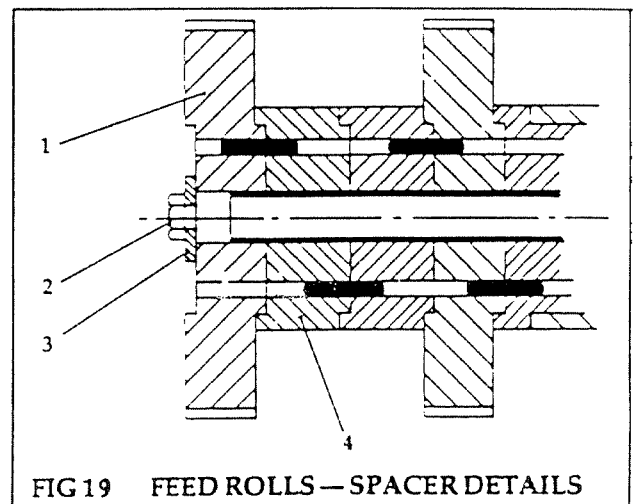


FIG 19 FEED ROLLS - SPACER DETAILS

If necessary, change the rolls as follows:

- a. Slacken centre screw (2), using a 19mm A/F spanner.
  - b. Remove 'c' washer (3), add or remove rolls, or spacers (4), to suit width of stock ensuring that each roll drive pin engages with its mating part
  - c. Refit 'c' washer (3) and re-tighten centre screw (2).
- (2) Set feed roll height 3mm lower than thinnest workpiece to give a positive drive.
  - (3) When set up, inch timber through the machine to check the setting and switch off.

- (2) Check the plain feed rolls (2) after the top head to suit the new dimension of the finished workpiece. These are adjusted independently by screws (3) when inching timber through machine. These rolls should be set 1mm lower than the workpiece.
- (3) Set the pneumatic loading on the feedrolls (1) and (2) using the air supply regulators (4) and gauges.

**NOTE:** The regulator and gauge for the serrated steel rolls up to the top head, should be set to a lower pressure than the plain rolls. The following pressures are recommended:

- a. Steel feedrolls - 3 bar (1 bar = 14.5 psi)
- b. Plain (composition) covered - 4 bar
- c. bedrolls - fixed (where fitted)

#### Set Feed Roll Pressures (fig 20)

- (1) Check infeed (serrated) feed rolls (1) for height setting. These rolls should be set 3mm lower than workpiece.

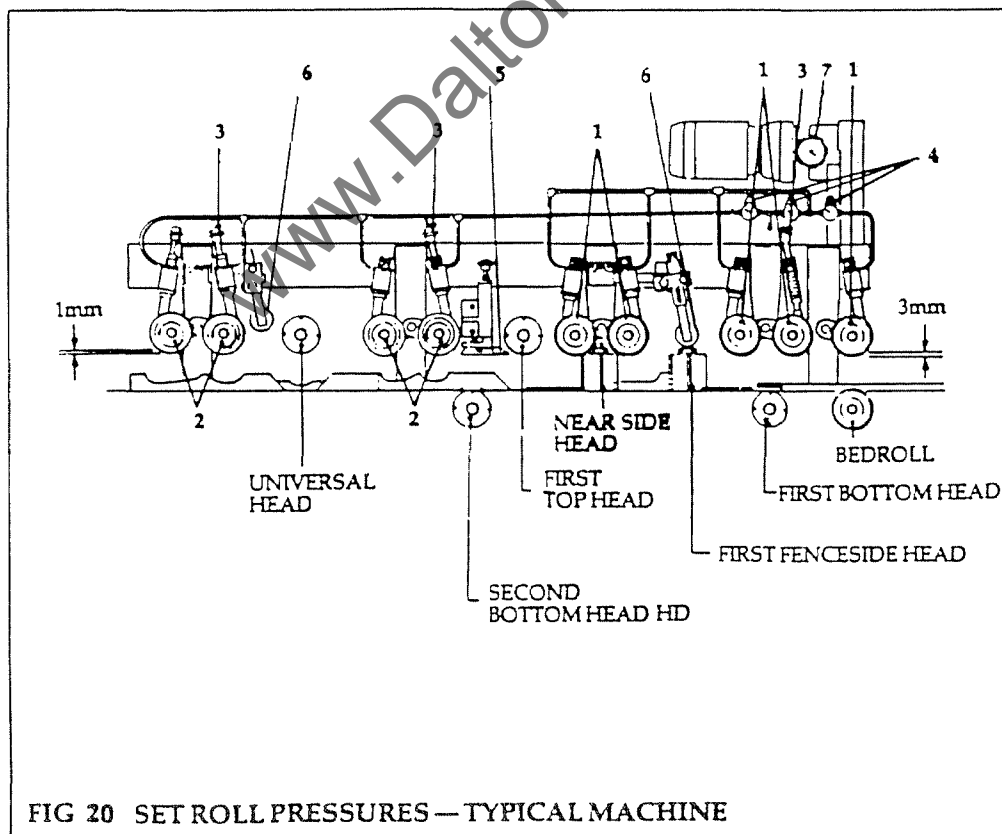


FIG 20 SET ROLL PRESSURES — TYPICAL MACHINE



- (4) Pass a test piece through the machine and check the dimensions.
- (5) Check pressure pad adjustment (5) after top head. Raise or lower by use of the starwheel.
- (6) Check the top pressure rollers (6) are in contact with the workpiece and maintain this in contact with the table.
- (7) Set the machine feed speed by rotation of the handwheel (7) on the speed indicator dial (see **Machine Controls**) with the machine running.

**NOTE: DO NOT** adjust with machine feed stationary

**Universal Head Modes** (fig 21, 22, 23)

The universal spindle attachment can be positioned above or below the bed and at any angle between horizontal and vertical. Basically it can be considered as a three position head providing:

- Bottom Horizontal mode
- Top Horizontal mode
- Nearside Vertical mode (at any angle 0-90 degrees.)

Optional 4 position universal head can be used in the fence side position.

**NOTE:** After any change of mode, run the motor momentarily to check direction of spindle rotation.

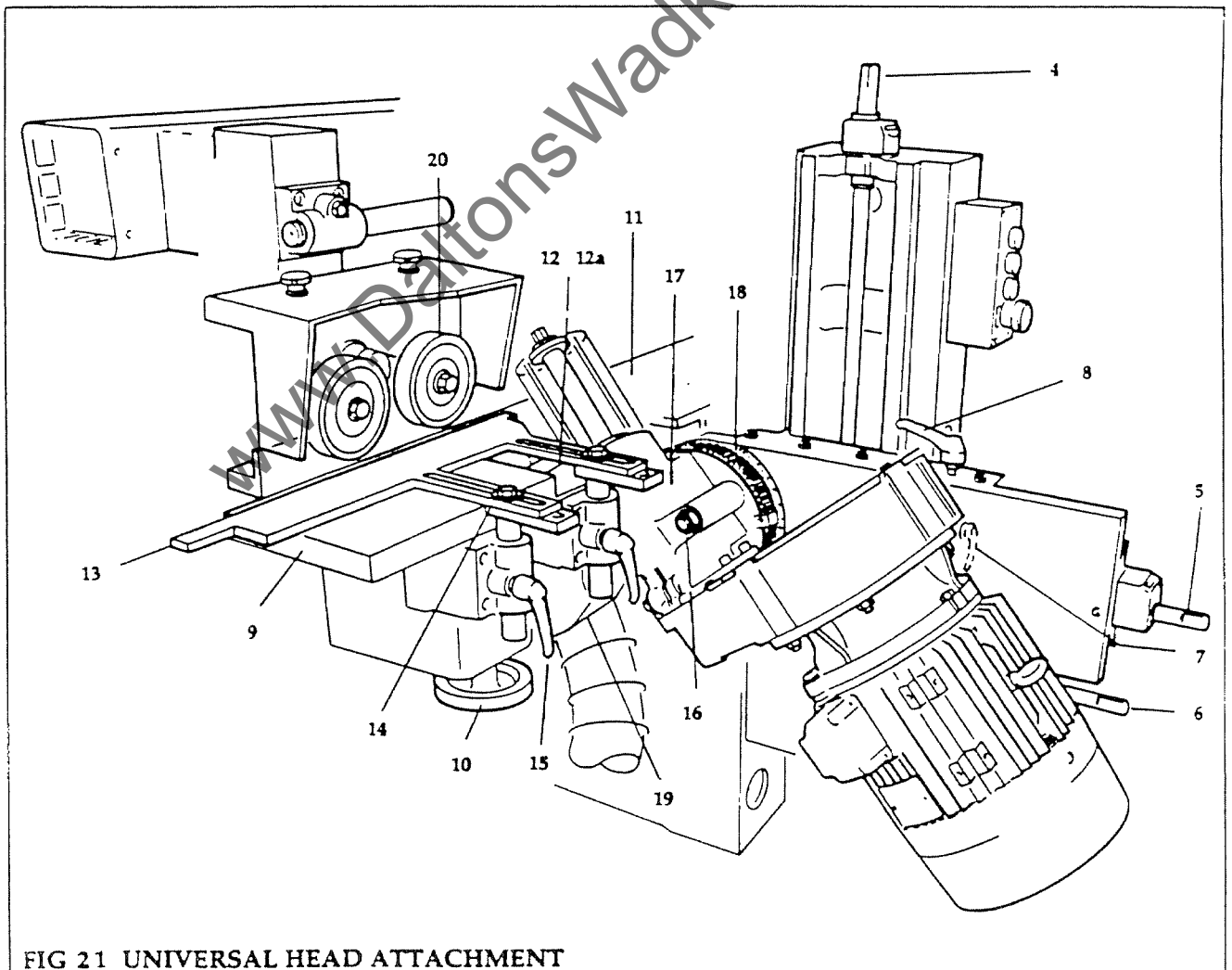


FIG 21 UNIVERSAL HEAD ATTACHMENT

When the spindle is in the bottom position, two adjustable bedplates are fitted to suit the cutting circle of the cutterblock. If the spindle is in the nearside vertical, angled, or top horizontal position, metal rails are fitted as bedplates. The forward rail is secured by two square-headed bolts.

In this situation the outfeed table is adjusted vertically to the same height as the bedplate after the **Second Bottom Head**, using the handwheel (10). Adjust the feedrolls (20) and roller pressure to suit the thickness of work (see fig 20)

Height and lateral adjustment of the universal head can be made in 0.1mm increments using the traverse screws (4) and (5). Angle adjustments can be made using the wormdrive shaft (6).

#### Reversing Switch

A reversing switch is fitted to the control panel to change the drive motor direction of rotation as below:

|   |  |
|---|--|
| Switch to the right (FWD) (spindle in bottom head position) (or fence on fan end of motor side vertical position) | Universal head motor rotates clockwise when viewed on fan end of motor |
|---|--|

|   |  |
|---|--|
| Switch to the left (REV) (spindle in top or near-side vertical positions) | - Universal head motor rotates anti-clockwise. |
|---|--|

**NOTE:** Check direction of spindle rotation before commencing work (see fig 22)

#### In Bottom Horizontal Mode

- (1) Remove the dust cover from the spindle hood and fit the extractor hood (19) to the frame support using two M8x12 mm long hexagon bolts. Connect the dust extractor.
- (2) Set the spindle in the required position under the table.

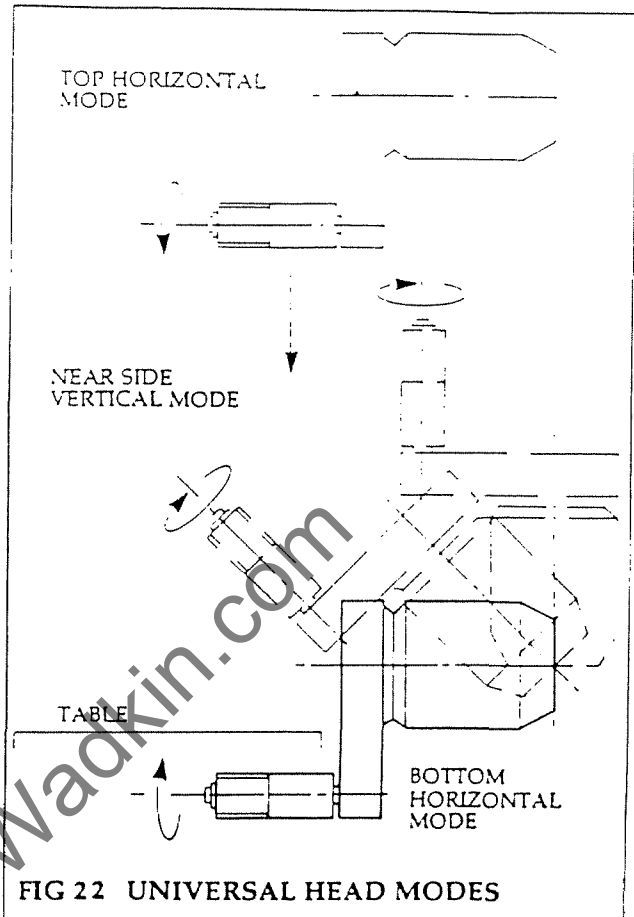


FIG 22 UNIVERSAL HEAD MODES

**NOTE:** In this position always change the cutterblock from the rear of the machine.

- (3) Fit the cutterblock see **Mounting the Cutterblocks**. The adjustment of the cutterblock in relation to the bedplate (11) is as follows:
  - a. To adjust vertically: release locking handle (7), place crank handle on square of vertical traverse (4), turn handle clockwise to raise head or anti-clockwise to lower. Refasten locking handle (7) after making adjustment.
  - b. To adjust laterally: release locking handle (8), place crank handle on square of traverse screw (5), turn clockwise to move head forward or anti-clockwise to move backward. Refasten locking handle (8) after adjustment.

- (4) Adjust the outfeed table (9) height in relation to the infeed table to suit timber cut using handwheel (10)

Level with a straightedge in the same manner as **First and Second Bottom Heads**.

- (5) Set guide (13) for width and height using setscrews (14) and locking handles (15) (see fig 21)

#### In Top Horizontal Mode (fig 23)

- (1) Set the spindle in the required working position, above the bedplates, using the traverse screws (4) and (5)
- (2) Remove the pressure rollers and pressure shoes, together with clamps and support bars. Fit dust extraction hood (22).

**NOTE:** In raising or moving the spindle, ensure it does not come into contact with any part of the machine. Check direction of rotation of spindle after each change of mode.

- (3) Adjust the outfeed table (9) to the same height as the infeed table (11). Replace bedplates with the metal rails (12) (12a) provided. These are placed side by side the last rail fitted prevents sideways movement of the others.

The rails ensure a continuous feed transfer between the infeed and outfeed tables.

- (4) Fit the cutterblock. Note change in direction of spindle rotation. Adjust vertically and laterally, using traverse screws (4) and (5), as required.
- (5) Mount pressure shoes, when supplied, before and after the cutterblock.

- (6) Select reverse motor drive (left hand position REV) at control panel. Check rotation of spindle.

- (7) Before feeding the timber, spin the cutterblock to ensure there is adequate clearance at dust hood and moving parts.

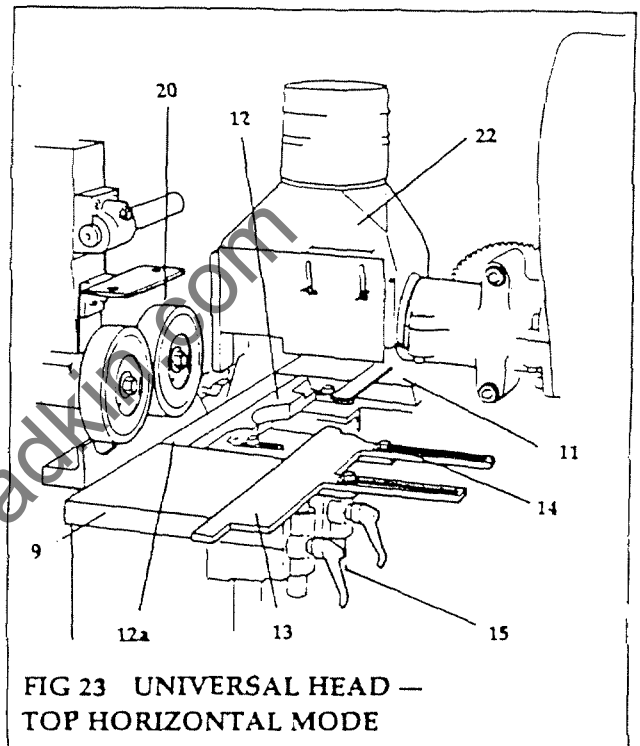


FIG 23 UNIVERSAL HEAD — TOP HORIZONTAL MODE

- (8) Set guide (13) to suit width of timber in the same way as **Bottom Horizontal Mode** after releasing setscrews (4). Vertical height is set using handles (15). Re-tighten after adjustment.

#### In Nearside Vertical Mode

The universal head in the nearside vertical mode will accommodate a cutterblock having a cutting circle of 125 to 180mm. The spindle can be positioned at any angle between vertical and horizontal as required (see fig 20), using the wormdrive shaft (6). In addition, the cutter can be positioned vertically and laterally in relation to the workpiece, in increments of 0.1mm, using the traverse screws (4) and (5).



**NOTE:** In the nearside and angled positions it is necessary to remove the dust-hood (19).

- (1) To adjust vertically: release the locking handle (7), place crank handle on square of vertical traverse screw (4), turn clockwise to raise head or anti-clockwise to lower. Refasten locking handle (7) after adjustment.
- (2) To adjust laterally: release the locking handle (8), place crank handle on square of lateral traverse screw (5), turn clockwise to move forward or anti-clockwise to move back. Refasten locking handle (8) after adjustment.
- (3) To angle (cant) the spindle: Unscrew the two hexagon nuts (16) at the spindle carriage (17), place crank handle on square of worm drive (6) and adjust angle. Retighten the two nuts (16) after adjustment. The angle is measured in degrees from the horizontal on the graduated scale (18).
- (4) Fit metal rails (12a) to suit width of the work.
- (5) Select reverse motor drive (lefthand position REV) at the control panel. Check rotation of spindle.
- (6) Adjust the feed roll pressure, pressure shoes and side guides on first workpiece to ensure a smooth feed.
- (3) Move spindle across to fence side position.
- (4) Replace bedplates with metal rails as for top head.
- (5) Select motor drive position (FWD) at the control panel. Check rotation of spindle.
- (6) Set up and operate as for near side mode.

#### **In fence Side Vertical Mode (option)**

The fence vertical mode is similar in operation to the near side vertical mode except for direction of the cutters.

- (1) Set the spindle in a vertical position as for the near side head.
- (2) Remove intervening bedplates and dust hood.

## JOINTING

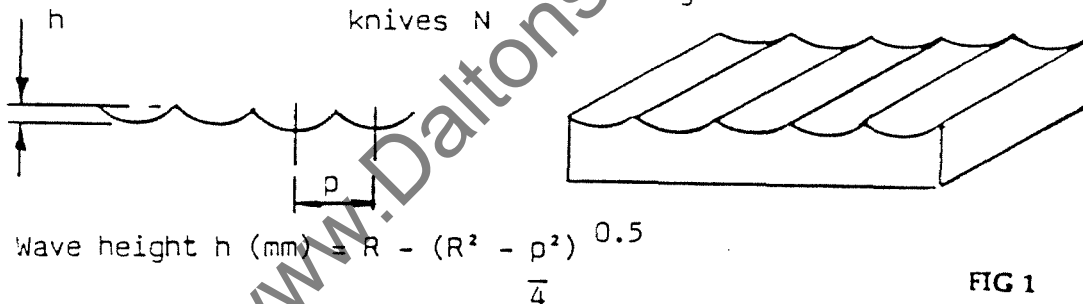
### Principles and practice (Fig 1, Fig 2)

Jointing is a dressing technique which is applied to a rotating cutterblock in order to true all the knives to a common cutting circle. By applying this technique the feed speed of the machine can be increased by a factor equal to the number of knives in the cutterblock.

In order to appreciate this fact, the nature of the machined surface of the timber resulting from the rotary cutting technique must be understood.

The surface finish consists of a series of adjacent waves, (as shown in Fig 1), the pitch and depth of these waves being directly related to the cutter spindle speed, number of finishing knives, feed speed and radius of cutter head. These are related, (see Operating Practice).

$$\text{Wave pitch } p \text{ (mm)} = \frac{\text{Feed Speed } f \text{ (mm/min)}}{\text{Spindle Speed } n \text{ (rpm)} \times \text{number of finishing knives } N}$$



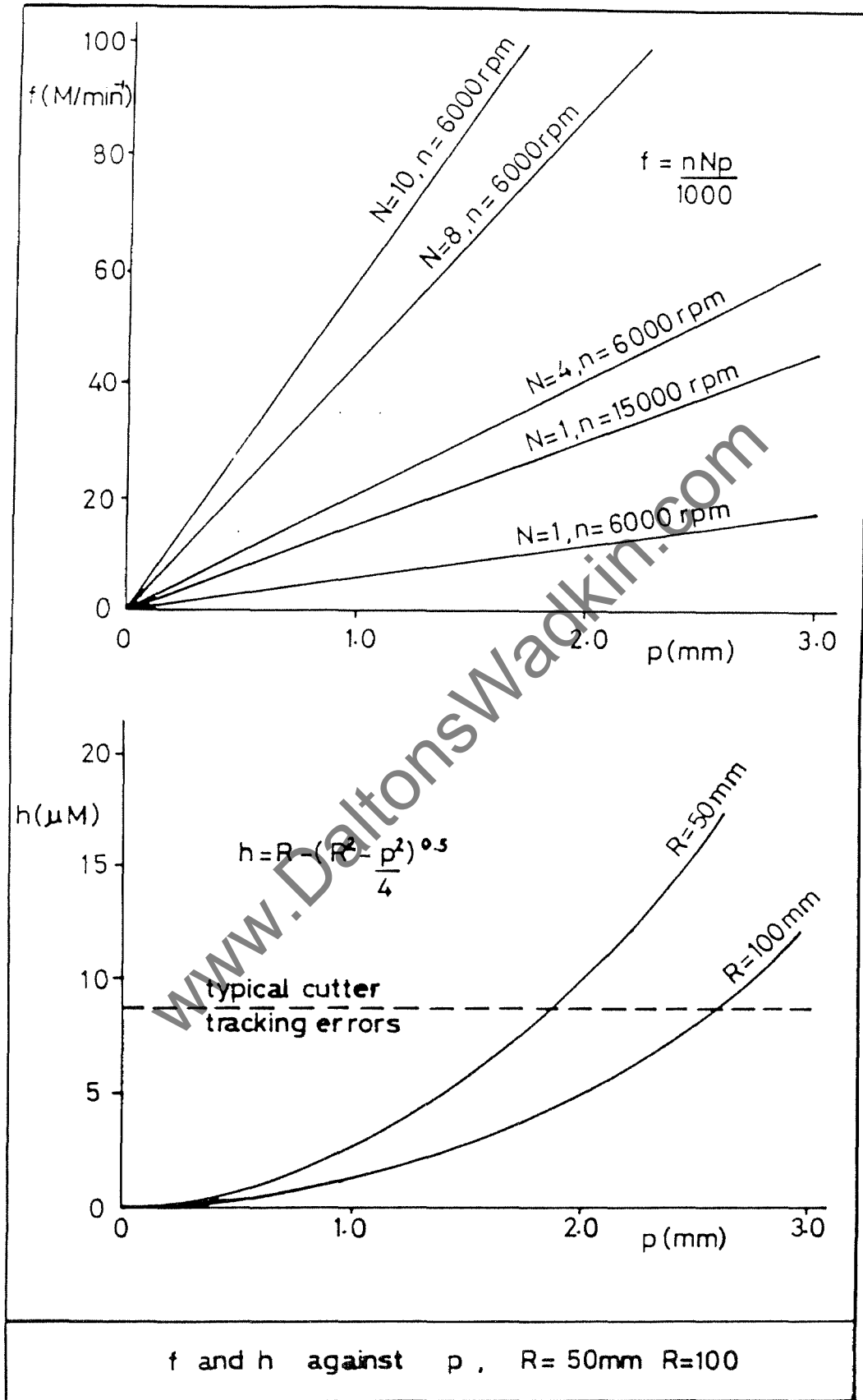
$$\text{Wave height } h \text{ (mm)} = R - \frac{(R^2 - p^2)^{0.5}}{4}$$

FIG 1

Under normal toolsetting techniques only one knife in the cutterblock produces a finishing wave, the other knives cut the timber but do not affect the finish.

When jointing is applied the cutting edges are trued exactly and consequently all the knives in the cutterblock produce a finishing wave. In theory, this would produce a very fine wave pitch if run at the feed speed suitable for a single finishing knife. This would produce overcutting and power requirements would also increase.

In practice wave pitch values of 1.0 to 2.5mm are necessary, depending on the end use of the timber. Therefore, when jointing the feed speed must be increased to give desired wave pitch.



50A

Typical wave pitch values for different applications are:

|                |              |
|----------------|--------------|
| Sawmilling     | 1.5 to 2.5mm |
| Joinery        | 1.5 to 2.0mm |
| Strip Moulding | 1.3 to 2.0mm |
| Furniture      | 1.0 to 1.5mm |

These are for the visible surfaces of a product, clearly larger values can be permitted on hidden faces.

It should be noted that as wave pitch and depth of cut are reduced the power required may increase, due to the cutting edge tending to rub over the timber surface rather than cutting.

### PRACTICE

The technique of jointing is achieved by grinding all cutting edges of the knives in the cutterblock within 0.010mm of the true cutting circle in the toolroom. When mounted in the machine an abrasive stone is traversed across the width of the cutterblock (straight jointing) while it rotates at the correct operating speed, (normally 4500 or 6000 rpm).

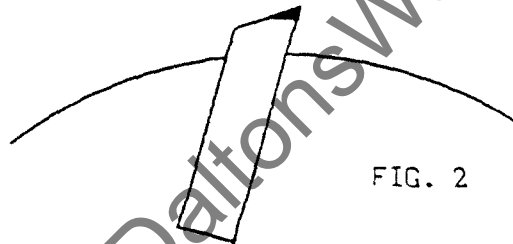


FIG. 2

This action effectively puts a flat on the cutting edges of the knives in the cutterblock. The width of flat (joint) produced increases for each successive jointing and for efficient operation should not exceed 0.5mm.

There are two types of jointing, depending on the cutters to be jointed. 'Straight', across the knife, for planing; or 'Profile', toward the knife, for profiled moulding cutters. The latter operation is also referred to as 'plunge' jointing.

The stone used in straight jointing is relatively hard. This is set to the cutter as shown in **Operating Practice**, then traversed across the cutterblock face to ensure that all cutters touch. The spindle is then rotated under power and a traverse taken to true the cutting circle.

The stone used in profile jointing is relatively soft. This is fed toward the cutterblock knife faces, the stone being shaped to suit the cutter profile. Both methods are described.

### Straight Jointing

- 1) Using the index wheel, set the jointing stone to just touch the cutter knives, then traverse the stone across the cutter head (stationary) to ensure that all cutters touch. Park the stone 5 to 10mm away from cutters until ready to use.
- 2) Set spindle in operation. When up to normal operating speed, traverse once. Set a further increment of cut on the index wheel and repeat traverse. A smooth hand operation is best.
- 3) Switch off spindle head. Bring the spindle to rest as smoothly as possible using automatic braking (if fitted).
- 4) Check the cutter joint, using a light to ascertain if even jointing has been applied to all cutting edges.
- 5) Repeat as necessary until an even joint heel (see Operation Practice - Jointing) has been achieved. Park the stone away from the cutters.

When rejointing, it is useful to apply a black ink marker along the cutting edges. This will help identify when all the cutters have been successfully jointed.

### Profile Jointing

- 1) The profile to be used is first marked out on the stone, which is then hand-ground to the required shape, using a profile template. It is good practice to finally bevel the stone edges (see Fig 3).
- 2) Mount the profiled stone in the holder located on the machine body and secure in position with the locking screws.

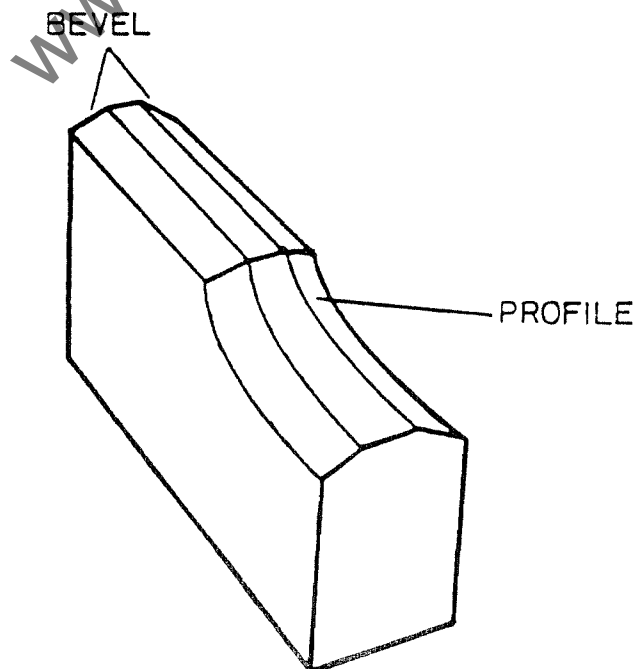


FIG 3  
TYPICAL PROFILE  
JOINTING STONE



- 3) Position the stone to the cutterhead using the jointer cross traverse and radial feed screws. Lock the jointer slide in the correct axial position, making sure that the stone profile corresponds to the cutter knives.
- 4) The stone is finally shaped to the cutters turning the spindle slowly by hand - termed 'chipping'.
- 5) Carry out jointing operation, steps (2) to (5) as for 'Straight' jointing; except that instead of traversing the cutter knives, the stone is now progressively fed (plunged) into the tool face until the correct heel or land is achieved on the cutter knives.
- 6) When profile jointing, the index ratchet may be disengaged to allow the stone to be retracted quickly after the required joint has been achieved.
- 7) Park the profile jointing stone 5 to 10mm away from the cutters.

#### Jointer - Fence Side Head (Fig 4)

This is a combined straight knife and profile jointer with traverse screw and index feed, located on a post fitted to the fence side head cross slide and positioned adjacent to the cutterblock.

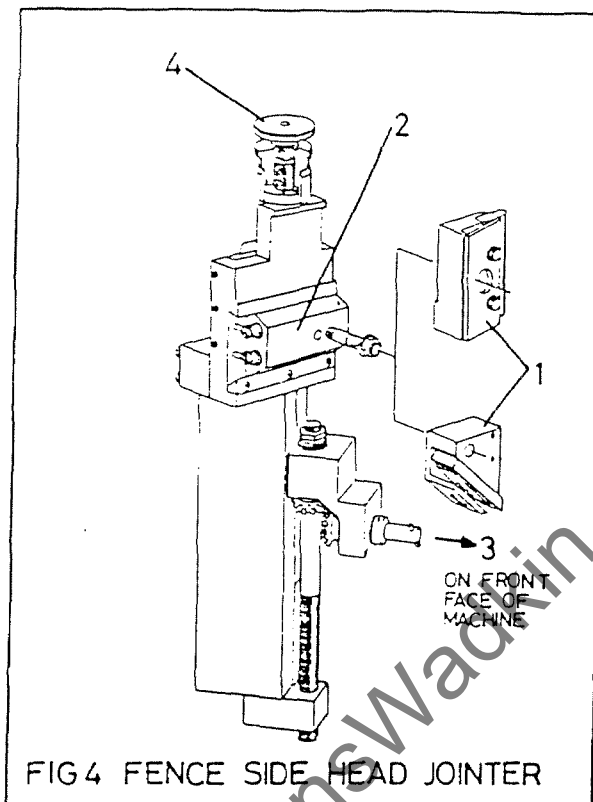
The traverse screw is operated from the front of the machine via a bevel gear arrangement using a removable handle applied to a square on the geared shaft extension which forms part of the fence side head controls.

The jointer locating post and bevel gear form an integral part of the head cross slide. The jointer itself is demountable, but will normally remain in position.

#### Method of Use

- 1) Fit pre set profile or straight jointer stone cartridge (1) to head clamp block (2) and secure.
- 2) Move the jointer head into position relative to the cutterblock using the traverse (3) and index wheel (4).
- 3) Proceed as described in Jointing Practice - Methods, as applicable, until an even joint has been obtained.
- 4) When straight jointing: Fit winding handle to the square on the traverse screw (3).

- 5) When profile jointing: Lock the traverse screw in position. Feed the profile stone to the cutter using index wheel (4).



- 6) On completion, retract the jointing stone and park away from the cutter knives. Restore head covers to original position.

**Note:** When straight jointing the stone is positioned in the angled slot. When profile jointing, parallel to the cutters.

#### Jointer - Near Side Head (Fig 5)

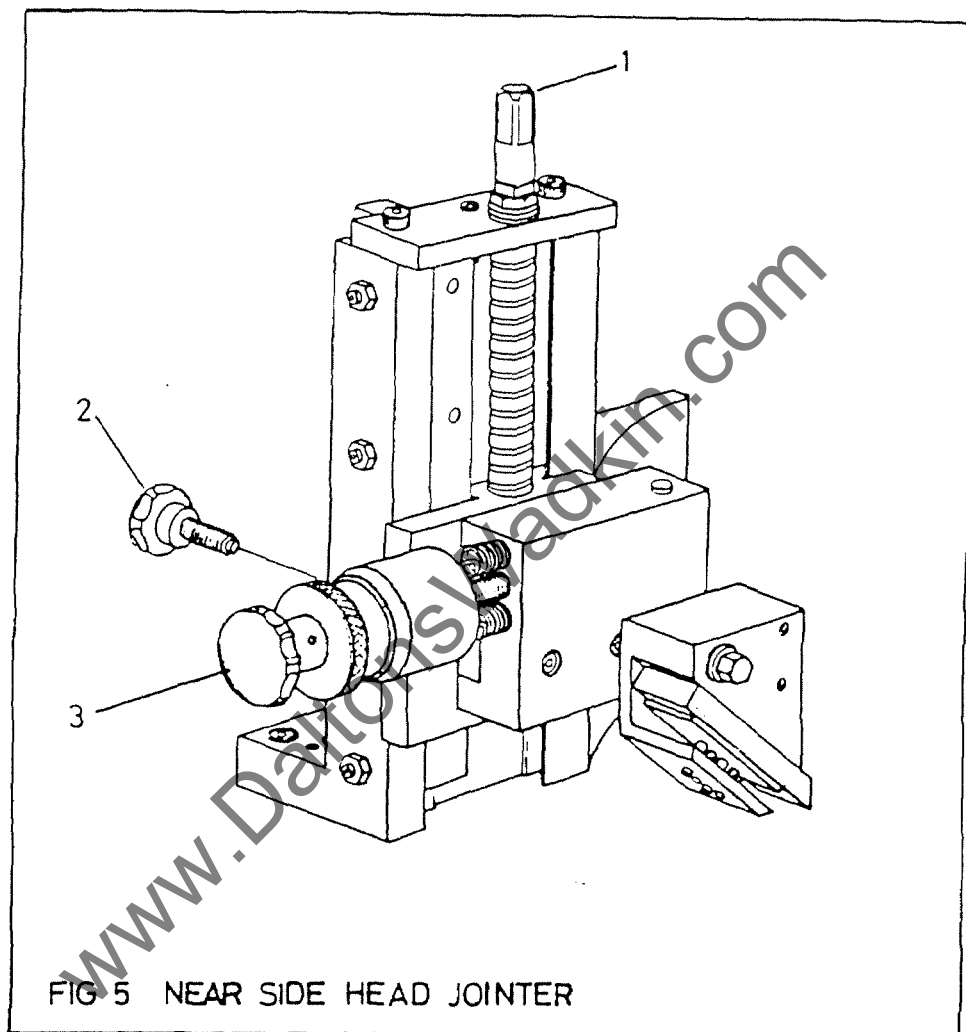
This is a combined straight knife and profile jointer with traverse and indexed feed similar to the fence side head. The jointer is located on a post positioned adjacent to the cutter spindle on the near side.

The traverse screw is operated by a removable handle applied to a square extension located at the top of the jointer slide. The feed index operates in a similar way to the fence side head.

When the jointer is in use the cover of the near side hood may be removed to give increased access to the cutterblock. After use retract and park the stone. Replace covers or guards removed.

Method of use

- 1) Proceed as described in Fence Side Head, items (1) to (3), until an even joint has been obtained.
- 2) When straight jointing: Fit winding handle to the square on the traverse screw (1).



- 3) When profile jointing: Lock the traverse screw in position with screw (2). Feed the profile stone to the cutter using index wheel (3).
- 4) On completion, retract the jointing stone and park away from the cutter knives in nearside position. Restore head covers to original position.

**NOTE:** When straight jointing the stone is positioned in the angled slot. When profile jointing, use the slot parallel to the cutters.

### Jointer - Top Heads (Fig 6)

This is a built-in combined straight and profile jointer, forming part of the assembly which also carries the top head chipbreaker and outboard bearing attachment.

The method of traverse and feed are similar to the bottom heads. When straight knife jointing, the axial traverse is effected by a winding handle applied to the square end of the traverse screw. A locking screw is provided to lock the slide traverse while profile jointing.

#### Method of Use

- 1) Fit pre set profile or straight jointer stone cartridge (1) to head clamp block (2) and secure.
- 2) Move the jointer head into position relative to the cutterblock using the traverse (3) and index feed (4).
- 3) Proceed as described in Jointing Practice - Methods, as applicable, until an even joint has been obtained.
- 4) When straight jointing: Fit winding handle to the square on the traverse screw (3).

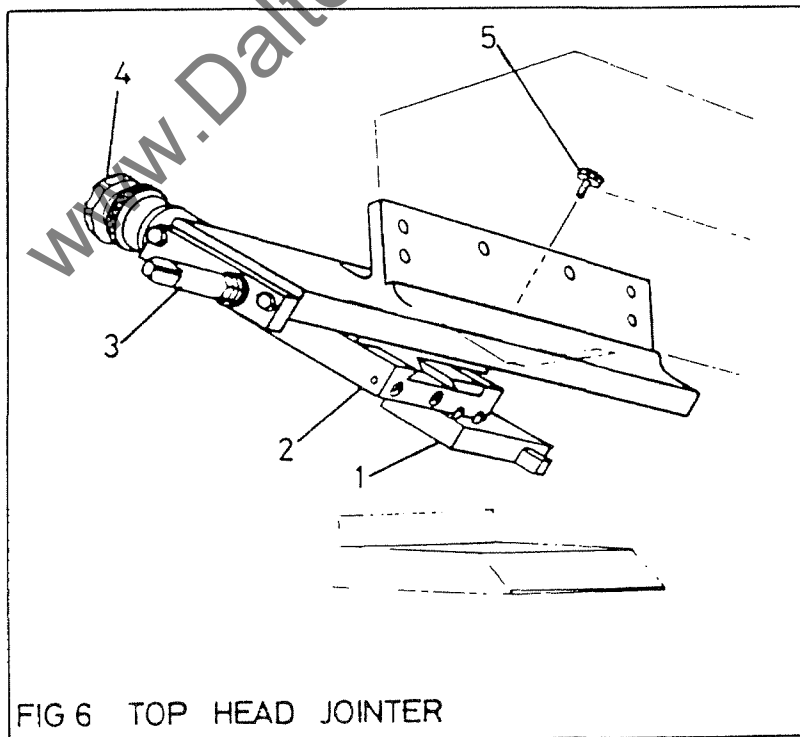


FIG 6 TOP HEAD JOINTER

- 5) When profile jointing: Lock the traverse screw in position with screw (5). Feed the profile stone to the cutter using index wheel (4).
- 6) On completion, retract the jointing stone and park away from the cutter knives in nearside position.

**NOTE:** When straight jointing, the stone is positioned in the angled slot. When profile jointing, use the slot parallel to the cutters.

### Jointer - Second Bottom Head (Fig 7)

This is a 'built in' combined straight knife and profile jointer, with index feed wheel and traverse screw similar to the top head jointer. The method of operation is similar.

On the Second Bottom head the outfeed bedplate can be retracted to give increased access to the jointer by slackening two screws on the bedplate.

When straight jointing the axial traverse is effected by using a winding handle on the square end of the traverse screw.

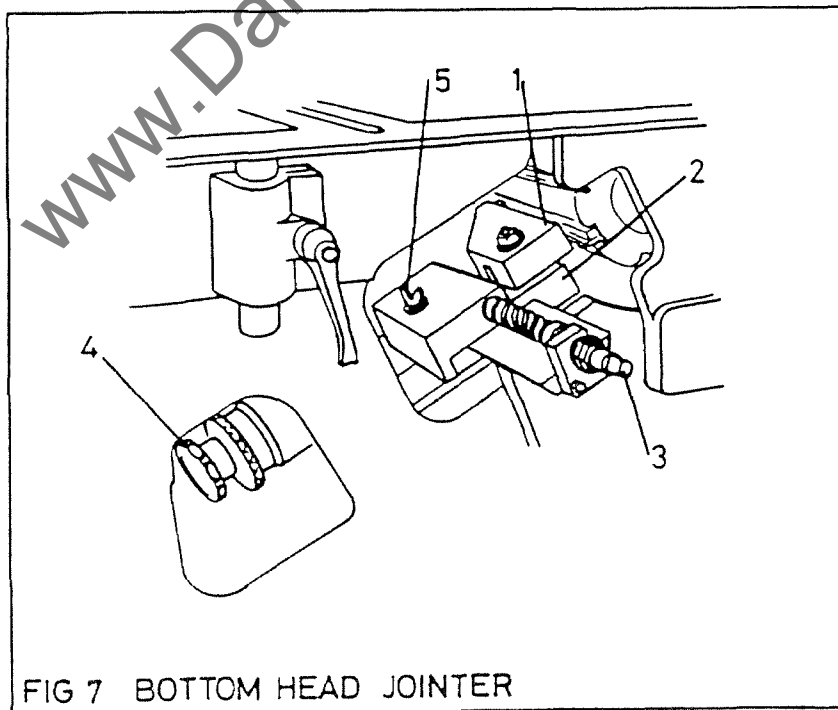


FIG 7 BOTTOM HEAD JOINTER

Method of Use

- 1) Fit pre set profile or straight jointer stone cartridge (1) to head clamp block (2) and secure.
- 2) Move the jointer head into position relative to the cutterblock using the traverse screw (3) and index wheel (4).
- 3) Proceed as described in Jointing Practice - Methods, as applicable, until an even joint has been obtained.
- 4) When straight jointing: Fit winding handle to the square on the traverse screw (3).
- 5) When profile jointing: Lock the traverse screw in position with screw (5). Feed the profile stone to the cutter using index wheel (4).
- 6) On completion, retract the jointing stone and park away from the cutter knives in nearside position.

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## DIAL-A-SIZE ELECTRONIC POSITIONING

### Near Side Head and Top Head

The powered traverse movement to the near side head is by a 'KEMO' geared motor.

The traverse movements of the heads are each connected to an 'encoder' which sends pulse signals to its respective 'Elgo' digital read out controller situated in the electrical control panel (see Fig 1).

The traverse of the heads reacts to data put into the 'Elgo' controller which displays the cutterblock position in relation to its datum face. The datum face for the near side head is the fence. Datum for the top head is the bedplate.

The head traverse movements may be hand or power operated and a switch is provided for this purpose.

### Setting Up

All setting parameters are available via the front keypad. Programming is inhibited until a link at the back of the unit is opened.

The programming link is in the form of a two terminal plug-in block, with a shorting wire. Unplug to set in parameters. Re insert plug to operate.

**NOTE:** The controller will not run with the link open.

Setting of the parameters is achieved as follows:

- (1) Press T, top display extinguishes and 'CH' is displayed. This ensures that the operator knows when the T button has been depressed (even by accident).
- (2) Enter functions [1] .....[5], 'CH' is extinguished. Title name is displayed in top window; value of parameter is displayed in bottom window.
- (3) Press C to clear existing value, enter required value.
- (4) Press T again to revert to operating mode.

The [T] functions/parameters are as follows:

[1] This sets the slowdown point during approach to position. 'SLSP' is displayed.

[2] This sets the stop correction offset. 'COR' is displayed.

[3] Saw width compensation is entered. 'SABL' is displayed.

[4] Time at standstill during backlash over-run and delay in drop-off of 'In Position' relay after drive stop is initiated.

'Ti' is displayed. Time can be set from 00.0 to 15.9 seconds. Also sets the auto retract time (ie; distance).

[5] This sets the decimal point position in the displays.

'DP' is displayed.

1 means units only, (ie; no decimal point).

2 means tenths displayed, (ie; one decimal place 0.0).

3 means hundreds displayed, (ie; two decimal places 0.00).

One [T] function is available with programme link either open or closed. That is Inch/Metric selection. This is used as follows:

- (1) Press [T], 'CH' appears in display.
- (2) Press [O], 'INCH' or 'MM' appears in display.
- (3) Press [C] to changeover.
- (4) Press [T] to revert to operation.

The decimal point is automatically moved and any actual value correctly recalculated. The set up parameters are also in the chosen units.

When [T] is pressed inadvertently, 'CH' is displayed to warn operator that he has pressed the button. Simply pressing [T] again returns controller to operating mode.

**NOTE:** All these parameters will be preset by Wadkin during the setting-up of the machine.

### Method of Operation

#### To Set Datum

- (1) Switch to 'Hand' operation (see Fig 1).
- (2) Determine the distance between the cutterblock and either the fence or bedplate, by use of a known thickness setting block or piece of timber; by hand winding the spindle up to the setting block.
- (3) Enter this figure using the keypad.
- (4) Press Datum pushbutton (Blue) on control panel.

These figures will be displayed on the demand value display (bottom window). The Datum figure is now set.

**NOTE: (a)** These Datum figures need only be re-set at machine switch-on, or if the cutterblocks are changed.

**NOTE: (b)** To hand set the height of the top horizontal spindle independently of the beam, disengage clutch (ie; operate changeover lever).

To move the heads to a pre-determined position

- (1) Switch to 'Elgo' operation (see Fig 1).
- (2) Enter the required position using the keypad.
- (3) Press 'Start' push button.

The head selected will now move automatically to the set position and the figures will be displayed in the actual value display (top window).

- (4) To move to a new position, repeat steps (2) and (3).

**NOTE:** The feed can only be inched in this mode.

To run the machine

- (1) Switch to 'Auto' position.
- (2) The feed can now be run continuously, or inched.

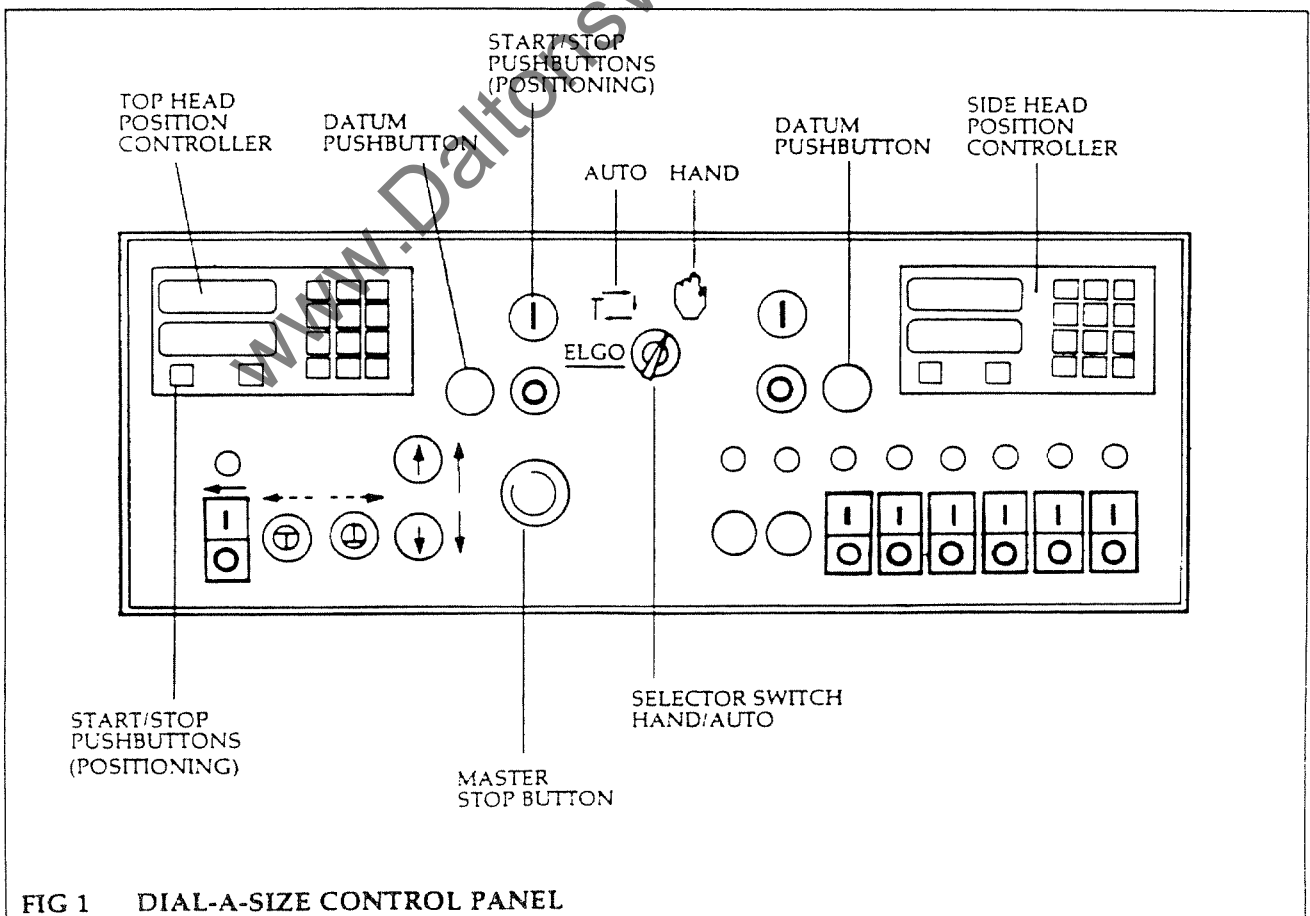


FIG 1 DIAL-A-SIZE CONTROL PANEL



## 99 SETTING PROGRAMABLE MEMORY POSITIONING

### Near Side Head and Top Head

This unit has the capacity to be programmable for ninety-nine positional head settings.

The powered traverse movement to the near side head is by a geared motor.

The traverse movements of the heads are each connected to an 'encoder' which sends pulse signals to its respective digital read out controller situated in the electrical control panel.

The traverse of the heads reacts to data put into the controller which displays the cutter-block position in relation to its datum face. The datum face for the near side head is the fence. Datum for the top head is the bedplate.

The head traverse movements may be hand or power operated and a switch is provided for this purpose.

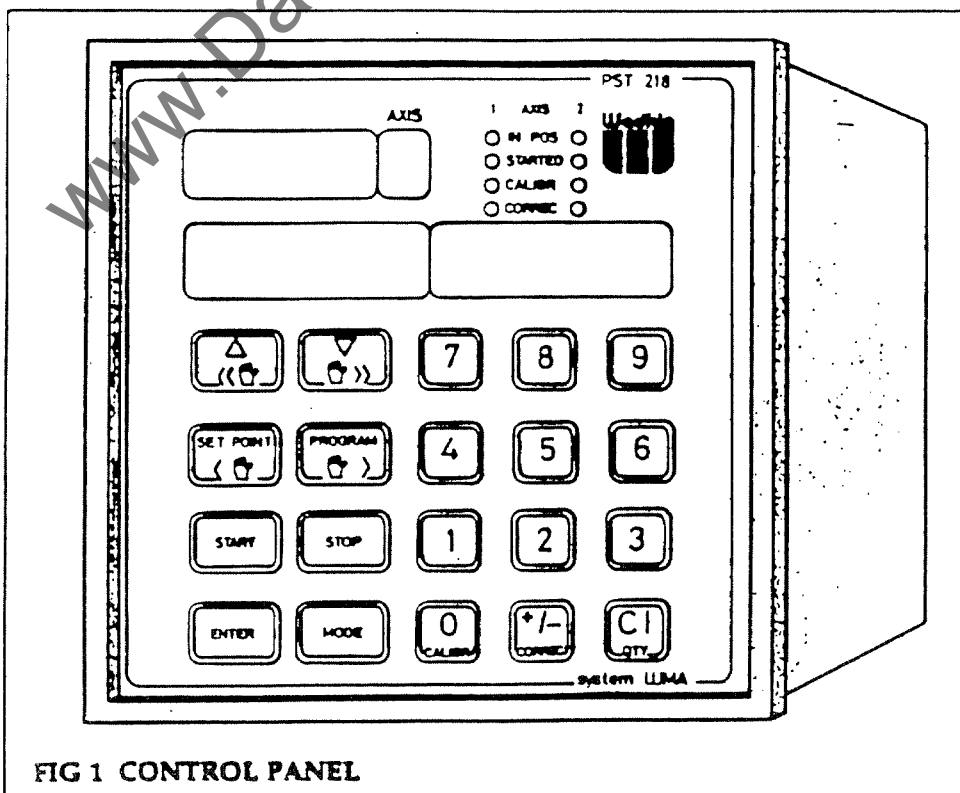


FIG 1 CONTROL PANEL

The illustrations (buttons) on the left hand side of each page show the buttons to be pressed, and in what order.

If buttons are shown with an '&' sign between them, they must then be pressed simultaneously.

### POSITIONING

PST 218

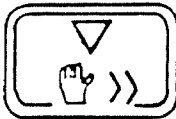
SWITCH ON MACHINE

### CALIBRATION (Manual)

Each axis must be datumed before production is started.

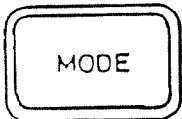
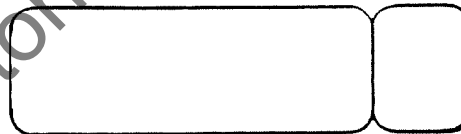
The calibrating procedure is as follows:

The PST 218 unit can control 2 axes, both of which must be independently datumed.



Push the button until the axis to be datumed (either axis 1 or axis 2) is shown as a number in the LED display.

AXIS



&



The mode and calibration buttons must be pressed simultaneously.

Enter new value.



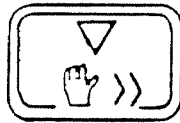
Press enter.

The axis should now be datumed. Repeat the same operation for the second axis. When both axes have been datumed, the unit is ready for use.

Confirmation is in the top right of the unit where there are LED lights for each axis which represent the calibration.

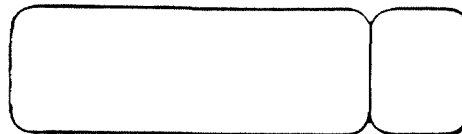
**MANUAL POSITIONING**

The axis to be moved must be selected first.

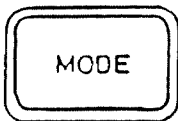


Push the button until the axis to be moved (either axis 1 or axis 2) is shown as a number in the LED display.

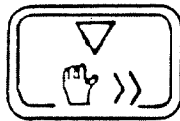
AXIS



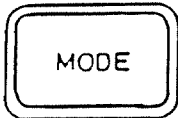
For manual positioning of the unit, the mode key and the direction of travel must be pressed simultaneously.



&



Move to a higher value than the position.



&



Move to a lower value than the position.



When manual positioning is finished, the stop button must be pressed to put the unit back into the automatic mode.

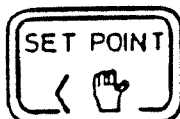
**DIAL-A-SIZE POSITIONING (SET POINTS)**

The axis to be moved must be selected first.



Push the button until the axis to be moved (either axis 1 or axis 2) is shown as a number in the LED display.

AXIS



To use the Dial-A-Size option, this is simply a case of pressing the set point button and then the dimension.



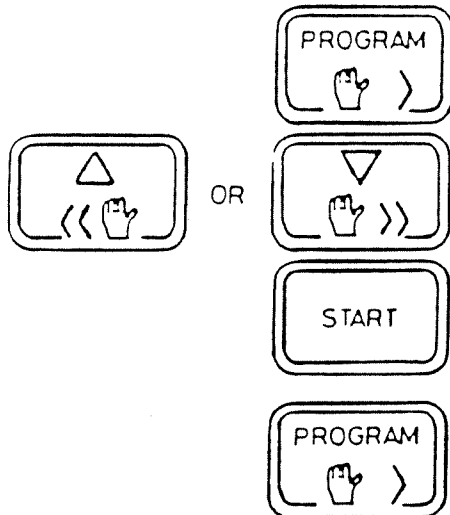
Pressing the 'start' button will send the axis to the position.

When in position, an LED in the top right of the unit will be lit.

Whilst positioning is taking place, the 'started' LED will be lit.

PROGRAM POSITIONING (For programming of,  
see later  
instructions)

CALLING UP PROGRAM



By press the 'program' button, the display will change to the program mode.

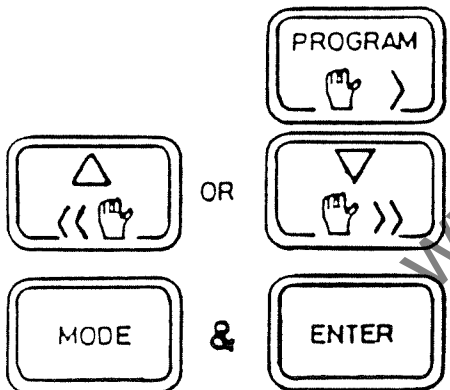
Pushing either of the two button will increase or decrease the program number to the one required.

Pushing the 'start' button will drive the axis to the position stated in the program.

NOTE: To escape from the program mode of the unit, press the 'program' button.

When the axis is in position, the 'in position' LED will be illuminated in the top right of the unit.

PROGRAMMING OF THE UNI



By pressing the 'program' button, the display will change to the program mode.

Push either of the two buttons until the program number required to be programmed is found.

The buttons 'mode' and 'enter' when pressed simultaneously will enable you to have the access to the program number that is illustrated in the display.

You will now have access to the axis.

Enter the required figures if a new number or an alteration.

NOTE: If the figures for axis 1 are correct and it is only axis 2 which has to be altered, you can press 'ENTER' without altering any figures will give you access to axis 2.



Pushing the 'enter' button will enter the figures into the memory and give you access to axis 2.

Enter the required figures.



Pressing the 'enter' button will enter the new figures into the memory.

The unit is now ready for use as 'calling up program'.



NOTE: Program P O is only for test purposes.

To clear existing information, press 'CL Qty' before entering new figures.

## FAULT FINDING

### FAULT

Axis will not position accurately.

### SOLUTION/CHECK

Check that unit is calibrated (LED top right if unit), recalibrate if necessary.

Physical object causing an obstruction. Remove object and check overload. Try again.

Movement is greater than the axis limits. Insert new figures.

Negative value in positioning memory.

## FAULTS IN THE WORKPIECES AND THEIR CAUSES

### General

- FAULT** — Blips at the leading end of the underside of the timber.  
**Cause** — The cutterblock is too low in relation to the outfeed bedplate.  
**Remedy** — Adjust the cutterblock correctly.
- FAULT** — Scars on the trailing end of the underside of the timber.  
**Cause** — The cutterblock is too high in relation to the outfeed bedplate.  
**Remedy** — Adjust the cutterblock correctly.
- FAULT** — The trailing end of the top face of the timber shows blips.  
**Cause** — Pad and roller pressures are incorrectly adjusted.  
**Remedy** — Adjust the pad pressures correctly

### Faults Caused by Tools

- FAULT** — Out of square stock after planing.  
**Cause** — The cutters are not parallel to the

outfeed bedplate, or are badly ground.

- Remedy** — Adjust, or sharpen the cutters carefully

- FAULT** — Burn marks on the stock.  
**Cause** — Cutters are blunt and need regrinding.  
**Remedy** — Regrind cutters.

### Faults in Grinding and Setting

- FAULT** — Nicks in the edges of the cutters especially carbide.  
**Cause** — Generally caused by removing too much metal when regrinding. This results in undue stresses and subsequent cracking and breaking away of the cutting edge when machining.  
**Remedy** — Take greater care when regrinding cutters.
- FAULT** — Vibrating heads  
**Cause** — Cutterblocks have been set up incorrectly. Reset.

## CLEANING THE MACHINE

Machines are designed to need a minimum of maintenance. However, it is recommended that the machine be cleaned thoroughly once a week. This is essential when working on hardwood such as Sipo (Utile) or similar.

If cleaning with compressed air, take care not to direct the jet onto the spindle and moving shaft, bearing housings, etc. Clean the spindles and remove all remains of resin and grease. Do the same with the cutterblock collars and

machine tables (bedplates) and lightly lubricate.

Check that all machine parts slide easily at friction points. Lubricate as indicated in the lubricating instructions (see **Maintenance**).

Adjust the variable speed drive unit through the full range once a week to avoid the feed drive mechanism jamming.

## SECTION 4 MAINTENANCE

### SCHEDULED MAINTENANCE

Scheduled maintenance consists of regularly maintaining the machine in a good operating condition, capable of safely producing good quality trouble free work, with the minimum of downtime.

This includes tasks such as daily/weekly cleaning and lubrication which can and should be performed by the operator. Tasks carried out at longer intervals will require more specialised knowledge and tools to perform.

#### Lubrication

Much attention has been given to keeping lubrication and maintenance to a minimum. In consequence, 'sealed for life' bearings and 'Oilite' bushes have been used where possible. The cutterblock spindles have been fitted with permanently lubricated bearings; these should only require replacement of lubricant if the spindle bearings are replaced. However, there are exceptions.

Electric motors, where 'sealed for life' bearings have not been fitted, are provided with grease nipples. These should be greased at monthly intervals with Wadkin L6 grease.

There is no requirement for periodic lubrication of the feed rolls mechanical variable speed drive unit.

#### Daily

Grease the machine slideways and the various traverse screws with Wadkin Grade L6 grease (see Approved Lubricants) as needed. A hand operated lubricating pump is fitted to provide oil feed lubrication to the machine bed. The hand lever is operated to deliver the required amount of oil to the bed, a tap is fitted to the pump to control the oil flow rate to a pre-set amount. The oil reservoir holds 1 litre (1.76 pints) of oil. Replenish with Wadkin Grade L4 oil (see Approved Lubricants) as needed.

The machine can be fitted with auto-bed lubrication, this is controlled by a selector switch on the main panel. The amount of oil delivered is pre-set by taps on the machine.

#### Weekly

The chain drives to the bottom feedrolls should be lubricated weekly with an oil can using Wadkin Grade L4 oil. Access to the chains driving the feedrolls is gained from the rear of the machine.

#### Monthly/3 Monthly

Grease machine drive spindles and drive motor shafts, where fitted with grease nipples, using Wadkin Grade L6 unless otherwise stated. Do not overfill bearing housings.

Generally, machine drive spindles and cardan shafts will be lubricated monthly using Wadkin Grade L6 grease.

#### Shaft Drives

The XE woodworking machine is fitted with shaft drive to the feedworks.

The primary drive is by solid shaft and couplings to a gearbox at each working head. The primary drive is virtually maintenance free.

Power transfer to each feedroll is via a right-angle gearbox and cardan shaft. The bottom rolls are driven by a chain and sprocket drive taken off the rear of the gearbox. Each gearbox is filled with lubricant on assembly and will normally not need any attention for long periods (10,000 hour intervals). Request information for this item before changing lubricant.

The cardan shafts should be lubricated at intervals as specified in Lubrication. No other maintenance will normally be required on the shaft drive.

#### Chain Drive Tensioning (Fig.1)

Adjustment is provided to the chain drives. These should be checked at regular intervals (Monthly/3 Monthly) and any slack in the drive taken up.

Checking/Adjustment is carried out as follows:

- (1) Remove the drive cover.
- (2) Check chain for adjustment or wear. Adjustment is correct if no slack is present in the chain.

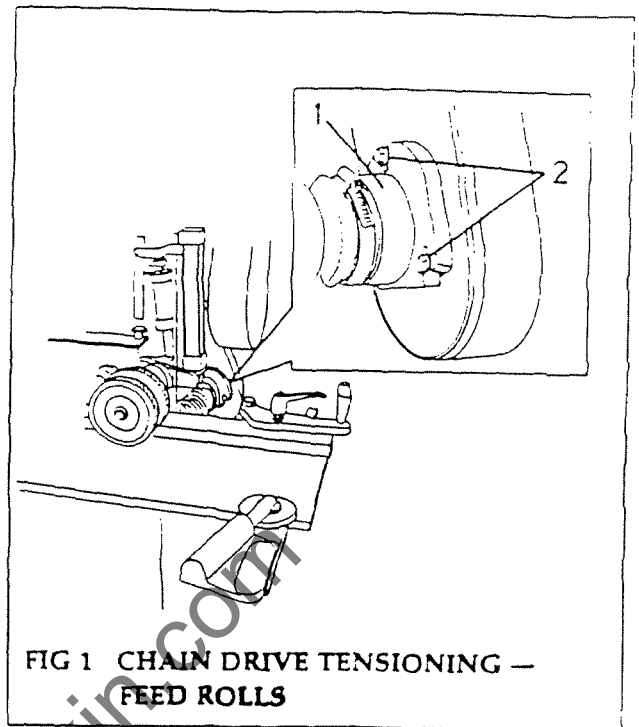


FIG 1 CHAIN DRIVE TENSIONING —  
FEED ROLLS

- (3) To adjust: Re-position the driven sprocket spindle (1), by slackening the securing screws (2) and moving the spindle with sprocket outward to take up any slack in the chain. Retighten screws (2) after adjustment.

Note: Do not overtension chain.

- (4) Refit drive cover.

#### Vee-Belt Drive Tensioning

Vee-belts are fitted to the primary drive to the feedworks shafts on the hydraulic variable speed drive arrangement and to the individual motor drives to the cutterblock spindles on either arrangement.

Check drive belts at regular intervals (as indicated below). If the need arises re-tension. Insufficient tension causes slipping and premature belt wear. Too much tension causes bearing wear. Tension as indicated in checking/Adjustment.



Observe the operation of the machine when first put into service. After approximately one hours effective use, check and retension spindle drive belts to take up initial belt stretch for the feedworks drive.

In general, Vee-belts will require adjustment at intervals to take up any slack due to use. Three-monthly intervals are recommended as an initial belt stretch.

It is important to check the condition and tension of the cutterspindle drive belts at regular intervals, depending on conditions of use, if problems relating to quality of finish are to be avoided. Monthly intervals are recommended initially.

Checking/Adjustment is carried out as follows:

(1) Remove the drive cover.

(2) Check belt tension. The belt should be capable of being depressed approximately 1 1/2 - 2 cm per metre of span by application of average thumb pressure, 5 -7 pounds force.

3) The method of adjustment is as follows :-

**variable speed drive belt (Fig 2)**

To adjust: Release the securing screws (1). Turn the adjusting screws (2), on the motor support bracket until any slack has been removed from the drive. Retighten the securing screws after adjustment. Do not overtension belts.

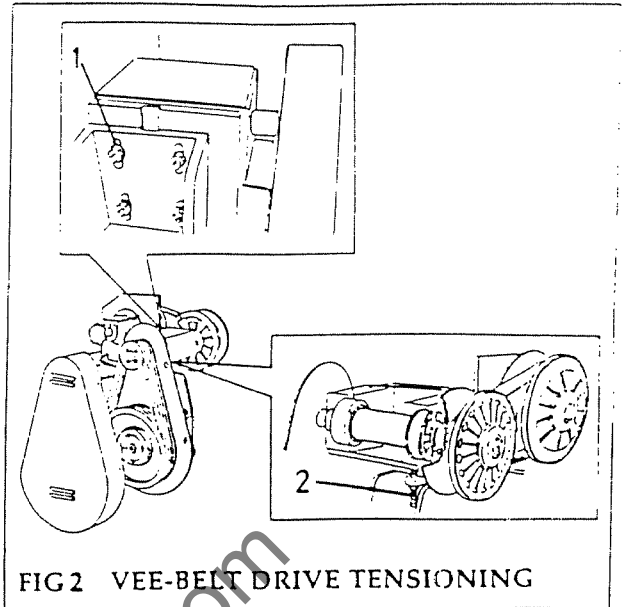


FIG2 VEE-BELT DRIVE TENSIONING

**Hydraulic Feed Drive Belts (Fig 3)**

- a) Slacken off the five clamping bolts (1).
- b) Slacken off adjusting screw locknut (2).

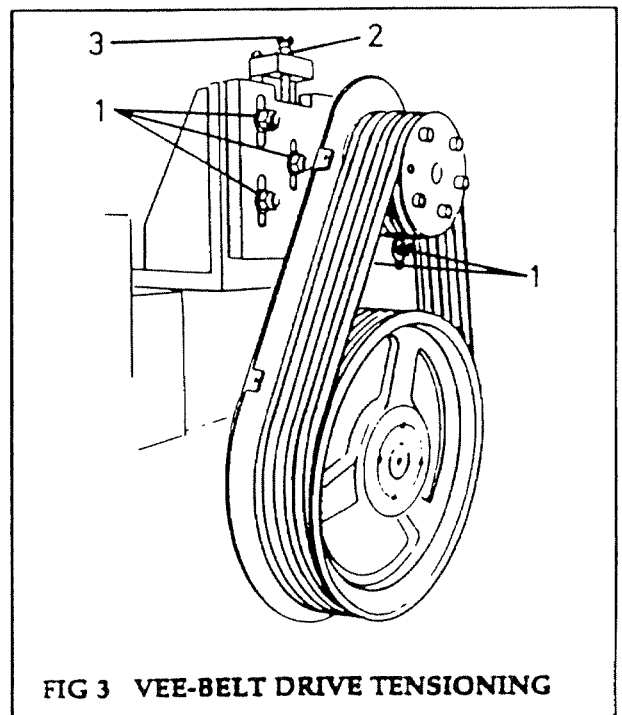


FIG 3 VEE-BELT DRIVE TENSIONING

- c) Turn adjusting screw (3) to remove any slack.

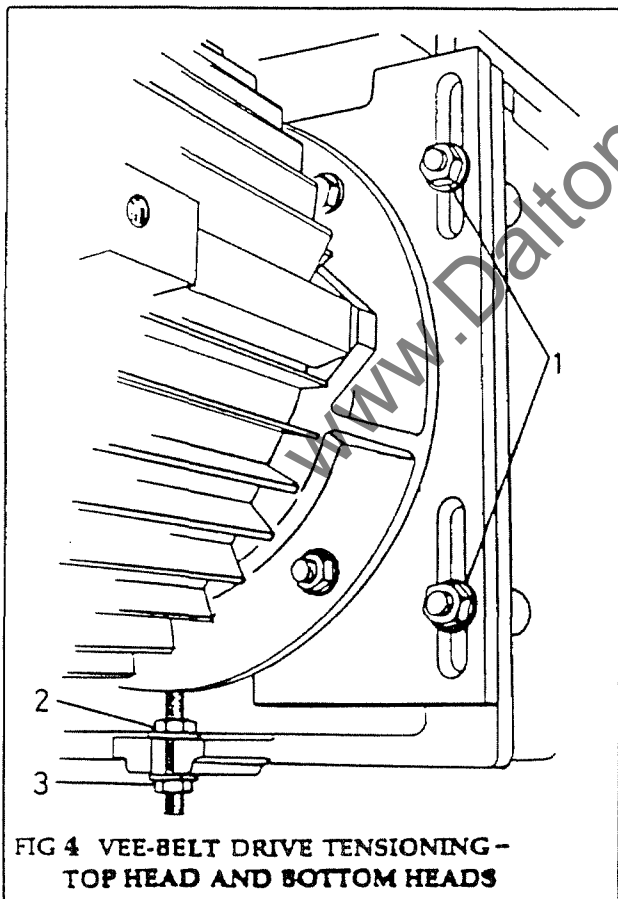
NOTE:- Do not over tension belts

- d) Lock adjusting screw locknut (2).

- e) Retighten clamping bolts (1).

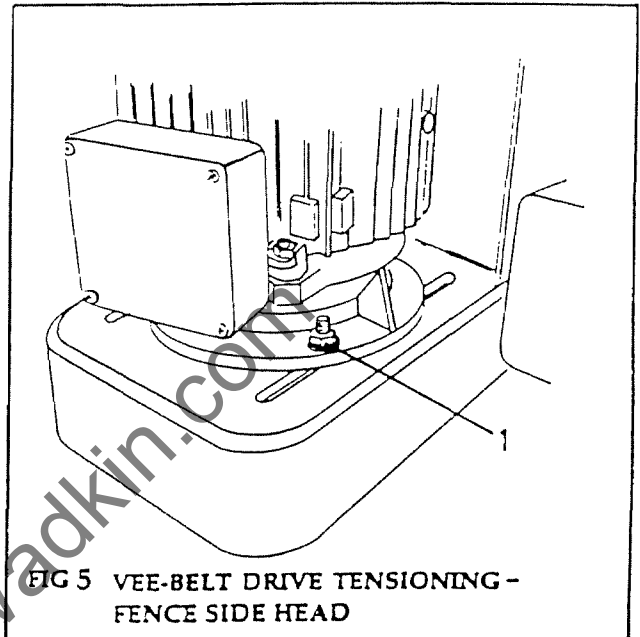
Top and bottom heads (Fig 4)

- a) Slacken of motor mounting plate clamp bolts (1)  
b) Tension belt by slackening the top locknut (2) and turning the bottom locknut (3) in a Clockwise direction.  
c) When tensioned lock up both locknuts (2 and 3) and motor mounting plate clamp bolts(1).



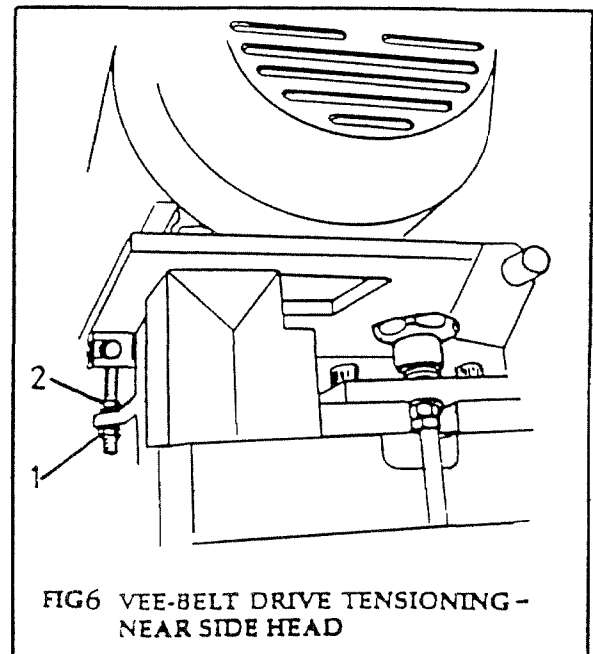
Fence side head (Fig 5)

- a) Slacken off motor clamping bolts (1)  
b) Tension belt using an outward force on the motor.  
c) Tighten motor clamp bolts. (1)



Near side head (Fig 6)

This motor is pivoted and as such the tensioning is against the pivot.



- a) Slacken off the back locknut (1) and turn the front locknut (2) in an anti-clockwise direction to tension.
  - b) When the correct tension has been reached lock up both nuts (1 and 2).
- (4) Refit drive cover.

There may be occasions where the tensioning arrangement does not follow that described. However, all belt drive adjustment follows the same general principle: This involves moving the drive pulley centres or motor platform, thus taking up any slack in the belt drive. The method used will normally be self evident. Always retighten any securing features fitted.

If one or more of the vee-belts becomes faulty it will usually be necessary to replace as a complete set. (see Replacing Drive Belts). It is impossible to obtain a correctly tensioned drive, with all belts taking an equal share of the load, by mixing old and new, or different belts.

### Cleaning

Woodworking machines are designed to need a minimum of maintenance. However, a certain level of maintenance, especially cleaning and lubrication, will pay dividends in quality of work.

It is recommended that the machine be cleaned thoroughly once a week, especially when working on hardwood or highly resinous material, to prevent choking of ventilator airways and build-up of deposits on working parts.

Clean all spindles regularly and remove all remains of resin and grease. Do the same with cutterblock collars and machine tables. Check that all machine parts slide, or rotate freely. Lightly lubricate as directed, do not over-lubricate.

If cleaning with compressed air, take care not to direct the jet onto the spindle bearing housings, moving shafts, etc., and avoid forcing dust and debris into bearings and housings.

## UNSCHEDULED MAINTENANCE

Unscheduled maintenance consists of replacing or correcting worn, damaged, or unserviceable components on the machine. Generally items which are defective will be replaced. These tasks require specialised knowledge and tools to perform.

Following this type of maintenance, the machine will need to be set up prior to return to work.

All - such as changing bearings, should be performed by competent personnel.

### Changing Cutterblock Spindle Bearings

The bearings have been fitted to the cutterblock spindles in an orthodox manner. At the non-drive end of the spindle a liquid engineering adhesive ('Loctite' grade 241) has been applied to the internal thread diameter of the bearing nut (3).

Note: This nut can be right or left-hand thread, dependant upon spindle rotation and tightens against the direction of rotation.

To dis-assemble parts joined by 'Loctite' adhesive use normal tools and methods. If the holding force of the 'Loctite' joint is too great then apply gentle heat and break the bond while the parts are still hot. The bonding adhesive may be left as a powder and must be removed before applying further adhesive.

### Preparation Prior to Fitting Bearings

Wadkin strongly recommend buying an exchange spindle unit rather than attempting a bearing change.

Before fitting a new bearing, the protection lubricant must be meticulously removed with petroleum spirit, triethanolamine, or other volatile solvent.

In order to prevent the moving parts from being damaged by drying out due to over cleaning, add a small amount of the bearing lubricant to the cleaning agent at the second bath. The film of grease which remains after the solvent has evaporated will provide protection for the bearing until charged with lubricant.

The new bearings should be charged with 'Kluber' lubricant, type 'Isoflex' NBU 15. It is important that the correct amount of grease is applied, preferably using the formula:

$$G \text{ (weight in grams)} = d \times B \times 0.01$$

$d$  = bore of bearing in mm  
 $B$  = width in mm

This is approximately sufficient to fill one third of the bearing volume.

### Bearing Change 40mm Spindles only (Fig.1)

#### NOTE:

Work must take place in a clean and dry environment failure to do so could result in premature bearing failure.

(i) Remove pulley assembly from spindle by unscrewing the M12 hexagon screw (9), withdraw spigot (8), pulley (7) and remove parallel key (11) from spindle.

(ii) Ensure spindle nut (1) has been removed. Release and remove bearing nuts (3 & 4). The spindle (2) can now be withdrawn from the pulley end (rear) of the spindle housing (10). Remove existing bearings (6) and bearing spaces (5), using a bearing pulley on the bearing rings.

**NOTE:-** Care must be taken, not to damage the spindle (2) or the housing (10).

(iii) After preparation; fit new bearings (6) to spindle (2) and housing (10), ensuring that the bearings (6) are fitted the correct way round and that the bearing spacers (5) are re-fitted. Use only sufficient pressure to fit bearings, applying pressure to the inner ring only.

Ensure that bearing fits up to location shoulder. Bearings (6) must be lubricated (see preparation) before fitting.

(iv) Reassemble spindle unit, fit bearing nuts (3 & 4). Tighten nuts until assembly is secure (see note on changing cutterblock bearings)

**NOTE:** DO NOT OVERTIGHTEN

(v) Check that spindle assembly runs freely and without end float.

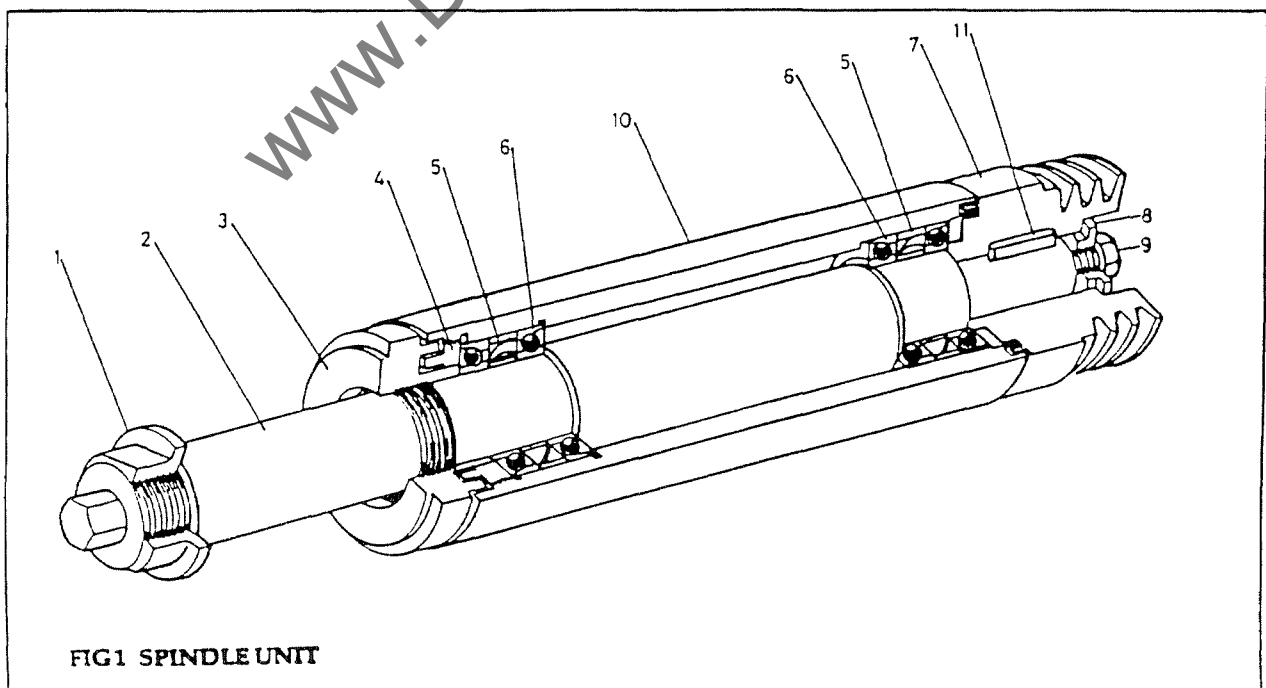
(vi) Refit parallel key (11), pulley (7), spigot (8) and M12 hexagon securing screw (9). Tighten screw to spindle until assembly is secure.

#### Bearing Change

50mm and 1.13/16" Spindles only (Fig.2)

**NOTE:**

Work must take place in a clean and dry environment, failure to do so could result in premature bearing failure.



(i) Remove pulley assembly from spindle by unscrewing the M12 hexagon screw (9). Withdraw pulley (7), spigot (8), and remove parallel key (11) from spindle.

(ii) Ensure spindle nut (1) has been removed. Release and remove bearing nuts (3 & 4). The spindle (2) can now be withdrawn from the spindle end (front) of the spindle housing (10). Remove existing bearings (6) and bearing spacers (5 & 12), using a bearing puller on the bearing rings.

**NOTE:** Care must be taken not to damage the spindle (2) or the housing (10).

(iii) After preparation; fit new bearings (6) to spindle (2) and housing (10) ensuring that the bearings (6) are fitted the correct way round and that bearing spacers (5) are refitted. Use only sufficient pressure to fit bearings, applying pressure to the inner ring only.

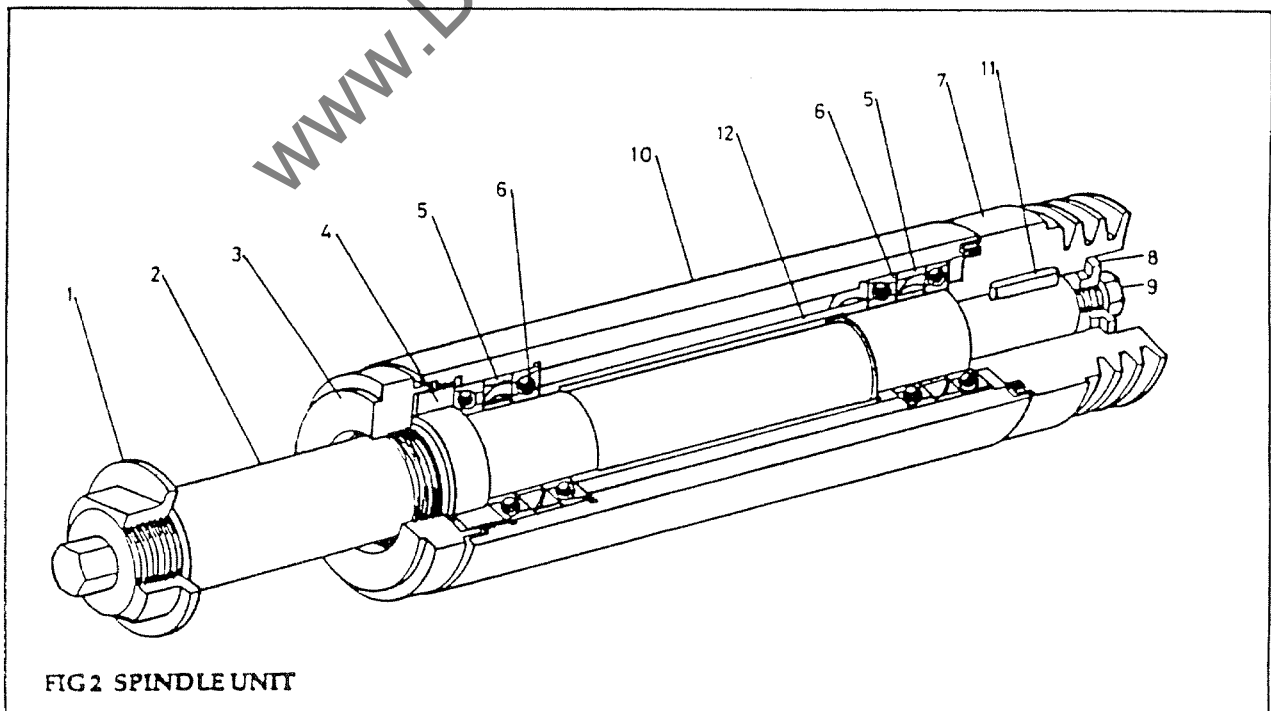
Ensure that bearing fits up to location shoulder. Bearings (6) must be lubricated (see preparation) before fitting.

(iv) Reassemble spindle unit ensuring that bearing spacer (12) is fitted correctly, fit bearing nuts (3 & 4). Tighten nuts until assembly is secure. (See note on changing cutter block bearings)

**NOTE:** DO NOT OVERTIGHTEN

(v) Check that spindle assembly runs freely and without end float.

(vi) Refit parallel key (11), pulley (7) and hexagon securing screw (9). Tighten screw to spindle until the assembly is secure.



### Outboard Bearing Change 1st & 2nd Bottom Heads (Fig.3)

#### NOTE

Work must take place in a clean and dry environment, failure to do so could result in premature bearing failure.

To remove bearings

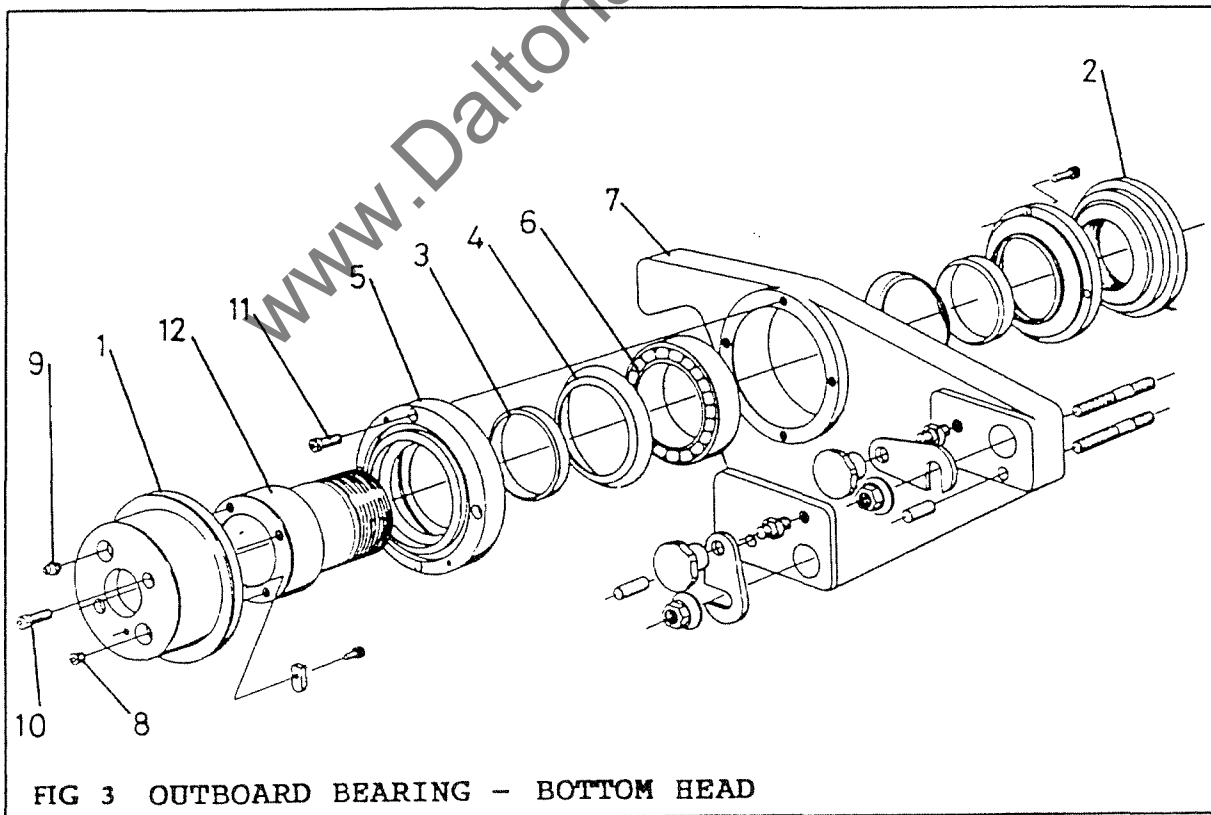
(i) Remove outboard bearings assembly from machine.

(ii) Remove bearing locknut (2), un-screw hexagon socket capscrews (10) and remove the protective ring (1), it is not necessary to remove the grease nipple (9) or the pressure release valve (8).

(iii) Remove the end cap for the outboard bearing housing (5) by removing 4-off hexagon socket capscrews (11).

(iv) Withdraw the ETP sleeve (12), the bearing spacer (3) and the spring disc (4). The bearing (6) should be withdrawn with the sleeve, unless the failure of the bearing (6) has caused it to seize in the housing (7). If the bearing is stuck in the housing remove it using a bearing puller on the bearing rings. Take care not to damage the housing (7).

(v) After preparation, (see preparation prior to fitting bearing) fit new bearing (6) to ETP sleeve (12) ensuring that the bearing spacer (3) and the disc spring (4) have also been fitted. Use only sufficient pressure to fit bearings, applying pressure to the inner ring only. Ensure that bearing ring fits up to location.



(vi) Lubricate bearing (see preparation)

(vii) Reassemble unit by reversing stages iii, ii, i) ensuring that the labrinyth seals in the outboard bearing end caps (5) are refilled with grease. Care must be taken when fitting bearing locknut (2) not to overtighten. A small amount of engineering adhesive (loctile grade 241) should be applied to the thread of the bearing locknut (2).

**NOTE:**

The bonding adhesive from the previous assembly may be left as a powder and must be removed before applying further adhesive.

(viii) Check that outboard assembly runs freely.

**Outboard Bearing Change  
Mk III Top Heads (Fig.4)**

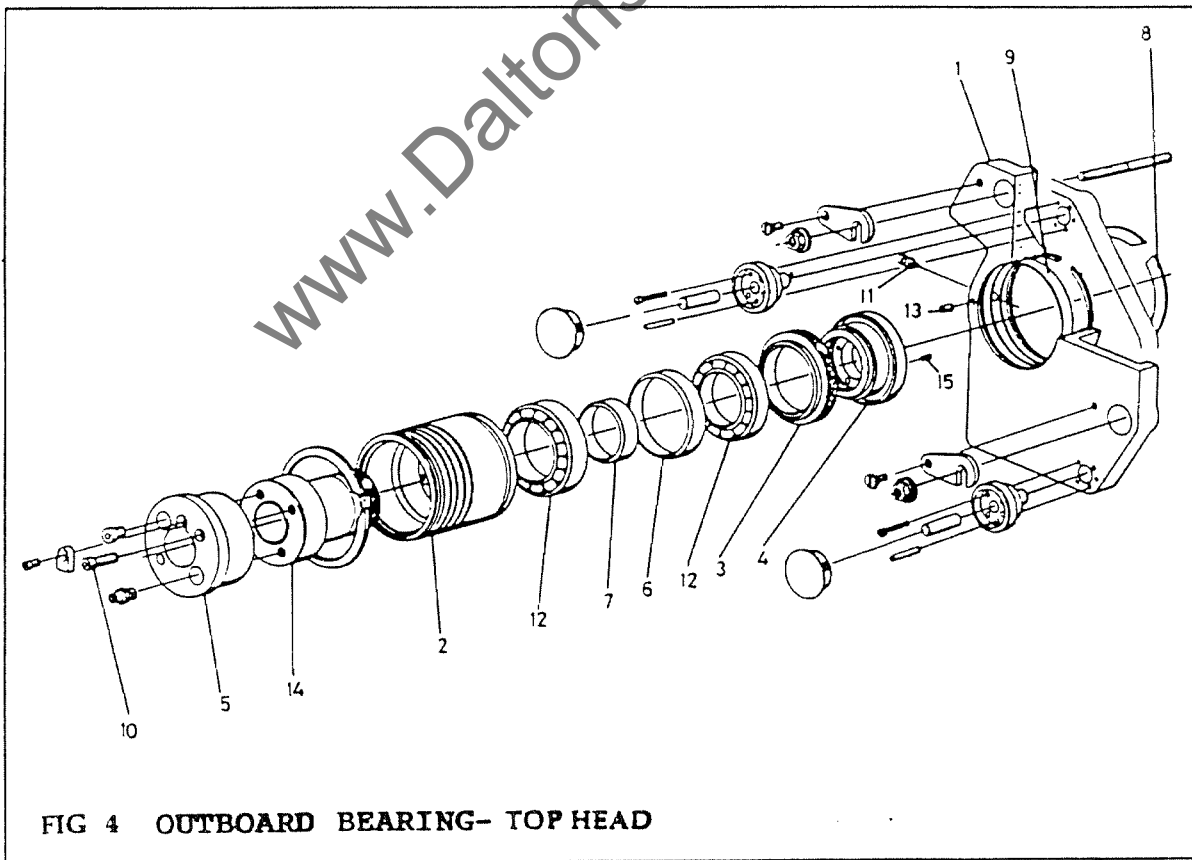
**NOTE**

Work must take place in a clean and dry environment, failure to do so could result in premature bearing failure.

(i) Remove outboard bearing assembly from machine.

**NOTE:** It is not necessary to remove the housing assembly (2) from the mounting plate (1), unless the housing (2) has become damaged. To remove see later note "housing removal".

(ii) Remove 2.off GRUB SCREW (15)  
Remove ETP sleeve locknut (4), remove 2-off hexagon socket capscrow (10) which will then allow the ETP end cap (5) to be withdrawn.



**FIG 4 OUTBOARD BEARING- TOP HEAD**





Remove bearing locknut (3), the ETP sleeve (14) and the bearing assembly can be withdrawn from the rear of the housing (2).

(iii) The bearings (12) can now be removed along with the bearing spacers (6 & 7) using a bearing puller.

#### NOTE

Care must be taken not to damage the ETP sleeve (14).

(iv) After preparation (see preparation prior to fitting bearings), and lubrication. The new bearings (12) can now be fitted to the ETP sleeve (14) complete with the bearing spacers (6 & 7). Ensure that the bearings (12) are fitted the correct way round. Use only sufficient pressure to fit bearings, applying pressure to the liner rung only. Ensure that the bearing rung fits up to the location shoulder.

(v) Refit ETP sleeve (14) and bearing assembly into the housing (2) ensuring that the assembly fits right up to the shoulder of the housing (2). Refit bearing locknut (3) ensuring that it is tight. Refit sleeve end cap (5) and sleeve locknut (4) insert grubscrews (15).

#### NOTE

Ensure all Labyrinth seals are re-filled with grease.

#### HOUSING REMOVAL

(i) Remove outboard bearing assembly from machine.

(ii) Remove grubscrew (13), remove anti rotation pin (11). Remove the External circlip (8) from the rear of the housing, this will allow the

housing assembly to be removed from the front of the machine. Care must be taken not to damage the housing assembly (2) or the mounting plate (1).

(iii) To refit the housing reverse the previous steps. Re-assembly will be aided by smearing the bore of the housing plate (1) with oil.

#### NOTE

Care must be taken when re-assembly not to damage the tape strip (9) in the housing plate (1).

#### Replacing Drive Belts

Drive belts must be replaced as a set to obtain correct drive performance. Before access can be gained to any drive belt it will be necessary to remove the guard covers.

To replace a belt drive

(i) Relieve tension on the drive by reducing drive centres. This can be done by either:

a. Releasing the fixing bolts on the motor support bracket and sliding the motor forward or upward.

b. Slackening off the motor tensioner bolt, or bolts.

(ii) Remove old drive belts, fit a new set of belts, same size, type and reference (see motor drive belt data).

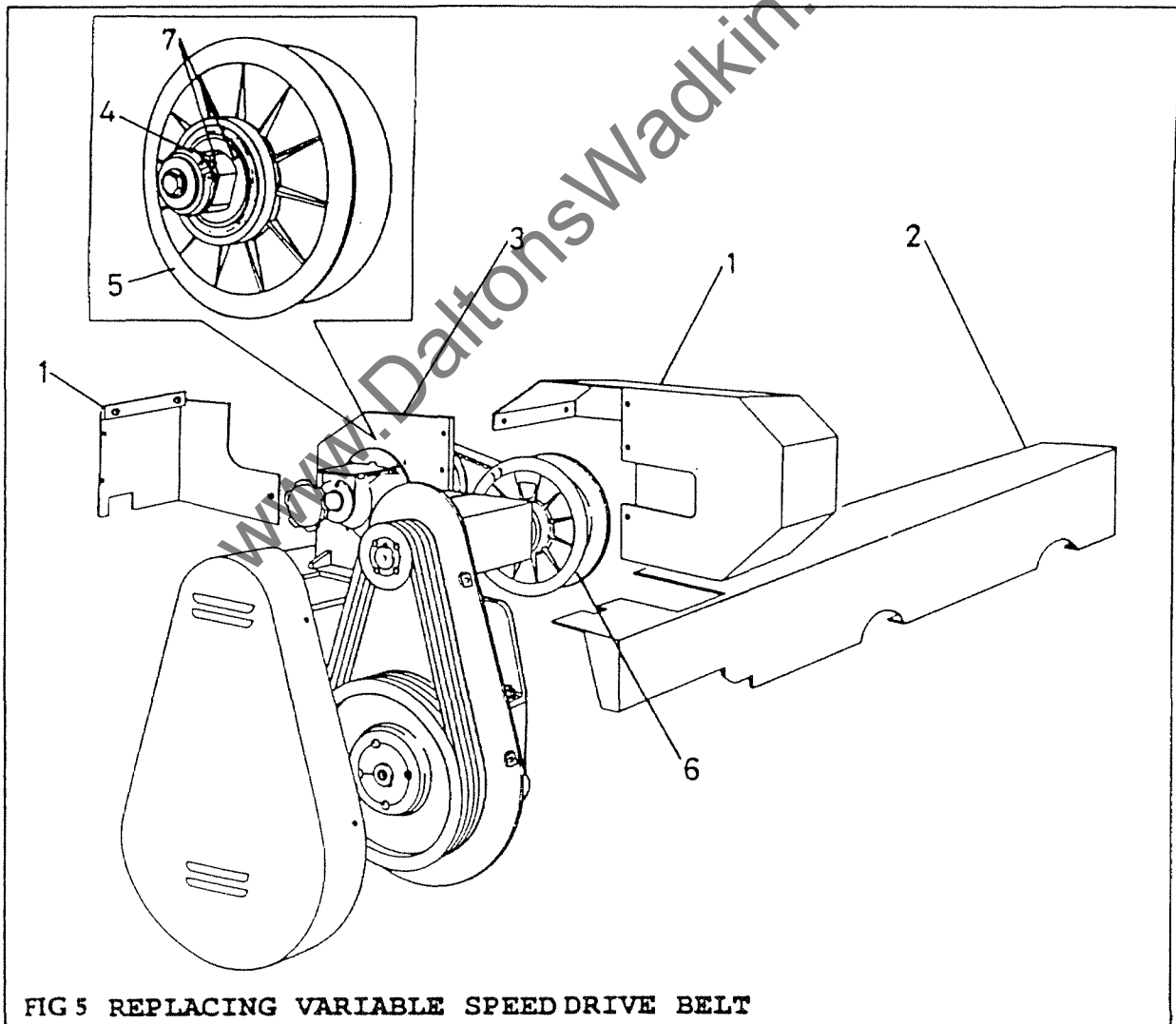
(iii) Retension the new belt set (see Vee-Belt tensioning - scheduled maintenance) as applicable to drive motor attachment. Secure all fixing/adjusting belts.

**NOTE**

It may at times be necessary to remove a drive pulley. The motor shaft pulleys are fitted with Taper-Lock bushes (See fig 3), cutterblock spindles are fitted with parallel keys. (See, remove and refit Drive pulleys)

**Replacing Variable Speed Drive Belt (Fig 5)**

- (1) With the machine in motion adjust the drive unit to the maximum output speed. Before dismantling switch off drive.
- (2) Remove the front and rear covers (1) and the first rear drive cover (2).
- (3) Unbolt and remove the variable speed adjustment unit mounting bracket (3).
- (4) Removing the circlip (4) at the end of the pulley shaft, allows the variable speed pulley to be separated by sliding the outer pulley half (5) off the shaft.
- (5) The old belt may now be removed and a new 'Simplabelt' drive belt fitted.



**FIG 5 REPLACING VARIABLE SPEED DRIVE BELT**

First place the new belt into the sprung loaded pulley (6). Ensure belt is seated below pulley rims.

NOTE:- It may be necessary to slightly open out the pulley halves with a soft piece of wood to allow the belt to fit. Care must be taken not to damage or distort pulley.

(6) Refit variable pulley outer halve (5) trapping the belt between halves. Replace Circlip (4).

NOTE:- The pulley is balanced and as such should be refitted lining up balance lines (7).

(7) Assembly procedure is the reverse sequence.

#### Removal and Refit of Drive Pulleys (Fig.6)

To remove a Taper-Lock bush pulley:

(1) Slacken off all screws (1) several turns using a hexagonal key. Remove one or two screws according to number of jacking holes (2).

(2) Insert screws in jacking holes after oiling thread and point of grub screws, or thread and head of cap screws, as applicable.

(3) Tighten screws (1) alternatively until bush (3) is loosened in Pulley hub and assembly is free on shaft.

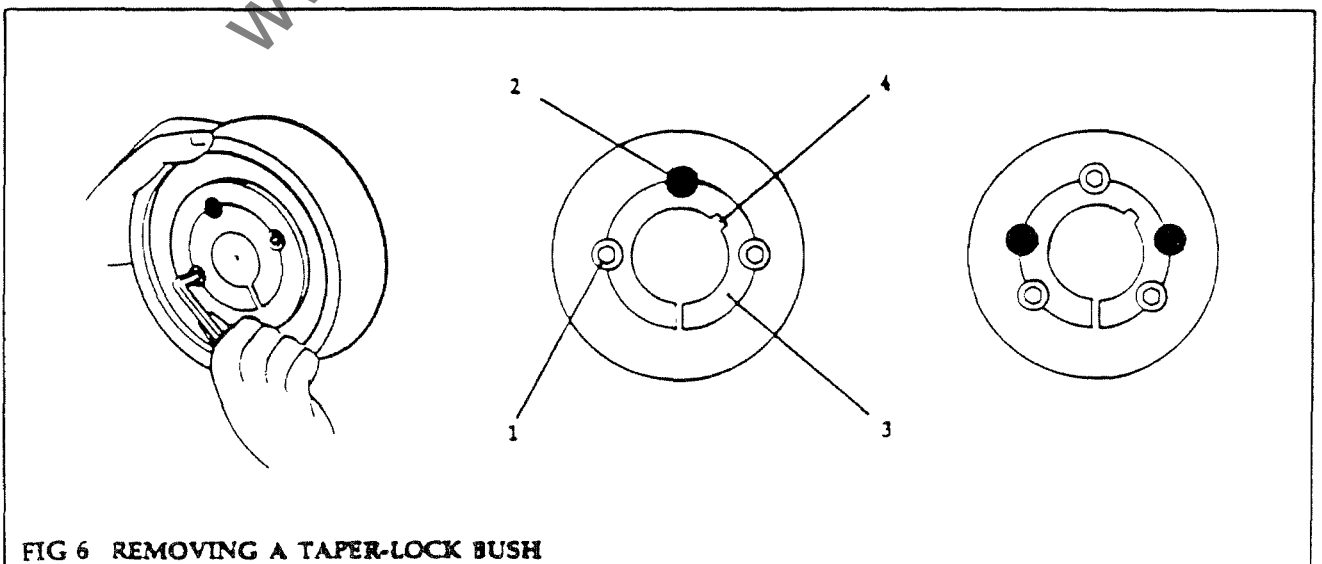
(4) Remove pulley assembly from shaft.

To refit a Taper-Lock bush pulley:

(1) Ensure that mating taper surfaces are completely clean and free from oil or dirt. Insert bush in hub and line up screw holes.

(2) Oil thread and point of grub screws, or thread and head of cap screws. Place screws (1) loosely in threaded holes in hub of pulley.

(3) Clean shaft, fit hub and bush to the shaft as a unit. Locate in position. On fitting; the bush will nip the shaft first, then hub will be drawn onto bush.



NOTE: It is necessary to axially align drive and driven pulleys.

(4) Using a hexagon key, alternately tighten screws (1), until all screws are pulled up securely. Use a short length of pipe on key to increase leverage.

(5) After the bush (3) has been tightened onto the shaft, fit the parallel key (4). The key is side fitting with top clearance.

(6) After the drive has been running under load for a short time, stop and check tightness of screws. Tighten if needed.

(7) Fill empty screw holes with grease to exclude dirt.

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## FAULT FINDING

### Mechanical Faults

Apart from mechanical failure (breakage) the majority of mechanical faults can be attributed to incorrectly tensioned drive chains or belts; the setting of cutterblocks and cutterblades; items working loose due to vibration — failure to set or tighten correctly; wrong speed setting; or misuse.

Therefore to get the best performance it is essential that the machine is set-up and used correctly, when many mechanical faults can be avoided.

### Elimination of Vibration

It is important to check condition and tension of the cutter spindle drive belts regularly (see **Scheduled Maintenance**).

It is also important that the cutters are evenly ground and set to run true in the cutterblock, the assembled cutterblock should be statically balanced before fitting to the spindle.

In the case of high speed machines it is highly recommended that cutterblocks be dynamically balanced (see **Maintenance: Cutters and Toolholders**).

### Electrical Faults

**FAULT** The machine does not run when any 'START' button is operated

#### Diagnosis

- Disconnect (isolator) switch has not been closed
- Main fuse or control circuit fuse has blown
- Overload relay has tripped

#### Remedial Action

- Check and close if needed
- Replace fuse
- Reset relay. Check reason for trip

**FAULT** A motor does not start — loud humming sound

#### Diagnosis

- An open circuit in at least two 'line leads' of the motor
- The fuses of the motor have blown

#### Remedial Action

- Check circuit and rectify
- Replace fuse

**FAULT** An air break magnetic contactor does not operate

#### Diagnosis

- The contacts are burned and make improper contact
- Broken connection wire
- An overload relay has tripped
- A fuse has blown

#### Remedial Action

- Clean or replace contacts
- Remake connections
- Reset relay. Check reason for overload
- Replace fuse



**FAULT** A Star/Delta connected motor does not operate when the contactor is connected in star

**Remedial Action**

Check. Remedy the symptoms outlined in paragraph above

**FAULT** When a motor is started, the fuses blow and the overload relay trips

**Diagnosis**

- a. The motor does not run freely
- b. There is a short circuit in the wiring mains
- c. The motor windings or winding are/is earthed

**Remedial Action**

- a. Check that the motor is free running
- b. Check the circuit wiring
- c. Check the windings in turn for electrical continuity and also earth faults with a 'Megger'

**FAULT** The motor overheats when running 'light' (unloaded)

**Diagnosis**

- a. The motor windings are connected in delta instead of star
- b. The mains voltage is too high
- c. The ventilating air ducts of the motor frame have become blocked with dust or chips, the cooling air passage has become impeded, or the cooling fan (if fitted) is not functioning correctly

**Remedial Action**

- a. Check connections
- b. Check mains voltage and correct
- c. Clean airways. Check fan operation

**FAULT** Motor overheats while working

**Diagnosis**

- a. The motor is overloading
- b. The motor is running under single phase conditions

**Remedial Action**

- a. Check reason and correct
- b. Check electrical circuits

**FAULT** The motor makes an abnormal noise

**Diagnosis**

- a. The cause can be of a mechanical or electrical nature
- b. If the noise is caused by an electrical fault, the noise will disappear when power is switched off
- c. If the noise is caused by a mechanical fault, the noise will diminish as speed of rotation decreases

**Remedial Action**

- a. Establish mechanical or electrical origin
- b.c. Check symptoms. Deduce by elimination to locate position and nature of fault

**FAULT** The Air Break Magnetic Starter is noisy

**Diagnosis**

- a. The mains voltage is too low
- b. The surfaces of the 'fixed' and 'moving' contacts are dirty

**Remedial Action**

- a. Check mains voltage and correct
- b. Replace contactor

**FAULT** The air break magnetic starter remains 'closed' after a STOP button has been operated

**Diagnosis**

- a. The contactor 'fixed' and 'moving' contacts have welded together following a short circuit

**Remedial Action**

- a. Check and remove cause of the short circuit. Replace the complete contactor

**FAULT** A fault condition arises on a motor and the overload current relay fails to operate.

**Diagnosis**

- a. The overload relay may be incorrectly rated – it should correspond to the normal full load current of the motor (given on the motor nameplate) for Direct-on-Line starting
- b. If the overload relay is connected in a Star/Delta starter, the rating of the overload should be the normal full load current of the motor (given on the motor nameplate) multiplied by 1/1.73 (0.58)

**Remedial Action**

- a. Replace with correctly rated relay

**FAULT** A Spindle stops, but the motor still runs

**Diagnosis**

- a. The drive belts are loose, broken, or have come off

**Remedial Action**

- a. Retension or replace belts

**FAULT** The Rise and Fall drive motor does not operate

**Diagnosis**

- a. The limit switch on the top horizontal head, or the limit switch at the infeed end of the machine is jammed by wood chips or is damaged
- b. The push button is faulty

**Remedial Action**

- a. Check and clean the limit switches
- b. Check and clean the push button

**FAULT** If the limit switch between the Top Head and Beam is operated simultaneously with either of the two Beam Vertical Traverse limit switches, the Beam will not lower

**Diagnosis**

Disengage the clutch on top head and manually wind down the top head until limit switch is released, then bring beam down by normal procedure (pushbutton control)

The foregoing observations are of a general nature and intended to be of assistance to avoid the incidence of breakdown. They do not preclude the user from calling a qualified electrician. In the case of an electrical fault or breakdown, in the interest of personal safety, it is always advisable to call a qualified electrician if the fault repeats.

**TABLES****APPROVED LUBRICANTS**

| WADKIN | CASTROL          | B. P.                             | SHELL                      | MOBIL                             | ESSO                           | GULF                         | CAITEX                        |
|--------|------------------|-----------------------------------|----------------------------|-----------------------------------|--------------------------------|------------------------------|-------------------------------|
| L1     | HYSPIN<br>AWS 32 | ENERGOL<br>HLP 32                 | VITROL<br>32               | DTE OIL<br>LIGHT 24               | NUTO 44<br>OR<br>ESSTIC<br>H44 | HARMONY<br>43 AW             | RANDO<br>OIL HDA              |
| L2     | ALPHA<br>ZN 150  | ENERGOL<br>HP 150<br>OR<br>CS 150 | VITREA<br>150              | VACTRA<br>EXTRA<br>HEAVY          | ESSTIC<br>65                   | SERVICE<br>13                | LRSA P40                      |
| L4     | MAGNA 68         | ENERGOL<br>HP 68<br>OR<br>CS 68   | VITREA<br>68               | VACTRAL<br>OIL<br>HEAVY<br>MEDIUM | ESSTIC<br>50                   | SERVICE<br>51                | LRSA P20                      |
| L6     | SPHEEROL<br>AP 3 | ENERGREASE<br>ES3                 | ALVANIA<br>GREASE<br>NO. 3 | MOBILPLEX<br>GREASE<br>NO. 48     | BEACON<br>3                    | GULFCROWN<br>GREASE<br>NO. 3 | REGAL<br>STARTAK<br>PREMIUM 3 |

- L1 OIL Hydraulic oil with anti-corrosion, anti-oxidation, anti-wear, anti-foam performance.
- L2 OIL Gear oil (Viscosity 150 centi-strokes at 40°C).
- L4 OIL Plain mineral oil (Viscosity 68 centi-strokes at 40°C).
- L6 GREASE Grease NLG1 No. 3 consistency Lithium bearing grease.





| Belts and pulleys for spindle drive to NEAR SIDE HEAD Frequency 50 Hertz |      |      |              |             |                       |             |             |             |               |             |     |                |               |
|--|------|------|--------------|-------------|-----------------------|-------------|-------------|-------------|---------------|-------------|-----|----------------|---------------|
| Motor  |      |      | Motor Pulley |             | Motor Taper Lock Bush |             |             | Belts       |               |             |     | Spindle Pulley | Spindle Speed |
| Frame Size   | K.W. | HP   | Fenner Ref.  | Wadkin Ref. | Bore M.M.             | Fenner Ref. | Wadkin Ref. | Fenner Ref. | Optibelt Ref. | Wadkin Ref. | Qty | Wadkin Ref.    | R.P.M         |
| D132   | 5.5  | 7.5  | 03120223     | K3078218    | 38                    | 2012        | K3078113    |             | SPZX/3V1662PL | K3078649    | 3   | GA 7714        | 6000          |
| D132   | 5.5  | 7.5  | 03120303     | K3078245    | 38                    | 2012        | K3078113    | 2362 0180   |               | K3078638    | 3   | GA 7714        | 9000          |
| D132   | 7.5  | 10.0 | 03120223     | K3078218    | 38                    | 2012        | K3078113    |             | SPZX/3V1662PL | K3078649    | 3   | GA 7714        | 6000          |
| D132   | 7.5  | 10.0 | 03120303     | K3078245    | 38                    | 2012        | K3078113    | 2362 0180   |               | K3078638    | 3   | GA 7714        | 9000          |
| D160   | 11.0 | 15.0 | 03120223     | K3078218    | 38                    | 2012        | K3078113    |             | SPZX/3V1662PL | K3078649    | 3   | GA 7714        | 6000          |
| D160   | 11.0 | 15.0 | 03120303     | K3078245    | 38                    | 2012        | K3078113    | 2362 0180   |               | K3078638    | 3   | GA 7714        | 9000          |

| Belts and pulleys for spindle drive to NEAR SIDE HEAD Frequency 60 Hertz |      |      |              |             |                       |             |             |             |               |             |     |                |               |
|--|------|------|--------------|-------------|-----------------------|-------------|-------------|-------------|---------------|-------------|-----|----------------|---------------|
| Motor  |      |      | Motor Pulley |             | Motor Taper Lock Bush |             |             | Belts       |               |             |     | Spindle Pulley | Spindle Speed |
| Frame Size   | K.W. | HP   | Fenner Ref.  | Wadkin Ref. | Bore M.M.             | Fenner Ref. | Wadkin Ref. | Fenner Ref. | Optibelt Ref. | Wadkin Ref. | Qty | Wadkin Ref.    | R.P.M         |
| D132   | 5.5  | 7.5  | 03120203     | K3078272    | 38                    | 2012        | K3078113    | 2362 0160   |               | K3078652    | 3   | GA 7714        | 6000          |
| D132   | 5.5  | 7.5  | 03120263     | K3078244    | 38                    | 2012        | K3078113    | 2632 0170   |               | K3078650    | 3   | GA 7714        | 9000          |
| D132   | 7.5  | 10.0 | 03120203     | K3078272    | 38                    | 2012        | K3078113    | 2362 0160   |               | K3078652    | 3   | GA 7714        | 6000          |
| D132   | 7.5  | 10.0 | 03120263     | K3078244    | 38                    | 2012        | K3078113    | 2362 0170   |               | K3078650    | 3   | GA 7714        | 9000          |
| D160   | 11.0 | 15.0 | 03120203     | K3078272    | 38                    | 2012        | K3078113    | 2362 0160   |               | K3078652    | 3   | GA 7714        | 6000          |
| D160   | 11.0 | 15.0 | 03120263     | K3078244    | 38                    | 2012        | K3078113    | 2362 0170   |               | K3078650    | 3   | GA 7714        | 9000          |

MOTOR AND DRIVE BELT DATA

| Belts and pulleys for spindle drive to TOP AND BOTTOM HEADS Frequency 50 Hertz |       |      |              |             |                       |             |             |             |                |             |     |                |               |
|--|-------|------|--------------|-------------|-----------------------|-------------|-------------|-------------|----------------|-------------|-----|----------------|---------------|
| Motor  |       |      | Motor Pulley |             | Motor Taper Lock Bush |             |             | Belts       |                |             |     | Spindle Pulley | Spindle Speed |
| Frame Size   | K.W.  | HP   | Fenner Ref.  | Wadkin Ref. | Bore M.M.             | Fenner Ref. | Wadkin Ref. | Fenner Ref. | Optibelt Ref.  | Wadkin Ref. | Qty | Wadkin Ref.    | R.P.M         |
| D132   | 5.5   | 7.5  | 03120266     | K3078240    | 38                    | 2517        | K3077194    |             | SPZX/3V-960PL  | K3078655    | 3   | GA 7713        | 6000          |
| D132   | 5.5   | 7.5  | 03120306     | K3078242    | 38                    | 2517        | K3077194    |             | SPZX/3V-1060PL | K3078670    | 3   | GA 7686        | 9000          |
| D132   | 7.5   | 10.0 | 03120266     | K3078240    | 38                    | 2517        | K3077194    |             | SPZX/3V-960PL  | K3078655    | 3   | GA 7713        | 6000          |
| D132   | 7.5   | 10.0 | 03120306     | K3078242    | 38                    | 2517        | K3077194    |             | SPZX/3V-1060PL | K3078670    | 3   | GA 7686        | 9000          |
| D160   | 11.0  | 15.0 | 03120266     | K3078240    | 38                    | 2517        | K3077194    |             | SPZX/3V-960PL  | K3078655    | 3   | GA 7713        | 6000          |
| D160   | 11.0  | 15.0 | 03120306     | K3078242    | 38                    | 2517        | K3077194    |             | SPZX/3V-1060PL | K3078670    | 3   | GA 7686        | 9000          |
| D160   | 15.0  | 20.0 | 03120266     | K3078240    | 42                    | 2517        | K3077101    |             | SPZX/3V-960PL  | K3078655    | 5   | GA 7713        | 6000          |
| D160   | 15.0  | 20.0 | 03120306     | K3078242    | 42                    | 2517        | K3077101    |             | SPZX/3V-1060PL | K3078670    | 5   | GA 7686        | 9000          |
| D160   | 18.75 | 25.0 | 03120266     | K3078240    | 42                    | 2517        | K3077101    |             | SPZX/3V-960PL  | K3078655    | 5   | GA 7713        | 6000          |
| D160   | 18.75 | 25.0 | 03120306     | K3078242    | 42                    | 2517        | K3077101    |             | SPZX/3V-1060PL | K3078670    | 5   | GA 7686        | 9000          |

| Belts and pulleys for spindle drive to TOP AND BOTTOM HEADS Frequency 60 Hertz |       |      |              |             |                       |             |             |             |               |             |     |                |               |
|--|-------|------|--------------|-------------|-----------------------|-------------|-------------|-------------|---------------|-------------|-----|----------------|---------------|
| Motor  |       |      | Motor Pulley |             | Motor Taper Lock Bush |             |             | Belts       |               |             |     | Spindle Pulley | Spindle Speed |
| Frame Size   | K.W.  | HP   | Fenner Ref.  | Wadkin Ref. | Bore M.M.             | Fenner Ref. | Wadkin Ref. | Fenner Ref. | Optibelt Ref. | Wadkin Ref. | Qty | Wadkin Ref.    | R.P.M         |
| D132   | 5.5   | 7.5  | 03120246     | K3078204    | 38                    | 2517        | K3077194    |             | SPZX/3V-950PL | K3078675    | 3   | GA 7713        | 6000          |
| D132   | 5.5   | 10.0 | 03120246     | K3078204    | 38                    | 2517        | K3077194    |             | SPZX/3V-950PL | K3078675    | 3   | GA 7713        | 6000          |
| D160   | 11.0  | 15.0 | 03120246     | K3078204    | 38                    | 2517        | K3077194    |             | SPZX/3V-950PL | K3078675    | 3   | GA 7713        | 6000          |
| D180   | 15.0  | 20.0 | 03120246     | K3078204    | 42                    | 2517        | K3077101    |             | SPZX/3V-900PL | K3078660    | 3   | GA 7713        | 6000          |
| D180   | 18.75 | 25.0 | 03120246     | K3078204    | 42                    | 2517        | K3077101    |             | SPZX/3V-900PL | K3078660    | 3   | GA 7713        | 6000          |





| Belts and pulleys for spindle drive to <b>FENCE SIDE HEAD</b> Frequency 50 Hertz |      |      |              |             |                       |             |             |             |               |             |     |                |               |
|--|------|------|--------------|-------------|-----------------------|-------------|-------------|-------------|---------------|-------------|-----|----------------|---------------|
| Motor  |      |      | Motor Pulley |             | Motor Taper Lock Bush |             |             | Belts       |               |             |     | Spindle Pulley | Spindle Speed |
| Frame Size   | K.W. | HP   | Fenner Ref.  | Wadkin Ref. | Bore M.M.             | Fenner Ref. | Wadkin Ref. | Fenner Ref. | Optibelt Ref. | Wadkin Ref. | Qty | Wadkin Ref.    | R.P.M         |
| D132   | 5.5  | 7.5  | 03120223     | K3078218    | 38                    | 2012        | K3077113    | 23620125    |               | K3078648    | 3   | GA 8366        | 6000          |
| D132   | 5.5  | 7.5  | 03120303     | K3078245    | 38                    | 2012        | K3077113    | 23620140    |               | K3078637    | 3   | GA 8366        | 9000          |
| D132   | 7.5  | 10.0 | 03120223     | K3078218    | 38                    | 2012        | K3077113    | 23620125    |               | K3078648    | 3   | GA 8366        | 6000          |
| D132   | 7.5  | 10.0 | 03120303     | K3078245    | 38                    | 2012        | K3077113    | 23620140    |               | K3078637    | 3   | GA 8366        | 9000          |
| D160   | 11.0 | 15.0 | 03120223     | K3078218    | 38                    | 2012        | K3077113    | 23620125    |               | K3078648    | 3   | GA 8366        | 6000          |
| D160   | 11.0 | 15.0 | 03120303     | K3078245    | 38                    | 2012        | K3077113    | 23620140    |               | K3078637    | 3   | GA 8366        | 9000          |

| Belts and pulleys for spindle drive to <b>FENCE SIDE HEAD</b> Frequency 60 Hertz |      |      |              |             |                       |             |             |             |               |             |     |                |               |
|--|------|------|--------------|-------------|-----------------------|-------------|-------------|-------------|---------------|-------------|-----|----------------|---------------|
| Motor  |      |      | Motor Pulley |             | Motor Taper Lock Bush |             |             | Belts       |               |             |     | Spindle Pulley | Spindle Speed |
| Frame Size   | K.W. | HP   | Fenner Ref.  | Wadkin Ref. | Bore M.M.             | Fenner Ref. | Wadkin Ref. | Fenner Ref. | Optibelt Ref. | Wadkin Ref. | Qty | Wadkin Ref.    | R.P.M         |
| D132   | 5.5  | 7.5  | 03120203     | K3078272    | 38                    | 2012        | K3077113    |             | SPZX3V1212PL  | K3078653    | 3   | GA 8366        | 6000          |
| D132   | 5.5  | 7.5  | 03120263     | K3078244    | 38                    | 2012        | K3077113    |             | SPZX3V1312PL  | K3078651    | 3   | GA 8366        | 9000          |
| D132   | 7.5  | 10.0 | 03120203     | K3078272    | 38                    | 2012        | K3077113    |             | SPZX3V1212PL  | K3078653    | 3   | GA 8366        | 6000          |
| D132   | 7.5  | 10.0 | 03120263     | K3078244    | 38                    | 2012        | K3077113    |             | SPZX3V1312PL  | K3078651    | 3   | GA 8366        | 9000          |
| D160   | 11.0 | 15.0 | 03120203     | K3078272    | 38                    | 2012        | K3077113    |             | SPZX3V1212PL  | K3078653    | 3   | GA 8366        | 6000          |
| D160   | 11.0 | 15.0 | 03120263     | K3078244    | 38                    | 2012        | K3077113    |             | SPZX3V1312PL  | K3078651    | 3   | GA 8366        | 9000          |

MAINTENANCE

SECTION 4

| Belts and pulleys for spindle drive to UNIVERSAL HEAD |      |      |              |             |                       |             |             |             |               |             |     |                |               | Frequency 50 Hertz |  |
|---|------|------|--------------|-------------|-----------------------|-------------|-------------|-------------|---------------|-------------|-----|----------------|---------------|--------------------|--|
| Motor   |      |      | Motor Pulley |             | Motor Taper Lock Bush |             |             | Belts       |               |             |     | Spindle Pulley | Spindle Speed |                    |  |
| Frame Size  | K.W. | HP   | Fenner Ref.  | Wadkin Ref. | Bore M.M.             | Fenner Ref. | Wadkin Ref. | Fenner Ref. | Optibelt Ref. | Wadkin Ref. | Qty | Wadkin Ref.    | R.P.M         |                    |  |
| D132  | 5.5  | 7.5  | 03120223     | K3078218    | 38                    | 2012        | K3077113    | SP2940      |               | K3077156    | 3   | GA 1475        | 6000          |                    |  |
| D132  | 5.5  | 7.5  | 03120303     | K3078245    | 38                    | 2012        | K3077113    | SPZ1120     |               | K3078513    | 3   | GA 1475        | 9000          |                    |  |
| D132  | 7.5  | 10.0 | 03120223     | K3078218    | 38                    | 2012        | K3077113    | SP2940      |               | K3077156    | 3   | GA 1475        | 6000          |                    |  |
| D132  | 7.5  | 10.0 | 03120303     | K3078245    | 38                    | 2012        | K3077113    | SPZ1120     |               | K3078513    | 3   | GA 1475        | 9000          |                    |  |
| D160  | 11.0 | 15.0 | 03120223     | K3078218    | 38                    | 2012        | K3077113    | SP2940      |               | K3077156    | 3   | GA 1475        | 6000          |                    |  |
| D160  | 11.0 | 15.0 | 03120303     | K3078245    | 38                    | 2012        | K3077113    | SPZ1120     |               | K3078513    | 3   | GA 1475        | 9000          |                    |  |

| Belts and pulleys for spindle drive to UNIVERSAL HEAD |      |      |              |             |                       |             |             |             |               |             |     |                |               | Frequency 60 Hertz |  |
|---|------|------|--------------|-------------|-----------------------|-------------|-------------|-------------|---------------|-------------|-----|----------------|---------------|--------------------|--|
| Motor   |      |      | Motor Pulley |             | Motor Taper Lock Bush |             |             | Belts       |               |             |     | Spindle Pulley | Spindle Speed |                    |  |
| Frame Size  | K.W. | HP   | Fenner Ref.  | Wadkin Ref. | Bore M.M.             | Fenner Ref. | Wadkin Ref. | Fenner Ref. | Optibelt Ref. | Wadkin Ref. | Qty | Wadkin Ref.    | R.P.M         |                    |  |
| D132  | 5.5  | 7.5  | 03120203     | K3078272    | 38                    | 2012        | K3078113    | 26020090    |               | K3078351    | 3   | GA 1475        | 6000          |                    |  |
| D132  | 5.5  | 7.5  | 03120263     | K3078244    | 38                    | 2012        | K3078113    | 26020090    |               | K3078351    | 3   | GA 1475        | 9000          |                    |  |
| D132  | 7.5  | 10.0 | 03120203     | K3078272    | 38                    | 2012        | K3078113    | 26020090    |               | K3078351    | 3   | GA 1475        | 6000          |                    |  |
| D132  | 7.5  | 10.0 | 03120263     | K3078244    | 38                    | 2012        | K3078113    | 26020090    |               | K3078351    | 3   | GA 1475        | 9000          |                    |  |
| D160  | 11.0 | 15.0 | 03120203     | K3078272    | 38                    | 2012        | K3078113    | 26020090    |               | K3078351    | 3   | GA 1475        | 6000          |                    |  |
| D160  | 11.0 | 15.0 | 03120263     | K3078244    | 38                    | 2012        | K3078113    | 26020090    |               | K3078351    | 3   | GA 1475        | 9000          |                    |  |



## SECTION 5 ILLUSTRATED PARTS LIST

## CONTENTS

- 1 Bedplate charts
- 1a Bedplate charts
- 2 Shaft drives
- 3 Fence side head unit adjusting mechanism
- 4 Top head — including power rise and fall
- 5 Outboard bearing - Bottom heads
- 6 Top head pressure pad
- 7 Side pressure unit before Near side head
- 8 Top head chipbreaker Mk II and Mk III
- 9 First bottom head
- 10 Outboard bearing-Top head Mk II and Mk III
- 11 Variable speed drive
- 12 Fence side head spindle unit — 40 mm Dia
- 13 Fence side head spindle unit — 50mm, 1  $\frac{13}{16}$ " Dia
- 14 Near side head spindle unit — 40 mm Dia
- 15 Near side head spindle unit — 50mm, 1  $\frac{13}{16}$ " Dia
- 16 Top head spindle unit — 40 mm Dia
- 17 Top head spindle unit — 50mm, 1  $\frac{13}{16}$ " Dia
- 18 Bottom head spindle unit — 40 mm Dia
- 19 Bottom head spindle unit — 50mm, 1  $\frac{13}{16}$ " Dia
- 20 Near Side head unit adjusting mechanism
- 21 Top roller pressure unit
- 22 Single side roller pressure
- 23 Mounting for top pad or roller pressure
- 24 Universal head adjusting mechanism
- 25 Joints — Near Side head
- 26 Joints — Fence side head Mk I and Mk II
- 27 Joints — Top head
- 28 Joints — Second bottom head
- 29 Bottom heads rise and fall
- 30 Bottom heads axial adjustment
- 31 Top heads axial adjustment
- 32 Double thro feed gearbox
- 33 Single thro feed gearbox
- 34 Single thro feed gearbox used with bottom roll drive
- 35 Bottom feedroll drive transfer
- 36 Near side head chip breaker Mk II and Mk III
- 37 Second bottom head axial adjustment

**IMPORTANT: WHEN ORDERING SPARES ALWAYS QUOTE MODEL AND MACHINE NUMBER**



ILLUSTRATED PARTS LIST

SECTION 5

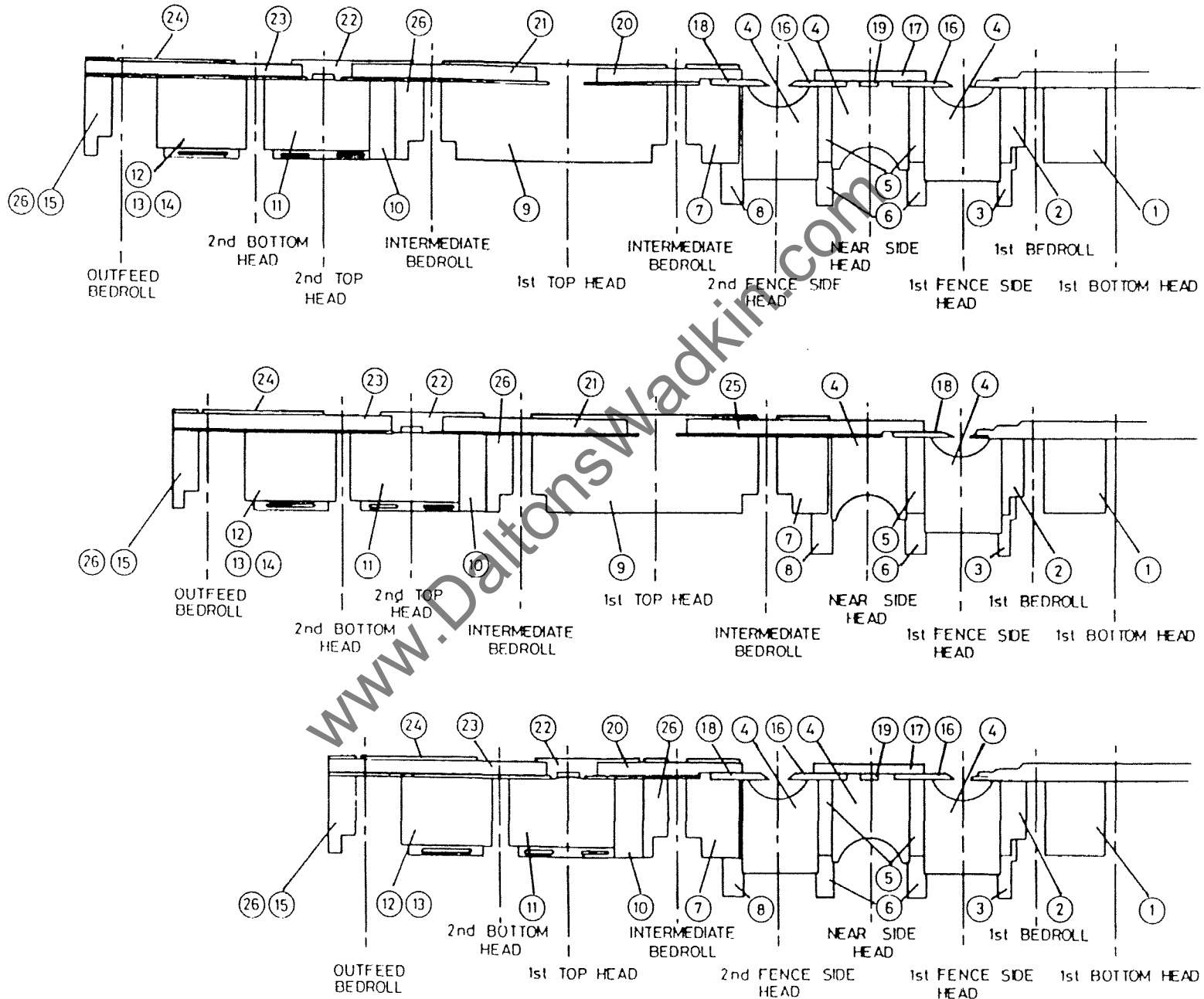


FIG 1. BEDPLATES FENCES AND SIDE GUIDE

1. BEDPLATES, FENCES AND SIDE GUIDES

| Ref. No. | Description   | No. Off |
|----------|---|---------|
| 1        | Bedplate after first bottom head                      | 1       |
| 2        | Bedplate before first fence side head                 | 1       |
| 3        | Retaining strip                                       | 1       |
| 4        | Bedplate for fence and near side heads                | 2 or 3  |
| 5        | Bedplate between side heads                           | 1 or 2  |
| 6        | Retaining strip                                       | 1 or 2  |
| 7        | Bedplate after near side head                         | 1       |
| 8        | Retaining strip                                       | 1       |
| 9        | Bedplate under first top head                         | 1       |
| 10       | Bedplate before second top head                       | 1       |
| 11       | Bedplate before second bottom head                    | 1       |
| 12       | Bedplate after second bottom head                     | 1       |
| 13       | Shim plate  | 1       |
| 14       | Bedplate after second bottom head (splitting)         | 1       |
| 15       | Shim Plate  | 1       |
| 16       | Adjustable fence after fence side head                | 2       |
| 17       | Support for adjustable fence                          | 1       |
| 18       | Adjustable fence after near side head                 | 1       |
| 19       | Centre fence between first and second fence side head | 1       |
| 20       | Fence between fence side head and top head            | 1       |
| 21       | Fence between top heads                               | 1       |
| 22       | Fence support strip                                   | 1       |
| 23       | Fence after second bottom head                        | 1       |
| 24       | Fence support (outfeed)                               | 1       |
| 25       | Fence between fence/near side head and top head       | 1       |
| 26       | Bedplate after bedroll                                | 1 or 2  |

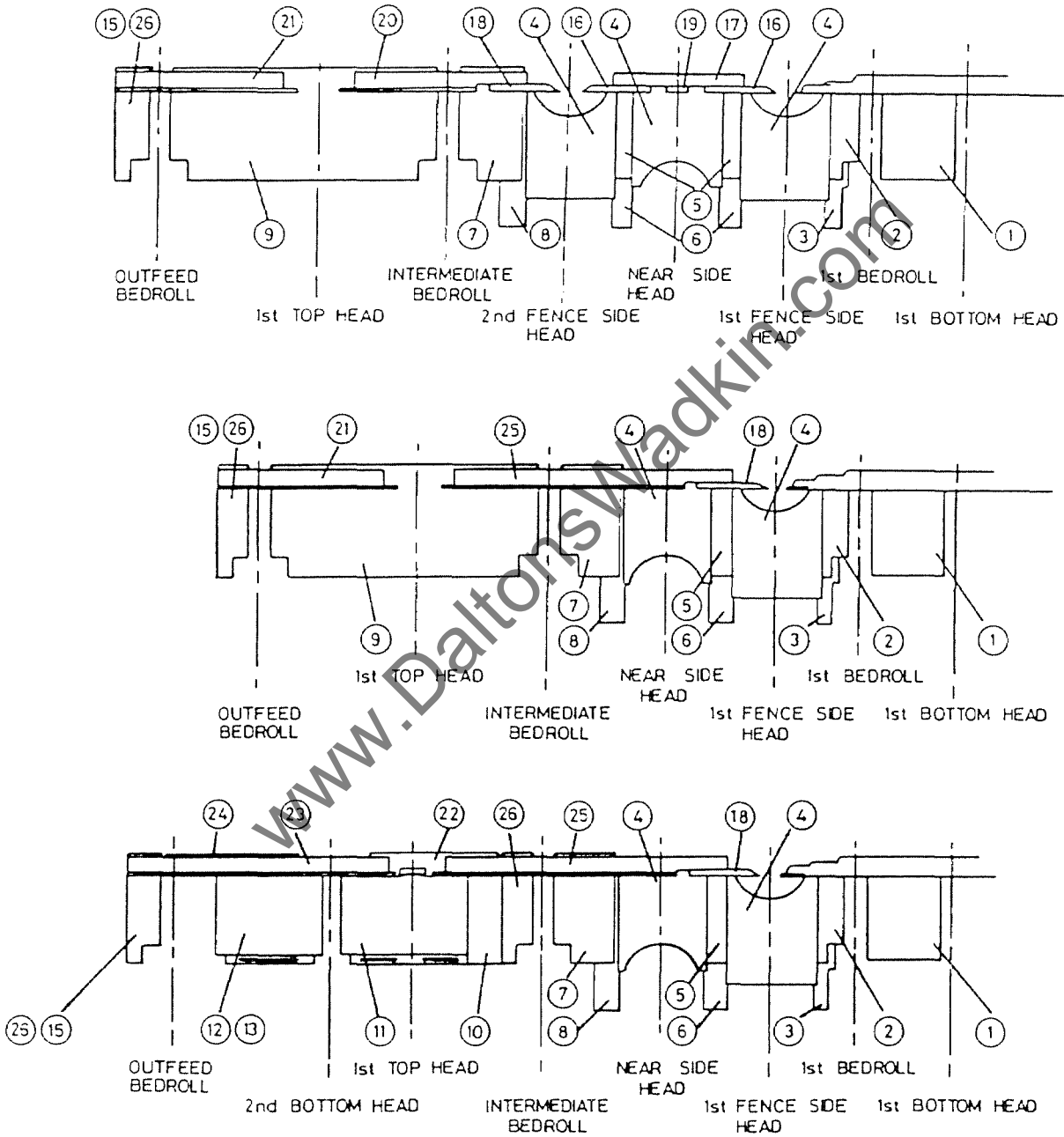


FIG 1A BEDPLATES FENCES AND SIDE GUIDE



1A. BEDPLATES, FENCES AND SIDE GUIDES

| Ref. No. | Description   | No. Off |
|----------|---|---------|
| 1        | Bedplate after first bottom head                      | 1       |
| 2        | Bedplate before first fence side head                 | 1       |
| 3        | Retaining strip                                       | 1       |
| 4        | Bedplate for fence and near side heads                | 2 or 3  |
| 5        | Bedplate between side heads                           | 1 or 2  |
| 6        | Retaining strip                                       | 1 or 2  |
| 7        | Bedplate after near side head                         | 1       |
| 8        | Retaining strip                                       | 1       |
| 9        | Bedplate under first top head                         | 1       |
| 10       | Bedplate before second top head                       | 1       |
| 11       | Bedplate before second bottom head                    | 1       |
| 12       | Bedplate after second bottom head                     | 1       |
| 13       | Shim plate  | 1       |
| 14       | Bedplate after second bottom head (splitting)         | 1       |
| 15       | Shim Plate  | 1       |
| 16       | Adjustable fence after fence side head                | 2       |
| 17       | Support for adjustable fence                          | 1       |
| 18       | Adjustable fence after near side head                 | 1       |
| 19       | Centre fence between first and second fence side head | 1       |
| 20       | Fence between fence side head and top head            | 1       |
| 21       | Fence between top heads                               | 1       |
| 22       | Fence support strip                                   | 1       |
| 23       | Fence after second bottom head                        | 1       |
| 24       | Fence support (outfeed)                               | 1       |
| 25       | Fence between fence/near side head and top head       | 1       |
| 26       | Bedplate after bedroll                                | 1 or 2  |

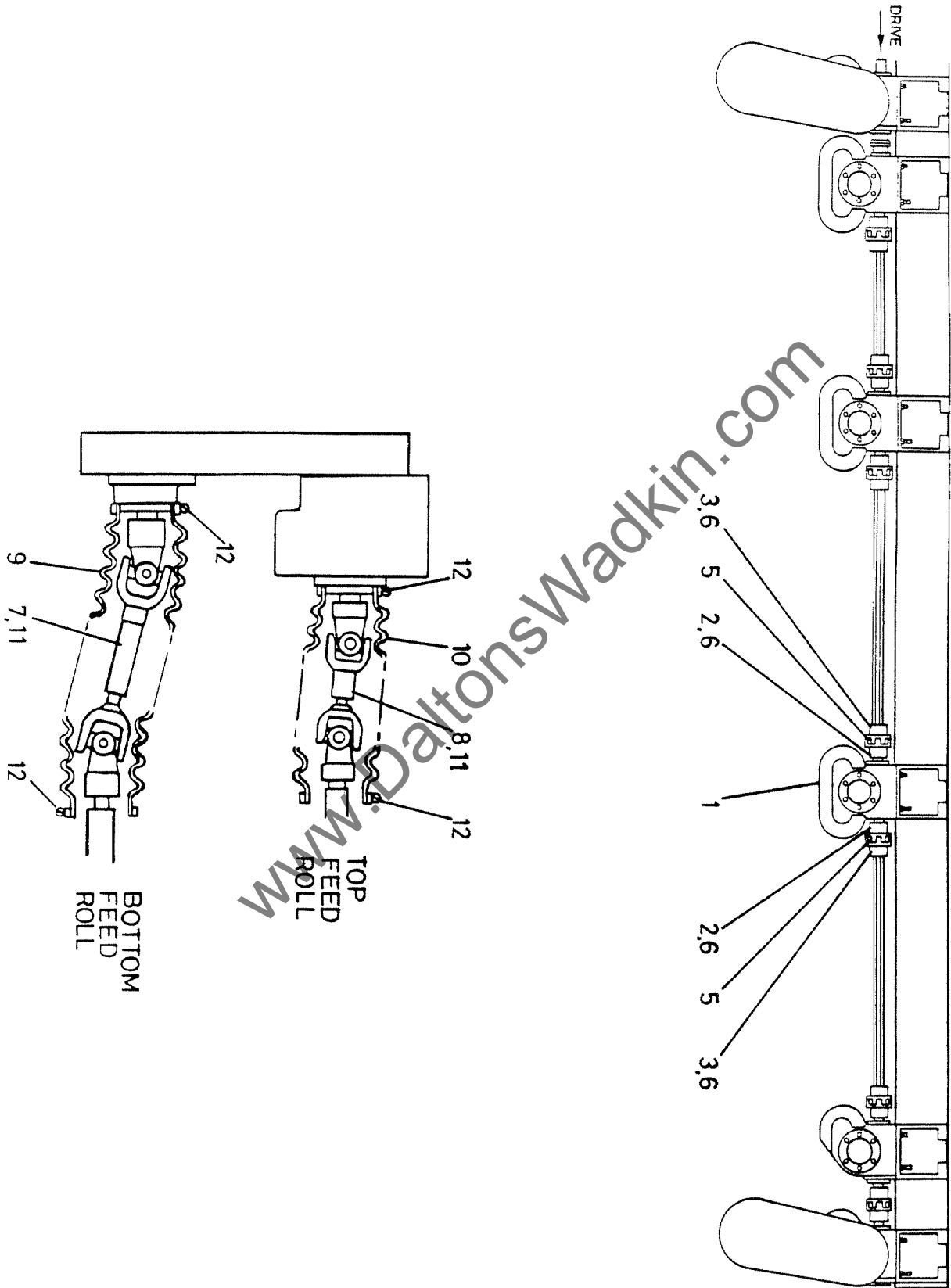


FIG 2 SHAFT DRIVES

## 2. SHAFT DRIVES

| Ref. No. | Description                                       | No. Off |
|----------|---|---------|
| 1        | Gearbox   | 1       |
| 2        | Coupling Segment dia.25 bore                      | 1       |
| 3        | Coupling Segment 19mm A/F hex bore                | 1       |
| 4        | Drive Shaft (Specify length when ordering)        | 1       |
| 5        | 'MINEX' gear ring                                 | 1       |
| 6        | Grubscrew M6 x 8 mm long                          | 1       |
| 7        | Telescopic drive shaft for bottom feed roll       | 1       |
| 8        | Telescopic drive shaft for top through feed rolls | 1       |
| 9        | P.V.C. gaiter for bottom feed roll                | 1       |
| 10       | P.V.C. gaiter for top through feed rolls          | 1       |
| 11       | Grubscrew M8 x 12mm long                          | 1       |
| 12       | Jubilee clip No.3X (80mm)                         | 1       |

**Note:** The illustration is only representational and parts should be related to the customers own machine configuration.



ILLUSTRATED PARTS LIST

SECTION 5

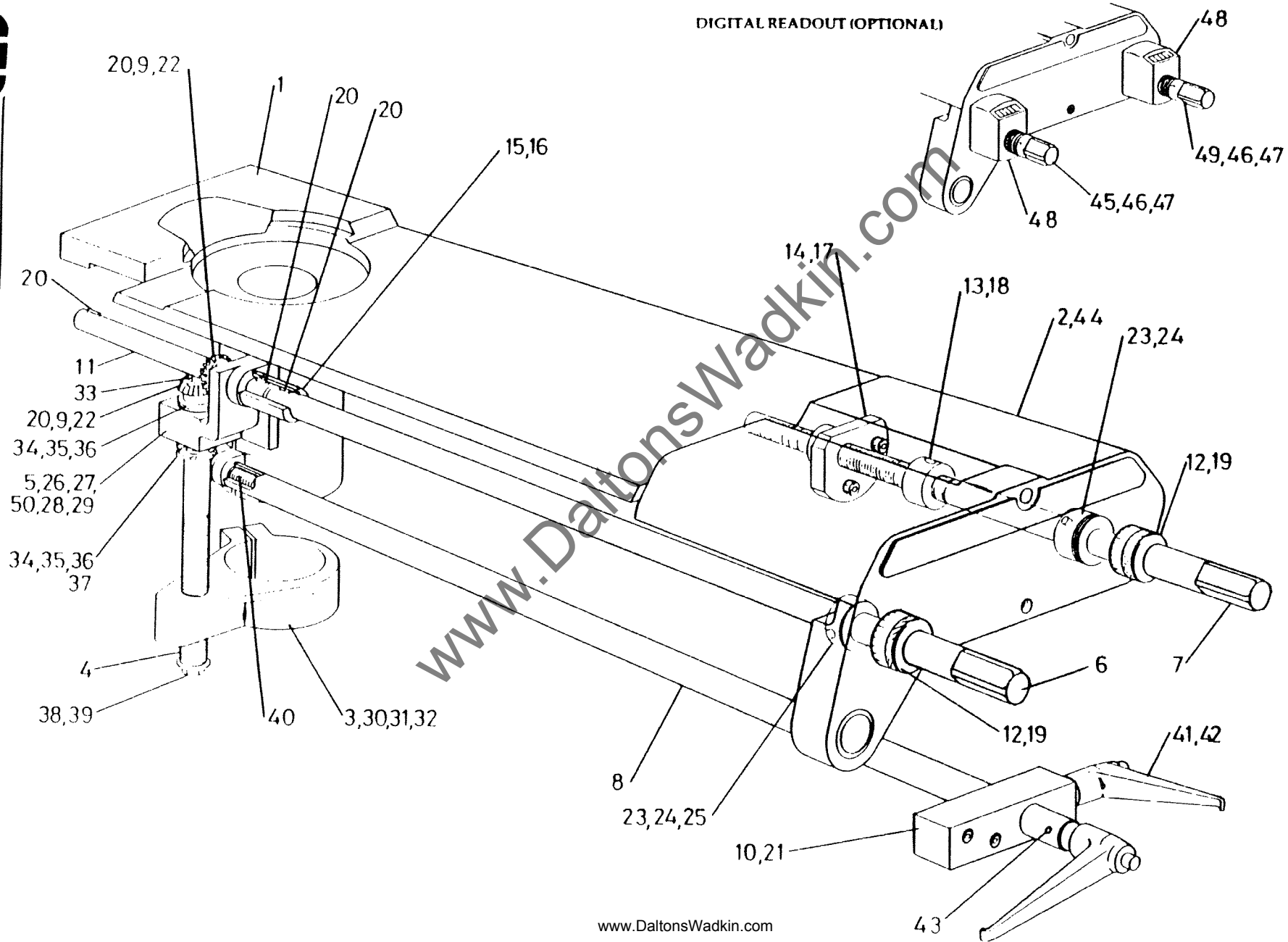


FIG 3 FENCE SIDE HEAD CARRIAGE UNIT ADJUSTING MECHANISM

3. FENCE SIDE HEAD CARRIAGE UNIT ADJUSTING MECHANISM

| Ref. No. | Description   | No. Off |
|----------|---|---------|
| 1        | Carriage for fence side head spindle  | 1       |
| 2        | Carriage extension for fence side head  | 1       |
| 3        | Nut for vertical side head adjustment   | 1       |
| 4        | Vertical adjusting screw  | 1       |
| 5        | Mitre gear bracket for side head adjustment   | 1       |
| 6        | Front horizontal shaft vertical adjustment  | 1       |
| 7        | Front horizontal shaft lateral adjustment   | 1       |
| 8        | Locking shaft or spindle barrel   | 1       |
| 9        | Straight mitre bevel gear   | 2       |
| 10       | Clamping block for horizontal movement  | 1       |
| 11       | Mitre gear through shaft for rise and fall and Vee Belt Drive                               | 1       |
| 12       | Calibrated dial for traverse screw  | 2       |
| 13       | Stop for rise and fall screw  | 1       |
| 14       | Nut for lateral movement  | 1       |
| 15       | Collar for horizontal shaft   | 1       |
| 16       | Hexagon socket grub screw M6 x 8mm long   | 1       |
| 17       | Hexagon socket capscrew M8 x 25mm long  | 2       |
| 18       | Hexagon socket grubscrew M8 x 8mm long  | 2       |
| 19       | Gaco 'O' ring RMO 246 24  | 2       |
| 20       | KEY 5mm x 5mm x 20mm  | 3       |
| 21       | Hexagon socket capscrew M8 x 35mm long  | 2       |
| 22       | Hexagon socket grubscrew M6 x 6mm long  | 2       |
| 23       | Loose collar Ø20  | 2       |
| 24       | Taper pin   | 2       |
| 25       | Ina thrust washer AS 2035   | 1       |
| 26       | Tension pin Ø6  | 2       |
| 27       | Hexagon head setscrew M8 x 60mm long  | 2       |
| 28       | Grease nipple NA 5799   | 2       |
| 29       | Plain washer M8   | 2       |
| 30       | Hexagon head setscrew M10 x 80mm long   | 1       |
| 31       | Plain washer M10  | 1       |
| 32       | Nut M10   | 1       |
| 33       | M12 Self locking nut  | 1       |
| 34       | INA Thrust bearing AXK 2542   | 2       |
| 35       | INA Thrust washer AS 2542   | 2       |
| 36       | INA Thrust washer LS 2542   | 2       |
| 37       | Notched nut M24 x 1.5   | 2       |
| 38       | Hexagon head setscrew M10 x 20mm long   | 1       |
| 39       | Large plain washer M10  | 1       |
| 40       | Stud M12 x 70mm long  | 1       |
| 41       | Locking handle M12 x 25mm male  | 2       |
| 42       | Brass pad   | 1       |
| 43       | Tension pin Ø4  | 1       |
| 44       | Hexagon socket capscrew M10 x 45mm long<br>(carriage extension fastening to carriage slide) | 4       |
| 45       | Front horizontal shaft vertical adjustment  | 1       |
| 46       | Square end shaft extension  | 2       |
| 47       | Taper pin   | 2       |
| 48       | 'SIKO' Digital readout  | 2       |
| 49       | Front horizontal shaft lateral adjustment   | 1       |
| 50       | Guard for gear bracket  | 1       |

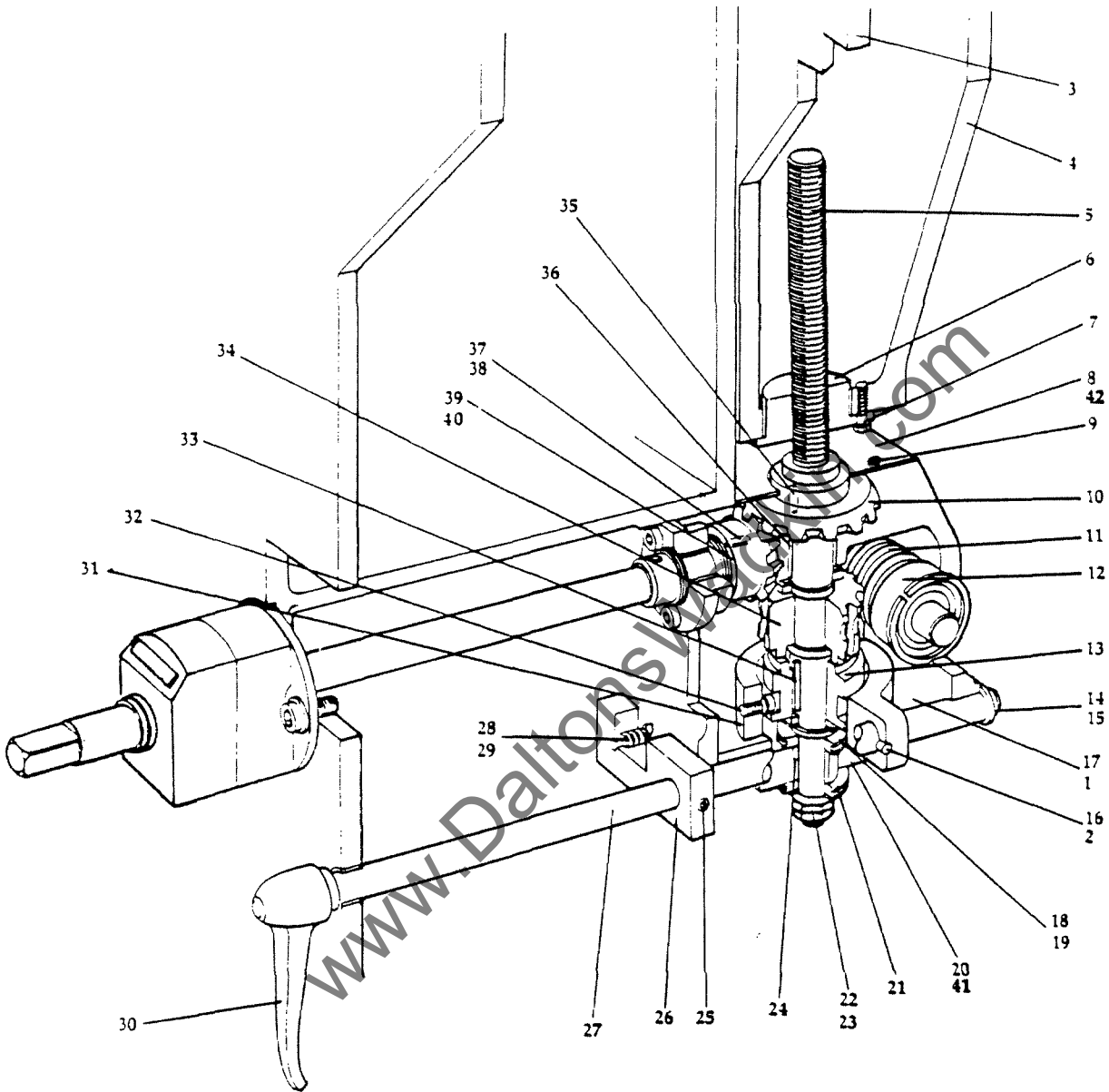


FIG 4 TOP HEAD POWER RISE AND FALL

4. TOP HEAD INCLUDING POWER RISE AND FALL

| Ref. No. | Description                                     | No. Off |
|----------|---|---------|
| 1        | Socket Head cap screw M12 x 30mm long           | 4       |
| 2        | Hexagon socket cup point screw M6 x 6mm long    | 1       |
| 3        | Slide strip                                     | 1       |
| 4        | Top Head vertical slide                         | 1       |
| 5        | Vertical screw, Top Head rise and fall          | 1       |
| 6        | Bracket nut, Top Head rise and fall             | 1       |
| 7        | Hexagon head screws, M8 x 25mm long             | 2       |
| 8        | Top cover, gearbox/clutch housing               | 1       |
| 9        | Socket head capscrews, M6 x 10mm long           | 4       |
| 10       | Bevel gear wheel                                | 1       |
| 11       | Worm gear, rise and fall top beam/head          | 1       |
| 12       | Bearing, 6204 RS                                | 2       |
| 13       | Dogclutch, Top Head rise and fall               | 1       |
| 14       | Circlip, 16mm external (not shown)              | 1       |
| 15       | Spacer washer                                   | 1       |
| 16       | Tension pin, 6mm x 32mm long                    | 1       |
| 17       | Gearbox/clutch housing                          | 1       |
| 18       | Spacer washer                                   | 2       |
| 19       | Circlip, 30mm external                          | 2       |
| 20       | Bottom cover, gearbox/clutch housing            | 1       |
| 21       | Thrust washer                                   | 2       |
| 22       | Plain washer, 16mm                              | 1       |
| 23       | M16 Hexagon nut                                 | 2       |
| 24       | Bronze bush, 25mm ID x 30mm OD x 20mm long      | 1       |
| 25       | Hexagon socket screw, cup point, M6 x 10mm long | 1       |
| 26       | Clutch location arm                             | 1       |
| 27       | Clutch shaft                                    | 1       |
| 28       | Spring, clutch location arm lock                | 1       |
| 29       | Steel ball, 10mm diameter                       | 1       |
| 30       | Locking handle, M10 x 25mm, male                | 1       |
| 31       | Clutch yoke, top head rise and fall             | 1       |
| 32       | Hexagon socket capscrews, M6 x 10mm long        | 2       |
| 33       | Parallel key, 8mm x 7mm x 32mm long             | 1       |
| 34       | Worm wheel, Top Head rise and fall              | 1       |
| 35       | Parallel key, 8mm x 7mm x 14mm long             | 1       |
| 36       | Bronze bush, 30mm ID x 35mm OD x 20mm long      | 1       |
| 37       | Circlip, 16mm external (not shown)              | 1       |
| 38       | Parallel key, 5mm x 5mm x 20mm long             | 1       |
| 39       | Spacer washer                                   | 2       |
| 40       | Bevel gear, pinion                              | 1       |
| 41       | Securing screws M8 x 16mm long                  | 4       |
| 42       | Hexagon head screw M12 x 30mm long              | 4       |

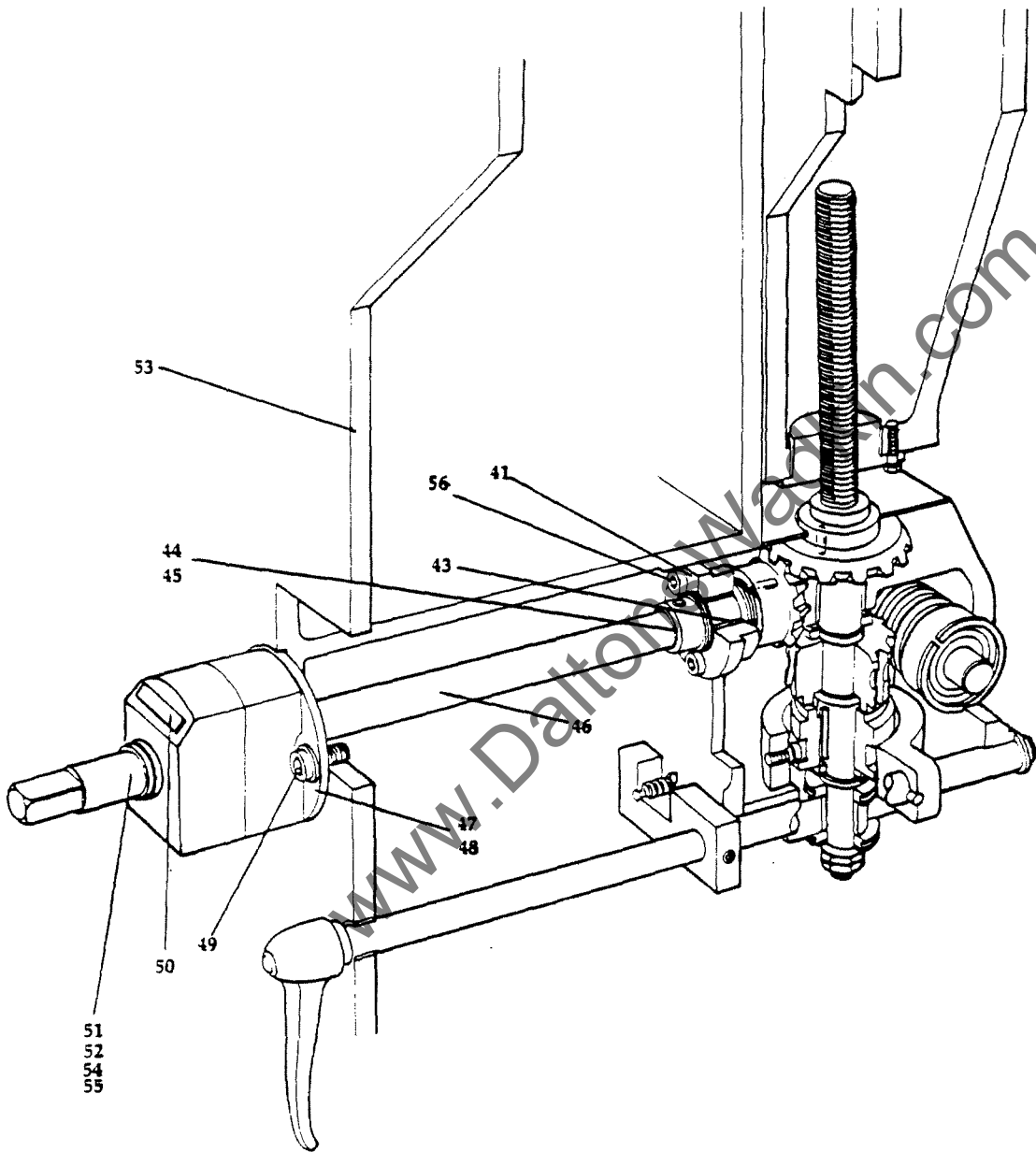


FIG 4 TOP HEAD POWER RISE AND FALL



## 4. TOP HEAD INCLUDING POWER RISE AND FALL (cont.)

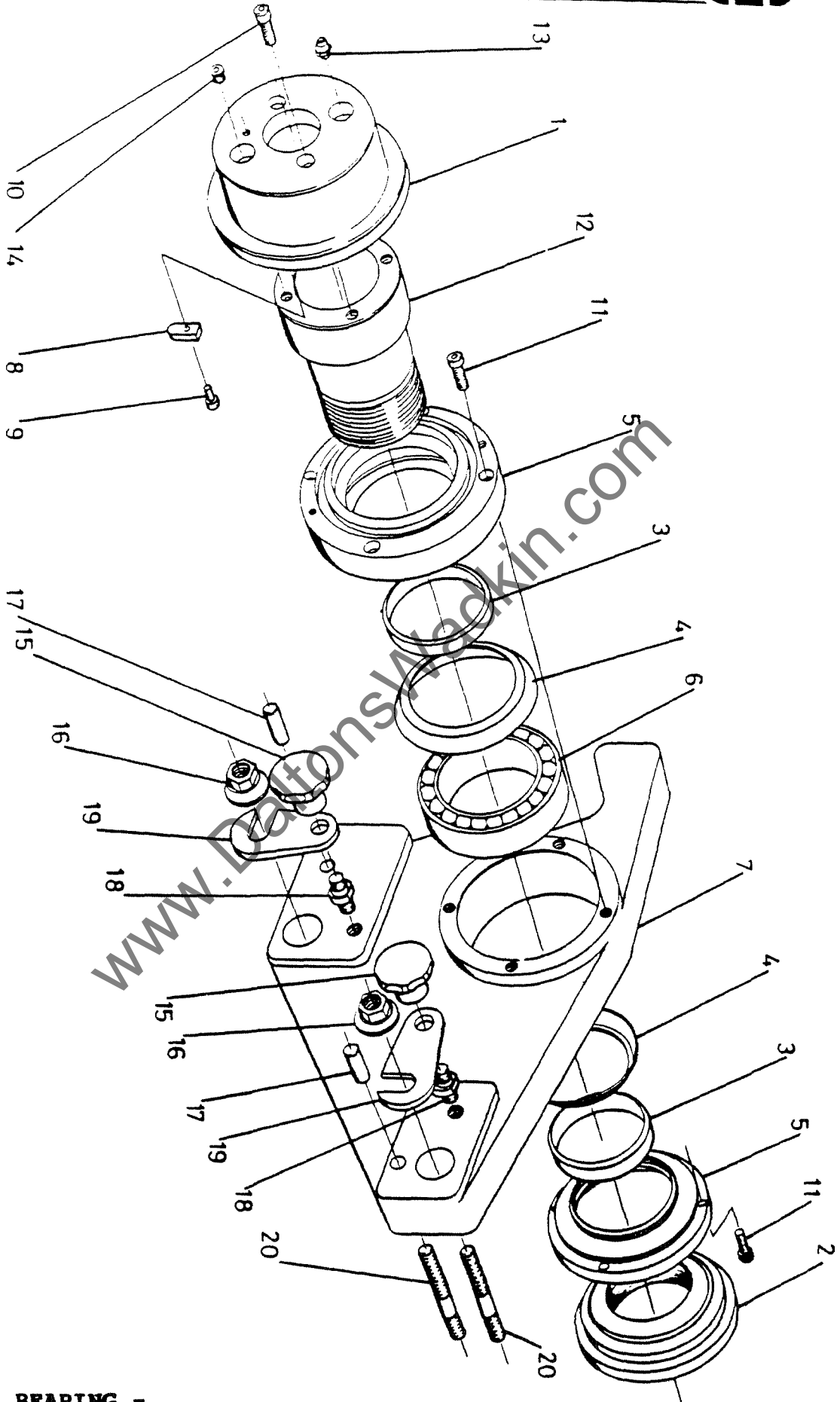
| Ref. No. | Description                                  | No. Off |
|----------|--|---------|
| 43       | Bronze bush, 20mm ID x 25mm OD x 25 Long     | 1       |
| 44       | Collar                                       | 1       |
| 45       | Hex. socket screw - cup point, M6 x 6mm long | 1       |
| 46       | Extension shaft                              | 1       |
| 47       | Bearing bracket, extension shaft             | 1       |
| 48       | Bronze bush, 20mm ID x 25mm OD x 25mm long   | 1       |
| 49       | Hex. socket capscrews, M6 x 20mm long        | 2       |
| 50       | Digital readout                              | 1       |
| 51       | Square end shaft extension                   | 1       |
| 52       | Taper pin, No.1                              | 1       |
| 53       | Main Frame                                   | 1       |
| 54+      | Circlip} Safety feature                      | 1       |
| 55+      | Spring }                                     | 1       |
| 56       | Socket head capscrew M6 x 20mm long          | 3       |

+ Not illustrated

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SECTION 5

ILLUSTRATED PARTS LIST



IG 5 OUTBOARD BEARING -  
BOTTOM HEADS



5. OUTBOARD BEARING - BOTTOM HEADS

| Ref. No. | Description                                 | No Off |
|----------|---|--------|
| 1        | Protective ring for hydrogrip sleeve        | 1      |
| 2        | Locknut for outboard bearing                | 1      |
| 3        | Bearing spacer                              | 2      |
| 4        | Disc spring 99mm O/D x 70.5mm I/D x 1mm     | 2      |
| 5        | End cap for outboard bearing housing        | 1      |
| 6        | R.H.P. grease packed bearing 6211-TB-EP7    | 1      |
| 7        | Outboard bearing housing                    | 1      |
| 8        | Drive key                                   | 1      |
| 9        | Hexagon socket capscrew M3 x 12mm long      | 1      |
| 10       | Hexagon socket capscrew M5 x 12mm long      | 2      |
| 11       | Hexagon socket cap screw M6 x 12mm long     | 8      |
| 12       | ETP sleeve (less front plate)               | 1      |
| 13       | Grease nipple ) Items only supplied         | 1      |
| 14       | Pressure release valve ) With E.T.P. sleeve | 1      |
| 15       | Hand wheel M8 threaded                      | 2      |
| 16       | Collar nut WDS 404-204 M12                  | 2      |
| 17       | Taper dowel 12 x 40                         | 2      |
| 18       | Shoulder screw                              | 2      |
| 19       | 'C' washer                                  | 2      |
| 20       | Stud M12 x 70mm long                        | 2      |

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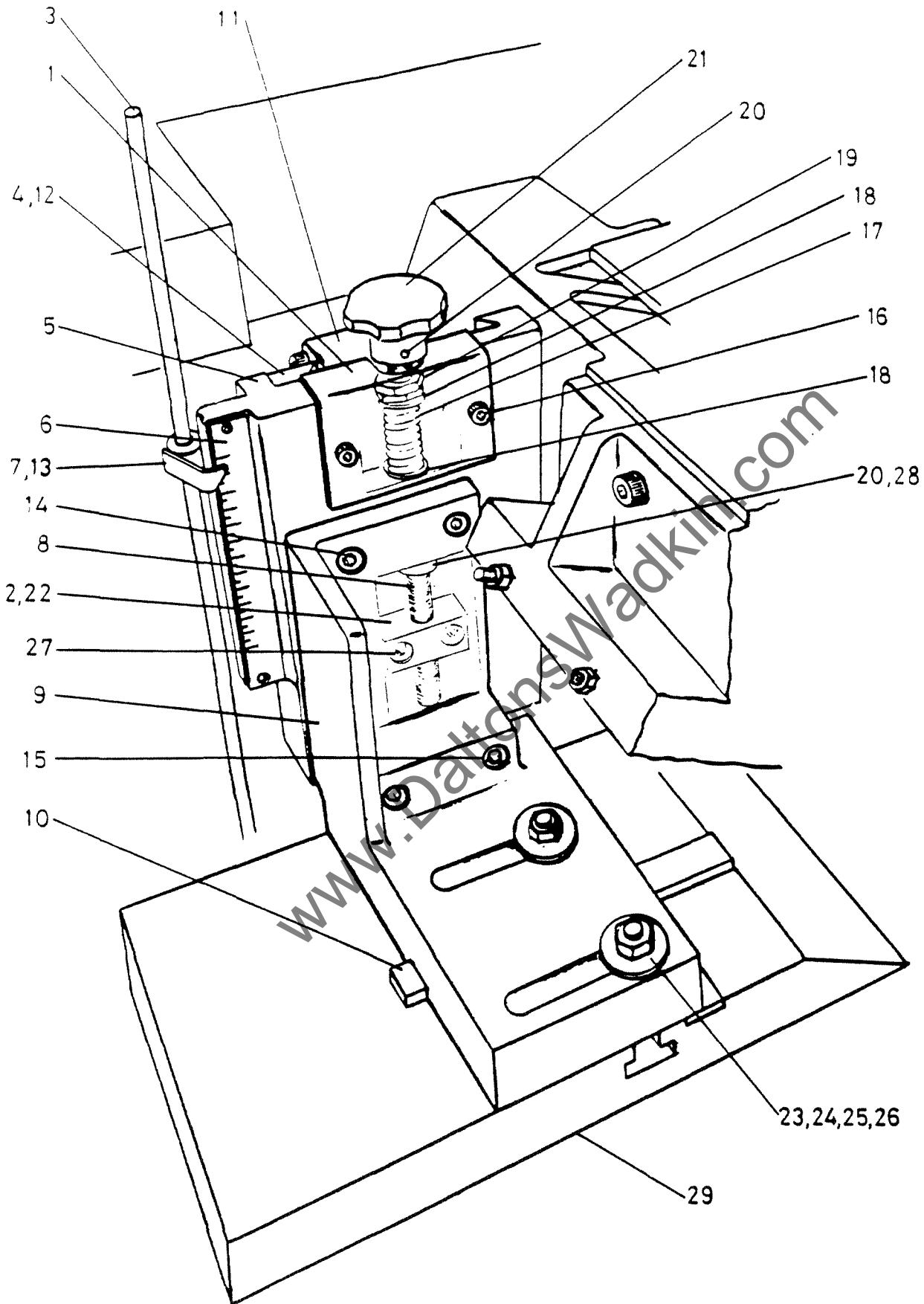
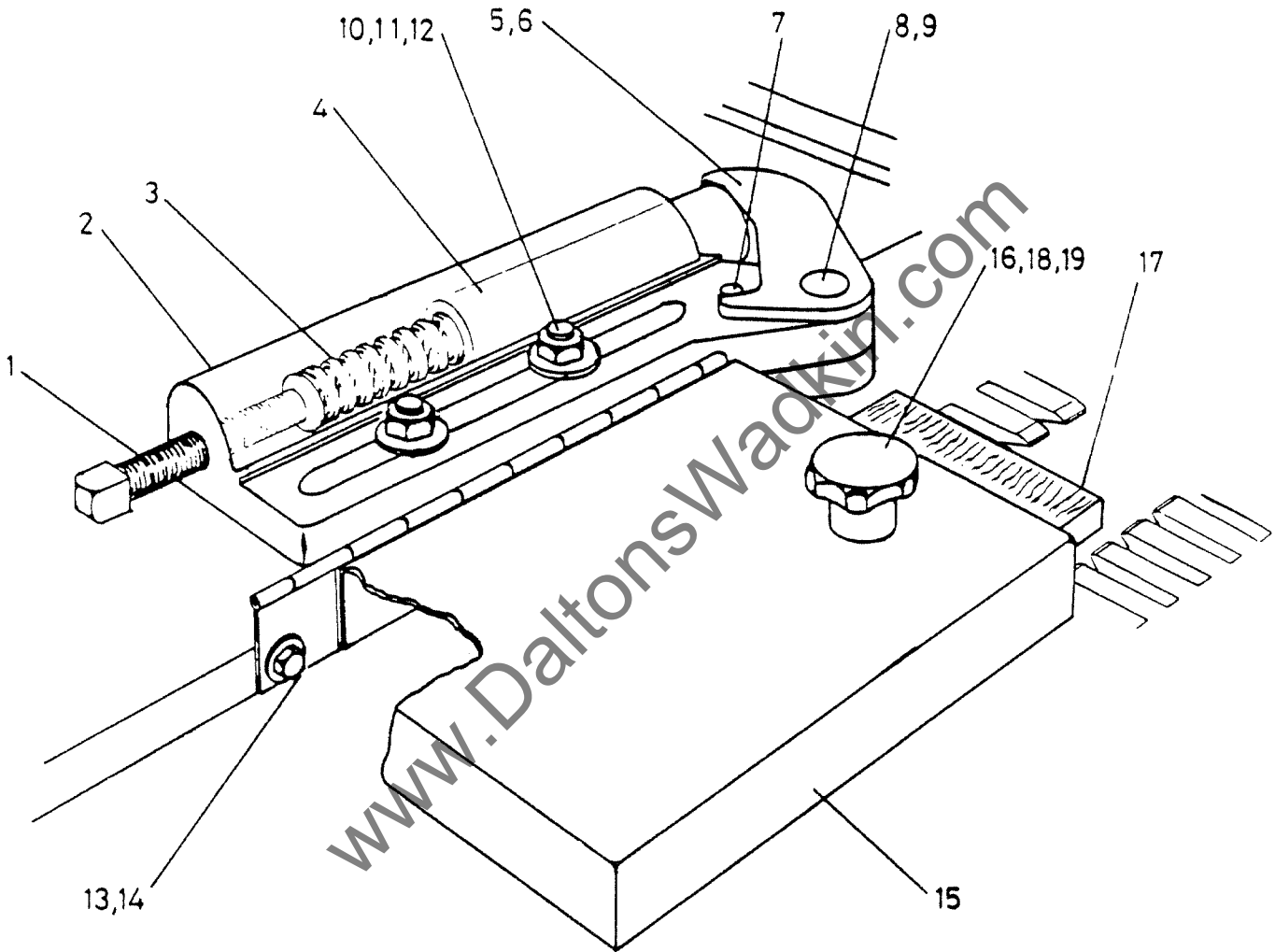


FIG 6 TOP HEAD PRESSURE PAD

6. PAD PRESSURE AFTER TOP HEAD

| Ref. No. | Description                                       | No. Off                                  |
|----------|---|--|
| 1        | Cover for top head pressure spring                | 1  |
| 2        | Nut for top head pressure adjustment              | 1  |
| 3        | Pointer support first top head                    | 1  |
| OR 4     | pointer support second top head                   | 1  |
| 4        | Wear strip  | 1  |
| 5        | Saddle for top head pressure                      | 1  |
| 6        | 0-130mm Metric scale                              | 1  |
| 7        | Pointer   | 1  |
| 8        | Screw for top head pressure adjustment            | 1  |
| 9        | Bracket for mounting top head pressure pad        | 1  |
| 10       | Cross tenon                                       | 1  |
| 11       | Slide for top head pressure                       | 1  |
| 12       | Hexagon head setscrew                             | 4  |
| 13       | Hexagon socket grubscrew M6 x 6mm long            | 1  |
| 14       | Hexagon socket capscrew M10 x 16mm long           | 2  |
| 15       | Hexagon socket capscrew M10 x 50mm long           | 2  |
| 16       | Hexagon socket capscrew M6 x 10mm long            | 2  |
| 17       | Compression spring 'Flexo' 283816                 | 1  |
| 18       | Thrust washer 'INA' AS 1226                       | 2  |
| 19       | Locknut M12                                       | 2  |
| 20       | Taper pin   | 2  |
| 21       | Handwheel M12                                     | 1  |
| 22       | Helicoil insert M12                               | 1  |
| 23       | Tee nut WDS 664203                                | 2  |
| 24       | Stud M10 x 55mm long                              | 2  |
| 25       | Nut M10   | 2  |
| 26       | Plain large washer M10                            | 2  |
| 27       | Hexagon socket capscrew M8 x 20mm long            | 2  |
| 28       | Collar  | 1  |
| 29       | Pad pressure shoe                                 |  |
| OR       | Pad pressure shoe for splitting/counter profiling | { for machine with one top head only     |
| OR       | Pad pressure shoe for Ø 125 cutting circle        | { for machine with two or more top heads |
| OR       | Pad pressure shoe for soft pads (optional)        |  |



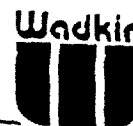
**FIG 7 SIDE PRESSURE BEFORE NEAR SIDE HEAD AND GUARD OVER FIRST BOTTOM HEAD**



7. SIDE PRESSURE UNIT BEFORE NEAR SIDE HEAD

| Ref. No. | Description                              | No. Off |
|----------|--|---------|
| 1        | Spring tension screw                     | 1       |
| 2        | Side pressure housing                    | 1       |
| 3        | Spring                                   | 1       |
| 4        | Plunger                                  | 1       |
| 5        | Skid pressure shoe                       | 1       |
| 6        | Taper pin                                | 1       |
| 7        | Dowel dia 10 x 25 long                   | 1       |
| 8        | Bronze bush 25ODmm, 20mmID x 15mm long   | 1       |
| 9        | Pivot pin                                | 1       |
| 10       | Stud M12 x 55mm long                     | 2       |
| 11       | Hexagon nut M12                          | 2       |
| 12       | Plain washer M12                         | 2       |
| 13       | Hexagon socket capscrews, M6 x 12mm long | 3       |
| 14       | Plain washer M6                          | 3       |
| 15       | Carrier for bottom head guard            | 1       |
| 16       | Pad                                      | 1       |
| 17       | Sliding wooden guard                     | 1       |
| 18       | Knob                                     | 1       |
| 19       | Screwed stud                             | 1       |

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SECTION 5

ILLUSTRATED PARTS LIST

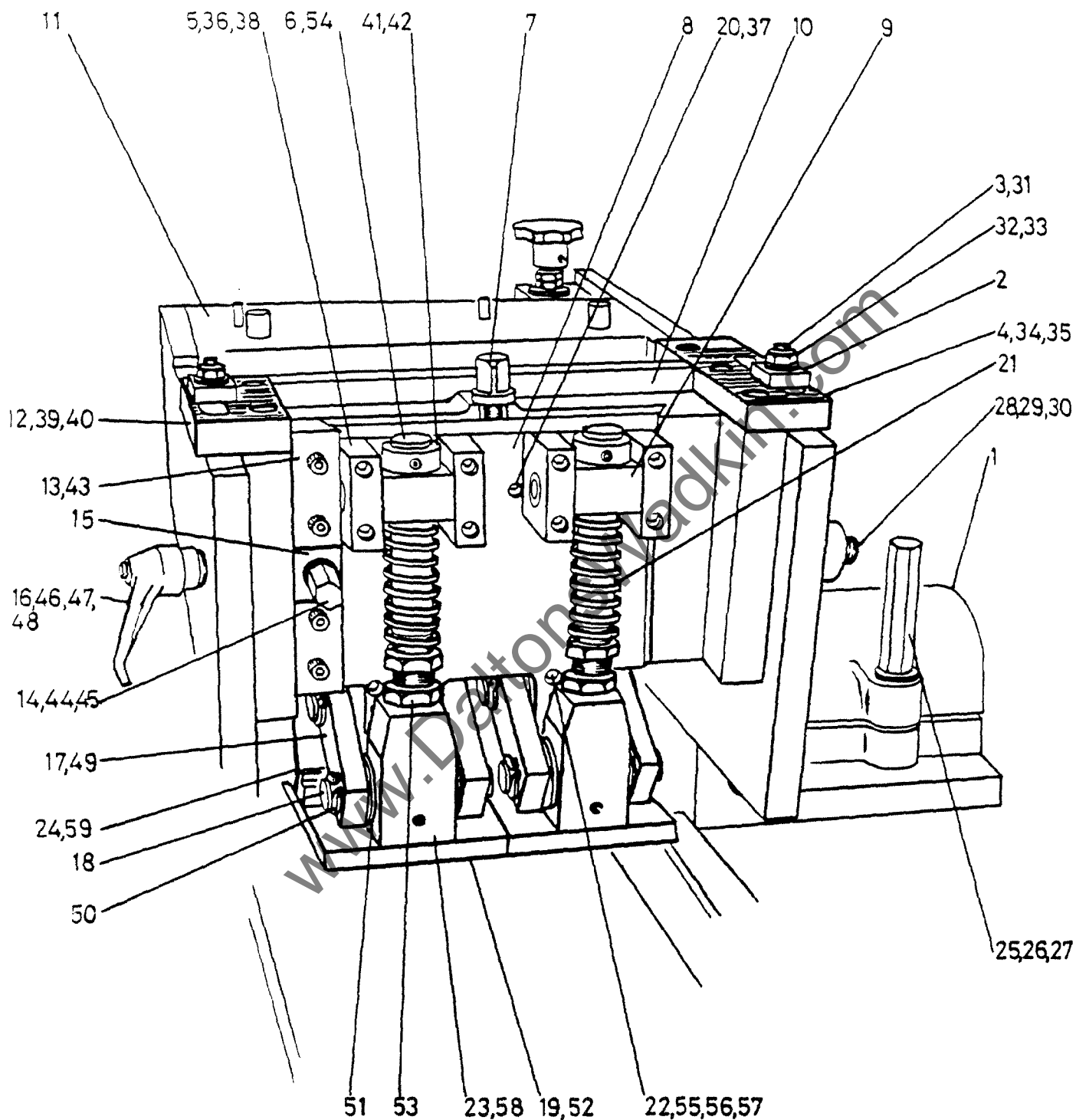


FIG. 8 TOP HEAD CHIPBREAKER



8. TOP HEAD CHIPBREAKER MK II

| Ref. No. | Description   | No. Off |
|----------|---|---------|
| 1        | Barrel housing backplate  | 1       |
| 2        | Serrated washer   | 2       |
| 3        | Compression spring 15.8mm OD x 13.6mm ID x 25.4mm long          | 2       |
| 4        | Serrated block R.H.   | 1       |
| 5        | Mounting block for trunion                                      | 4       |
| 6        | Chipbreaker bar   | 2       |
| 7        | Chipbreaker leadscrew   | 1       |
| 8        | Slide plate for chipbreaker                                     | 1       |
| 9        | Trunion block   | 2       |
| 10       | Chipbreaker carrier   | 1       |
| 11       | Stretcher   | 1       |
| 12       | Serrated block L.H.   | 1       |
| 13       | Slide strip   | 2       |
| 14       | Extended nut  | 1       |
| 15       | Locking pad   | 1       |
| 16       | Locking shaft   | 1       |
| 17       | Link arm  | 4       |
| 18       | Pivot pin   | 4       |
| 19       | Chipbreaker   | 2       |
| 20       | Vertical adjusting nut (not shown, fastened behind slide plate) | 1       |
| 21       | Compression spring 27.8mm OD x 22.5mm ID x 114mm long           | 2       |
| 22       | Pivot block (not shown, fastened behind slide plate)            | 2       |
| 23       | Chipbreaker shoe  | 2       |
| 24       | Chipdeflector   | 2       |
| 25       | Clamping nut  | 1       |
| 26       | Stud M12 x 80mm long  | 1       |
| 27       | Washer M12  | 1       |
| 28       | Collar 25mm OD x 12mm ID x 12mm thick                           | 1       |
| 29       | Taper pin   | 1       |
| 30       | Washer M12  | 1       |
| 31       | Stud M12 x 60mm long  | 2       |
| 32       | Nut M12   | 2       |
| 33       | Washer M12  | 2       |
| 34       | Hexagon socket capscrew M10 x 30mm long                         | 3       |
| 35       | Tension pin dia 8mm x 32mm long                                 | 2       |
| 36       | Hexagon socket capscrew M6 x 40mm long                          | 8       |
| 37       | Hexagon socket capscrew M6 x 16mm long                          | 2       |
| 38       | Oilite bush 25mm OD x 20mm ID x 25mm                            | 4       |
| 39       | Hexagon socket capscrew M10 x 30mm long                         | 2       |
| 40       | Tension pin dia 8mm x 32mm long                                 | 2       |
| 41       | Collar 32mm OD x 20mm ID x 14mm                                 | 2       |
| 42       | Taper pin   | 2       |
| 43       | Socket head capscrew M8 x 25mm long                             | 4       |
| 44       | Stud M10 x 50mm long  | 1       |
| 45       | Washer M10  | 1       |
| 46       | Oilite bush 16mm OD x 12mm ID x 12mm                            | 1       |
| 47       | M12 handle  | 1       |
| 48       | Taper pin   | 1       |

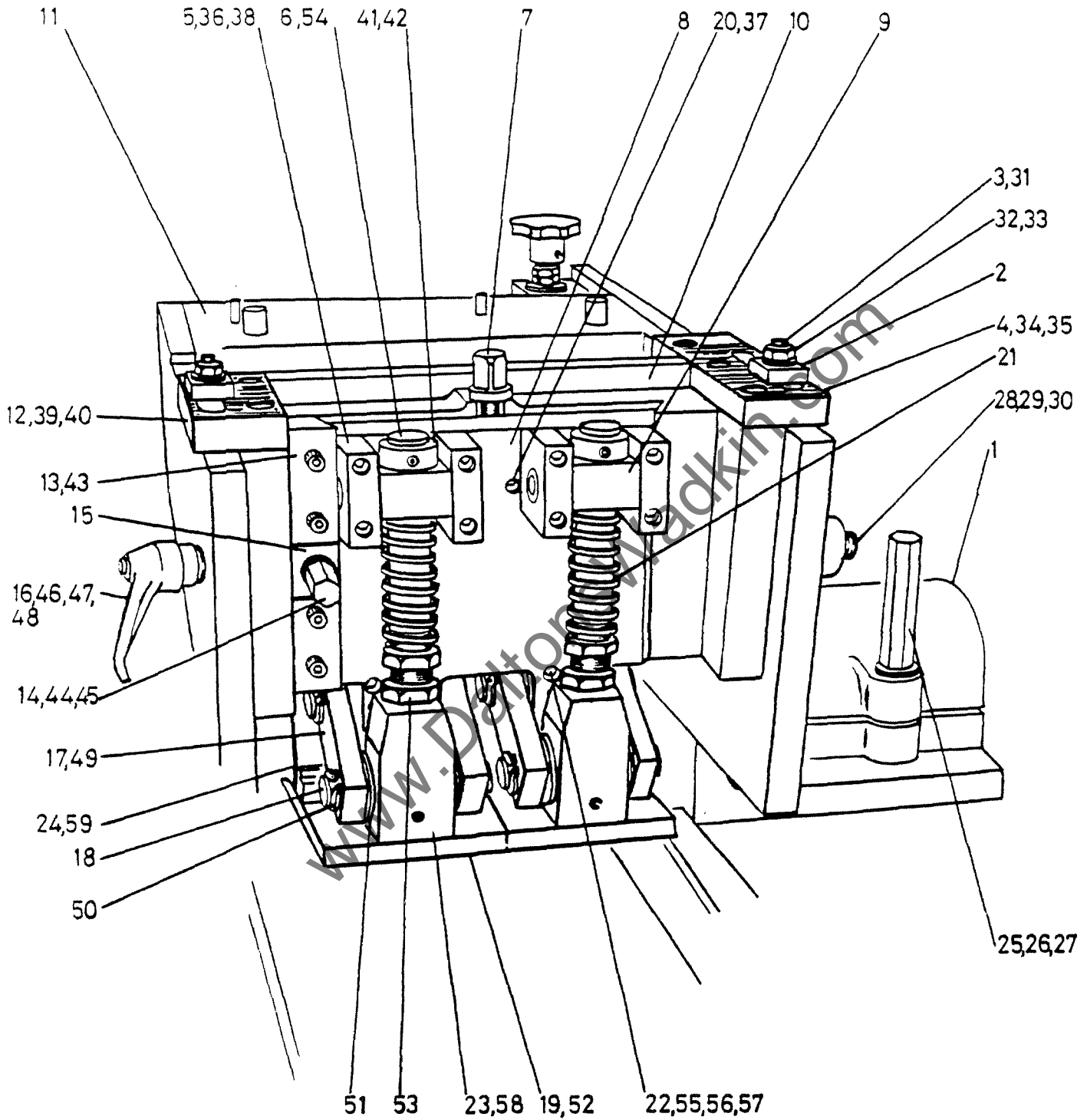


FIG. 8 TOP HEAD CHIPBREAKER

## 8. TOP HEAD CHIPBREAKER MK II (cont)

| Ref. No. | Description                                   | No. Off |
|----------|---|---------|
| 49       | INA needle roller bearing HK1516              | 8       |
| 50       | 15mm external circlip                         | 8       |
| 51       | Thrust washer INA LS1528                      | 16      |
| 52       | Socket head counter sunk screw M8 x 20mm long | 4       |
| 53       | Lock nut M20                                  | 4       |
| 54       | Special washer                                | 2       |
| 55       | Socket head cap screw M8 x 20mm long          | 4       |
| 56       | Tension pin dia 6mm x 20mm long               | 4       |
| 57       | Socket head grub screw M8 x 8mm long          | 2       |
| 58       | Socket head grub screw M6 x 8mm long          | 2       |
| 59       | Socket head counter sunk screw M6 x 12mm long | 4       |

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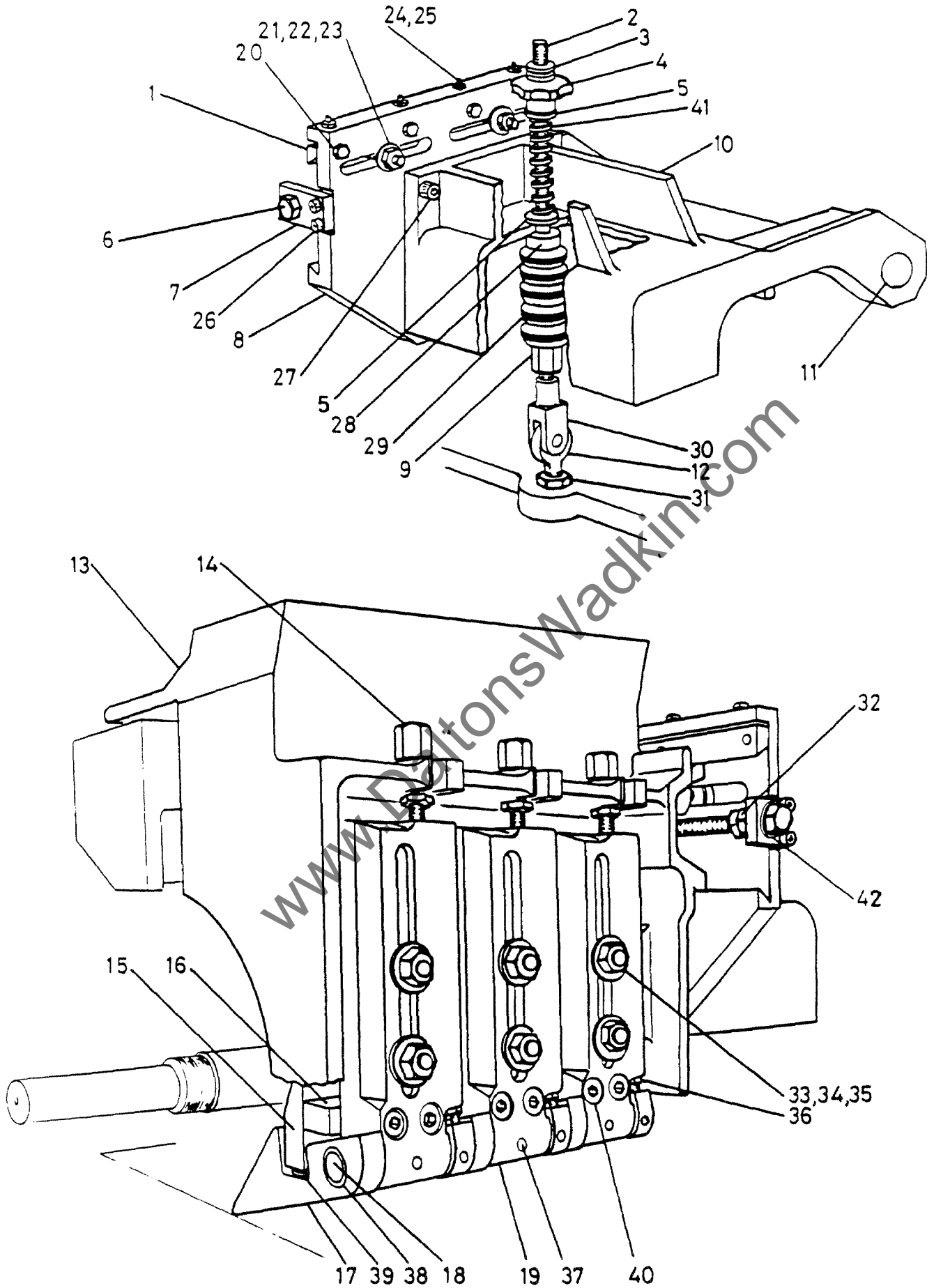


FIG 8 TOP HEAD CHIPBREAKER

8. TOP HEAD CHIPBREAKER MK III

| Ref. No. | Description                                       | No. Off |
|----------|---|---------|
| 1        | Wear strip  | 1       |
| 2        | Screw   | 1       |
| 3        | Thumb nut WDS 614-204                             | 1       |
| 4        | Hand knob   | 1       |
| 5        | Cap for tension spring                            | 2       |
| 6        | Adjusting screw                                   | 1       |
| 7        | Plate for adjusting screw                         | 1       |
| 8        | Swing for chipbreaker (front)                     | 1       |
| 9        | Stop for top head chipbreaker                     | 1       |
| 10       | Swing for chipbreaker (rear)                      | 1       |
| 11       | Shaft for chipbreaker pivot                       | 1       |
| 12       | Eye bolt  | 1       |
| 13       | Rod for chipbreaker carrier                       | 1       |
| 14       | Adjusting screw for top chipbreaker               | 3       |
| 15       | Baffle/spring housing                             | 3       |
| 16       | Block for spacing baffle                          | 3       |
| 17       | Shoe for chipbreaker                              | 3       |
| 18       | Pin of chipbreaker shoe pivot                     | 3       |
| 19       | Bracket for mounting chipbreaker shoe             | 3       |
| 20       | Hexagon head setscrew M8 x 20mm long              | 4       |
| 21       | Stud M12 x 50mm long                              | 2       |
| 22       | Large washer M12                                  | 2       |
| 23       | Nut M12   | 2       |
| 24       | Hexagon head grub screw M6 x 20mm long            | 4       |
| 25       | Locknut M6  | 4       |
| 26       | Hexagon socket capscrew M6 x 16mm long            | 2       |
| 27       | Hexagon socket capscrew M12 x 30mm long           | 4       |
| 28       | Collar 40mm OD x 25mm ID x 16mm wide              | 1       |
| 29       | Disc springs 50mm OD x 25.4mm ID x 1.5            | 10      |
| 30       | Rod clevis festo SG M12                           | 1       |
| 31       | Nut M12   | 1       |
| 32       | Lock screw M12                                    | 2       |
| 33       | Stud M12 x 65mm long                              | 6       |
| 34       | Washer M12  | 6       |
| 35       | Nut M12   | 6       |
| 36       | Hexagon head setscrew M6 x 30mm long              | 3       |
| 37       | Hexagon socket grub screw M6 x 10mm long          | 3       |
| 38       | Oilite bronze bush 20mm OD x 16mm ID x 12mm long  | 6       |
| 39       | Compression spring                                | 1       |
| 40       | Hexagon socket capscrew M10 x 60mm long           | 6       |
| 41       | Compression spring 135mm long x 28.2 OD x 21.8 ID | 1       |
| 42       | Thrust washer INA AS 1226                         | 2       |

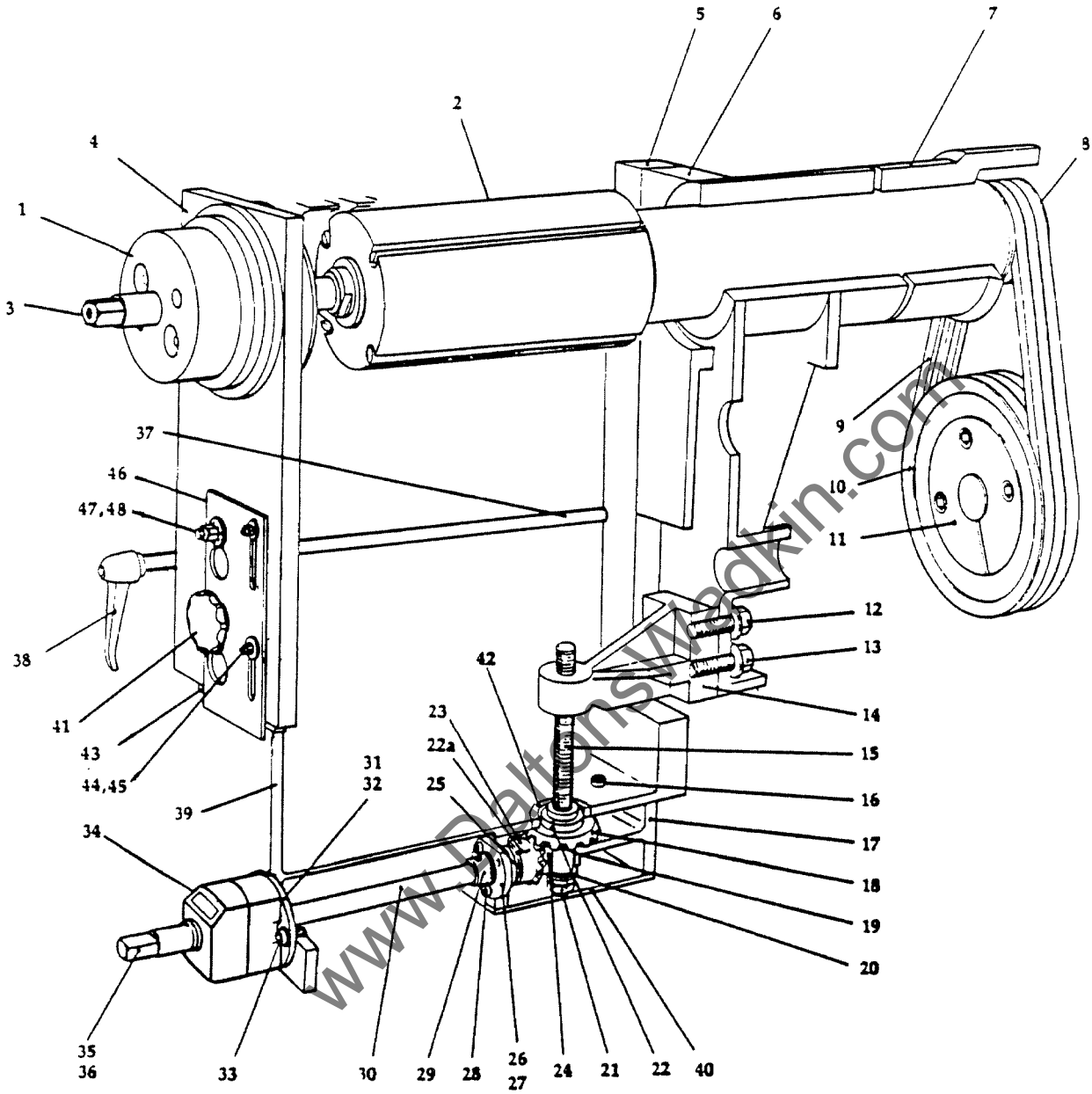


FIG. 9 FIRST BOTTOM HEAD

9. FIRST BOTTOM HEAD

| Ref. No. | Description                                      | No. Off |
|----------|--|---------|
| 1        | Outboard bearing (see separate illustration)     | 1       |
| 2        | Cutterblock                                      | 1       |
| 3        | Spindle (see separate illustrations)             | 1       |
| 4        | Housing for outboard bearing                     | 1       |
| 5        | Slide strip                                      | 1       |
| 6        | Bottom Head spindle housing, vertical slide      | 1       |
| 7        | Pulley belt housing, horizontal heads            | 1       |
| 8        | Spindle pulley, bottom and Top Heads             | 1       |
| 9        | Fenner vee belt, SPZ 850                         | 2 or 3  |
| 10       | Fenner vee belt pulley} see Tables               | 1       |
| 11       | Fenner Taper-Lock bush}                          | 1       |
| 12       | Hexagon head screw, M10 x 30mm long              | 4       |
| 13       | Spring washer, 10mm diameter, single coil        | 4       |
| 14       | Bracket nut, Bottom Head vertical adjustment     | 1       |
| 15       | Vertical adjustment screw, First Bottom Head     | 1       |
| 16       | Hexagon socket capscrews, M6 x 75mm long         | 4       |
| 17       | Bevel box, Bottom Head vertical adjustment       | 1       |
| 18       | Bevel gear wheel                                 | 1       |
| 19       | Bearing washer, top and bottom                   | 2       |
| 20       | Thrust washer                                    | 1       |
| 21       | M16 hexagonal nut                                | 2       |
| 22       | Parallel key 5mm x 5mm x 20mm long               | 1       |
| 22a      | Parallel key 8mm x 7mm x 20mm long               | 1       |
| 23       | Bevel gear pinion                                | 1       |
| 24       | Circlip, 16mm external, pinion shaft (not shown) | 1       |
| 25       | Thrust washer                                    | 1       |
| 26       | Bronze bush, 25mm ID x 30mm OD x 25mm long       | 1       |
| 27       | End cap, bevel box                               | 1       |
| 28       | Hexagon socket capscrews, M16 x 20mm long        | 3       |
| 29       | Collar   | 1       |
| 30       | Extension shaft, bevel gear                      | 1       |
| 31       | Bearing bracket, extension shaft                 | 1       |
| 32       | Bronze bush, 20mm ID x25mm OD x25mm long         | 2       |
| 33       | Hexagon socket capscrews, M6 x 20mm long         | 2       |
| 34       | Digital readout                                  | 1       |
| 35       | Square end shaft extension                       | 1       |
| 36       | Taper pin, No.1                                  | 1       |
| 37       | Extension shaft, vertical lock                   | 1       |
| 38       | Locking handle, M12 x25mm, male                  | 1       |
| 39       | Main Frame                                       | 1       |
| 40       | Cover, bevel box                                 | 1       |
| 41       | Black plastic moulded hand wheel M12             | 1       |
| 42       | Top cover, bevel gear                            | 1       |
| 43       | Block for mounting outboard bearing housing      | 1       |
| 44       | Stud M12 x 30mm long                             | 2       |
| 45       | Plain washer M12                                 | 2       |

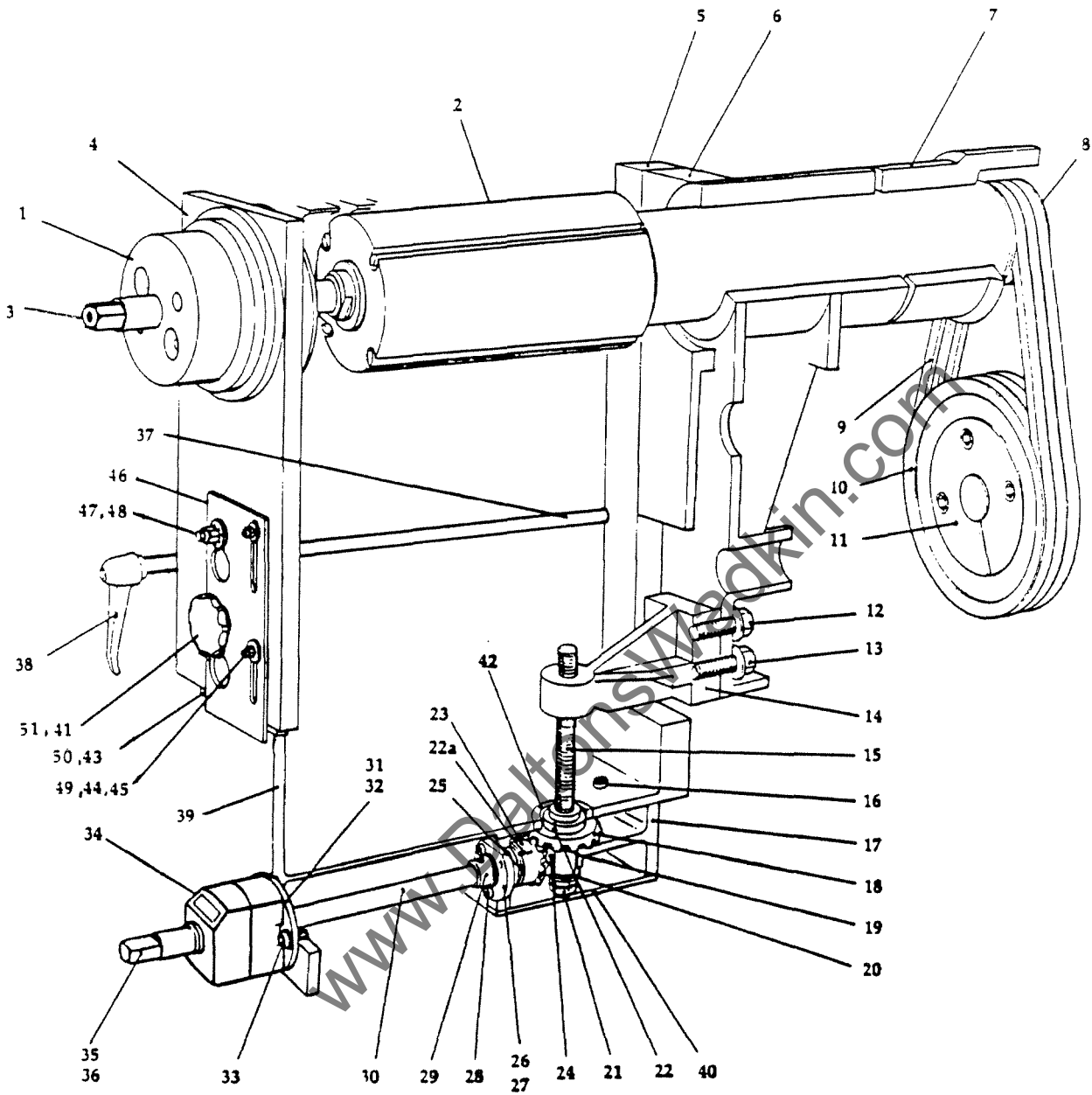


FIG. 9 FIRST BOTTOM HEAD





9. FIRST BOTTOM HEAD (cont.)

| Ref. No. | Description                             | No. Off |
|----------|---|---------|
| 46       | Latch plate for outboard bearing        | 1       |
| 47       | Collar nut WDS 404 - 205 M12            | 2       |
| 48       | Stud M12 x 70mm long                    | 2       |
| 49       | Nyloc nut M12                           | 2       |
| 50       | Hexagon socket capscrew M12 x 30mm long | 4       |
| 51       | Counter sunk screw M12 x 16 long        | 1       |

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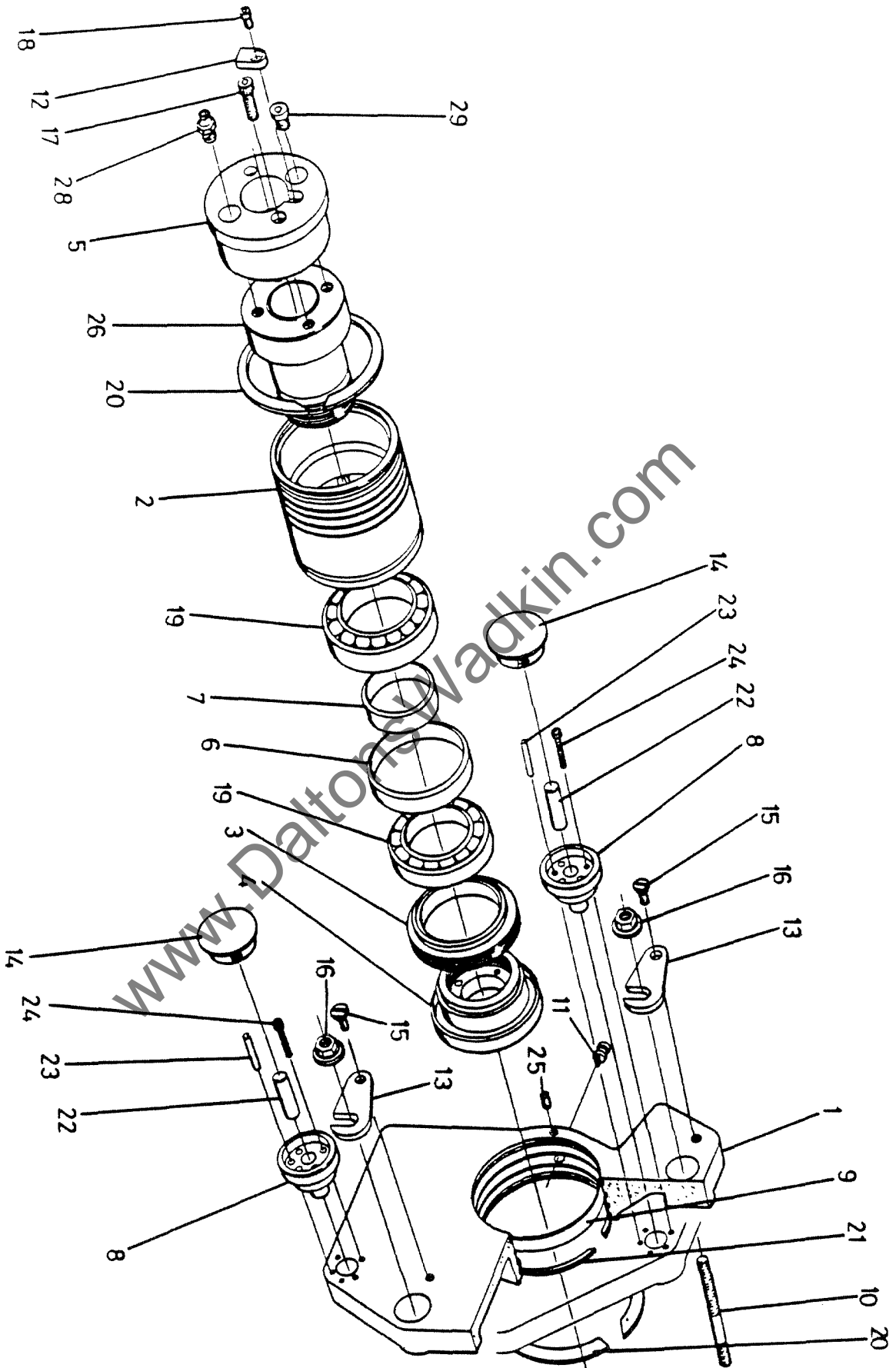


FIG 10 OUTBOARD BEARING -  
TOP HEADS

10. OUTBOARD BEARING - MK III TOP HEADS

| Ref. No. | Description                                  | No. Off |
|----------|--|---------|
| 1        | Plate for mounting outboard bearing housing  | 1       |
| 2        | Housing for adjustable outboard bearing      | 1       |
| 3        | Locknut for outboard bearing housing         | 1       |
| 4        | Locknut for hydro grip sleeve                | 1       |
| 5        | End cap for hydro grip sleeve                | 1       |
| 6        | Outer bearing spacer ) supplied as matched   | 1       |
| 7        | Inner bearing spacer ) pair                  | 1       |
| 8        | Knob for outboard location                   | 2       |
| 9        | Tape strip for outboard bearing housing      | 2       |
| 10       | Stud for outboard bearing plate              | 1       |
| 11       | Anti rotation pin for housing                | 1       |
| 12       | Drive key                                    | 1       |
| 13       | 'C' Washer                                   | 2       |
| 14       | DP 2000, 2783 black plug                     | 2       |
| 15       | Shoulder screw WDS 615-203                   | 2       |
| 16       | Collar nut WDS 404-204 M12                   | 2       |
| 17       | Hexagon socket capscrew M5 X12mm long        | 2       |
| 18       | Hexagon socket capscrew M3 X12mm long        | 1       |
| 19       | R.H.P bearing 7911 x 2TAU EP7                | 2       |
| 20       | INA external circlip WR95                    | 2       |
| 21       | INA internal snap ring BR98                  | 4       |
| 22       | Plain dowel Ø12 x 45mm long                  | 2       |
| 23       | Tension pin Ø6 x 32mm long                   | 4       |
| 24       | Hexagon socket capscrew M6 x 30mm long       | 6       |
| 25       | Hexagon socket grubscrew M6 x 16mm long      | 1       |
| 26       | ETP sleeve (less front plate)                | 1       |
| 27       | Pressure relieve valve ) Items only supplied | 1       |
| 28       | Grease nipple ) with ETP sleeve              | 1       |

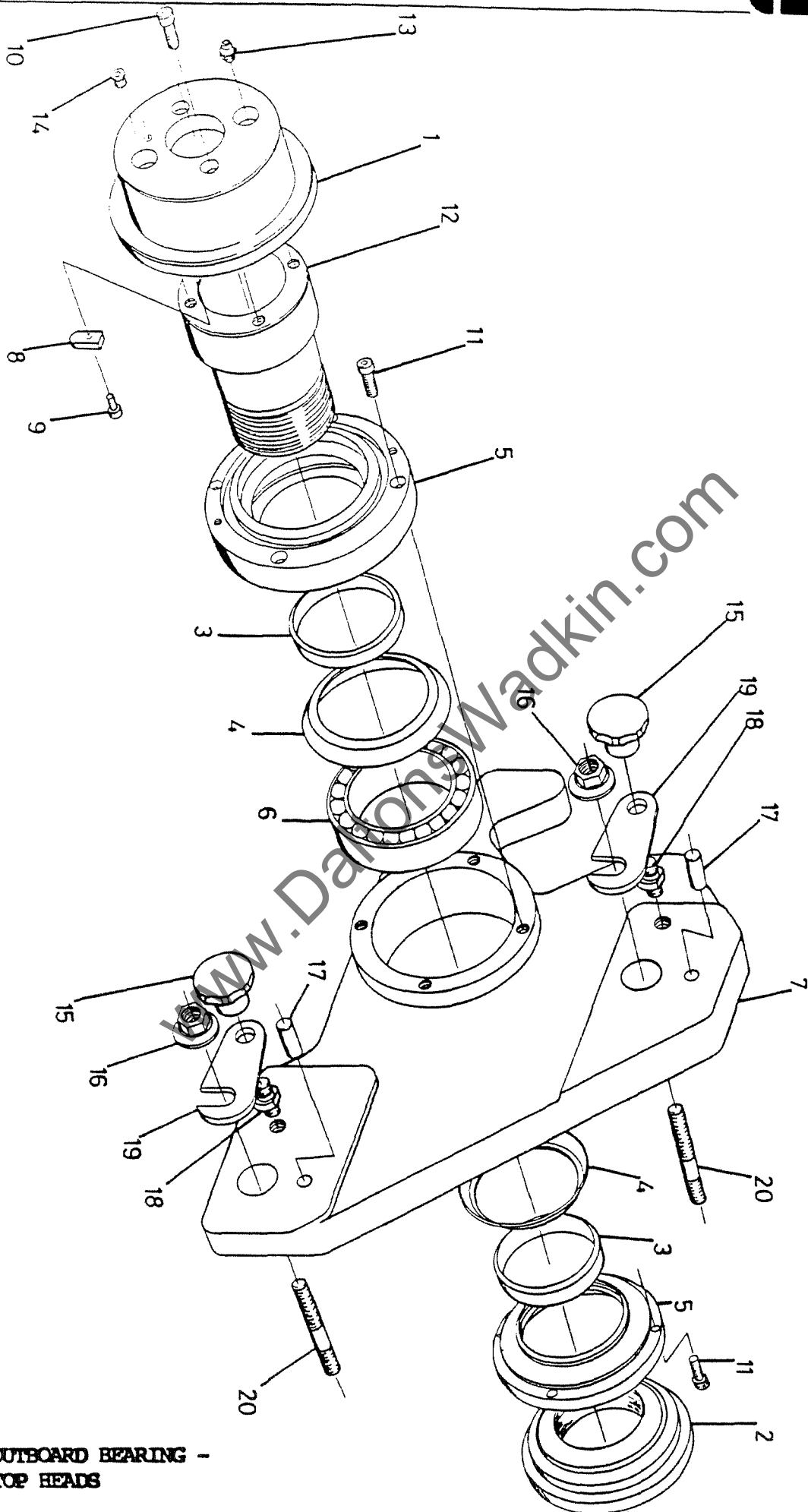


FIG 10 OUTBOARD BEARING -  
TOP HEADS

10. OUTBOARD BEARING - MK II TOP HEADS

| Ref. No. | Description                                 | No Off |
|----------|---|--------|
| 1        | Protective ring for hydrogrip sleeve        | 1      |
| 2        | Locknut for outboard bearing                | 1      |
| 3        | Bearing spacer                              | 2      |
| 4        | Disc spring 99mm O/D x 70.5mm I/D x 1mm     | 2      |
| 5        | End cap for outboard bearing housing        | 1      |
| 6        | R.H.P. grease packed bearing 6211-TB-EP7    | 1      |
| 7        | Outboard bearing housing                    | 1      |
| 8        | Drive key                                   | 1      |
| 9        | Hexagon socket capscrew M3 x 12mm long      | 1      |
| 10       | Hexagon socket capscrew M5 x 12mm long      | 2      |
| 11       | Hexagon socket cap screw M6 x 12mm long     | 8      |
| 12       | ETP sleeve (less front plate)               | 1      |
| 13       | Grease nipple ) Items only supplied         | 1      |
| 14       | Pressure release valve ) With E.T.P. sleeve | 1      |
| 15       | Hand wheel M8 threaded                      | 2      |
| 16       | Collar nut WDS 404-204 M12                  | 2      |
| 17       | Taper dowel 12 x 40                         | 2      |
| 18       | Shoulder screw                              | 2      |
| 19       | 'C' washer                                  | 2      |
| 20       | Stud M12 x 70mm long                        | 2      |

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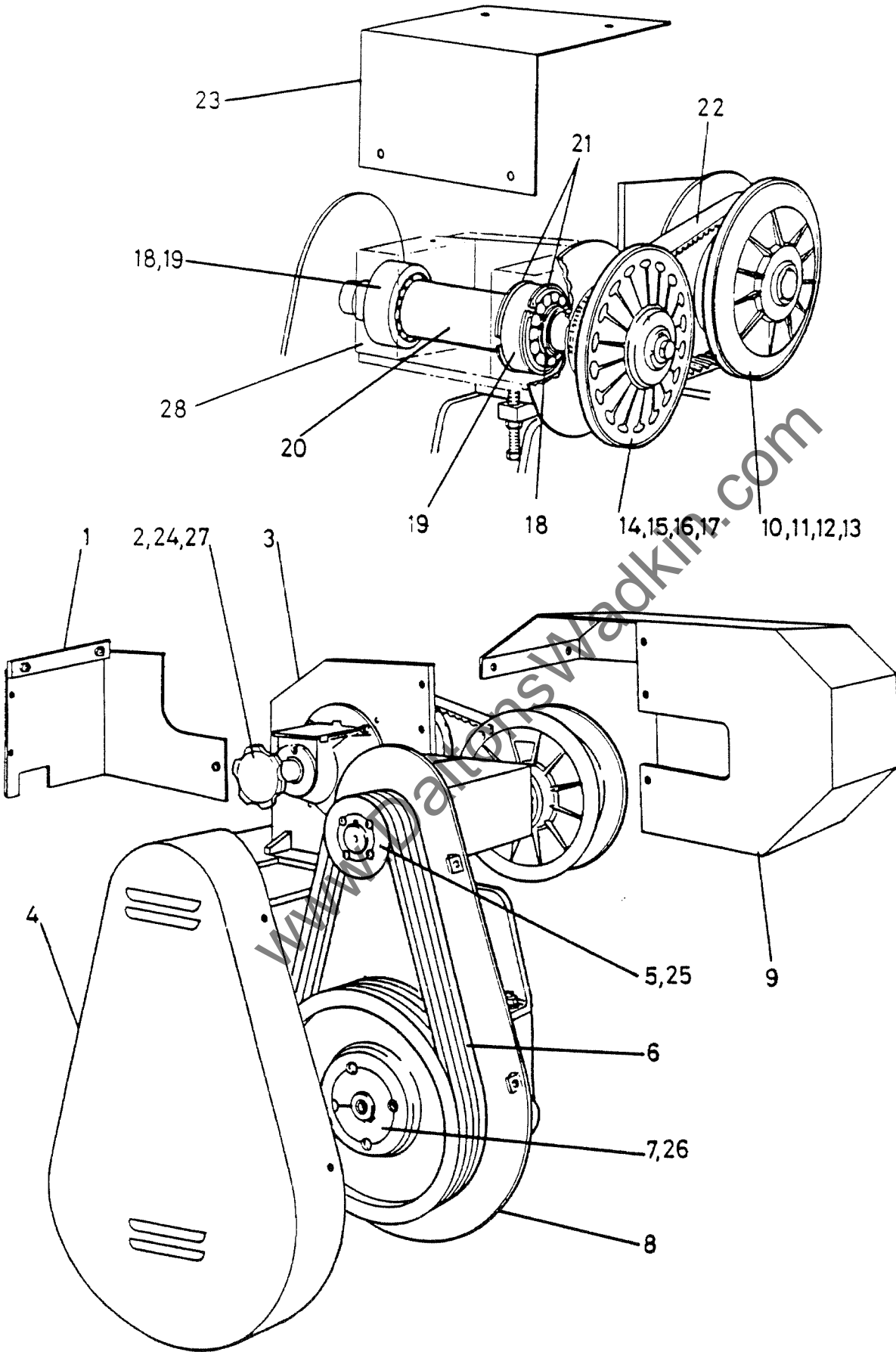


FIG 11 VARIABLE SPEED DRIVE

## 11. SIMPLABELT VARIABLE SPEED DRIVE UNIT

| Ref. No. | Description                                   | No.Off |
|----------|---|--------|
| 1        | Front drive cover                             | 1      |
| 2        | Simplatroll hand wheel HA15                   | 1      |
| 3        | Mounting plate for hand adjuster              | 1      |
| 4        | Cover for drive shaft pulleys                 | 1      |
| 5        | Pulley, Driver, Fenner 031Z-0125              | 1      |
| 6        | Vee belt Fenner SPZ 1320                      | 5      |
| 7        | Pulley driven Fenner 031Z 0335                | 1      |
| 8        | Back plate for drive shaft cover              | 1      |
| 9        | Rear drive cover                              | 1      |
| 10       | Mechanically adjustable pulley (motor driven) | 1      |
| 11       | Locking plate                                 | 1      |
| 12       | Tightening screw                              | 1      |
| 13       | Disc washer or nut                            | 1      |
| 14       | Spring loaded pulley (driven shaft)           | 1      |
| 15       | Locking plate                                 | 1      |
| 16       | Disc washer or nut                            | 1      |
| 17       | Tightening screw                              | 1      |
| 18       | External circlip 45mm                         | 2      |
| 19       | SKF or RHP bearing 6009-2Z                    | 2      |
| 20       | Drive shaft                                   | 1      |
| 21       | Internal circlip 75mm                         | 2      |
| 22       | Toothed belt, Simplabelt 47/1060              | 1      |
| 23       | Guard for bearing bracket                     | 1      |
| 24       | Simplatroll dial S8ON24I-1                    | 1      |
| 25       | Taperlock bush 1610 - 30mm bore               | 1      |
| 26       | Taperlock bush 2517 - 28mm bore               | 1      |
| 27       | Adjuster                                      | 1      |
| 28       | Bearing bracket                               | 1      |

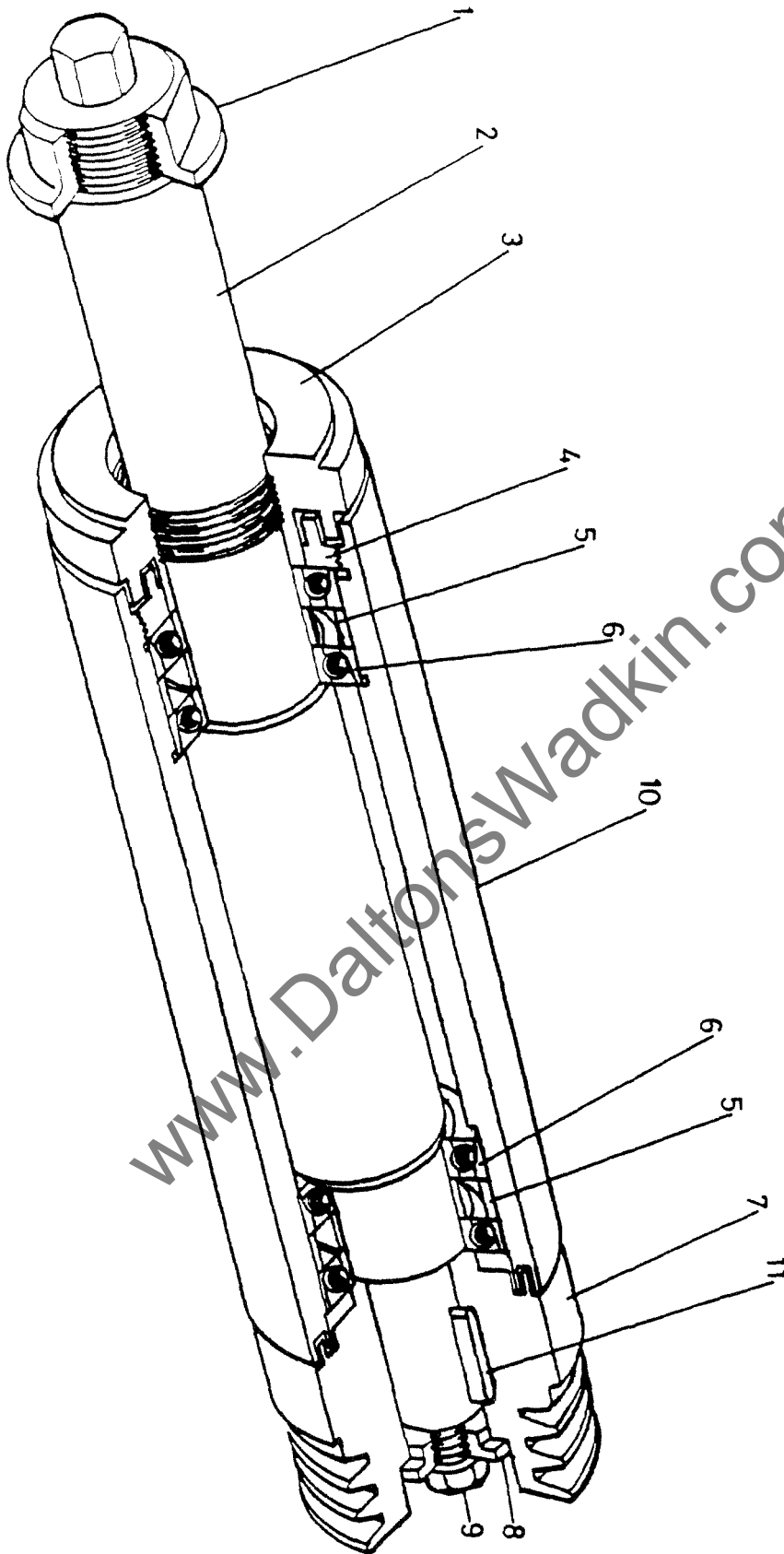


FIG 12 FENCE SIDE HEAD SPINDLE UNIT



## 12. FENCE SIDE HEAD SPINDLE UNIT - 40MM DIAMETER SQUARE SHOULDER

| Ref. No. | Description   | No. Off |
|----------|---|---------|
| 1        | Locking nut   | 1       |
| 2        | 40mm square shoulder fence side head spindle        | 1       |
| 3        | Nut for spindle front bearing R.H.                  | 1       |
| 4        | Nut for spindle barrel front bearing                | 1       |
| 5        | Spacer rings for bearings                           | 2       |
| *6       | R.H.P. paired bearings 7009 TDUF EP7                | 2       |
| 7        | Spindle pulley (refer to motor and drive belt data) | 1       |
| 8        | Pulley spigot for spindle                           | 1       |
| 9        | Hexagon head setscrew M12 x 40mm                    | 1       |
| 10       | Barrel housing                                      | 1       |
| 11       | Parallel key 12mm x 8mm x 50mm long                 | 1       |
| *        | 'Kluber' grease packed                              |         |

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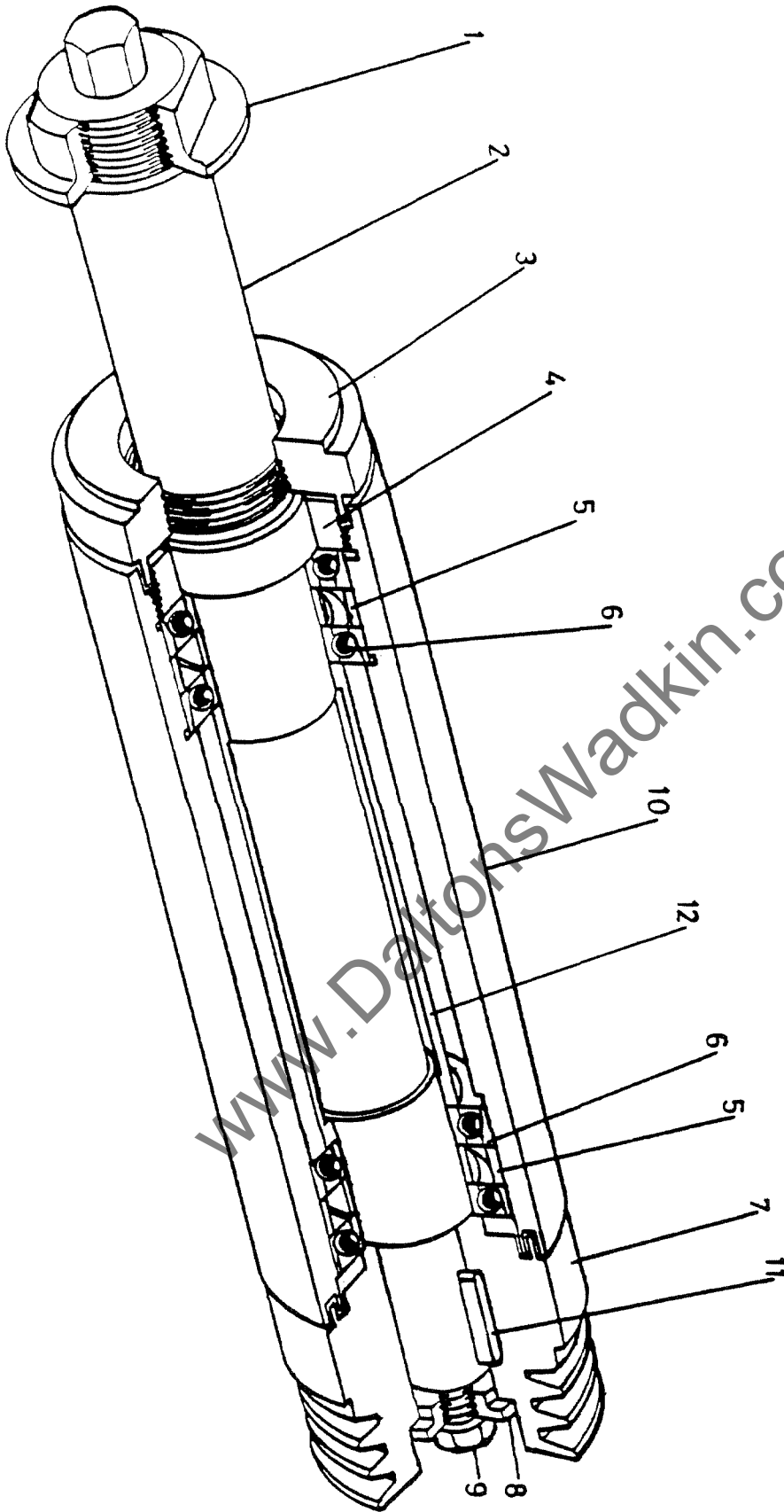


FIG 13 FENCE SIDE HEAD SPINDLE UNIT

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**13. FENCE SIDE HEAD SPINDLE UNIT - 50mm AND 1 13/16  
DIAMETER SQUARE SHOULDER**

| Ref. No. | Description   | No. Off |
|----------|---|---------|
| 1        | Locking nut   | 1       |
| 2        | 50mm diameter square shoulder spindle               | 1       |
|          | or 1 13/16 diameter square shoulder spindle         | 1       |
| 3        | Nut for spindle front bearing R.H                   | 1       |
| 4        | Nut for spindle barrel front bearing                | 1       |
| 5        | Spacer rings for bearings                           | 2       |
| *6       | R.H.P. paired bearings 7009 TDUF EP7                | 2       |
| 7        | Spindle pulley (refer to motor and drive belt data) | 2       |
| 8        | Pulley spigot for spindle                           | 1       |
| 9        | Hexagon head setscrew M12 x 40mm                    | 1       |
| 10       | Barrel housing                                      | 1       |
| 11       | Parallel key 12mm x 8mm x 50mm long                 | 1       |
| 12       | Bearing spacer                                      | 1       |
| *        | 'Kluber' grease packed                              |         |

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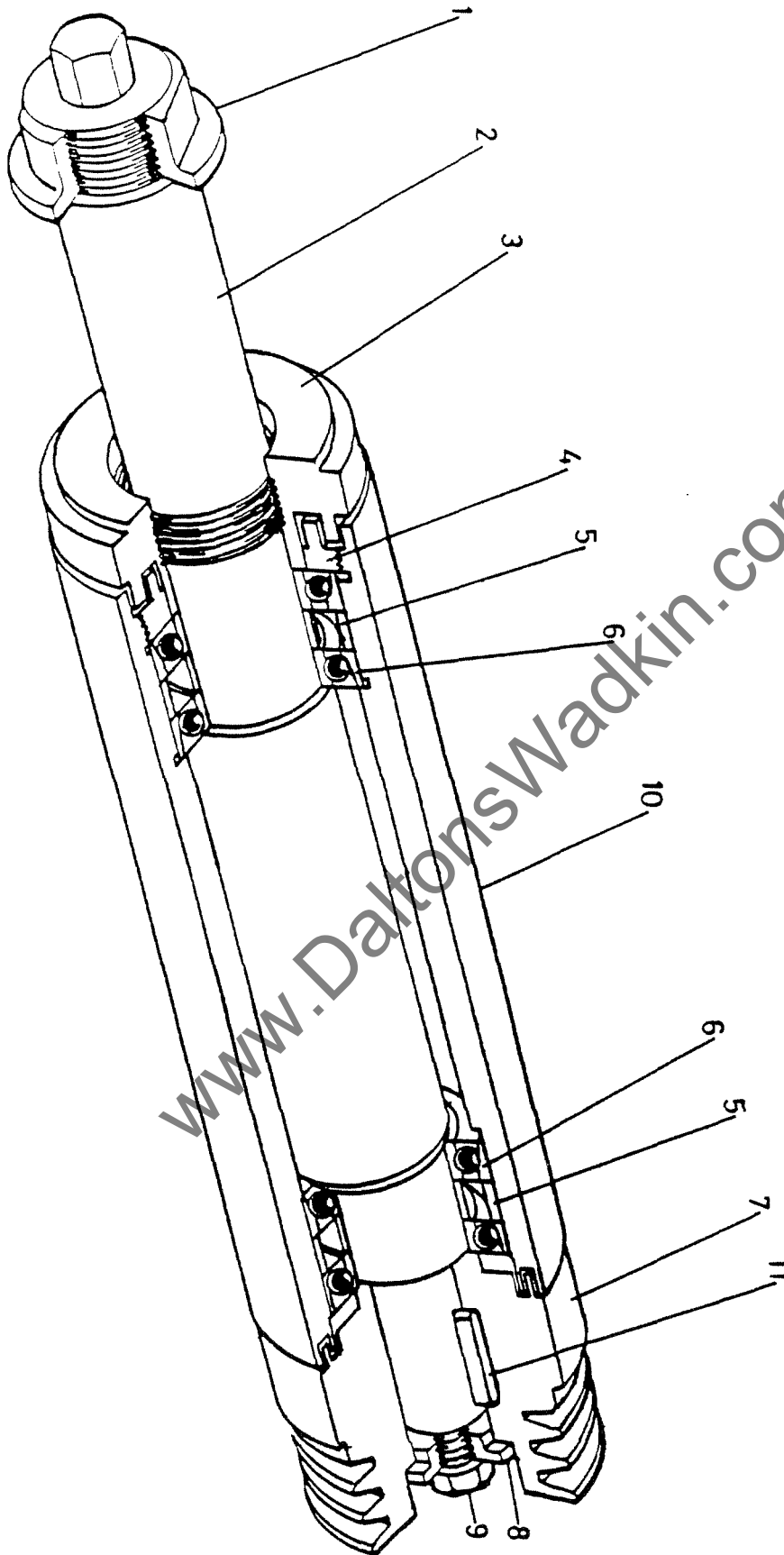


FIG 14 NEAR SIDE HEAD SPINDLE UNIT



14. NEAR SIDE HEAD SPINDLE UNIT - 40MM DIAMETER SQUARE SHOULDER

| Ref. No. | Description   | No. Off |
|----------|---|---------|
| 1        | Locking nut   | 1       |
| 2        | 40mm square shoulder near side head spindle         | 1       |
| 3        | Nut for spindle front bearing L.H                   | 1       |
| 4        | Nut for spindle barrel front bearing                | 1       |
| 5        | Bearing spacer rings                                | 2       |
| *6       | R.H.P. paired bearings 7009 TDUF EP7                | 2       |
| 7        | Spindle pulley (refer to motor and drive belt data) | 1       |
| 8        | Pulley spigot for spindle                           | 1       |
| 9        | Hexagon head setscrew M12 x 40mm                    | 1       |
| 10       | Barrel housing                                      | 1       |
| 11       | Parallel key 12mm x 8mm x 50mm long                 | 1       |
| *        | 'Kluber' grease packed                              |         |

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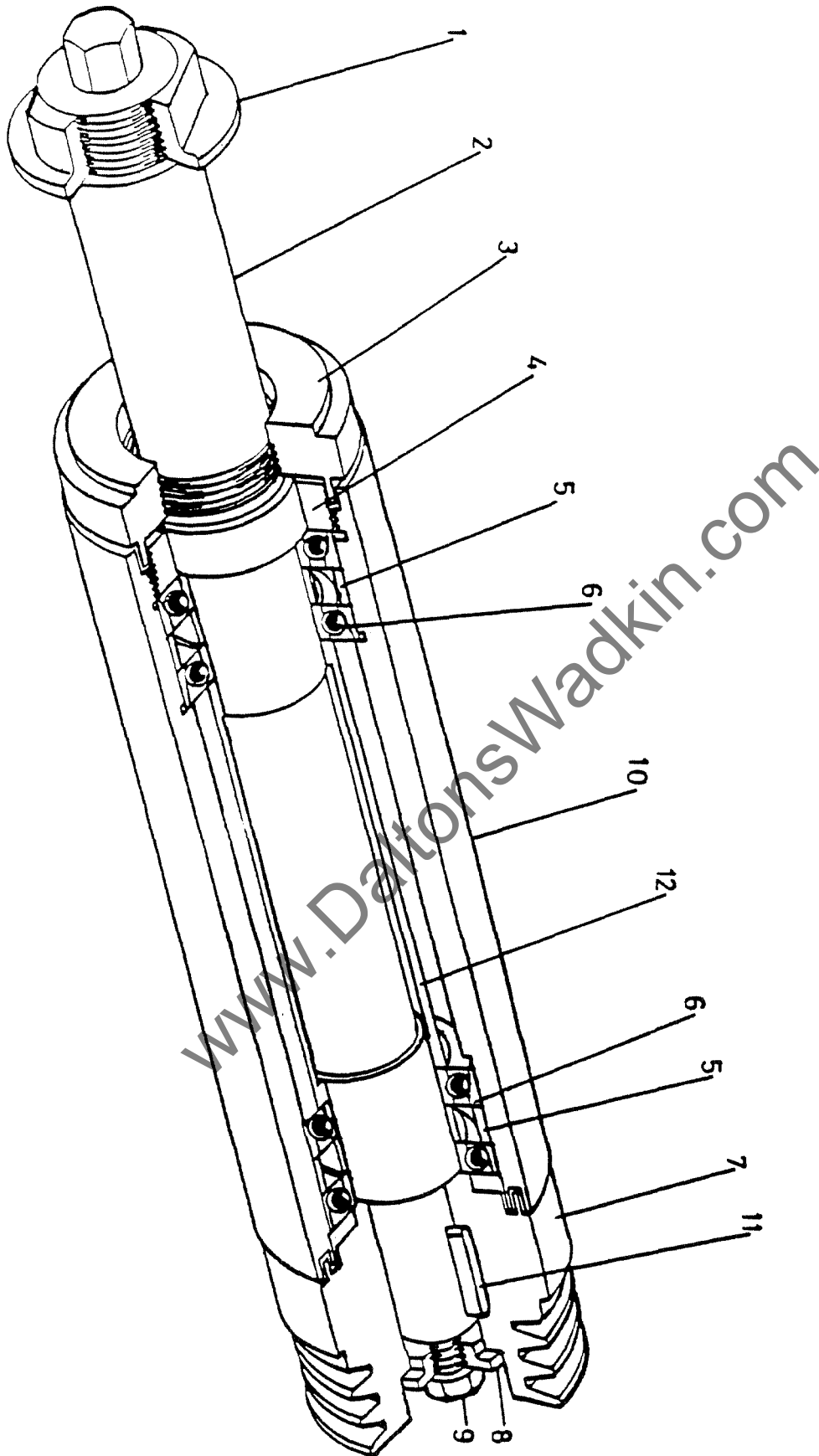


FIG 15 NEAR SIDE HEAD SPINDLE UNIT

**15. NEAR SIDE HEAD SPINDLE UNIT — 50mm AND 1 13/16  
DIAMETER SQUARE SHOULDER**

| Ref. No. | Description   | No. Off |
|----------|---|---------|
| 1        | Locking nut   | 1       |
| 2        | 50mm diameter square shoulder spindle               | 1       |
|          | or 1 13/16 diameter square shoulder spindle         | 1       |
| 3        | Nut for spindle front bearing R.H                   | 1       |
| 4        | Nut for spindle barrel front bearing                | 1       |
| 5        | Spacer rings for bearings                           | 2       |
| *6       | R.H.P. paired bearings 7009 TDUF EP7                | 2       |
| 7        | Spindle pulley (refer to motor and drive belt data) | 2       |
| 8        | Pulley spigot for spindle                           | 1       |
| 9        | Hexagon head setscrew M12 x 40mm                    | 1       |
| 10       | Barrel housing                                      | 1       |
| 11       | Parallel key 12mm x 8mm x 50mm long                 | 1       |
| 12       | Bearing spacer                                      | 1       |
| *        | 'Kluber' grease packed                              |         |

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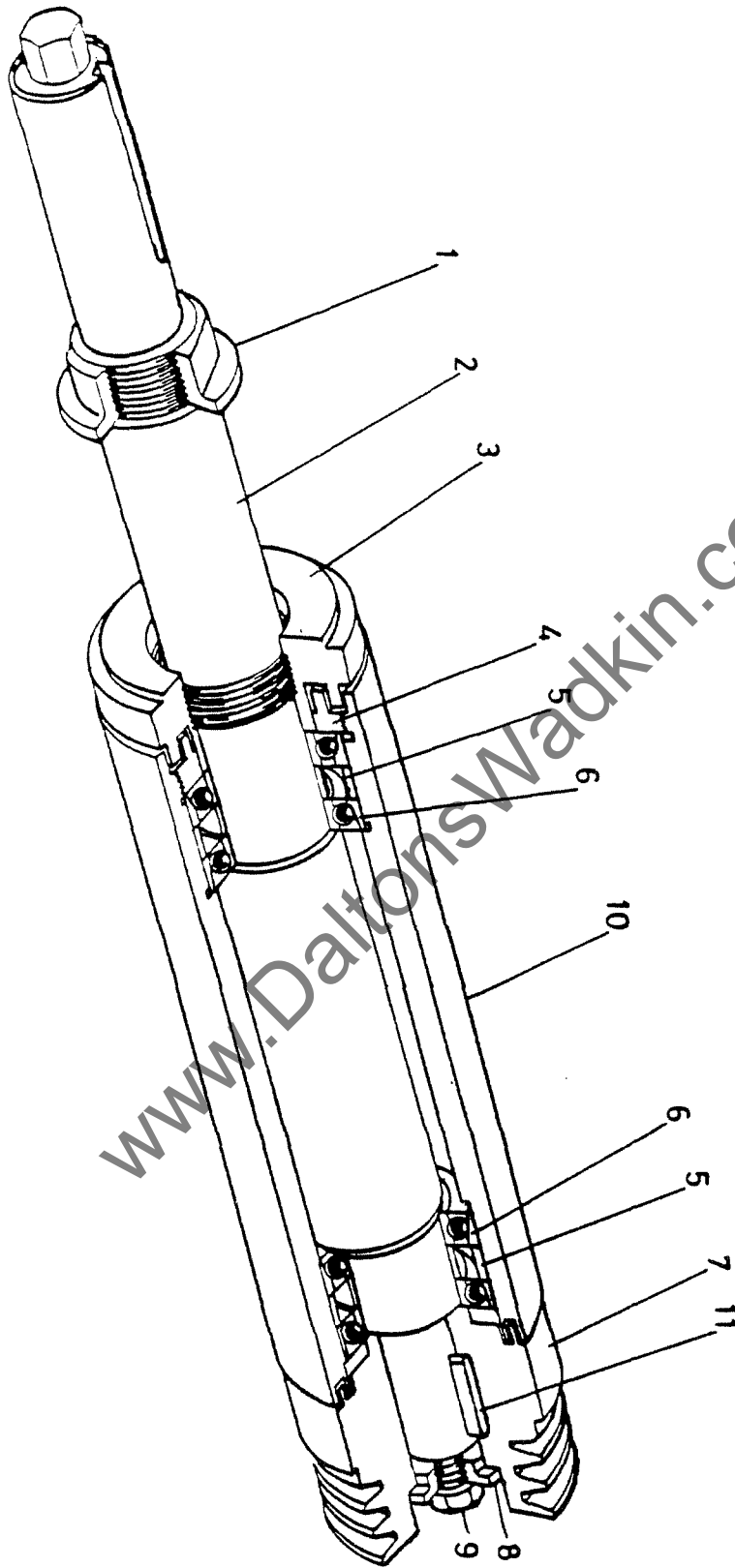


FIG 16 TOP HEAD SPINDLE UNIT



**16. TOP HEAD SPINDLE UNIT — 40MM DIAMETER SQUARE SHOULDER**

| Ref. No. | Description   | No. Off |
|----------|---|---------|
| 1        | Locking nut   | 1       |
| 2        | 40mm square shoulder Top head spindle               | 1       |
| 3        | Nut for spindle front bearing R.H.                  | 1       |
| 4        | Nut for spindle barrel front bearing                | 1       |
| 5        | Spacer rings for bearings                           | 2       |
| *6       | R.H.P. paired bearings 7009 TDUF EP7                | 2       |
| 7        | Spindle pulley (refer to motor and drive belt data) | 1       |
| 8        | Pulley spigot for spindle                           | 1       |
| 9        | Hexagon head setscrew M12 x 40mm                    | 1       |
| 10       | Barrel housing                                      | 1       |
| 11       | Parallel key 12mm x 8mm x 50mm long                 | 1       |

\*'Kluber' grease packed

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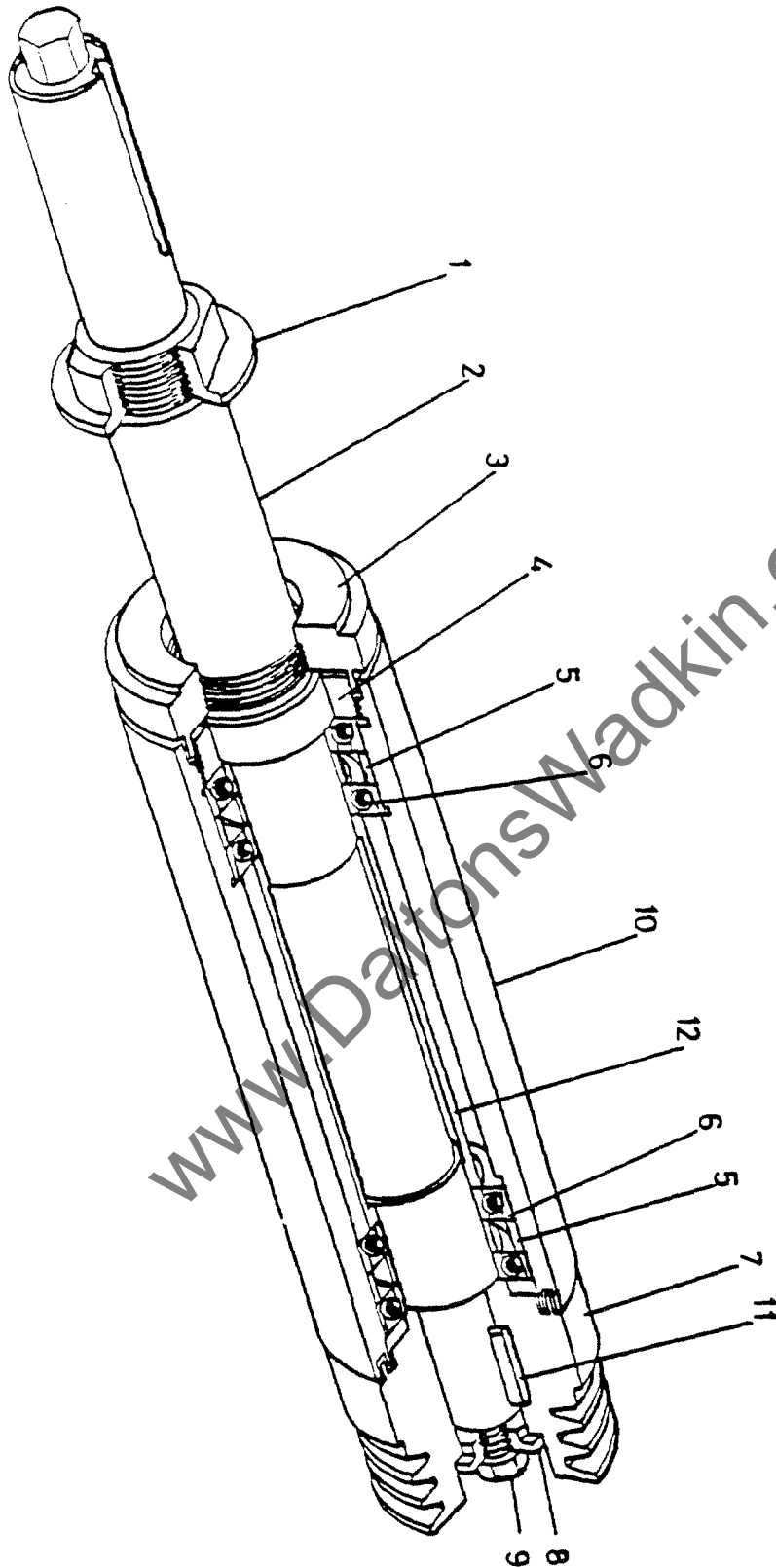


FIG 17 TOP HEAD SPINDLE UNIT



17. TOP HEAD SPINDLE UNIT- 50mm AND 1 13/16 DIAMETER SQUARE  
SHOULDER

| Ref. No. | Description   | No. Off |
|----------|---|---------|
| 1        | Locking nut   | 1       |
| 2        | 50mm diameter square shoulder spindle               | 1       |
| or 1     | 1 13/16 diameter square shoulder spindle            | 1       |
| 3        | Nut for spindle front bearing R.H                   | 1       |
| 4        | Nut for spindle barrel front bearing                | 1       |
| 5        | Spacer rings for bearings                           | 2       |
| *6       | R.H.P. paired bearings 7009 TDUF EP7                | 2       |
| 7        | Spindle pulley (refer to motor and drive belt data) | 2       |
| 8        | Pulley spigot for spindle                           | 1       |
| 9        | Hexagon head setscrew M12 x 40mm                    | 1       |
| 10       | Barrel housing                                      | 1       |
| 11       | Parallel key 12mm x 8mm x 50mm long                 | 1       |
| 12       | Bearing spacer                                      | 1       |
| *        | 'Kluber' grease packed                              |         |

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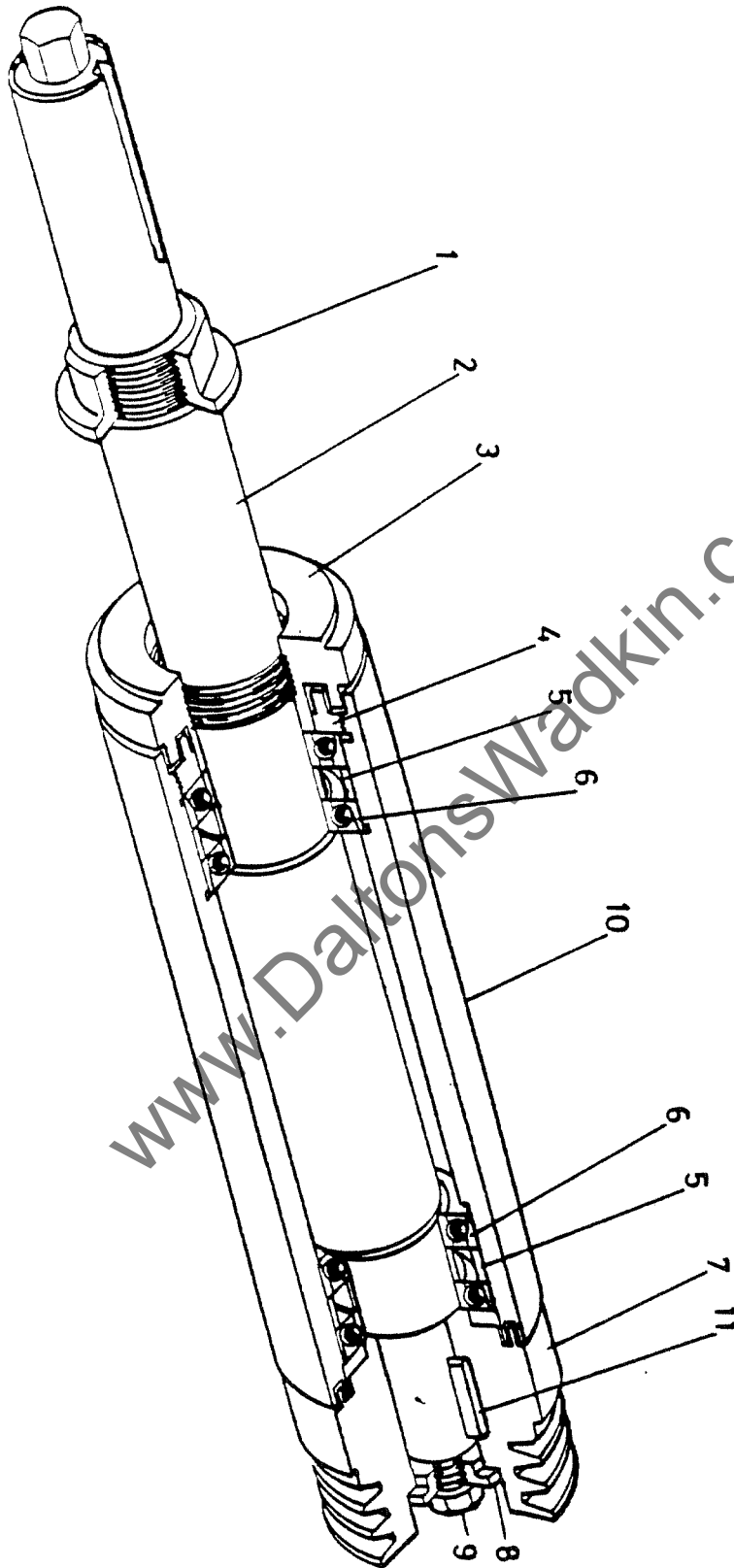


FIG 18 BOTTOM HEAD SPINDLE UNIT



## 18. BOTTOM HEAD SPINDLE UNIT - 40MM DIAMETER SQUARE SHOULDER

| Ref. No. | Description  | No. Off |
|----------|--|---------|
| 1        | Locking nut  | 1       |
| 2        | 40mm square shoulder near side head spindle        | 1       |
| 3        | Nut for spindle front bearing L.H                  | 1       |
| 4        | Nut for spindle barrel front bearing               | 1       |
| 5        | Bearing spacer rings                               | 2       |
| *6       | R.H.P. Paired bearings 7009 TDUF EP7               | 2       |
| 7        | Spindle pulley(refer to motor and drive belt data) | 1       |
| 8        | Pulley spigot for spindle                          | 1       |
| 9        | hexagon head set screw M12 x 40mm                  | 1       |
| 10       | Barrel housing                                     | 1       |
| 11       | Parallel key 12mm x 8mm x 50mm long                | 1       |
| *        | 'Kluber' grease packed                             |         |

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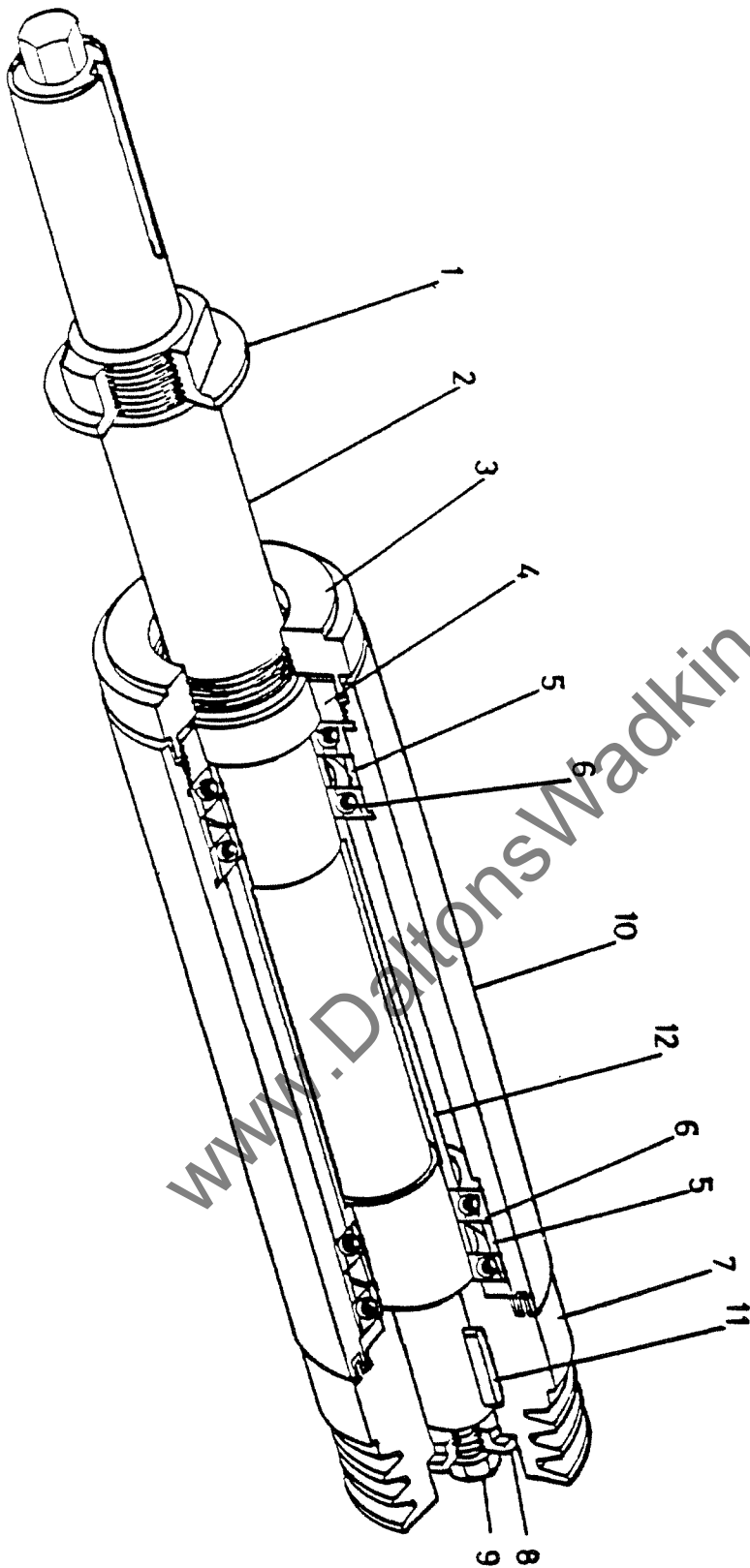


FIG 19 BOTTOM HEAD SPINDLE UNIT



19. BOTTOM HEAD SPINDLE UNIT - 50mm AND 1 13/16" DIAMETER SQUARE SHOULDER

| Ref. No. | Description   | No. Off |
|----------|---|---------|
| 1        | Locking nut   | 1       |
| 2        | 50mm diameter square shoulder spindle               | 1       |
| or       | 1 13/16 diameter square shoulder spindle            | 1       |
| 3        | Nut for spindle front bearing R.H.                  | 1       |
| 4        | Nut for spindle barrel front bearing                | 1       |
| 5        | Spacer rings for bearings                           | 2       |
| *6       | R.H.P. Paired bearings 7009 TDUF EP7                | 2       |
| 7        | Spindle pulley (refer to motor and drive belt data) | 2       |
| 8        | Pulley spigot for spindle                           | 1       |
| 9        | Hexagon head setscrew M12 x 40mm                    | 1       |
| 10       | Barrel housing                                      | 1       |
| 11       | Parallel key 12mm x 8mm x 50mm long                 | 1       |
| 12       | Bearing spacer                                      | 1       |
| *        | 'Kluber' grease packed                              |         |

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ILLUSTRATED PARTS LIST

SECTION 5

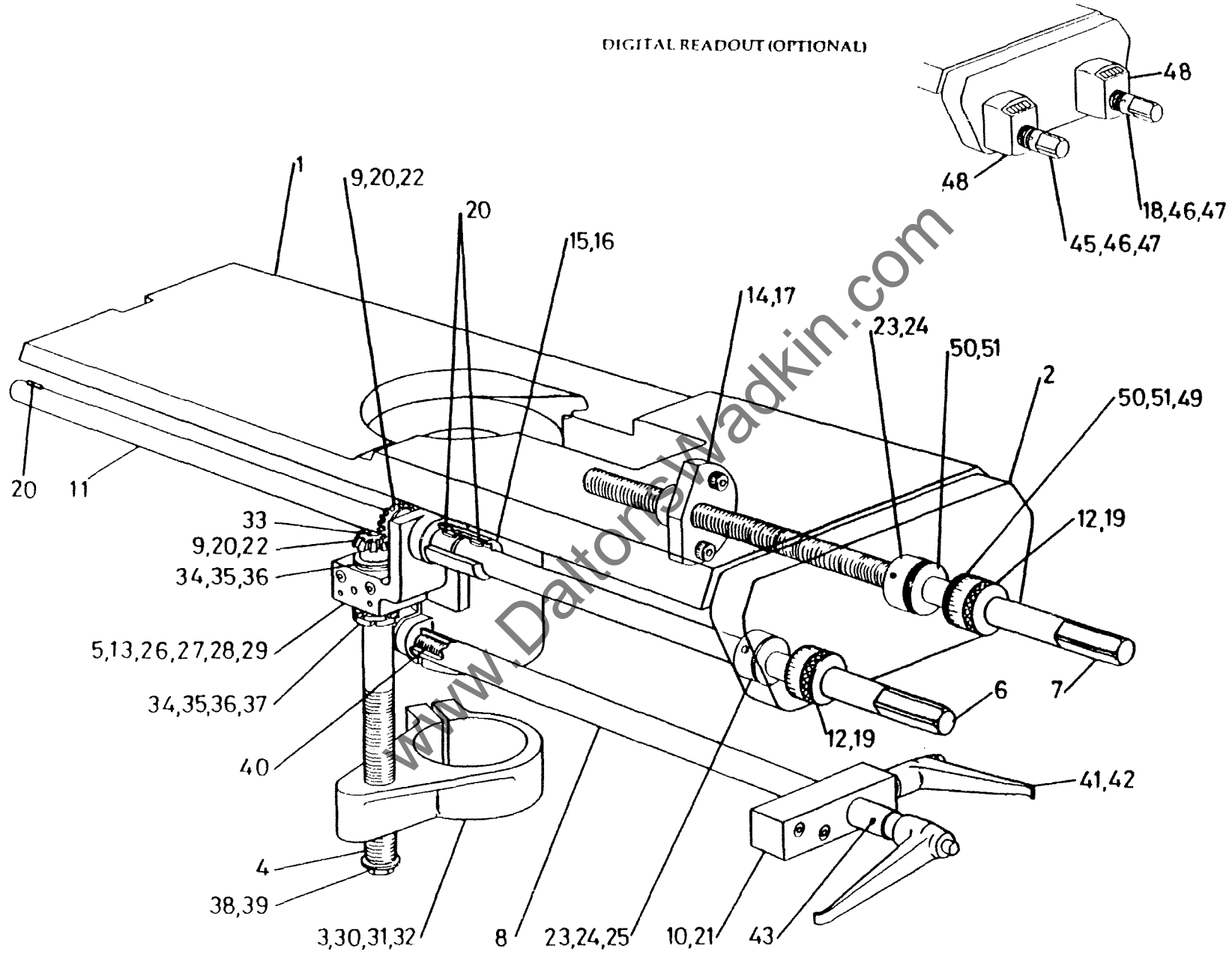


FIG 20 NEAR SIDE HEAD CARRIAGE UNIT ADJUSTING MECHANISM



20. NEAR SIDE HEAD CARRIAGE UNIT ADJUSTING MECHANISM

| Ref. No. | Description   | No. Off |
|----------|---|---------|
| 1        | Carriage for near side head spindle   | 1       |
| 2        | Bearing plate for near side head winding shafts   | 1       |
| 3        | Nut for vertical side head adjustment   | 1       |
| 4        | Vertical adjusting screw  | 1       |
| 5        | Mitre gear bracket for side head adjustment   | 1       |
| 6        | Front horizontal shaft vertical adjustment  | 1       |
| 7        | Front horizontal shaft lateral adjustment   | 1       |
| 8        | Locking shaft for spindle barrel  | 1       |
| 9        | Straight mitre bevel gear   | 2       |
| 10       | Clamping block for horizontal movement  | 1       |
| 11       | Mitre gear through shaft, for rise and fall and vee belt drive                          | 1       |
| 12       | Calibrated dial for traverse screw  | 2       |
| 13       | Guard for gear bracket  | 1       |
| 14       | Nut for lateral movement  | 1       |
| 15       | Collar for horizontal shaft   | 1       |
| 16       | Hexagon socket grub screw M6 x 8mm long   | 1       |
| 17       | Hexagon socket cap screw M8 x 25mm long   | 2       |
| 18       | Front horizontal shaft lateral adjustment   | 1       |
| 19       | GACO 'O' ring RMO 246 24  | 2       |
| 20       | Key 5mm x 5mm x 20mm  | 5       |
| 21       | Hexagon socket cap screw M8 x 35mm long   | 2       |
| 22       | Hexagon socket grub screw M6 x 6mm long   | 2       |
| 23       | Loose collar Ø 20   | 2       |
| 24       | Taper pin   | 2       |
| 25       | INA Thrust washer AS 2035   | 1       |
| 26       | Tension pin Ø 6   | 2       |
| 27       | Hexagon head setscrew M8 x 60mm long  | 2       |
| 28       | Grease nipple NA5799  | 2       |
| 29       | Plain washer M8   | 2       |
| 30       | Hexagon head setscrew M10 x 80mm long   | 1       |
| 31       | Plain washer M10  | 1       |
| 32       | Nut M10   | 1       |
| 33       | M12 Self locking nut  | 1       |
| 34       | INA Thrust bearing AXK 2542   | 2       |
| 35       | INA Thrust washer AS 2542   | 2       |
| 36       | INA Thrust washer LS 2542   | 2       |
| 37       | Notch nut M24 x 1.5   | 2       |
| 38       | Hexagon head setscrew M10 x 20mm long   | 1       |
| 39       | Large plain washer M10  | 1       |
| 40       | Stud M12 x 70mm long  | 1       |
| 41       | Locking handle M12 x 25mm male  | 2       |
| 42       | Brass pad   | 1       |
| 43       | Tension pin Ø 4   | 1       |
| 44+      | Hexagon socket cap screw M10 x 45mm long<br>(Bearing plate fastening to carriage slide) | 4       |
| 45       | Front horizontal shaft vertical adjustment  | 1       |
| 46       | Square end shaft extension  | 2       |
| 47       | Taper pin   | 2       |
| 48       | 'SIKO' digital readout (0902E 4mm)  | 2       |
| 49       | 'INA' shaft washer WS 81104   | 1       |
| 50       | 'INA' Thrust bearing AXK 2035   | 2       |
| 51       | 'INA' Thrust washer AS 2035   | 3       |

+ Not shown

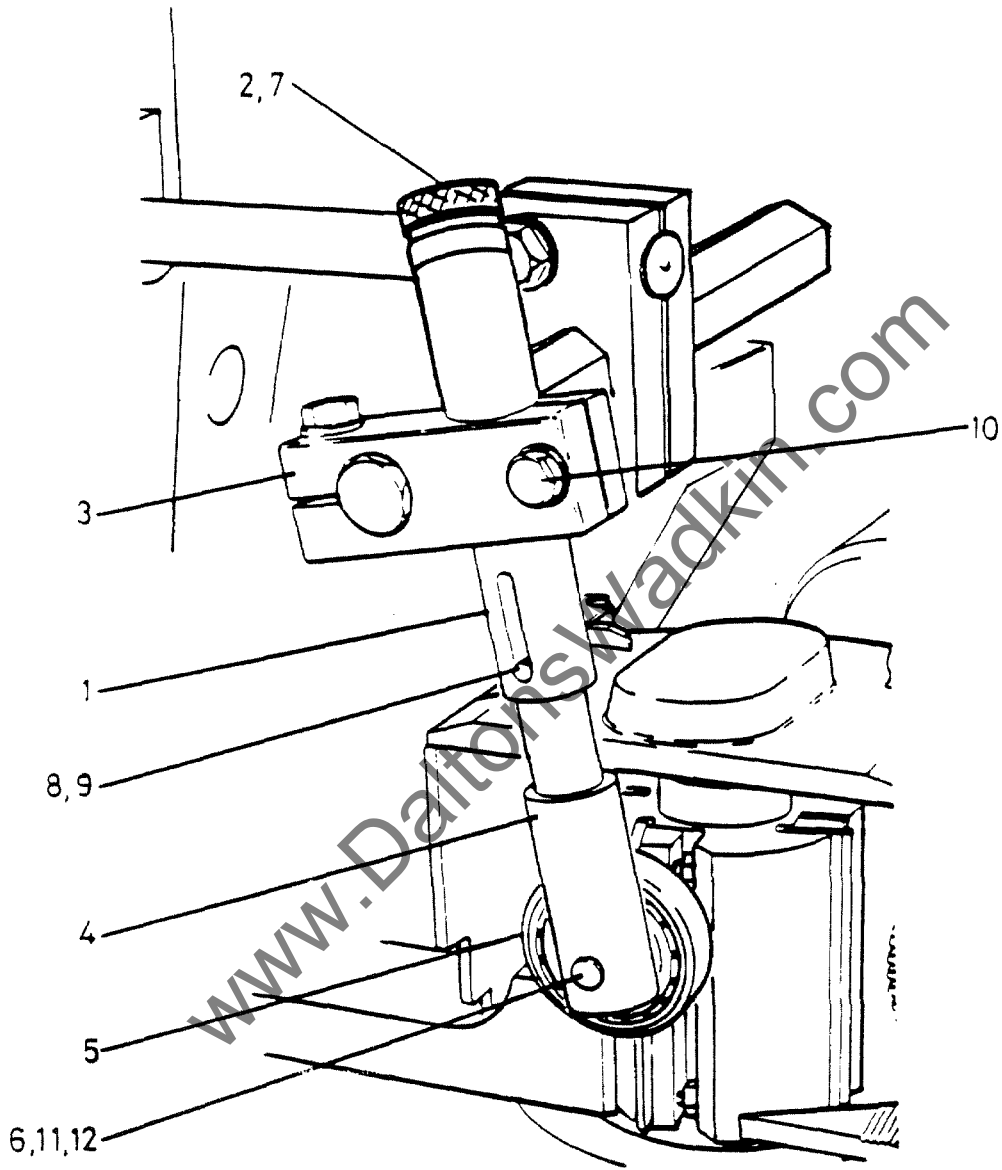


FIG 21 TOP ROLLER PRESSURE UNIT

**21. TOP ROLLER PRESSURE UNIT**

| Ref. No. | Description                         | No. Off |
|----------|-------------------------------------|---------|
| 1        | Barrel, top pressure roller         | 1       |
| 2        | Spring tensioner, top pressure      | 1       |
| 3        | Split clamp, top pressure barrel    | 1       |
| 4        | Roller arm, top pressure            | 1       |
| 5        | Roller, top pressure                | 1       |
| 6        | Roller pin, top pressure            | 1       |
| 7        | Spring, infeed pressure             | 1       |
| 8        | Tension pin, 8mm dia. x 24mm long   | 1       |
| 9        | Tension pin, 5mm dia. x 24mm long   | 1       |
| 10       | Hexagon head screw, M12 x 45mm long | 2       |
| 11       | Circlip, 20mm external              | 1       |
| 12       | Bearing, SKF 6004 2RS               | 1       |

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## 22. SINGLE SIDE ROLLER PRESSURE UNIT OPPOSITE FENCE SIDE HEAD

| Ref. No. | Description                               | No. Off |
|----------|---|---------|
| 1        | Bracket, single roller side pressure unit | 1       |
| 2        | Pin, side pressure roller                 | 1       |
| 3        | Pressure roller                           | 1       |
| 4        | Sliding shaft, pressure roller            | 1       |
| 5        | Infeed pressure spring                    | 1       |
| 6        | Hexagon head screw, M12 x 35mm long       | 2       |
| 7        | Washer 12mm, bright mild steel            | 2       |
| 8        | 'Heyco'nylon domed plug, black, 8mm hole, | 1       |
| 9        | Circlip, 20mm external                    | 1       |
| 10       | Bearing, SKF 6004 2RS                     | 1       |
| 11       | Tension pin, 8mm dia x 30mm long          | 1       |
| 12       | Tension pin, 5mm dia x 30mm long          | 1       |

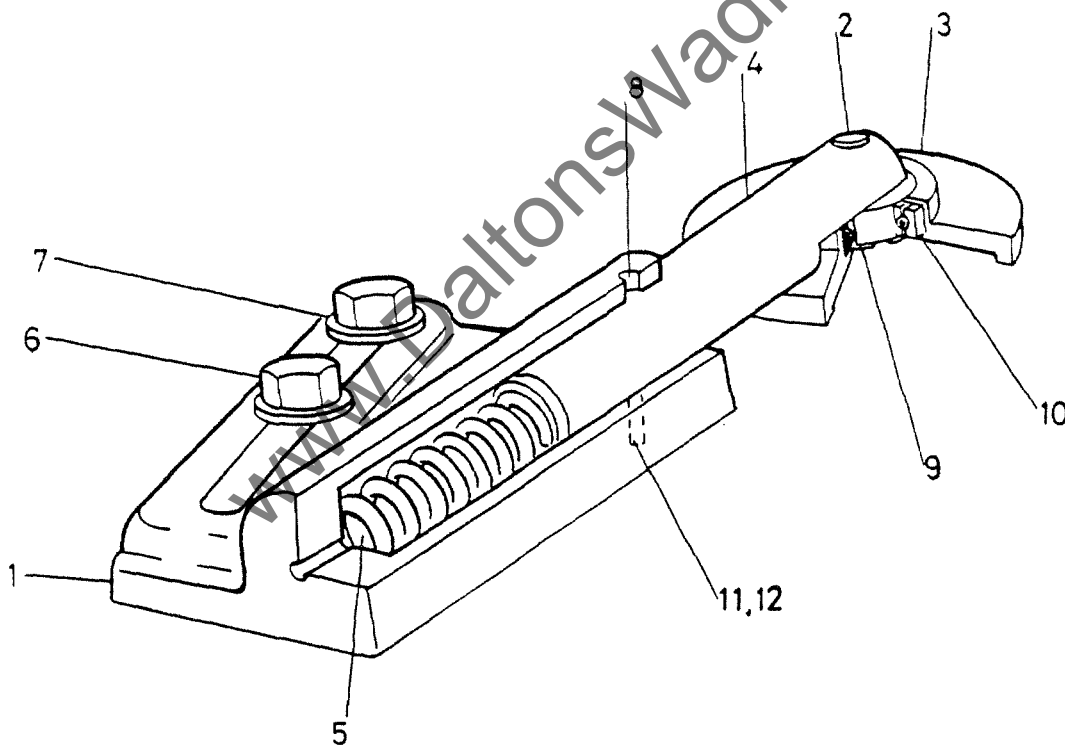


FIG 22 SINGLE SIDE ROLLER PRESSURE UNIT OPPOSITE FENCE SIDE HEAD

23. MOUNTING FOR TOP PAD OR ROLLER PRESSURE UNIT BEFORE TOP HEAD

| Ref. No. | Description                               | No. Off |
|----------|---|---------|
| 1        | Bracket, top pressure                     | 1       |
| 2        | Horizontal bar, longitudinal adjustment   | 1       |
| 3        | Horizontal bar, transverse adjustment     | 1       |
| 4        | Split clamp, top pressure horizontal bars | 1       |
| 5        | Screwed stud, M10 x 55mm long             | 1       |
| 6        | Hexagon nut, M10                          | 1       |
| 7        | Washer, 10mm, bright mild steel           | 1       |
| 8        | Hexagon socket screw, M10 x 25mm long     | 2       |
| 9        | Hexagon head screws, M12 x 40mm long      | 2       |

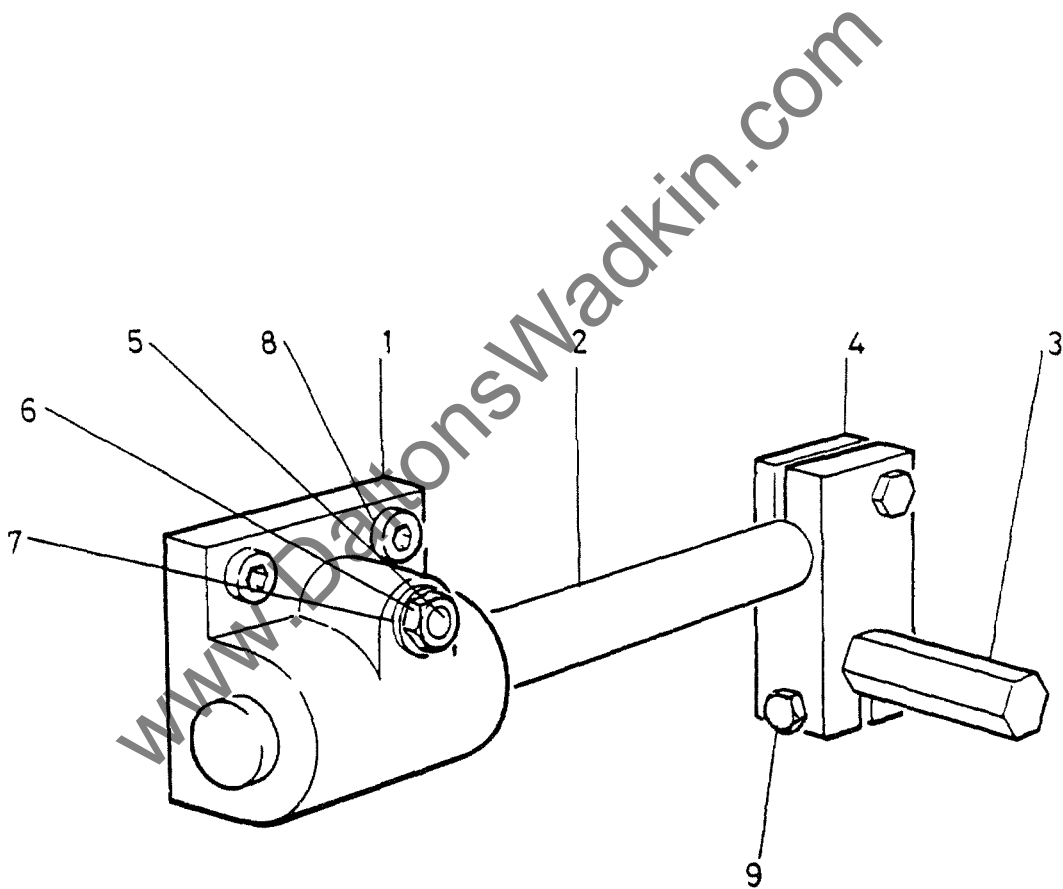


FIG 23 MOUNTING FOR TOP PAD OR ROLLER PRESSURE UNIT BEFORE TOP HEAD

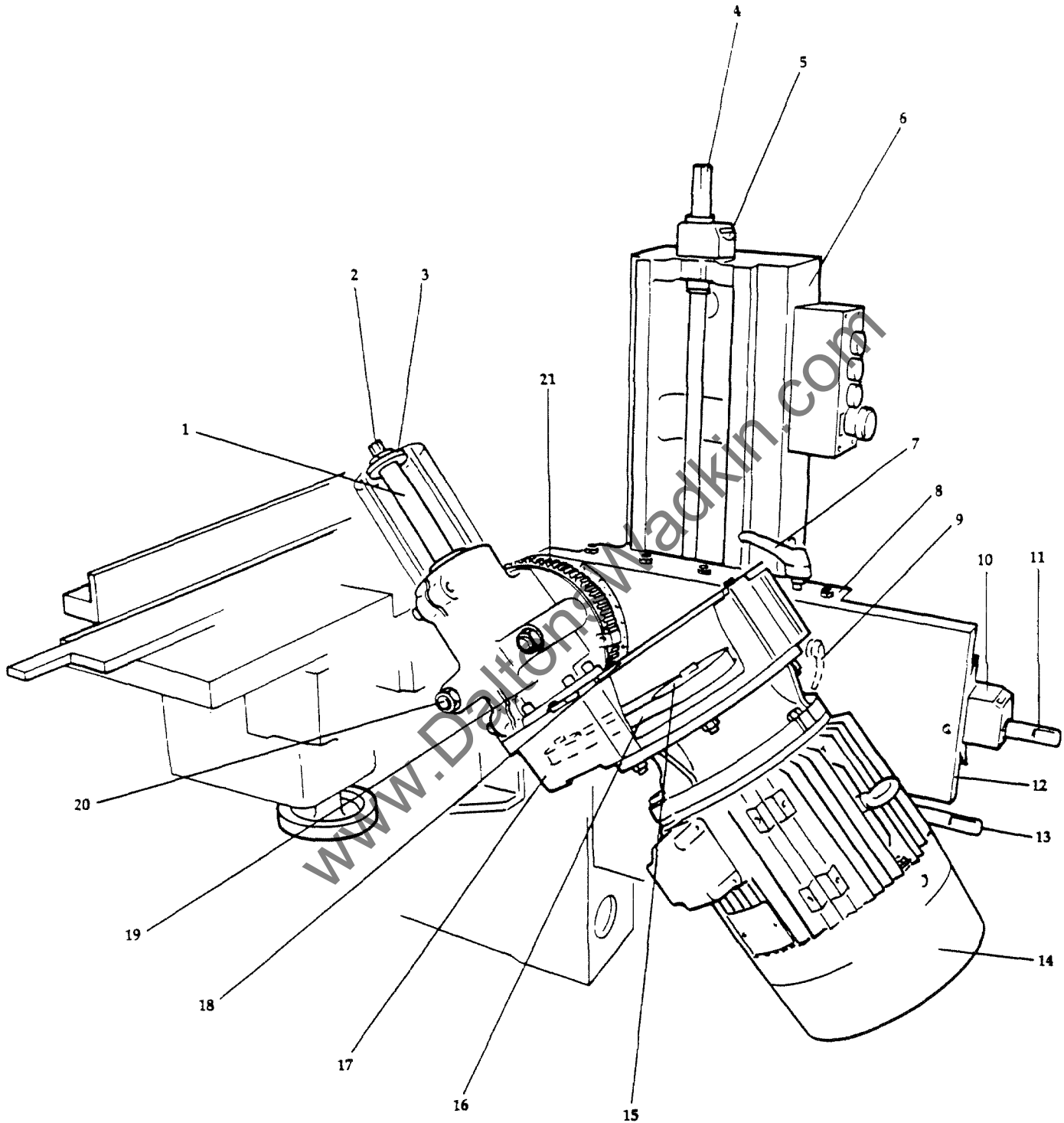


FIG 24 UNIVERSAL HEAD ADJUSTING MECHANISM

**24. UNIVERSAL HEAD ADJUSTING MECHANISM**

| Ref. No. | Description                                   | No. Off |
|----------|---|---------|
| 1        | Universal Head spindle, 40mm dia. sq.shoulder | 1       |
| 2        | Locking nut                                   | 1       |
| 3        | Locking collar assembly                       | 1       |
| 4        | Vertical traverse screw                       | 1       |
| 5        | Digital readout                               | 1       |
| 6        | Vertical slide stand                          | 1       |
| 7        | Locking handle, M10 X 50mm, male              | 1       |
| 8        | Saddle, Universal Head                        | 1       |
| 9        | Locking handle                                | 1       |
| 10       | Digital readout                               | 1       |
| 11       | Horizontal traverse screw                     | 1       |
| 12       | Cross slide, Universal Head                   | 1       |
| 13       | Worm gear shaft                               | 1       |
| 14       | Electric motor, frame D132                    | 1       |
| 15       | Drive pulley                                  | 1       |
| 16       | Drive belt, Fenner, SPZ 940                   | 3       |
| 17       | Pulley/belt housing                           | 1       |
| 18       | Pully/belt housing cover                      | 1       |
| 19       | Spindle carriage, Universal head              | 1       |
| 20       | Bolt, spindle carriage                        | 2       |
| 21       | Wormwheel, Universal Head                     | 1       |

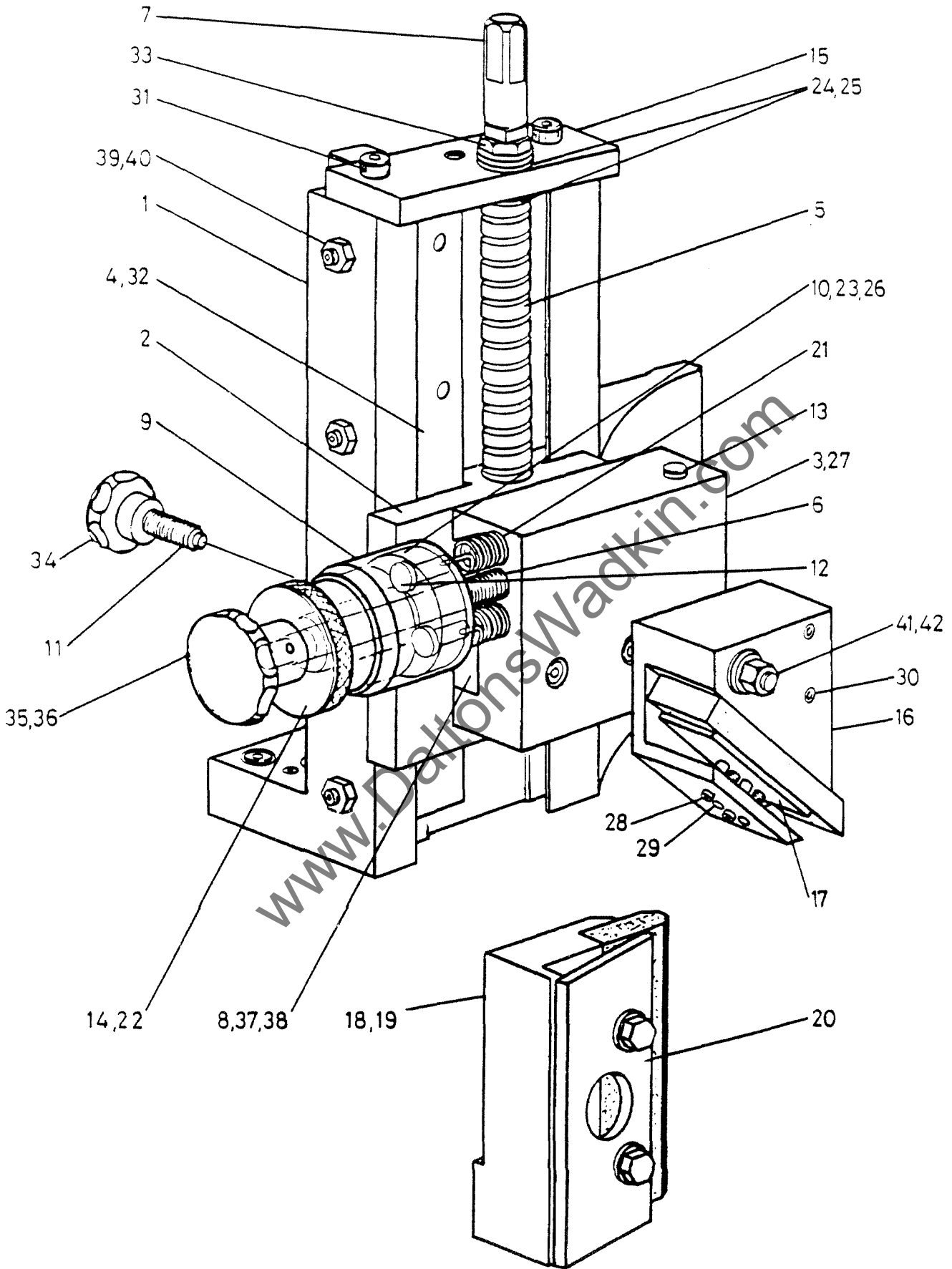


FIG 25 NEAR SIDE HEAD JOINTER



25. NEAR SIDE HEAD JOINTER MK II

| Ref. No. | Description                                       | No. Off |
|----------|---|---------|
| 1        | Slide for near side head jointer                  | 1       |
| 2        | Intermediate slide for jointer                    | 1       |
| 3        | Saddle for near side head jointer                 | 1       |
| 4        | Wear strip  | 1       |
| 5        | Traverse screw                                    | 1       |
| 6        | Screw for jointer feed                            | 1       |
| 7        | Square drive adaptor                              | 1       |
| 8        | Wear strip for saddle                             | 1       |
| 9        | Sleeve for jointer feed                           | 1       |
| 10       | Nut for jointer feed                              | 1       |
| 11       | Clamp screw                                       | 1       |
| 12       | Spring anchor pin                                 | 2       |
| 13       | Spring anchor post                                | 1       |
| 14       | Dial for jointer adjustment                       | 1       |
| 15       | Block for jointer screw bearing                   | 1       |
| 16       | Holder for straight jointer stone                 | 1       |
| 17       | Clamp   | 1       |
| 18       | Body for profile jointer stone                    | 1       |
| 19       | Washer  | 1       |
| 20       | Plate   | 1       |
| 21       | Extension spring                                  | 2       |
| 22       | 'GACO' 'O' ring RMO 445-30                        | 1       |
| 23       | Helicoil insert F112 - N24 M12                    | 1       |
| 24       | Bronze headed bush 16mm O/D x 10mm I/D x10mm long | 2       |
| 25       | Plain washer M10                                  | 2       |
| 26       | Hexagon socket capscrew M6 x 16mm long            | 2       |
| 27       | Hexagon socket capscrew M6 x 12mm long            | 3       |
| 28       | Tension pin Ø 4 x 12mm long                       | 2       |
| 29       | Hexagon head setscrew M6 x 12mm long              | 2       |
| 30       | Tension pin Ø 6 x 40mm long                       | 2       |
| 31       | Hexagon socket capscrew M8 x 30mm long            | 2       |
| 32       | Hexagon head setscrew M8 x 25mm long              | 4       |
| 33       | Lock nut M12                                      | 1       |
| 34       | Handwheel   | 1       |
| 35       | Handwheel   | 1       |
| 36       | Taper pin   | 1       |
| 37       | Hexagon socket grubscrew M6 x 25mm long           | 2       |
| 38       | Lock nut M6                                       | 2       |
| 39       | Hexagon socket grubscrew M8 x 25mm long           | 4       |
| 40       | Lock nut M8                                       | 4       |
| 41       | Stud M12 x 55mm long                              | 1       |
| 42       | Collar nut WDS 404-204 M12                        | 1       |

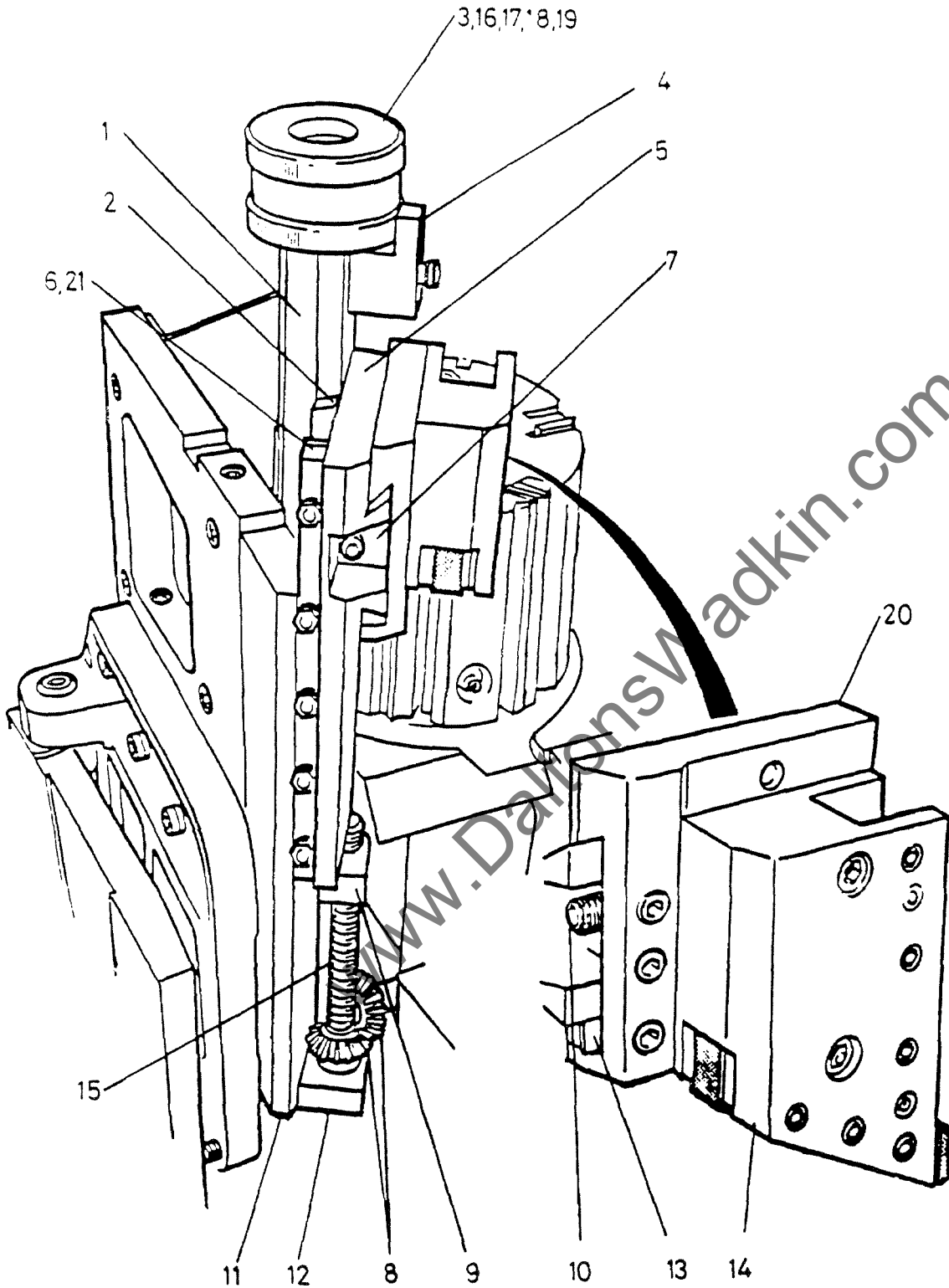


FIG 26 FENCE SIDE HEAD JOINTER

26. FENCE SIDE HEAD JOINTER MK I

| Ref. No. | Description                      | No. Off |
|----------|----------------------------------|---------|
| 1        | Adjustable shaft support         | 1       |
| 2        | Traverse slide strip             | 1       |
| 3        | Handwheel                        | 1       |
| 4        | Adaptor for ball catch           | 1       |
| 5        | Jointer carriage slide           | 1       |
| 6        | Traverse slide strip             | 1       |
| 7        | Nut for Cross slide              | 1       |
| 8        | Beval gear                       | 2       |
| 9        | Nut for vertical slide           | 1       |
| 10       | Horizontal screw                 | 1       |
| 11       | Traverse slide                   | 1       |
| 12       | Support for vertical screw       | 1       |
| 13       | Dove tail strip - adjustable     | 1       |
| 14       | Stone holder                     | 1       |
| 15       | Vertical screw                   | 1       |
| 16+      | Feed adjustment shaft            | 1       |
| 17+      | Helical gear                     | 1       |
| 18+      | Helical gear                     | 1       |
| 19+      | Cover - adjustable shaft support | 1       |
| 20       | Sliding adaptor for stone holder | 1       |
| 21       | Wear strip                       | 1       |

+ Not shown

SECTION 5

ILLUSTRATED PARTS LIST

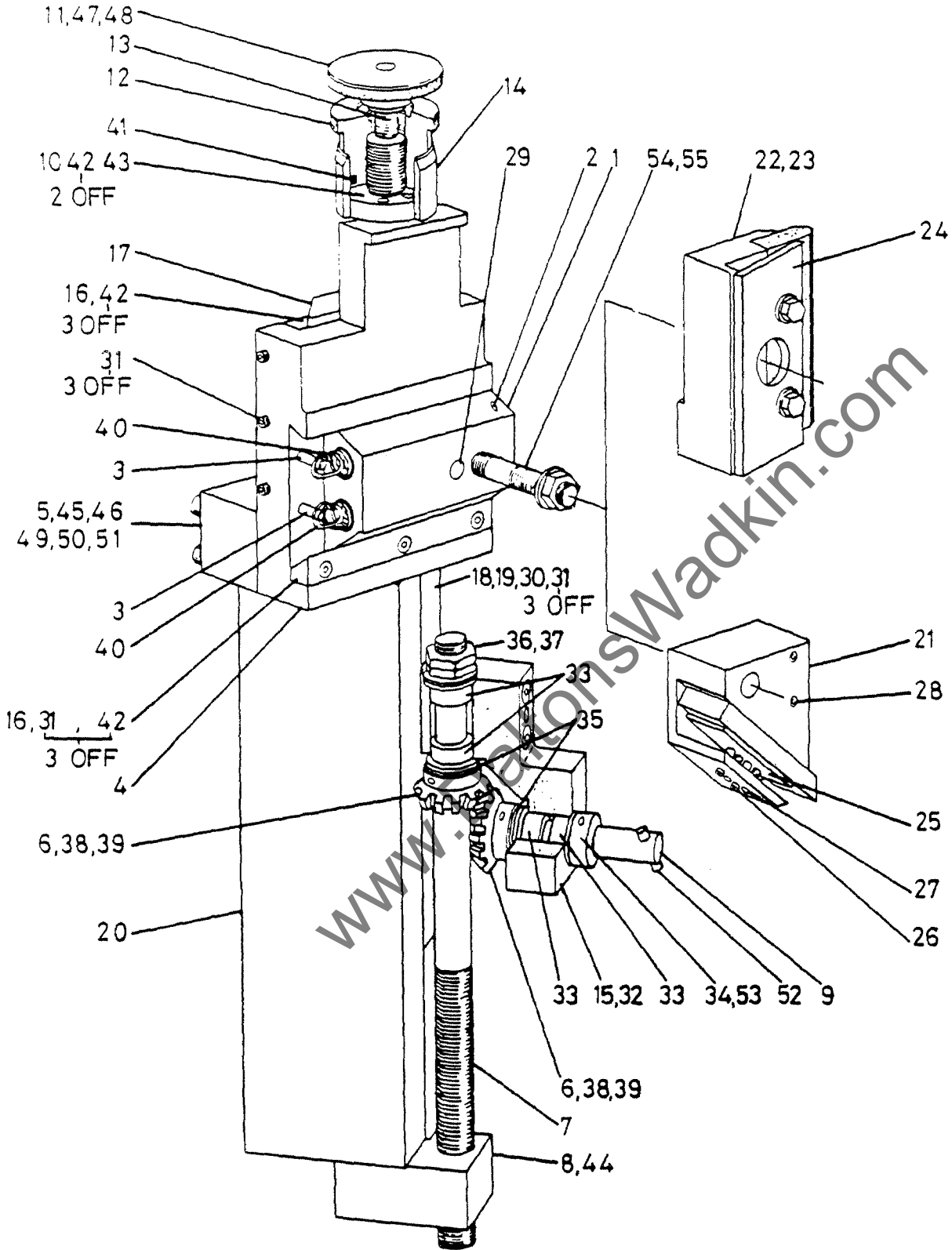


FIG 26 FENCE SIDEHEAD JOINTER

26. FENCE SIDE HEAD JOINTER MK 11

| Ref. No. | Description   | No. Off |
|----------|---|---------|
| 1        | Slide for fence side head jointer feed                    | 1       |
| 2        | Spring anchor post  | 1       |
| 3        | Post for Spring   | 2       |
| 4        | Slideway for jointer                                      | 1       |
| 5        | Foot for jointer slideway                                 | 1       |
| 6        | Bevel gear  | 2       |
| 7        | Screw for jointer rise and fall                           | 1       |
| 8        | Nut for jointer rise and fall                             | 1       |
| 9        | Shaft for bevel gear                                      | 1       |
| 10       | Nut for jointer feed                                      | 1       |
| 11       | Knob  | 1       |
| 12       | Dial for jointer adjustment                               | 1       |
| 13       | Screw for jointer feed                                    | 1       |
| 14       | Sleeve for jointer feed                                   | 1       |
| 15       | Bracket for bevel gears                                   | 1       |
| 16       | Wear strip for jointer                                    | 1       |
| 17       | Slide for feed control                                    | 1       |
| 18       | Vertical wear strip                                       | 1       |
| 19       | Vertical slideway   | 1       |
| 20       | Vertical slide  | 1       |
| 21       | Holder for straight jointer stone                         | 1       |
| 22       | Body for profile jointer stone                            | 1       |
| 23       | Washer  | 1       |
| 24       | Plate   | 1       |
| 25       | Clamp   | 1       |
| 26       | Tension pin Ø 4 x 12 mm long                              | 2       |
| 27       | Hexagon head setscrew M6 x 12 mm long                     | 2       |
| 28       | Tension pin Ø 6 x 40 mm long                              | 2       |
| 29       | Plain dowel Ø 10 x 25 mm long                             | 1       |
| 30       | Hexagon socket capscrew M6 x 20mm long                    | 3       |
| 31       | Hexagon socket grubscrew M6 x 12mm long                   | 9       |
| 32       | Hexagon socket capscrew M8 x 60mm long                    | 2       |
| 33       | Headed bronze bush 22 mm O/D x 12mm long                  | 4       |
| 34       | Loose collar 28 mm O/D x 16 mm I/D x 12mm thick           | 1       |
| 35       | INA Thrust washer As 1730                                 | 2       |
| 36       | Hexagon locknut M16                                       | 2       |
| 37       | Plain washer  | 1       |
| 38       | Hexagon socket grubscrew M6 x 6mm long                    | 2       |
| 39       | Key 5 mm x 5 mm x 20 mm long                              | 2       |
| 40       | Extension spring  | 2       |
| 41       | GACO 'O' ring seal RMO 445-30                             | 2       |
| 42       | Hexagon socket capscrew M6 x 16mm long                    | 1       |
| 43       | M12 Helicoil insert                                       | 8       |
| 44       | Hexagon socket capscrew M6 x 65mm long                    | 1       |
| 45       | Hexagon socket capscrew M8 x 45mm long<br>(foot to slide) | 1       |
| 46       | Tension pin Ø 6 x 50mm long                               | 2       |
| 47       | No 1 Taper pin  | 1       |
| 48       | M10 Plain washer  | 1       |

SECTION 5

ILLUSTRATED PARTS LIST

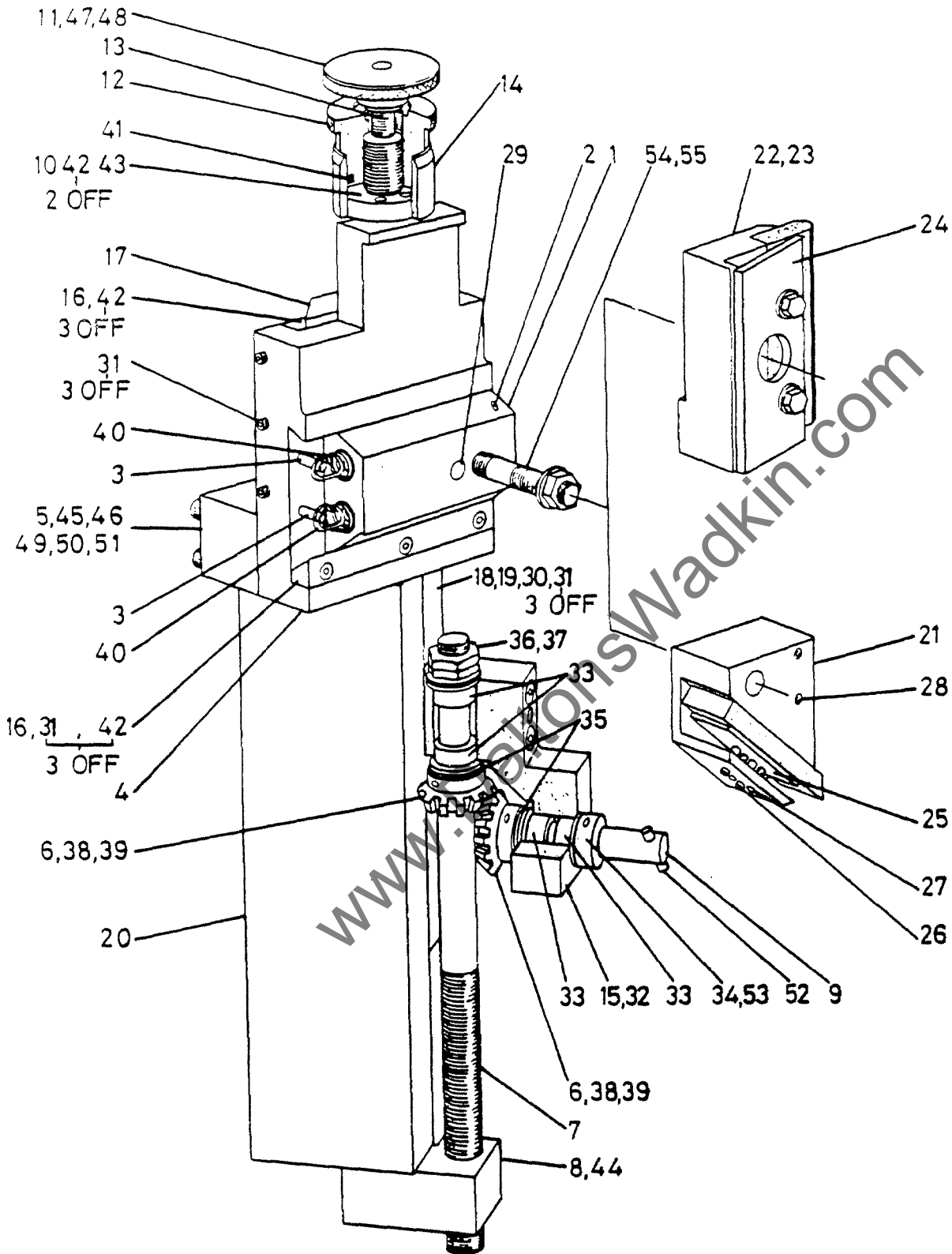


FIG 26 FENCE SIDE HEAD JOINTER

26. FENCE SIDE HEAD JOINTER MK 11 (cont.)

| Ref. No. | Description                                       | No. Off |
|----------|---|---------|
| 49       | Hexagon socket capscrew M6 x 60mm long            | 4       |
| 50       | Spring washer M6                                  | 4       |
| 51       | Tension pin 0 6 x 32mm long<br>(foot to slideway) | 2       |
| 52       | Tension pin 0 6 x 32 mm long                      | 1       |
| 53       | Taper pin No 2                                    | 1       |
| 54       | Stud M12 x 55 mm long                             | 1       |
| 55       |   | 1       |

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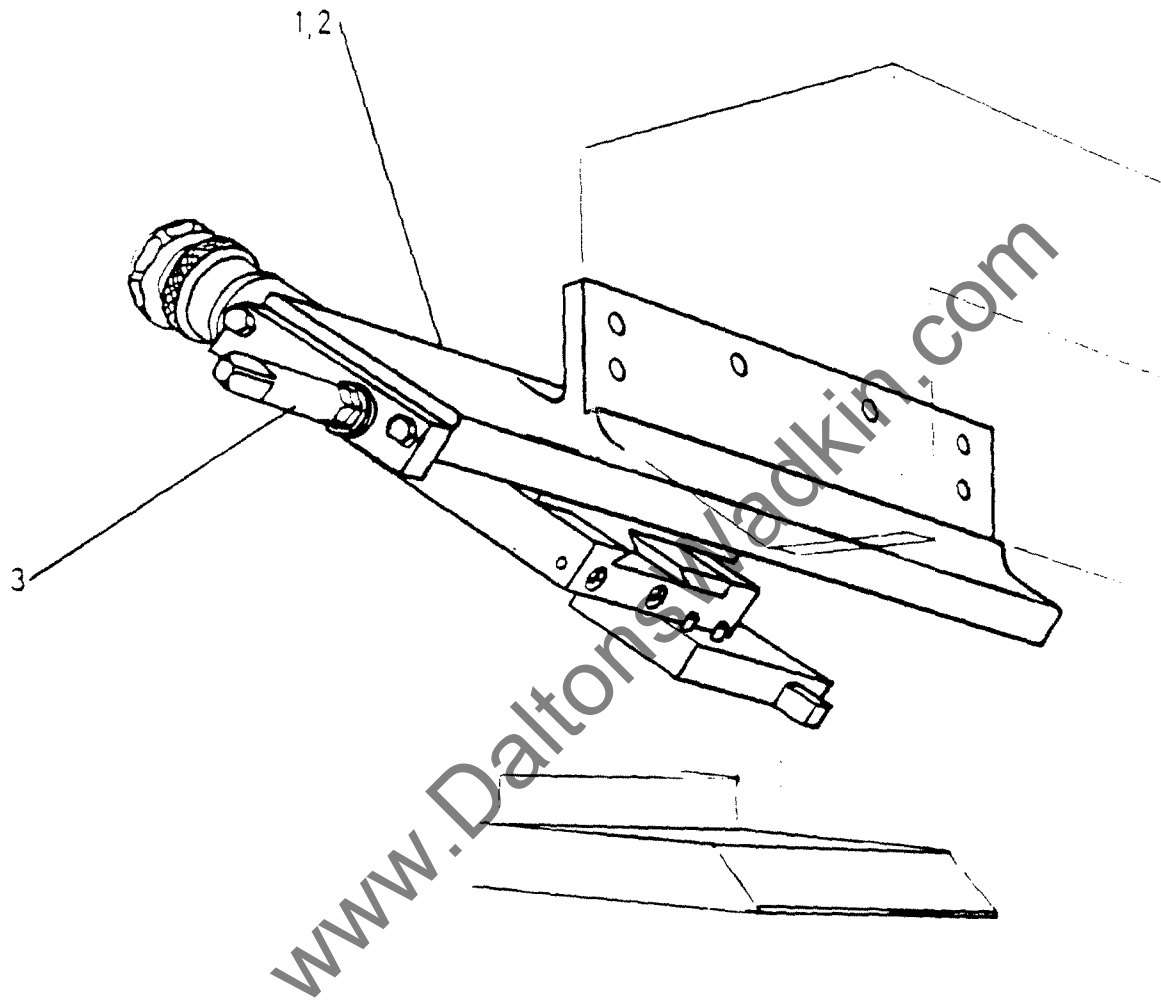


FIG 27 TOP HEAD JOINTER





27. TOP HEAD JOINTER

Build of the top head Jointer is the same as the MK II Near side head Jointer with the exceptions of the below items:-

| Ref. No. | Description                | No. Off |
|----------|----------------------------|---------|
| 1        | Slide for top head Jointer | 1       |
| 2        | Wear Strip                 | 1       |
| 3        | Traverse Screw             | 1       |

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OPERATING INSTRUCTIONS

SECTION 3

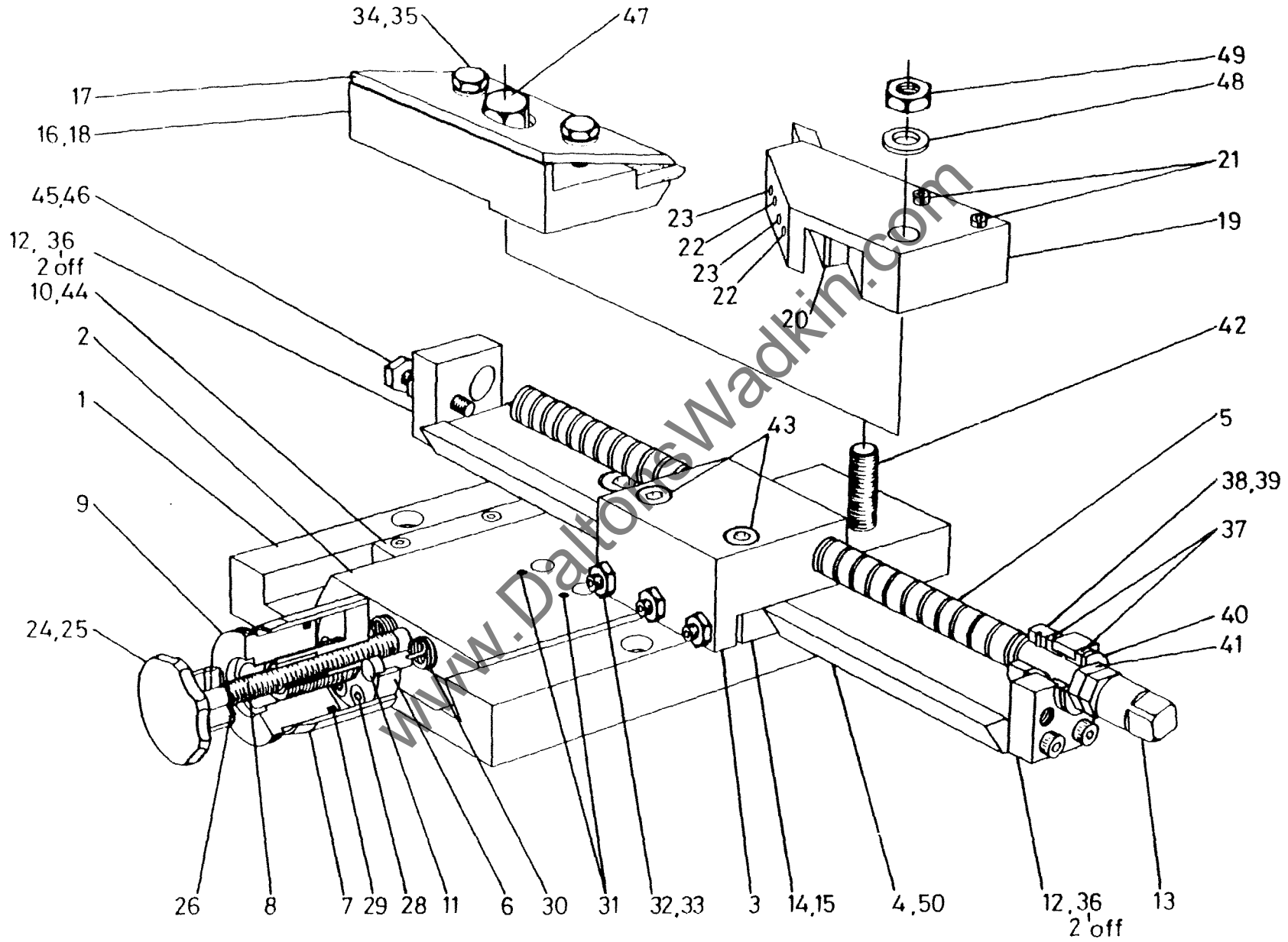


FIG 28 SECOND BOTTOM HEAD JOINTER

28. SECOND BOTTOM HEAD JOINTER

| Ref. No. | Description                                       | No. Off |
|----------|---|---------|
| 1        | Slideway for bottom head jointer feed             | 1       |
| 2        | Slide for bottom head jointer feed                | 1       |
| 3        | Saddle for bottom head jointer                    | 1       |
| 4        | Slide for bottom head jointer traverse            | 1       |
| 5        | Screw for horizontal jointer traverse             | 1       |
| 6        | Nut for jointer feed                              | 1       |
| 7        | Sleeve for jointer feed                           | 1       |
| 8        | Screw for jointer feed                            | 1       |
| 9        | Dial for jointer adjustment                       | 1       |
| 10       | Jointer feed slide strip                          | 1       |
| 11       | Spring anchor pin                                 | 2       |
| 12       | Block for jointer traverse/stop                   | 2       |
| 13       | Square drive adaptor                              | 1       |
| 14       | Wear Strip  | 1       |
| 15       | Clamp Block                                       | 1       |
| 16       | Body for profile jointer stone                    | 1       |
| 17       | Plate for profile jointer stone holder            | 1       |
| 18       | Washer for profile jointer stone holder body      | 1       |
| 19       | Holder for straight jointer stone                 | 1       |
| 20       | Clamp plate                                       | 1       |
| 21       | Tension pin 6mm dia x 40mm long                   | 2       |
| 22       | Tension pin 4mm dia x 12mm long                   | 2       |
| 23       | Hexagon socket grubscrew M6 x 12mm long           | 2       |
| 24       | Handwheel   | 1       |
| 25       | Taper Pin   | 1       |
| 26       | Large diameter plain washer M10                   | 1       |
| 27       | Helicoil insert M12 F112-N24                      | 1       |
| 28       | Hexagon socket capscREW M6 x16mm long             | 2       |
| 29       | 'GACO' 'O' ring RMO 445-30                        | 1       |
| 30       | Extension spring                                  | 2       |
| 31       | Tension pin 4mm dia x 16mm long                   | 2       |
| 32       | Hexagon socket grubscrew M8 x 25mm long           | 3       |
| 33       | Hexagon locknut M8                                | 3       |
| 34       | Hexagon head setscrew M8 x 30mm long              | 2       |
| 35       | Plain washer M8                                   | 2       |
| 36       | Hexagon socket capscREW M6 x 25mm long            | 4       |
| 37       | Bronze headed bush 18mm O/D x 12mm I/D x 8mm long | 2       |
| 38       | Plain collar 25mm O/D x 12mm I/D x 12mm width     | 1       |
| 39       | Tension pin 4mm dia x 24mm long                   | 1       |
| 40       | Plain washer M12                                  | 1       |
| 41       | Hexagon locknut M12                               | 1       |
| 42       | Stud M12 x 55mm long                              | 1       |
| 43       | Hexagon socket capscREW M8 x 50mm long            | 2       |
| 44       | Hexagon scoekt capscREW M8 x 25mm long            | 3       |
| 45       | Hexagon socket capscREW M8 x 40mm long            | 1       |
| 46       | Hexagon locknut M8                                | 1       |
| 47       | Collar nut 'WDS' 404-204 M12                      | 1       |
| 48       | Plain washer M12                                  | 1       |
| 49       | Hexagon nut M12                                   | 1       |
| 50       | Hexagon socket capscREW M10 x 20mm long           | 2       |

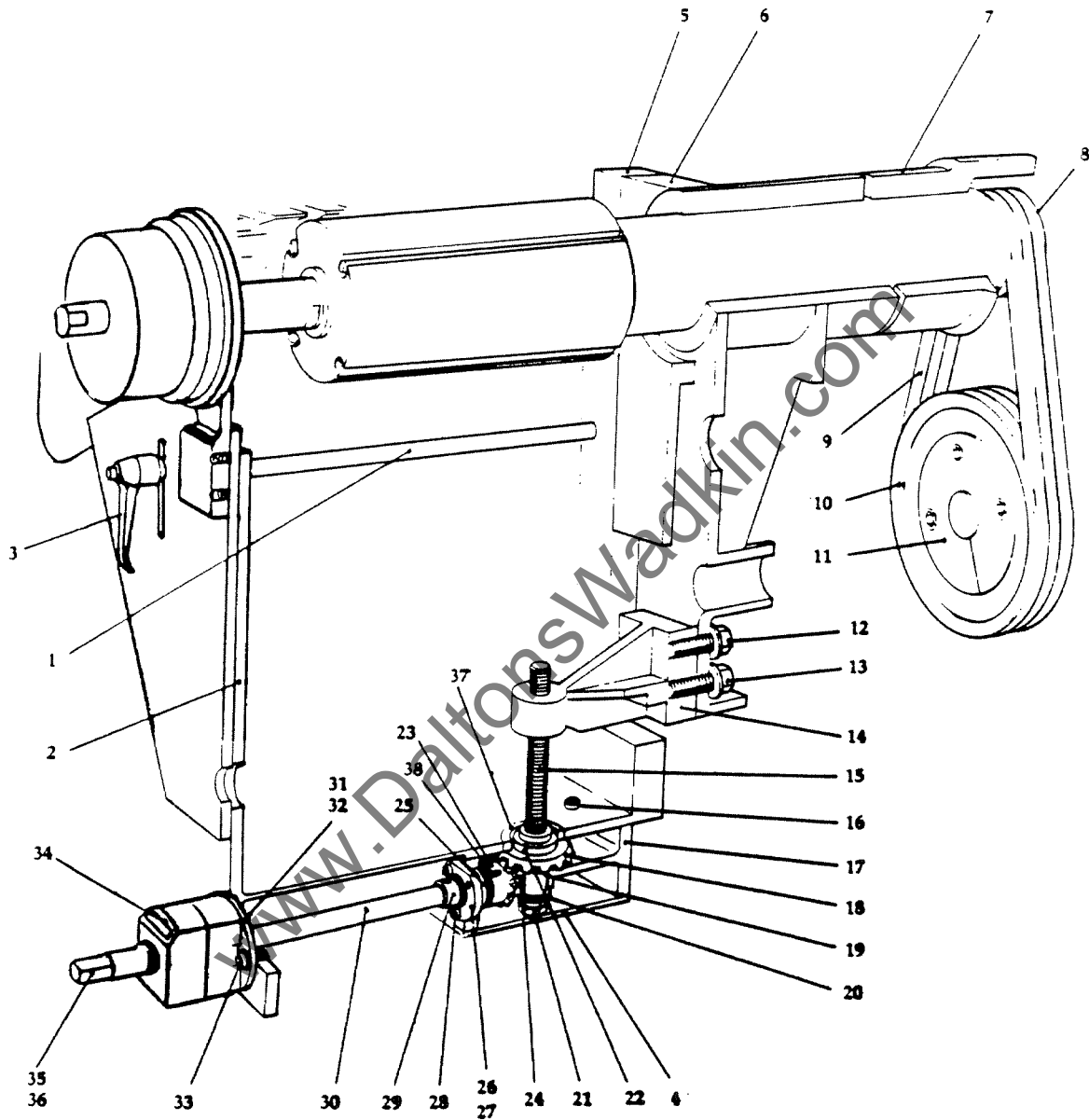


FIG 29 SECOND BOTTOM HEAD

29. SECOND BOTTOM HEAD

| Ref. No. | Description                                      | No. Off |
|----------|--|---------|
| 1        | Extension Shaft, Vertical Lock                   | 1       |
| 2        | Main Frame                                       | 1       |
| 3        | Locking Handle, M12 x 25mm, male                 | 1       |
| 4        | Cover, Bevel Box                                 | 1       |
| 5        | Slide Strip                                      | 1       |
| 6        | Bottom Head Spindle Housing, Vertical Slide      | 1       |
| 7        | Pulley Belt Housing, Horizontal Heads            | 1       |
| 8        | Spindle Pulley, Bottom and Top Heads             | 1       |
| 9        | Fenner Vee Belt, SPZ 850                         | 3 or 5  |
| 10       | Fenner Vee Belt Pulley ) See                     | 1       |
| 11       | Fenner Taper-Lock Bush ) Tables                  | 1       |
| 12       | Hexagon Head Screw, M10 x 30mm long              | 4       |
| 13       | Spring Washer, 10mm diameter, single coil        | 4       |
| 14       | Bracket Nut, Bottom Head Vertical Adjustment     | 1       |
| 15       | Vertical Adjustment Screw                        | 1       |
| 16       | Hexagon Socket Capscrews, M6 x 75mm long         | 4       |
| 17       | Bevel Box  | 1       |
| 18       | Bevel Gear Wheel                                 | 1       |
| 19       | Bearing Washer, Top and Bottom                   | 2       |
| 20       | Thrust Washer                                    | 1       |
| 21       | M16 Hexagonal Nut                                | 2       |
| 22       | Parallel Key 5mm x 5mm x 20mm long               | 1       |
| 23       | Bevel Gear Pinion                                | 1       |
| 24       | Circlip, 16mm external, Pinion Shaft (not shown) | 1       |
| 25       | Thrust Washer                                    | 1       |
| 26       | Bronze Bush, 25mm I/D x 30mm O/D x 25mm long     | 1       |
| 27       | End Cap, Bevel Box                               | 1       |
| 28       | Hexagon Socket Capscrews, M6 x 20mm long         | 3       |
| 29       | Collar   | 1       |
| 30       | Extension Shaft, Bevel Gear                      | 1       |
| 31       | Bearing Bracket, Extension Shaft                 | 1       |
| 32       | Bronze Bush, 20mm I/D x 25mm O/D x 25mm long     | 2       |
| 33       | Hexagon Socket Capscrews, M6 x 20mm long         | 2       |
| 34       | Calibrated Dial                                  | 1       |
| 35       | Square End Shaft Extension                       | 1       |
| 36       | Taper Pin No.5                                   | 1       |
| 37       | Top Cover, Bevel Gear                            | 1       |
| 38       | Parallel Key 8mm x 7mm x 20mm long               | 1       |

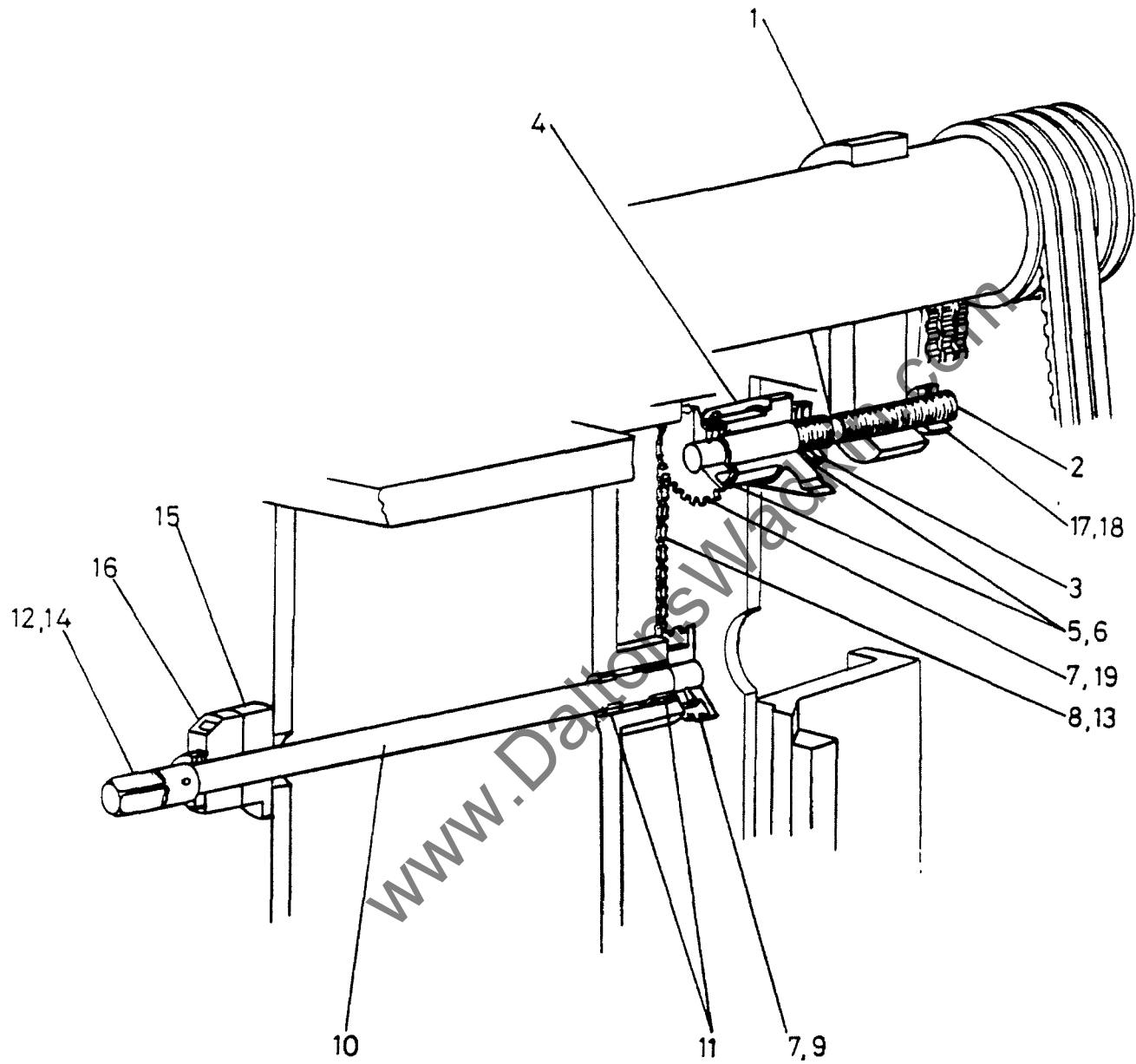


FIG 30 BOTTOM HEADS AXIAL ADJUSTMENT

30. BOTTOM HEADS AXIAL ADJUSTMENT

| Ref. No. | Description  | No. Off |
|----------|--|---------|
| 1        | Nut for Horizontal Head Adjustment                             | 1       |
| 2        | Shaft for Horizontal Head Adjustment                           | 1       |
| 3        | M24 x 1.5 Chamfered Notch Nut                                  | 2       |
| 4        | Bearing Bracket for Horizontal Head Adjustment                 | 1       |
| 5        | 'INA' Thrust Bearing AXK 2542                                  | 2       |
| 6        | 'INA' Thrust Washer AS 2542                                    | 4       |
| 7        | Sprocket for Horizontal Head Axial Adjustment                  | 2       |
| 8        | 'RENOLD' Roller Chain No. 111046 12.9mm (½") Pitch, 40 Pitches | 1       |
| 9        | No.4 Taper Pin   | 1       |
| 10       | Shaft  | 1       |
| 11       | 20mm I/D x 25mm O/D x 20mm long Bronze Bush                    | 2       |
| 12       | Square Shaft Extension   | 1       |
| 13       | Chain Link Connector   | 1       |
| 14       | Taper Pin No.1   | 1       |
| 15       | Bearing Block  | 1       |
| 16       | Digital Readout  | 1       |
| 17       | Threaded Collar M20 Trapezoidal                                | 1       |
| 18       | Hexagon Socket Grubscrew M8 x 8mm long                         | 2       |
| 19       | 6mm dia x 40mm long Tension Pin                                | 1       |

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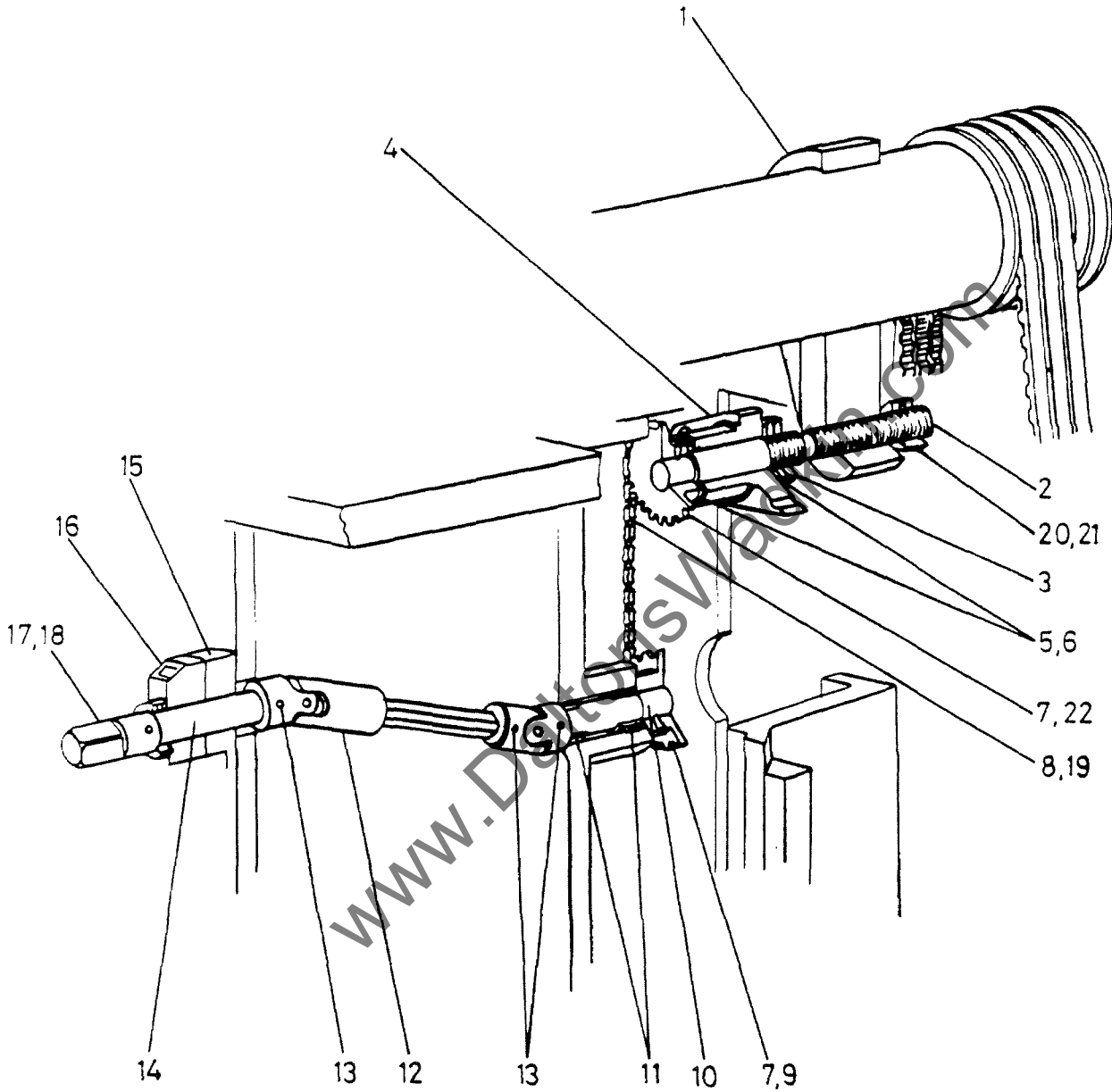


FIG 31 TOP HEADS AXIAL ADJUSTMENT



31. TOP HEADS AXIAL ADJUSTMENT

| Ref. No. | Description  | No. Off |
|----------|--|---------|
| 1        | Nut for Horizontal Head Adjustment                             | 1       |
| 2        | Shaft for Horizontal Head Adjustment                           | 1       |
| 3        | M24 x 1.5 Chamfered Notch Nut                                  | 2       |
| 4        | Bearing Bracket for Horizontal Head Adjustment                 | 1       |
| 5        | 'INA' Thrust Bearing AXR 2542                                  | 2       |
| 6        | 'INA' Thrust Washer AS 2542                                    | 4       |
| 7        | Sprocket for Horizontal Head Axial Adjustment                  | 2       |
| 8        | 'RENOLD' Roller Chain No. 111046 12.9mm (½") Pitch, 40 Pitches | 1       |
| 9        | No.4 Taper Pin   | 1       |
| 10       | Shaft  | 1       |
| 11       | 20mm I/D x 25mm O/D x 20mm long Bronze Bush                    | 2       |
| 12       | Universal Coupling with 12mm A/F Telescopic Shaft              | 1       |
| 13       | 6mm dia. x 24mm long Tension Pin                               | 1       |
| 14       | Shaft for Horizontal Head Cross Adjustment                     | 1       |
| 15       | Bearing Block  | 1       |
| 16       | Digital Readout  | 1       |
| 17       | Square Shaft Extension   | 1       |
| 18       | Taper Pin No.1   | 1       |
| 19       | Chain Connector Link   | 1       |
| 20       | Threaded Collar M20 Trapezoidal                                | 1       |
| 21       | Hexagon Socket Grubscrew M8 x 8mm long                         | 2       |
| 22       | 6mm dia. x 40mm long Tension Pin                               | 1       |

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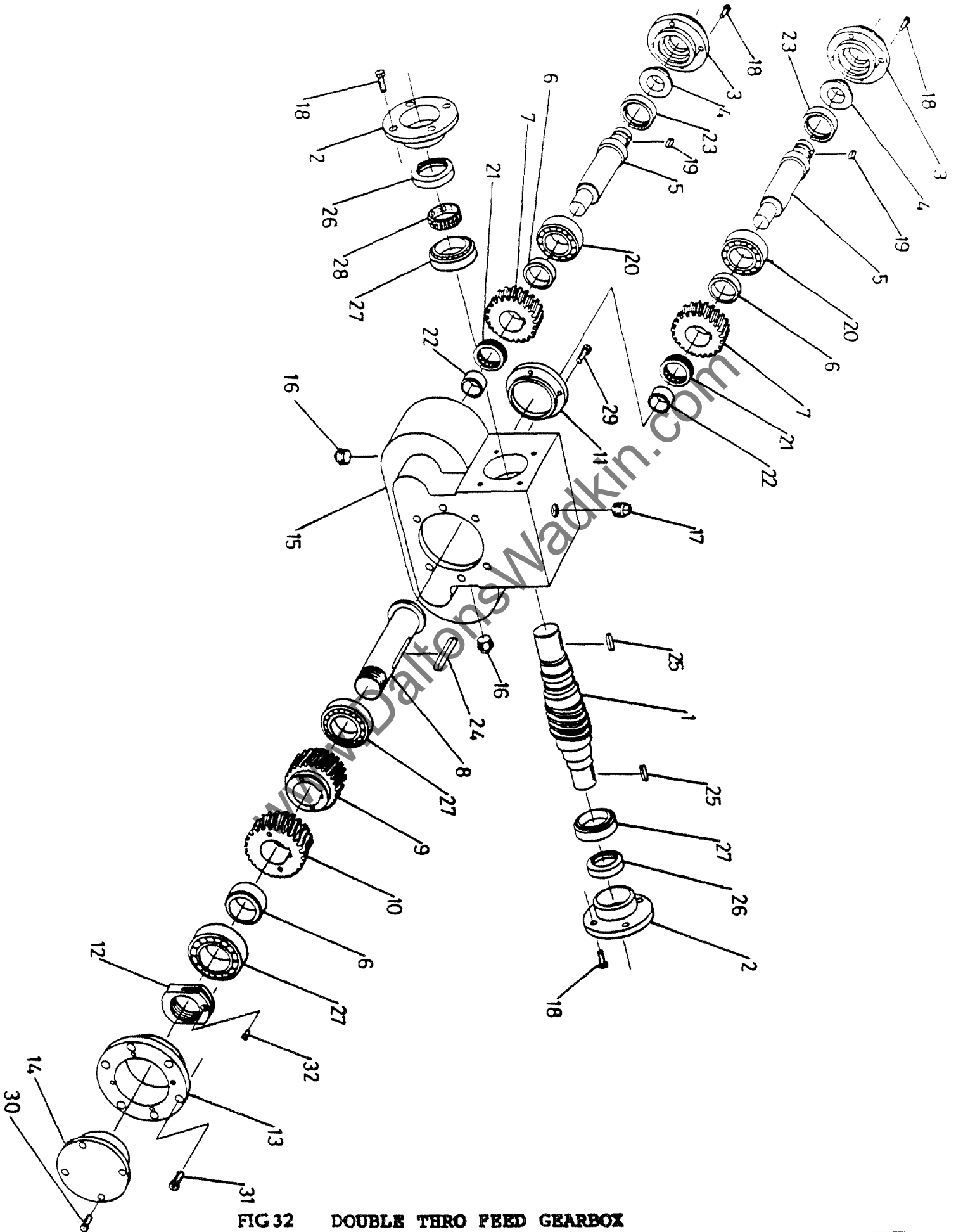


FIG 32 DOUBLE THRO FEED GEARBOX

32. DOUBLE THRO FEED GEARBOX

| Ref. No. | Description                                    | No. Off |
|----------|--|---------|
| 1        | Worm shaft                                     | 1       |
| 2        | Bearing end cap                                | 2       |
| 3        | End cap for feed roll drive shaft              | 2       |
| 4        | Bush for feed roll drive shaft                 | 2       |
| 5        | Feed roll drive shaft                          | 2       |
| 6        | Bearing spacer                                 | 3       |
| 7        | Gear   | 1       |
| 8        | Shaft for worm wheel drive                     | 1       |
| 9        | Intermediate gear                              | 1       |
| 10       | Worm wheel                                     | 1       |
| 11       | End cap  | 1       |
| 12       | Locknut  | 1       |
| 13       | Bearing housing                                | 1       |
| 14       | Bearing end cap                                | 1       |
| 15       | Gearbox for double feed rolls                  | 1       |
| 16       | Plug $\frac{1}{4}$ B.S.P taper                 | 2       |
| 17       | Plug $\frac{1}{4}$ B.S.P                       | 1       |
| 18       | Hexagon socket capscrew M6 x 25mm long         | 16      |
| 19       | Key 8mm x 7mm x 20mm                           | 2       |
| 20       | Bearing SKF 6206 ball bearing                  | 2       |
| 21       | Thrust bearing SKF 51106                       | 2       |
| 22       | Bronze bush 20mm I/D x 25mm O/D x25mm long     | 2       |
| 23       | Gaco spiroseal                                 | 2       |
| 24       | Key 8mm x 7mm x 60mm                           | 1       |
| 25       | Key 8mm x 7mm x 32mm                           | 2       |
| 26       | Gaco oil seal WR 826                           | 2       |
| 27       | Bearing SKF 7206 angular contact               | 4       |
| 28       | Tolerance ring                                 | 1       |
| 29       | Hexagon socket capscrew M4 x 20mm long         | 4       |
| 30       | Hexagon socket capscrew M4 x 12mm long         | 4       |
| 31       | Hexagon socket capscrew M6 x 16mm long         | 6       |
| 32       | Hexagon socket countersunk screw M4 x 8mm long | 1       |

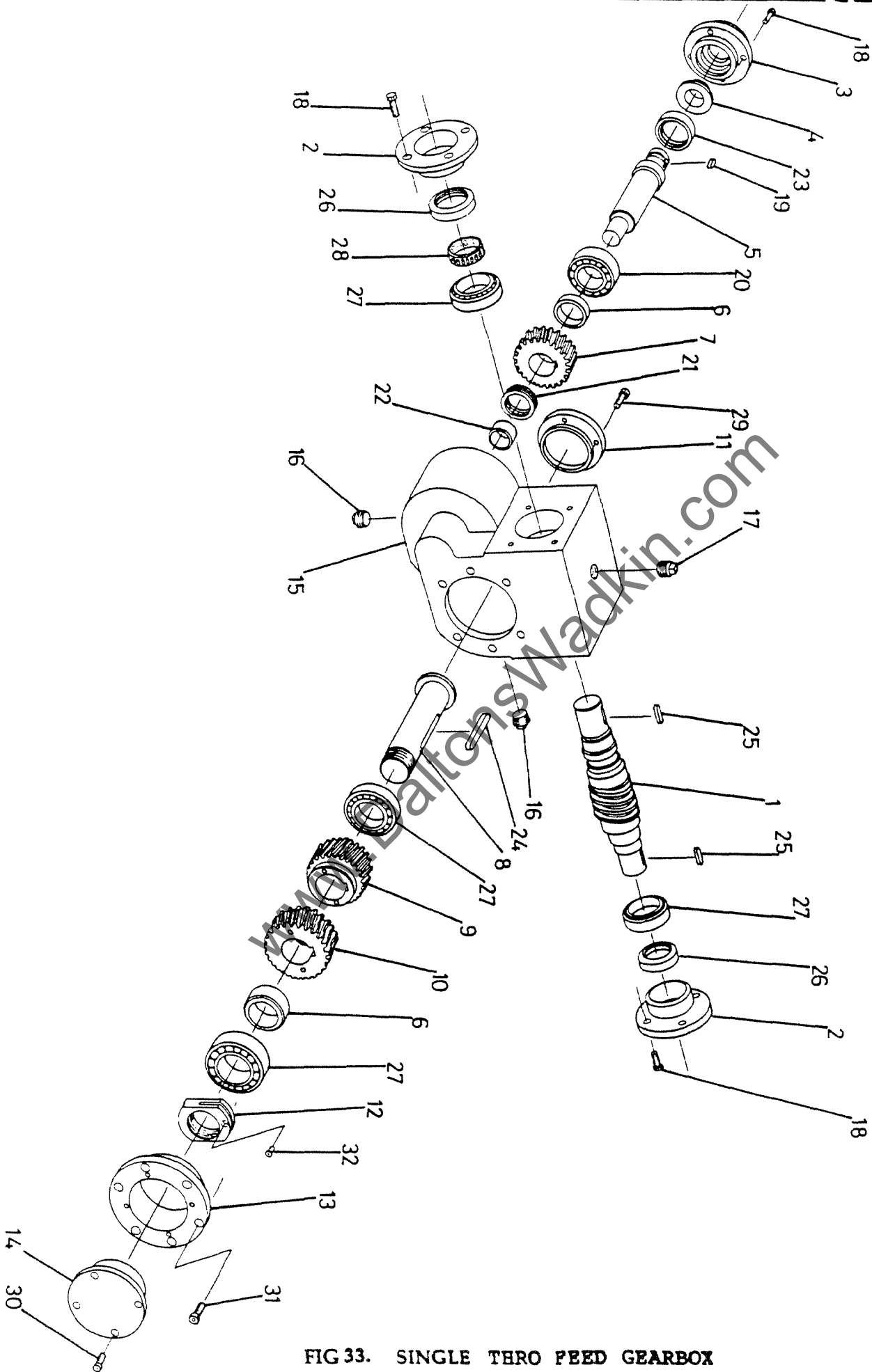
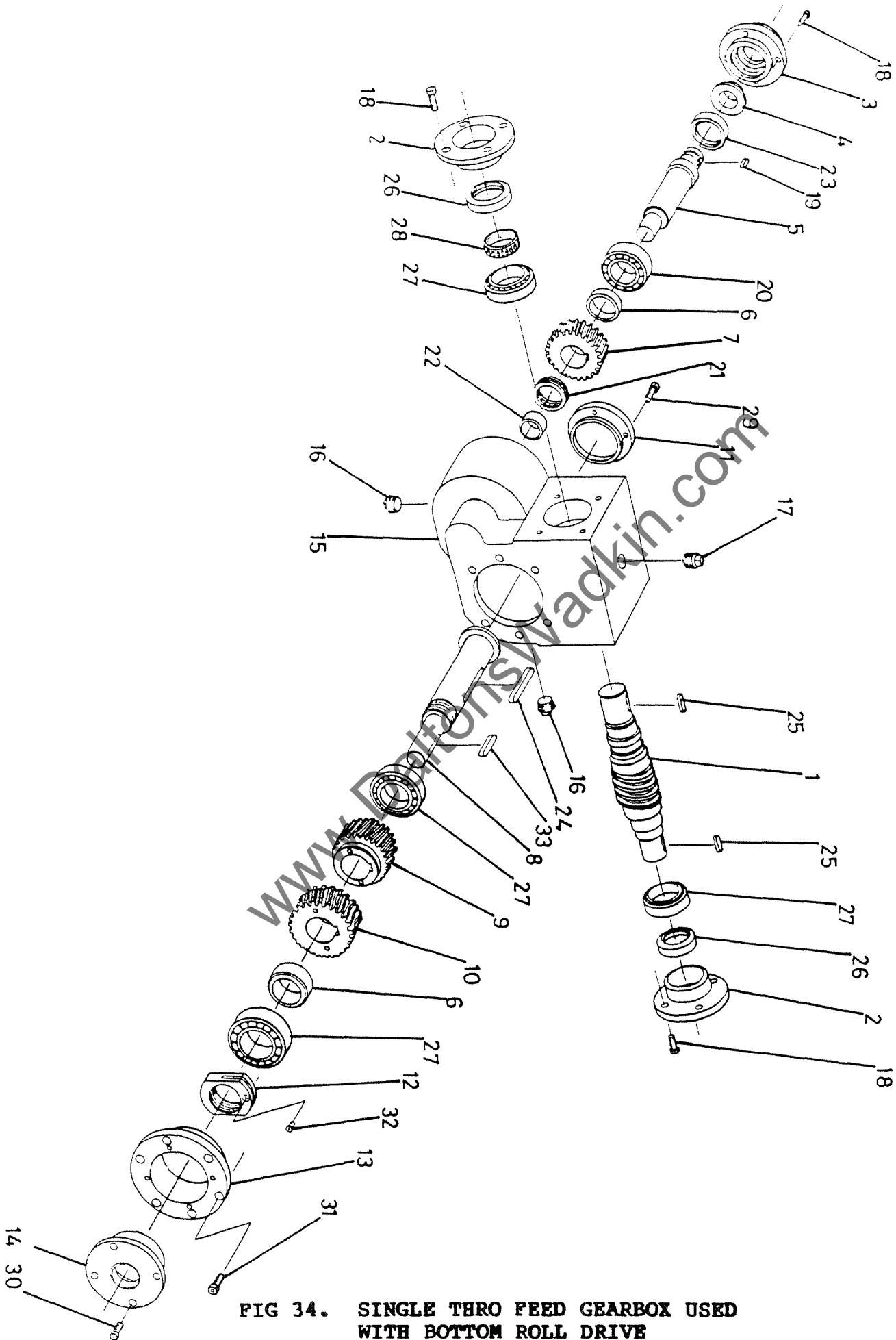


FIG 33. SINGLE THRO FEED GEARBOX

33. SINGLE THERO FEED GEARBOX

| Ref. No. | Description                                    | No. Off |
|----------|--|---------|
| 1        | Worm shaft                                     | 1       |
| 2        | Bearing end cap                                | 2       |
| 3        | End cap for feed roll drive shaft              | 1       |
| 4        | Bush for feed roll drive shaft                 | 1       |
| 5        | Feed roll drive shaft                          | 1       |
| 6        | Bearing spacer                                 | 2       |
| 7        | Gear   | 1       |
| 8        | Shaft for worm wheel drive                     | 1       |
| 9        | Intermediate gear                              | 1       |
| 10       | Worm wheel                                     | 1       |
| 11       | End cap  | 1       |
| 12       | Locknut  | 1       |
| 13       | Bearing housing                                | 1       |
| 14       | Bearing end cap                                | 1       |
| 15       | Gearbox for single feed roll                   | 1       |
| 16       | Plug $\frac{1}{4}$ B.S.P taper                 | 2       |
| 17       | Plug $\frac{1}{4}$ B.S.P                       | 1       |
| 18       | Hexagon socket capscrew M6 x 25mm long         | 12      |
| 19       | Key 8mm x 7mm x 20mm                           | 1       |
| 20       | Bearing SKF 6206 ball bearing                  | 1       |
| 21       | Thrust bearing SKF 51106                       | 1       |
| 22       | Bronze bush 20mm I/D x 25mm O/D x25mm long     | 1       |
| 23       | Gaco spiroseal                                 | 1       |
| 24       | Key 8mm x 7mm x 60mm                           | 1       |
| 25       | Key 8mm x 7mm x 32mm                           | 2       |
| 26       | Gaco oil seal WR 826                           | 2       |
| 27       | Bearing SKF 7206 angular contact               | 4       |
| 28       | Tolerance ring                                 | 1       |
| 29       | Hexagon socket capscrew M4 x 20mm long         | 4       |
| 30       | Hexagon socket capscrew M4 x 12mm long         | 4       |
| 31       | Hexagon socket capscrew M6 x 16mm long         | 6       |
| 32       | Hexagon socket countersunk screw M4 x 8mm long | 1       |



**FIG 34. SINGLE THRO FEED GEARBOX USED WITH BOTTOM ROLL DRIVE**

34. SINGLE THRO FEED GEARBOX USED WITH BOTTOM ROLL DRIVE

| Ref. No. | Description                                    | No. Off |
|----------|--|---------|
| 1        | Worm shaft                                     | 1       |
| 2        | Bearing end cap                                | 2       |
| 3        | End cap for feed roll drive shaft              | 1       |
| 4        | Bush for feed roll drive shaft                 | 1       |
| 5        | Feed roll drive shaft                          | 1       |
| 6        | Bearing spacer                                 | 2       |
| 7        | Gear   | 1       |
| 8        | Shaft for worm wheel drive                     | 1       |
| 9        | Intermediate gear                              | 1       |
| 10       | Worm wheel                                     | 1       |
| 11       | End cap  | 1       |
| 12       | Locknut  | 1       |
| 13       | Bearing housing                                | 1       |
| 14       | Bearing end cap                                | 1       |
| 15       | Gearbox for single feed roll                   | 1       |
| 16       | Plug ¼ B.S.P taper                             | 2       |
| 17       | Plug ¼ B.S.P                                   | 1       |
| 18       | Hexagon socket capscrew M6 x 25mm long         | 12      |
| 19       | Key 8mm x 7mm x 20mm                           | 1       |
| 20       | Bearing SKF 6206 ball bearing                  | 1       |
| 21       | Thrust bearing SKF 51106                       | 1       |
| 22       | Bronze bush 20mm I/D x 25mm O/D x25mm long     | 1       |
| 23       | Gaco spiroseal                                 | 1       |
| 24       | Key 8mm x 7mm x 60mm                           | 1       |
| 25       | Key 8mm x 7mm x 32mm                           | 2       |
| 26       | Gaco oil seal WR 826                           | 2       |
| 27       | Bearing SKF 7206 angular contact               | 4       |
| 28       | Tolerance ring                                 | 1       |
| 29       | Hexagon socket capscrew M4 x 20mm long         | 4       |
| 30       | Hexagon socket capscrew M4 x 12mm long         | 4       |
| 31       | Hexagon socket capscrew M6 x 16mm long         | 6       |
| 32       | Hexagon socket countersunk screw M4 x 8mm long | 1       |
| 33       | Key 6mm x 6mm x 30mm                           | 1       |

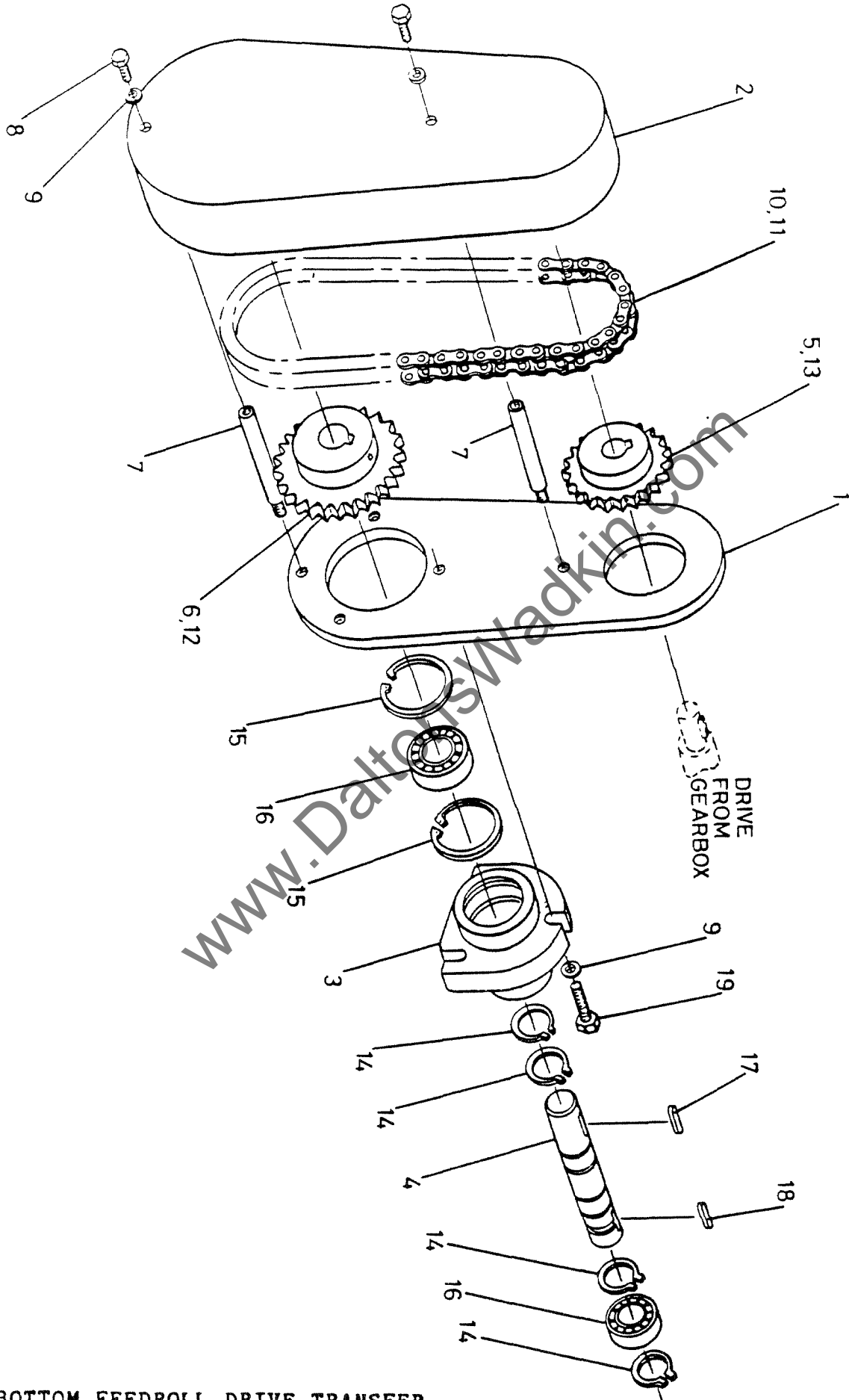


FIG 35 BOTTOM FEEDROLL DRIVE TRANSFER



35 . BOTTOM FEEDROLL DRIVE TRANSFER

| Ref. No. | Description                             | No. Off |
|----------|---|---------|
| 1        | Support plate                           | 1       |
| 2        | Cover for chain drive                   | 1       |
| 3        | Bearing housing                         | 1       |
| 4        | Driving shaft for bottom infeed roll    | 1       |
| 5        | Top procket                             | 1       |
| 6        | Bottom sprocket                         | 1       |
| 7        | Support pillar for cover                | 2       |
| 8        | Hexagon head setscrew M8 x 16mm long    | 2       |
| 9        | Plain washer M8                         | 5       |
| 10       | Chain 5/8" pitch x 57 pitches           | 1       |
| 11       | Connecting Link No.26                   | 1       |
| 12       | Hexagon socket grubscrew M8 x 25mm long | 1       |
| 13       | Hexagon socket grubscrew M6 x 25mm long | 1       |
| 14       | External Circlip 30mm dia               | 4       |
| 15       | Internal Circlip 62mm dia               | 2       |
| 16       | Bearing 6206-2RS 'SKF'                  | 2       |
| 17       | Key 8mm x 7mm x 32mm long               | 1       |
| 18       | Key 8mm x 7mm x 36mm long               | 1       |
| 19       | Hexagon head setscrew M8 x 25mm long    | 3       |

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SECTION 5

ILLUSTRATED PARTS LIST

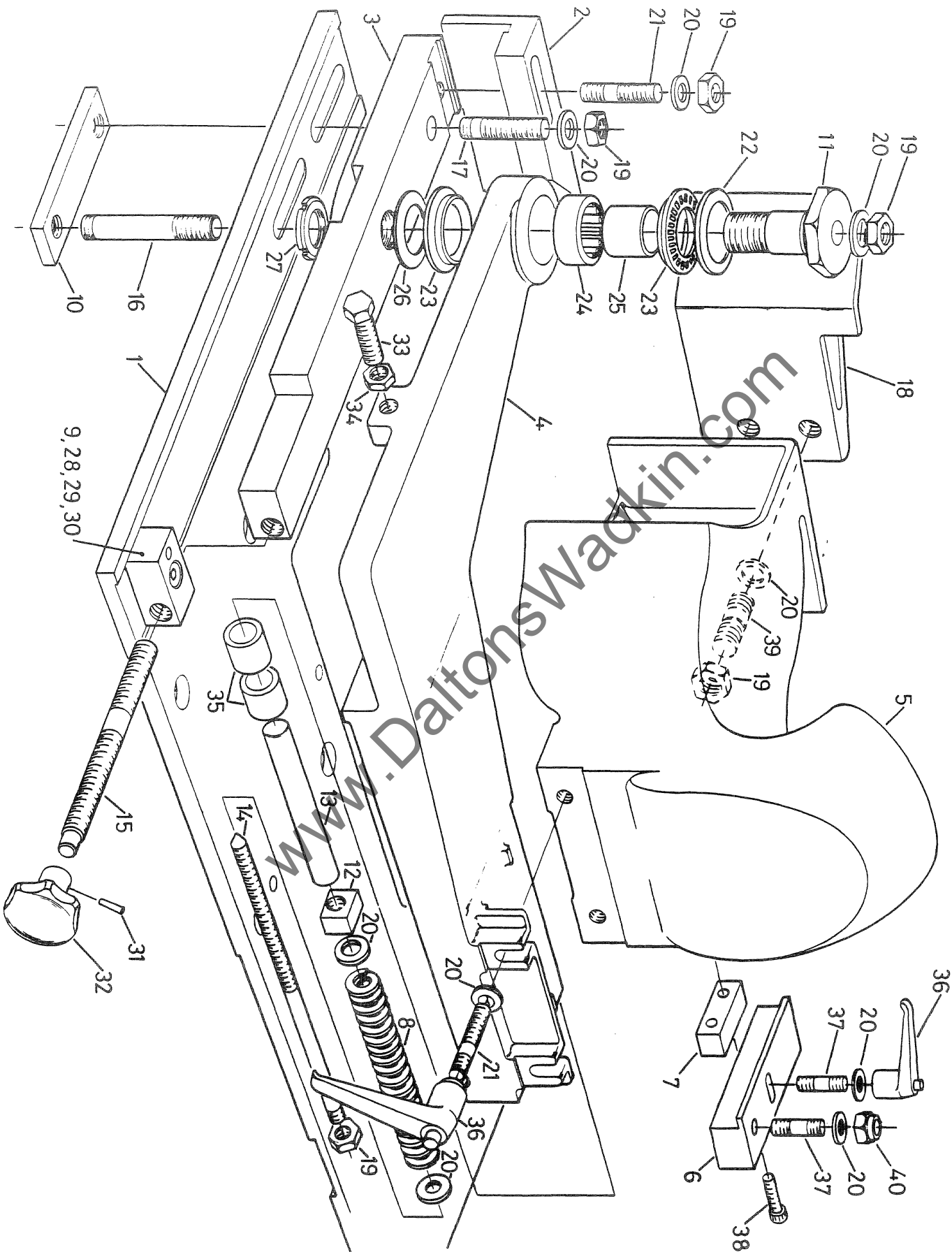


FIG 36. NEAR SIDE HEAD CHIPBREAKER MK III

36. NEAR SIDE HEAD CHIPBREAKER MK III

| Ref No. | Description                                    | No. off |
|---------|--|---------|
| 1       | Plate for mounting near side head chipbreaker  | 1       |
| 2       | Pad for near side head side guide              | 1       |
| 3       | Block for mounting near side head chipbreaker  | 1       |
| 4       | Arm for near side head chipbreaker             | 1       |
| 5       | Hood for near side head                        | 1       |
| 6       | Latch for near side head chipbreakers          | 1       |
| 7       | Block for retaining near side head chipbreaker | 1       |
| 8       | Spring   | 1       |
| 9       | Block for near side head adjustment            | 1       |
| 10      | Clamp for near side head adjustment            | 1       |
| 11      | Bolt for near side head chipbreaker pivot      | 1       |
| 12      | Nut for near side head chipbreaker spring      | 1       |
| 13      | Plunger  | 1       |
| 14      | Guide for spring                               | 1       |
| 15      | Screw for side guide adjustment                | 1       |
| 16      | Stud for pivot bolt                            | 1       |
| 17      | Stud for block                                 | 1       |
| 18      | Shoe for chipbreaker                           | 1       |
| 19      | Nut M12  | 6       |
| 20      | Plain washer M12                               | 11      |
| 21      | Stud M12 x 55mm long                           | 3       |
| 22      | 'INA' Thrust washer LS-3552                    | 1       |
| 23      | 'INA' Thrust bearing AXW - 30                  | 2       |
| 24      | 'INA' Needle bearing HK 3020                   | 1       |
| 25      | 'INA' Inner ring IR25 x 30 x 30                | 1       |
| 26      | (INA) Thrust washer AS-3047                    | 1       |
| 27      | Notch nut                                      | 1       |
| 28      | Tension pin dia 8mm x 40mm long                | 1       |
| 29      | Hexagon socket cap screw M10 x 35mm long       | 1       |
| 30      | 'helicoil' insert M12                          | 1       |
| 31      | Taper pin No. 1                                | 1       |
| 32      | Handwheel                                      | 1       |
| 33      | Hexagon head setscrew M12 x 35mm long          | 1       |
| 34      | Locknut M12                                    | 1       |
| 35      | Oilite bush                                    | 2       |
| 36      | Locking handle                                 | 3       |
| 37      | Stud m12 x 65mm long                           | 2       |
| 38      | Hexagon socket capscrew M12 x 30mm long        | 2       |
| 39      | Stud M12 x 45mm long                           | 2       |
| 40      | Self locking nut M12                           | 1       |

SECTION 5

ILLUSTRATED PARTS LIST

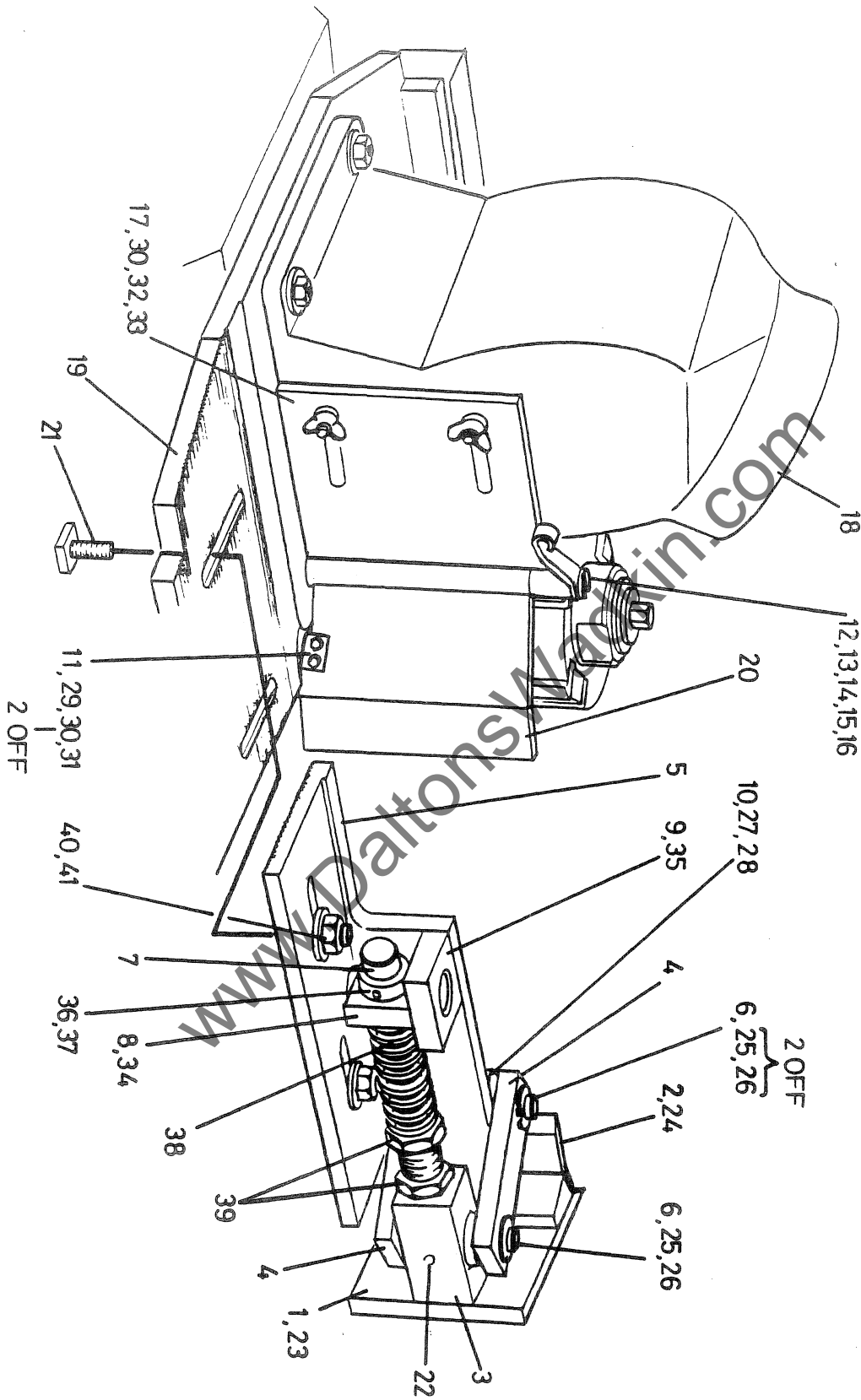


FIG 36. NEARSIDE HEAD CHIPBREAKER MK II

36. NEARSIDE HEAD CHIPBREAKER MK II

| Ref No. | Description                                     | No. off |
|---------|---|---------|
| 1       | Chipbreaker                                     | 1       |
| 2       | Chip deflector                                  | 1       |
| 3       | Chipbreaker shoe                                | 1       |
| 4       | Chipbreaker link                                | 2       |
| 5       | Adjustable carrier for chipbreaker              | 1       |
| 6       | Chipbreaker pivot pin                           | 2       |
| 7       | Chipbreaker bar                                 | 1       |
| 8       | Trunion block                                   | 1       |
| 9       | Trunion mounting block                          | 1       |
| 10      | Pivot block                                     | 1       |
| 11      | Chipdeflector (flexible)                        | 1       |
| 12      | Torsion spring                                  | 1       |
| 13      | Support post for cover                          | 1       |
| 14      | Spring for hood cover                           | 2       |
| 15      | Shoulder pin                                    | 2       |
| 16      | Spacer for spring clip                          | 2       |
| 17      | Sliding cover                                   | 1       |
| 18      | Exhaust hood                                    | 1       |
| 19      | Base plate                                      | 1       |
| 20      | Pivoting chip deflector                         | 1       |
| 21      | Tee bolt  | 2       |
| 22      | Hexagon socket head grubscrew M6 x 8mm long     | 1       |
| 23      | Hexagon socket head grubscrew M8 x 8mm long     | 2       |
| 24      | Hexagon socket countersunk screw M6 x 12mm long | 2       |
| 25      | External circlip 15mm dia                       | 4       |
| 26      | Needle roller bearing HK1516 'INA'              | 4       |
| 27      | Tension pin dia 6mm x 20mm long                 | 2       |
| 28      | Hexagon socket capscrew M8 x 30mm long          | 3       |
| 29      | Hexagon socket countersunk screw M6 x 16mm long | 2       |
| 30      | Plain washer M6                                 | 4       |
| 31      | Hexagon nut M6                                  | 2       |
| 32      | Spring washer M6                                | 2       |
| 33      | Wingnut M6                                      | 2       |
| 34      | Bush 25mm O/D x 20mm I/D x 25mm long            | 2       |
| 35      | Hexagon socket capscrew M6 x 40mm long          | 2       |
| 36      | Loose collar 20mm I/D                           | 1       |
| 37      | Taper pin                                       | 1       |
| 38      | Spring  | 1       |
| 39      | Hexagon lock nut                                | 2       |
| 40      | Plain washer M12                                | 2       |
| 41      | Hexagon nut M12                                 | 2       |

SECTION 5

ILLUSTRATED PARTS LIST

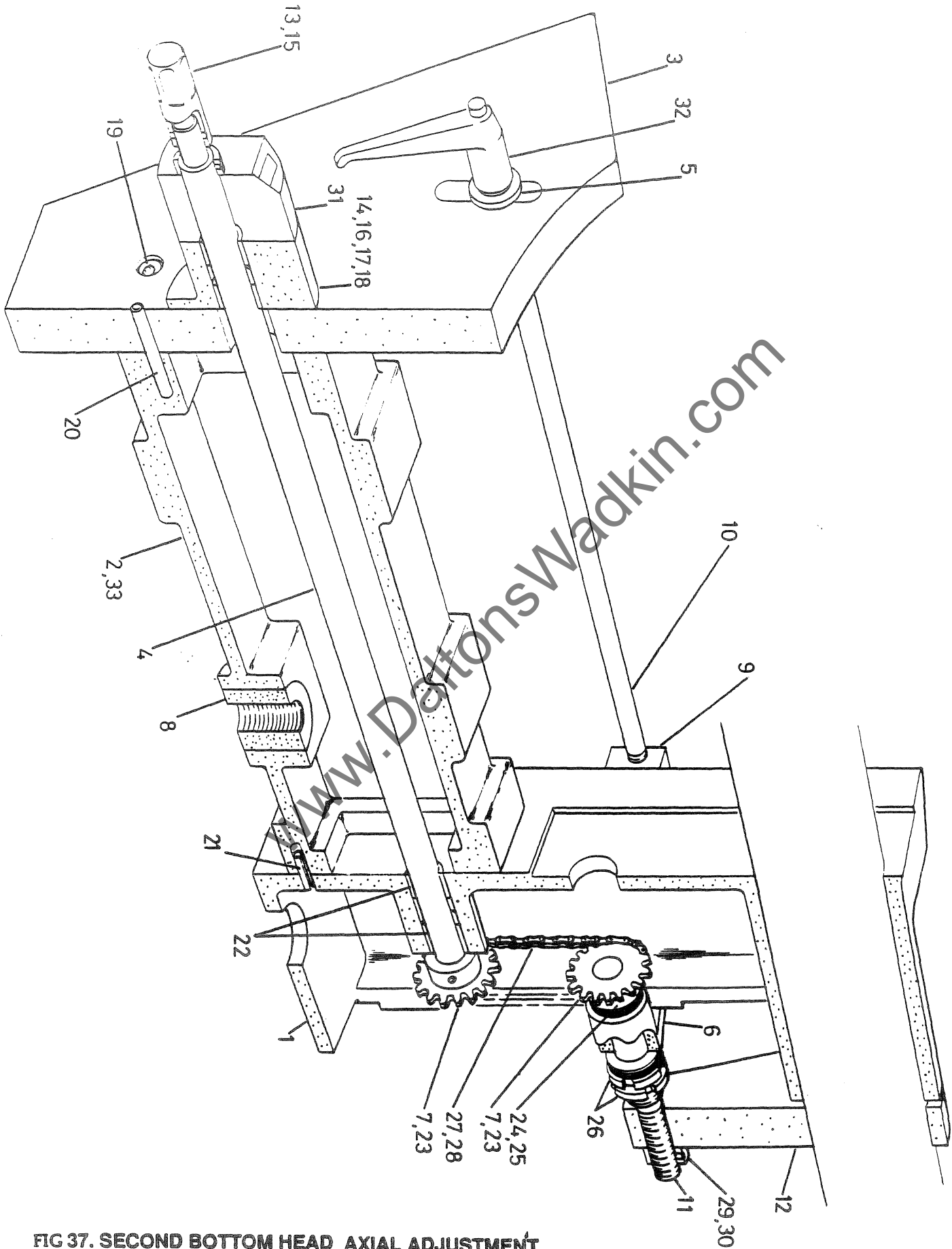


FIG 37. SECOND BOTTOM HEAD AXIAL ADJUSTMENT

LIST OF ILLUSTRATIONS

37. SECOND BOTTOM HEAD AXIAL ADJUSTMENT

| Ref No. | Description  | No. Off |
|---------|--|---------|
| 1       | Bottom head Vertical Slide   | 1       |
| 2       | Stretcher for bottom head  | 1       |
| 3       | Front plate  | 1       |
| 4       | Axial adjustment shaft   | 1       |
| 5       | Clamping washer  | 2       |
| 6       | Bearing bracket  | 1       |
| 7       | Chain sprocket   | 2       |
| 8       | Nut for bottom head rise and fall  | 1       |
| 9       | Locking pad for slide  | 1       |
| 10      | Shaft for bottom head clamping   | 1       |
| 11      | Sprocket shaft for axial adjustment                                      | 1       |
| 12      | Barrel clamping nut for axial adjustment                                 | 1       |
| 13      | Square end shaft extension   | 1       |
| 14      | Bracket for axial shaft bearings   | 1       |
| 15      | No 1 Taper pin   | 1       |
| 16      | Hexagon socket cap screw M8 x 25mm long                                  | 2       |
| 17      | Plain washer M8  | 2       |
| 18      | Bush 25mm O/D x 20mm I/D x 15mm long                                     | 2       |
| 19      | Hexagon socket capscrew M10 x 25mm long                                  | 4       |
| 20      | Dowel 8mm diameter x 40mm long   | 2       |
| 21      | Tension pin 8mm diameter x 35mm long                                     | 2       |
| 22      | Bush 25mm O/D x 20mm I/D x 20mm long                                     | 2       |
| 23      | Taper pin No 4   | 2       |
| 24      | 'INA' Thrust bearing AXK - 2542  | 2       |
| 25      | 'INA' Thrust washer AS 2542  | 4       |
| 26      | Notch nut M24 X 1.5mm pitch  | 2       |
| 27      | Chain connecting link No 26  | 1       |
| 28      | 'Reynold' chain 1/2" pitch x39 pitches                                   | 1       |
| 29      | Threaded collar M20 trapezoidal  | 1       |
| 30      | Hexagon socket grubscrew M8 X8mm long                                    | 1       |
| 31      | 'Siko' position indicator 0902E 4mm                                      | 1       |
| 32      | Locking handle M12   | 2       |
| 33      | Hexagon socket capscrew M10 X 30mm long<br>(stretcher to side fastening) | 4       |

## HYDRAULIC DRIVE

### General

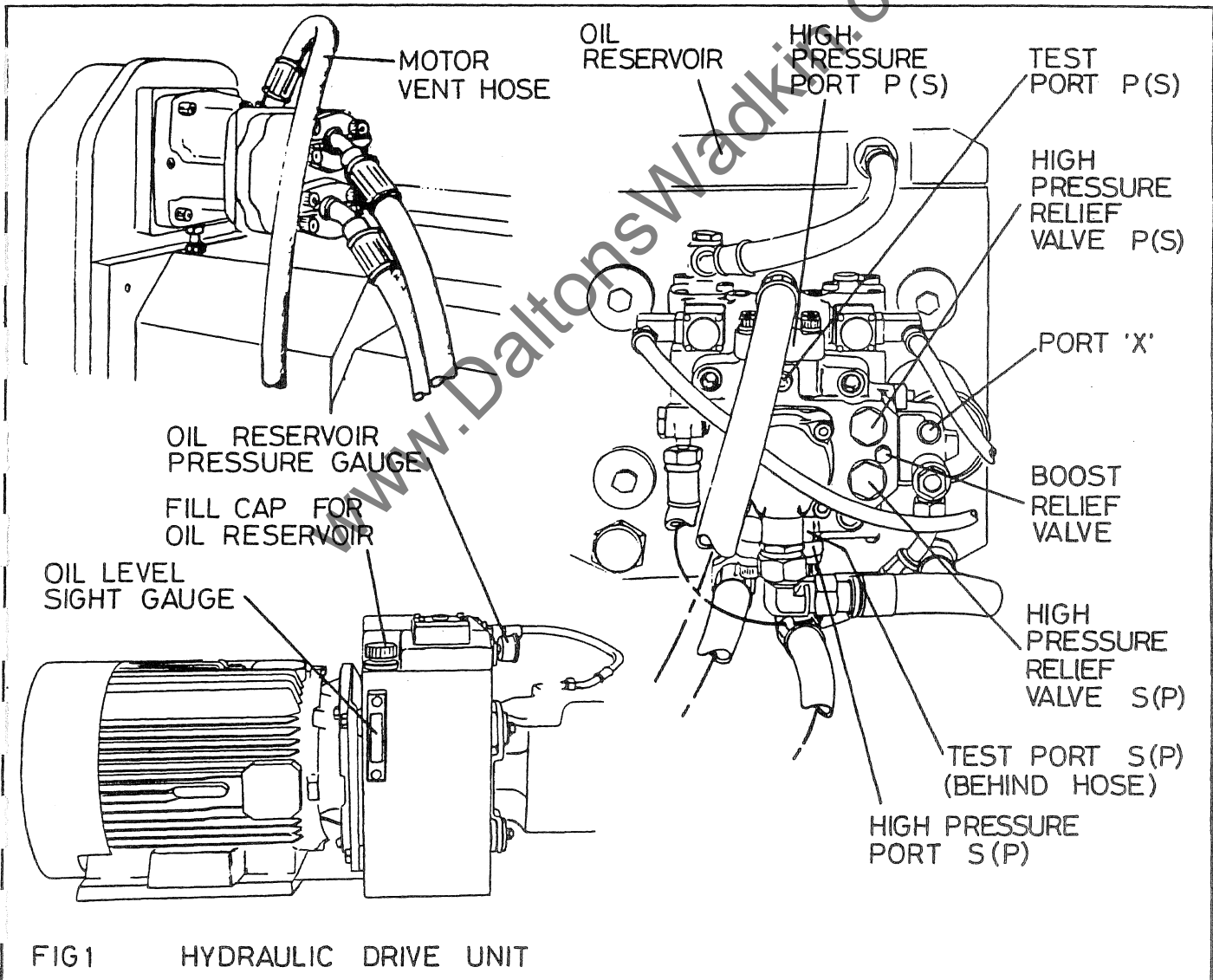
Machines running at less than 50m/min may have a direct hydraulic drive as opposed to a drive via a belt.

The orientation of the hydraulic motor varies depending on drive. With direct drive the vent port is uppermost whilst when belt driven the port is on the side.

The system must be filled under completely clean conditions. Before removing filters or filter caps ensure that components and surrounding areas are clean and completely free from all dirt, sawdust and wood chippings.

If the system does become contaminated due to ingress of foreign matter, it must be thoroughly cleaned and flushed out before reuse, and if necessary, the pipelines and hydraulic unit dismantled.

Filling must be carried out systematically, so that all air can escape from the high pressure circuit before the unit is operated under load. Motor vent hose connection must always point upwards to allow air to escape. An integral purge valve is fitted to assist in the venting of the system, this valve discharges a controlled flow of oil from the high pressure circuit,







## HYDRAULIC DRIVE

so that any entrained air can escape freely to the vent tank.

## Procedure for filling

1) The hydraulic motor must be free to rotate under 'no load' conditions.

2) Loosen vent plug in port 'X' on the pump filter body.

3) Fill the oil reservoir (and thus also the pump housing) to the maximum level on the fluid gauge. Fill the motor housing via the vent port on the body.

4) To prime the system:

a. If the machine is in a line, position switch on control panel to 'independent'. With the machine power on, start hydraulic pump and run for approximately 10 seconds then stop machine using master stop. Wait for 2 or 3 minutes to allow air to escape from the pump housing via vent hose.

b. Disengage master stop. Switch machine power on and repeat above process (a) 3 to 5 times. During this time the fluid reservoir must be kept topped up to prevent further ingress of air.

c. Check the vent plug on the filter block, close the plug when oil appears.

5) To purge the system of air:

a. With machine power on and the hydraulic pump on, select maximum speed. Using the inch forward button run the machine for 20 seconds then stop. Reset machine and using the inch reversal button run the machine for 20 seconds at full speed then stop.

b. Repeat this three times in both directions.

6) Run the hydraulic motor for several minutes at low speed to bring the operating fluid up to working temperature, then increase speed/load steadily to ensure that any residual air in the system is released to the vent tank.

**Note:** No wood should be passed through during above procedures.

On some applications, a complete fluid change may not be necessary. In this case, only the filter of the pump is changed after initial start up and then every 500 hours. Any fluid lost during filter changing must be replaced by fresh fluid of the same type added to the cooler/fluid tank. Consult Wadkin if in doubt.

## MAINTENANCE

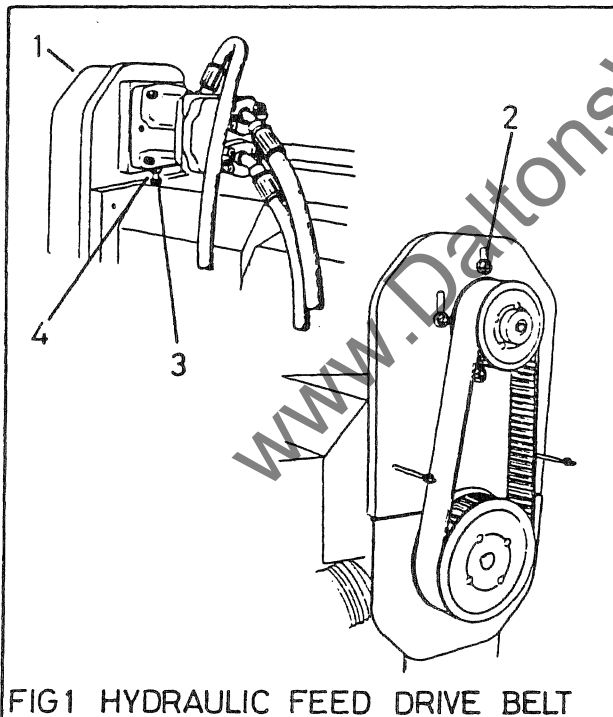
### General

Maintenance of the hydraulic system is limited to changing the filter element of the power unit pump and the pressure fluid. Hoses will only need replacement if damaged.

No other maintenance should be carried out unless by trained personnel.

### Hydraulic Feed Drive Belt (Fig 1)

- 1) To replace drive belt, first remove cover (1)
- 2) Slacken off locking nuts (2) and (3)
- 3) Turn jacking screw (4) clockwise to lower motor.
- 4) Remove and replace drive belt.



- 5) Raise motor, turning jacking screw (4) anti-clockwise to remove any slack.

**Note:** Do not over tension belt

- 6) Tighten locking nuts (2) and (3) and refit cover (1).

### Changing the Pressure Fluid

The high pressure fluid must be changed at intervals of 1000 to 2000 hours, according to application.

The change is carried out by draining the vent tank, cooler, pump and motor housings, then replenishing with fresh fluid of the correct type, (see pressure fluids).

**Note:** High working temperatures and frequent cooling down phases with low temperatures (condensation) will shorten the life of the fluid.

The oil remaining in the pressure circuit (power pack to pump) need not be changed. Do not open up the high pressure lines unless the hoses are damaged and require replacement.

### Changing the Filter

The filter cartridge fitted to the pump must be replaced not later than 50 operating hours after initial start up.

Use filter element, ref, 000-983-06-15, obtainable from Wadkin.

Further filter changes should be made at 500 operating hours intervals.

### Pressure fluids

Suitable hydraulic fluids are: Wadkin Ref: L1 (refer to lubricants table).

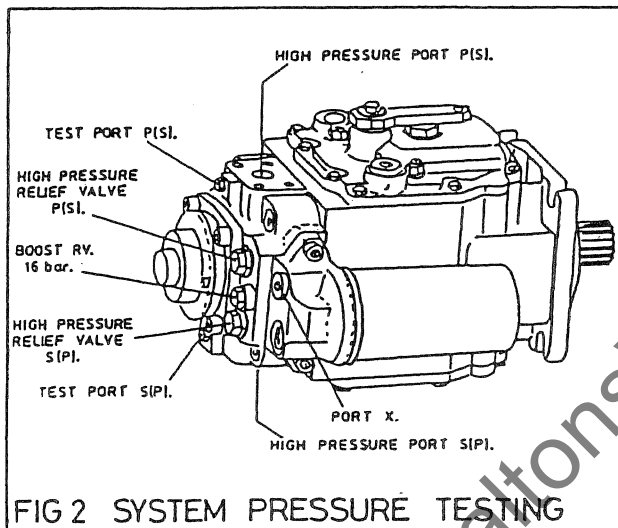
## FAULT FINDING PROCEDURE

### FOR

## LINDE BPV PUMP/BMF AND BMV MOTOR SYSTEMS

System operating pressure can be taken by connecting a 600 bar (8000 psi) pressure guage into each side of the closed circuit at the pressure test tappings provided at the side of the main port flanges P(s) and S(p) on the pump. The test tappings are threaded M14 x 1.5.

The pressure taken at P(s) is the operating pressure in that side of the closed circuit and it is limited by the high pressure relief valve on that side of the pump. Similarly, the guage reading at S(p) is the operating pressure on that side of the circuit, again limited by the adjacent high pressure relief valve. The relief valves have a three digit number stamped on the exposed end. This denotes the valve setting (i.e., 420 = 420 bar).



Boost pressure is taken by connecting a 40 bar (600 psi) guage to port 'X' which is threaded M14 x 1.5. The normal boost pressure is 16 bar (230 psi) and this is regulated by the 16 bar relief valve.



| SYMPTOM  | CAUSE   | REMEDY/CHECK   |
|--|---|--|
| <p>1. System will not operate in either direction.</p> | <p>A. Low oil level system.</p> <p>B. Insufficient pilot pressure or flow. Remote electro/hydraulic controlled pump -'EH'</p> <p>C. Damaged or disconnected coupling or clutch.</p> <p>D. Low boost</p> | <ol style="list-style-type: none"> <li>1. Check oil level in reservoir and replenish as necessary with the correct hydraulic oil.</li> <li>2. Locate and repair the leaks causing the loss of oil.</li> <li>3. Thoroughly fill and vent the pump and motor casings, the closed loop and (where fitted) the coolant circuit.</li> </ol> <ol style="list-style-type: none"> <li>1. 'EH' - check             <ol style="list-style-type: none"> <li>a) That forward/Reverse direction is selected out of neutral.</li> <li>b) The continuity of wiring from battery through to solenoids on pump control.</li> <li>c) With an ammeter, check the output from the amplifiers, through the full range of the speed controller. If incorrect consult the manufacturer of the control.</li> <li>d) If the amplifier output is correct, then remove the solenoid/solenoid valve from pump and check operation. Replace as necessary</li> <li>e) Check the pressure at port X of the pump. If 16 bar is not achieved see symptom 1.D.1</li> </ol> </li> <li>1. Check to ensure that couplings between electric motor and pump shaft and hydraulic motor shaft to gearbox are functioning correctly. Rectify as necessary.</li> <li>1. Connect a 40 bar (600 psi) pressure gauge into port X on the filter block of the pump.</li> <li>2. Operate the pump in neutral at approximately 1000 RPM and observe the boost pressure which should be 16 bar (230 psi). If boost pressure is normal in neutral, operate the pump in forward and reverse and again check the boost pressure.</li> <li>3. Low boost pressure may be caused by:-             <ol style="list-style-type: none"> <li>a) Boost relief valve not seating correctly. Dismantle and check. Replace as necessary.</li> </ol> </li> </ol> |



| SYMPTOM                                       | CAUSE   | REMEDY/CHECK   |
|---|---|--|
| 1.continued                                   |   | <ul style="list-style-type: none"> <li>b) Cold start relief valve not seating correctly. Dismantle and check. Replace as necessary.</li> <li>c) Low oil level in system. See symptom 1.A.</li> <li>d) Restricted inlet to gear pump. Check external inlet pipework and remove restrictions.</li> <li>e) Gear pump drive coupling sheared.</li> <li>f) Worn or damaged pump or motor causing excessive internal leakage. Replace damaged components after a thorough examination for subsequential damage. If in doubt, contact the manufacturer.</li> </ul>  |
| 2.System operates flow in one direction only. | <p>E. Low and fluctuating boost pressure</p> <p>A. Insufficient pilot pressure or flow in one direction Electro/Hydraulic controlled pump 'EH'.</p> <p>B. Faulty high pressure relief valve/ non return valve.</p> <p>C. Damaged shuttle valve (where fitted in BMF motor).</p> | <p>1. Air in system. Air will also cause the system to be noisy. Check the system oil level,ensure all pipe connections are tight, with particular attention to the inlet circuit where a gear pump with external inlet is fitted. Ensure the system is thoroughly vented of air.</p> <p>1. See symptom 1.C.1.</p> <p>1. Switch the two high pressure relief valve assemblies from one side to the other. If the system then operates in the direction to which it would not operate before, one of the valves is faulty. Examine and rectify as necessary.</p> <p>NOTE: Each high relief valve assembly also incorporates a boost non-return valve.</p> <p>1. Remove shuttle valve components and check for damage. Replace as necessary.</p> |



| SYMPTOM  | CAUSE   | REMEDY/CHECK  |
|--|---|---|
| <p>3. Neutral is difficult or impossible to find i.e. motor in system when the pump is in neutral.</p> | <p>D. Damaged pump control pistons or piston seals.</p> <p>A. Pilot system malfunction (remote hydraulic controlled pump-'HF')</p> <p>B. Control system malfunction Electro/ Hydraulic controlled pump-'EH'.</p> <p>C. Pump servo out of adjustment. Electro/ Hydraulic controlled pump-'EH'.</p> | <p>1. Control effect will be normal in the drive direction, but hard in the direction which is not driving. Replace the damaged parts in the pump, or replace the complete pump.</p> <p>1. Tee pressure gauges into pilot lines at ports Y and Z at the pump. Check pressure differential does not exceed 0.5 bar with the pilot valve in its neutral position. If pressure differential is excessive, examine and rectify as necessary.</p> <p>2. Pilot line damaged or restricted. Check lines and rectify as necessary.</p> <p>1. Check continuity of wiring from speed controller through to both solenoid valves.</p> <p>2. Check output from the amplifier with the speed controller in neutral. There should be no zero output. Rectify as necessary. <b>WARNING:</b> Motors will rotate while checks and adjustments are made under symptom 3, therefore before commencing, ensure no timber is in the the machine and it is free to rotate. Appropriate action must be taken to protect against the rotation of other types of equipment.</p> <p>1. If in 3.B.1., 3.B.2. and 3.C.1 above, the external control is found to be in order, but motors continue to rotate when control is neutral then the hydraulic neutral of the pump must be adjusted as follows:-</p> <p>a) Slacken the large hexagon nut which secures the eccentric pivot in the centre of the cover.</p> <p>b) Run the pump at full specified speed.</p> |

| SYMPTOM                       | CAUSE  | REMEDY/CHECK   |
|-------------------------------|--|--|
| <p>4. System over-heating</p> | <p>A. System operating at maximum pressure for longer periods.</p> <p>B. Incorrect oil viscosity.</p> <p>C. Oil level too low.</p> <p>D. Cooler inoperative or working at reduced efficiency.</p> <p>E. Oil lines to or from cooler restricted.</p> <p>F. Cold valve not seating properly.</p> <p>G. Relief valve not seating properly (this would also show loss of speed and power).</p> | <p>c) With the speed control ('EH') in neutral, turn the eccentric pivot using a hexagon key in the socket provided.</p> <p>d) After turning the eccentric pivot slightly, check to determine whether the motor has slowed or increased in speed. If speed has increased, turn the pivot in the opposite direction. Continue to turn pivot until motor</p> <p>e) Tighten the locknut on the eccentric pivot, while preventing the pivot from turning.</p> <p>1. Limit periods of maximum pressure operation to manufacturers recommendations</p> <p>1. Refer to list of recommended oils.</p> <p>1. Replenish oil to the correct level. Refer to Symptom 1.A.</p> <p>1. Check adequate water supply to cooler.</p> <p>2. Blow through cooler matrix to clear dirt build up in air cooler (where fitted).</p> <p>1. Remove restrictions.</p> <p>1. Dismantle and clean the cold start valve if necessary.</p> <p>1. Install pressure gauges check the high pressure relief valve settings. If low dismantle and clean the respective HP relief valve.</p> |



| SYMPTOM                                 | CAUSE   | REMEDY/CHECK  |
|---|---|---|
| 5.Excessive noise.                      | H. Purge valve in motor not opening.  | 1. Dismantle and clean the purge valve. Ensure the ball is free to move and that portings are not restricted by contaminant particles. Fit a replacement valve if necessary.  |
|   | I. Shuttle valve in motor not opening.  | 1. Dismantle and clean the shuttle valve. Replace any damaged components.   |
|   | J. Worn components allowing excessive internal leakage.   | 1. Check the boost pressure. If low, replace the worn components or replace the complete unit, after first carrying out all the checks related to low boost pressure (Refer to Symptom 1.E.).   |
|   | A. Air leak in system.  | 1. Fill system correctly and purge air out of system.<br><br>2. Suction line to boost pump leaking allowing air to be drawn into the system. A good indication of air in the system is given by foaming of the oil in the reservoir. the reservoir. |
|   | B. Cavitation. A hammering effect caused by starvation of the supply to the main pump due to low boost pressure.  | 1. Carry our checks related to low boost pressure (Refer to Symptom 1.D).   |
|   | C. Prolonged operation against the high pressure valve.   | 1. Refer to Symptom 4.A.1.  |
| D. System pipework vibrating.           | 1. Check pipes and hoses. Clamp pipes and ensure they are not touching metal components such as oil tanks, fuel tanks or panelling which can act as sounding board. |   |
| E. Drive misalignment or worn coupling. | 1. Check for alignment and for wear in the coupling. Rectify as necessary.  |   |





| SYMPTOM   | CAUSE  | REMEDY/CHECK   |
|---|--|--|
| 6.Loss in power.  | F. Mechanical damage to component parts i.e. damaged bearings, broken pistons etc. | 1. Replace broken components after a thorough examination for subsequential damage. If in doubt, contact the manufacturer. |
|   | A. Loose pipe connection or fractured pipe in the system.                          | 1. Tighten connection or replace fractured pipe.   |
|   | B. Relief valve not seating properly.  | 1. Refer to Symptom 4.G.   |
|   | C.Reduced power from prime mover.  | 1. Check output from prime mover and rectify as necessary.   |
| 7. Motor in system does not rotate or rotates at low Speed. | D. Low boost pressure  | 1. Refer to Symptom 1.D.   |
|   | A. Prime mover speed too low.  | 1. Adjust prime mover to give correct speed.   |
|   | B. High pressure reliefvalves not seating properly.                                | 1. Refer to Symptom 4.G.   |
|   | C. Damaged shuttle valve in purge system.  | 1. Dismantle and clean the shuttle valve. Replace damaged components.  |
|   | D. Low boost pressure.   | 1. Refer to Symptom 1.D.   |
|   | E. Worn components allowing excessiv3e internal leakage.                           | 1.Replace worn unit.   |



1. HYDRAULIC DRIVE UNIT

| Ref No. | Description   | No Off. |
|---------|---|---------|
| 1.      | Inlet/return hose; SAE 100R2AT, 3/4" bore x 3 metres long, 45 degree flange 3/4" and 90 degree flange 1" end fittings | 2       |
| 2.      | Vent hose; SAE 100RIT, 5/8" bore x 3 metres long, stand pipe fittings both ends (including olive and nut)             | 1       |
| 3.      | Flange kit 16PA to suit 1" end fitting (includes 2 flange halves, 4 bolts, 4 washers and 'O' rings)                   | 2       |
| 4.      | Hydraulic motor 'Linde' BMF 35TFC   | 1       |
| 5.      | Variable displacement axial piston pump 'Linde' BVP 1005  | 1       |
| 6.      | Cooler/reservoir assembly driven by 40 hp, 200 LD frame, 3 phase electric motor                                       | 1       |
| 7.      | Top vent hose from pump to oil reservoir  | 1       |
| 8.      | External suction hose from reservoir to pump  | 1       |
| 9.      | Filter hose   | 1       |
| 10.     | Flange kit 12 PA to suit 3/4" end fitting (includes 2 flange halves, 4 bolts, 4 washers and 'O' rings)                | 2       |

www.DaltonsWadkin.com

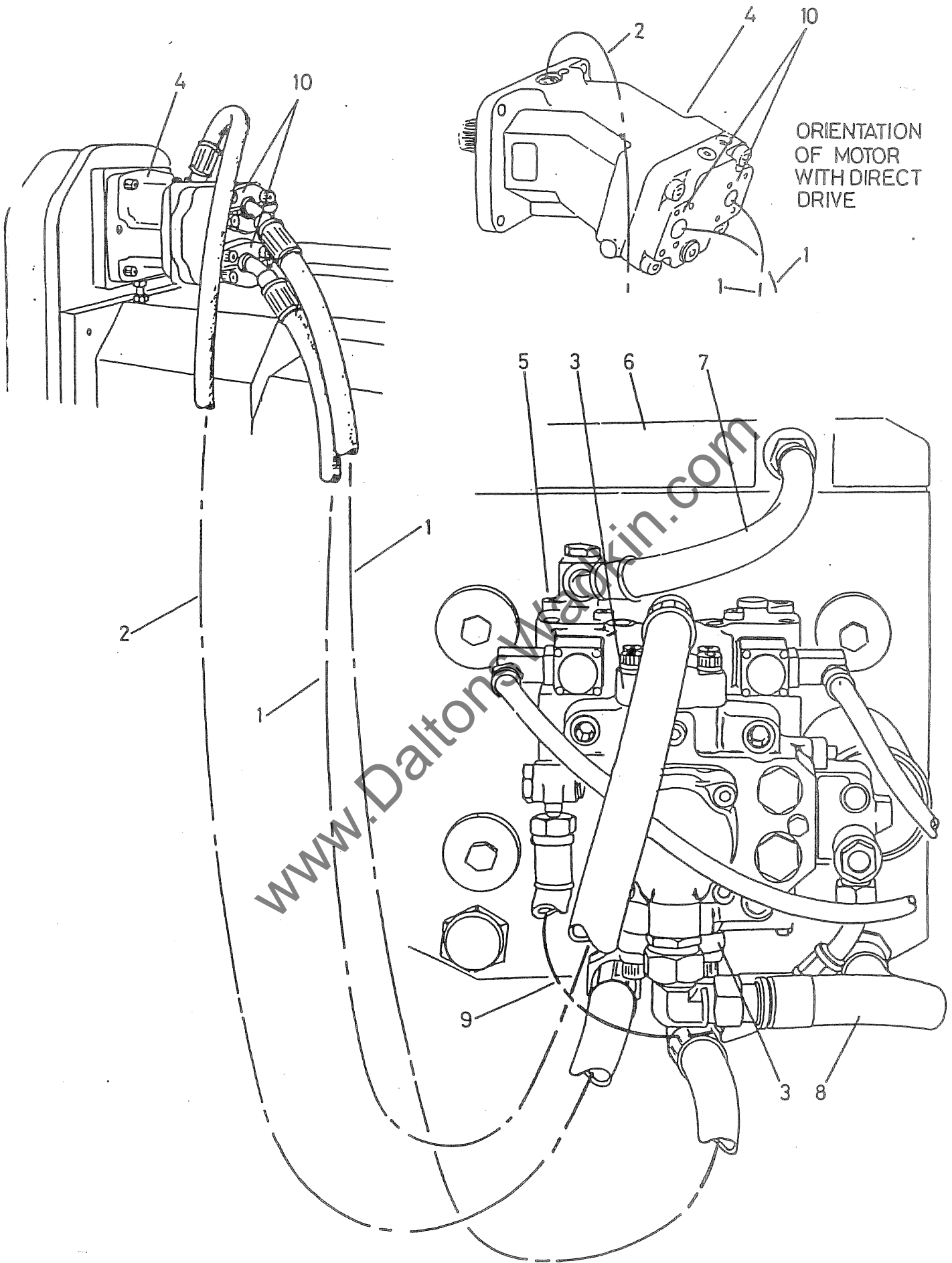
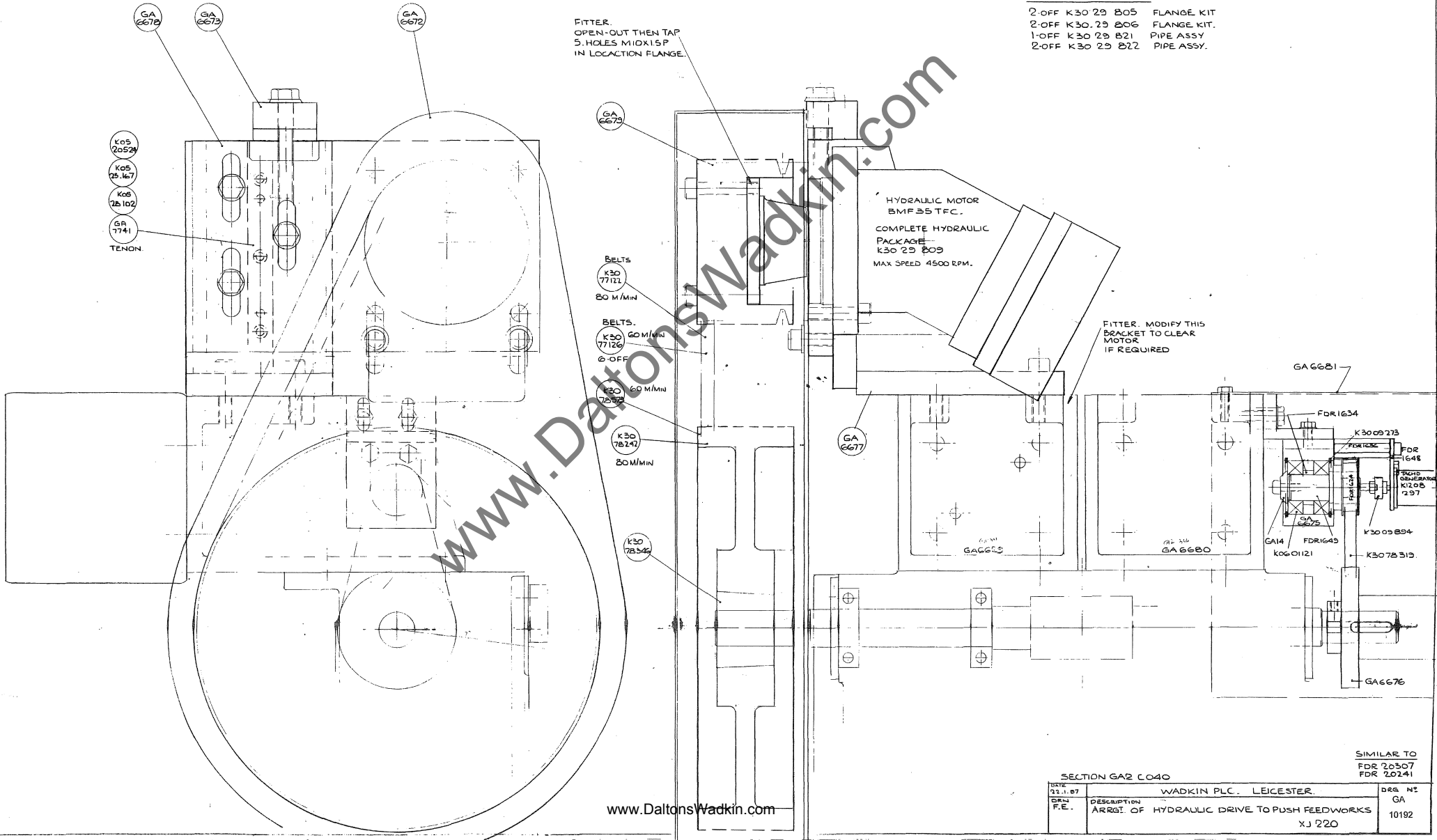


FIG 1 HYDRAULIC DRIVE UNIT



HYDRAULIC FITTINGS.

- 2-OFF K30 29 805 FLANGE KIT
- 2-OFF K30 29 806 FLANGE KIT.
- 1-OFF K30 29 821 PIPE ASSY
- 2-OFF K30 29 822 PIPE ASSY.

FITTER.  
OPEN-OUT THEN TAP  
5 HOLES MIDX1SP  
IN LOCATION FLANGE.

HYDRAULIC MOTOR  
BMF35 TFC.  
COMPLETE HYDRAULIC  
PACKAGE  
K30 29 809  
MAX SPEED 4500 RPM.

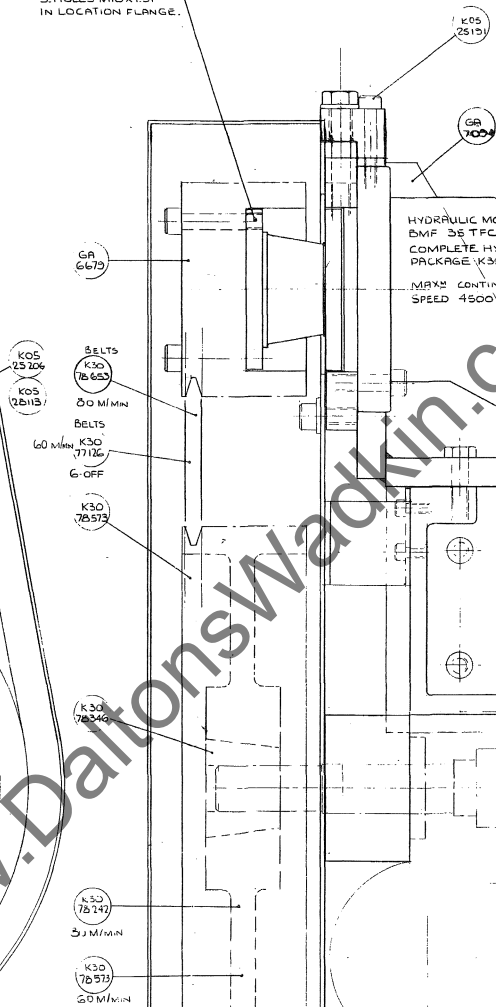
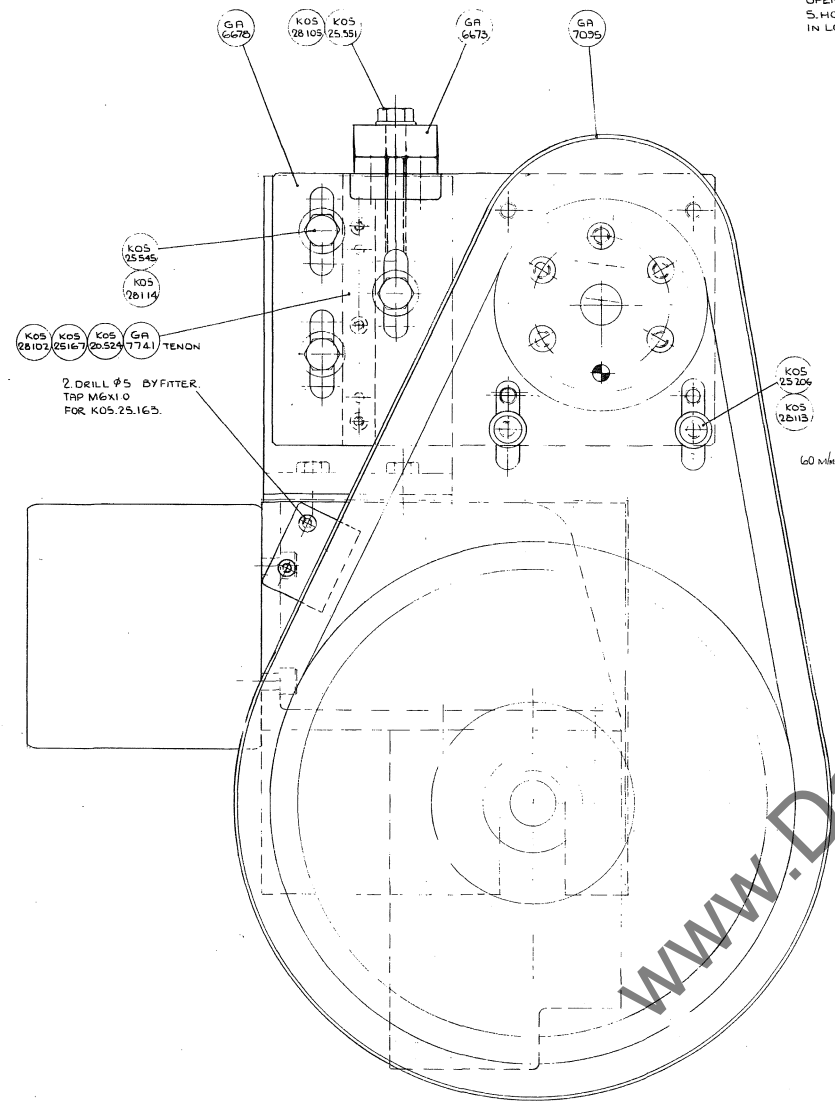
FITTER. MODIFY THIS  
BRACKET TO CLEAR  
MOTOR  
IF REQUIRED

SIMILAR TO  
FDR 20507  
FDR 20241

| SECTION GA2 C040 |   |               |
|------------------|---|---------------|
| DATE<br>22.1.87  | WADKIN PLC. LEICESTER.                                    | DRG. N°<br>GA |
| DRW<br>F.E.      | DESCRIPTION<br>ARRG. OF HYDRAULIC DRIVE TO PUSH FEEDWORKS | 10192         |
| XJ 220           |   |               |

HYDRAULIC FITTINGS.  
 2 OFF K30.29.806 FLANGE KIT.  
 2 OFF K30.29.821 PIPE ASSY.  
 1 OFF K30.29.821 PIPE ASSY.  
 2 OFF K30.29.822 PIPE ASSY.

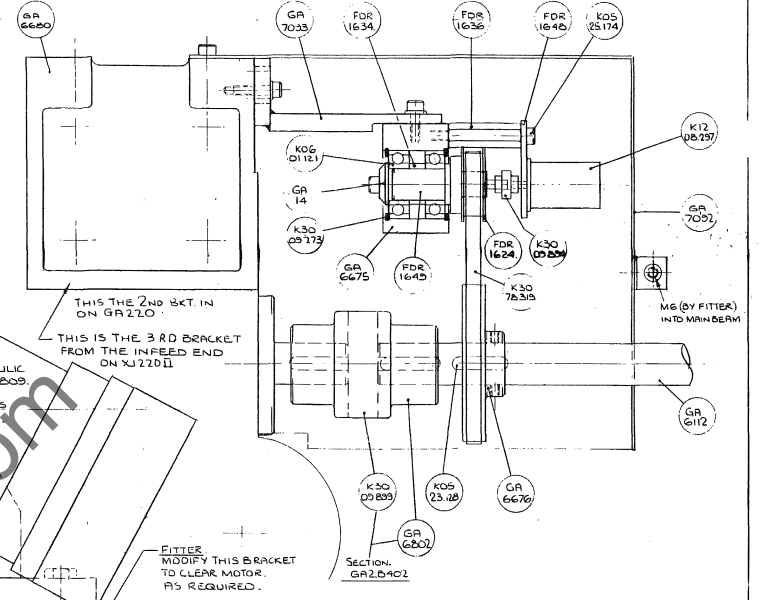
FITTERS  
 OPEN OUT THEN TAP  
 5 HOLES M10X1.5P  
 IN LOCATION FLANGE.



HYDRAULIC MOTOR  
 BMF 3E TFC.  
 COMPLETE HYDRAULIC  
 PACKAGE K30 29 809.  
 MAX CONTINUOUS  
 SPEED 4500RPM

THIS IS THE 3RD BRACKET  
 FROM THE INFEED END  
 ON XJ 220 II

FITTER  
 MODIFY THIS BRACKET  
 TO CLEAR MOTOR.  
 AS REQUIRED.

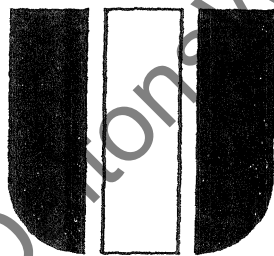


SECTION GA2 5045 (60 M/MIN) GA2 5057 (80 M/MIN)

|                   |  |                     |
|-------------------|--|---------------------|
| REV. A            | DESCRIPTION WADKIN PLC. LEICESTER.   | SCALE 1:1           |
| DES. DATE 23.2.87 | GENERAL ARRANGEMENT HYDRAULIC DRIVE TO INFEED PART I.E. STRAIGHTENING TABLE OR SHORT INFEED TABLE XJ 220 II. | DRAWING NO. GA10236 |

HYDRAULIC SERVO  
CONTROL RACK

WITH MANUAL SPEED CONTROL



QUINTON CRANE ELECTRONICS

## WADKIN HYDRAULIC FEED CONTROL (WITH CLOSED LOOP INCHING) SETTING UP PROCEDURE

This procedure relates to:

Wadkin hydraulic control units, part number K12-16-784 with  
Quinton Crane Servo cards, part number K12-16-799.

As the unit is set up it is important that readings are taken where specified and entered on the special test report sheet (see page 5). Doing this will enable spare parts to be calibrated before sending them to the customer; this will eliminate the need for subsequent on-site calibration.

### NOTES

1. See layout drawing for location of potentiometers, LEDs and test points etc.
2. Unless specified otherwise, all voltages are dc, measured with respect to system Ov. (white test point on Servo or Personality cards)
3. Tools required:- Digital voltmeter, hand tacho and 1 Amp moving coil ammeter.
4. Stages A - E are performed without pressing the RUN pushbutton.  
Stages F & G require the RUN pushbutton to be pressed

### A. INITIAL CHECKS

1. Ensure power supply links (on the motherboard) are set to the correct voltage (see Table 1).
2. Ensure link LK1 on Interface card PC1, is in the position nearest the edge connector (Test position).
3. On Servo card PC2, ensure jumper link (near R25) is set parallel to the edge connector.
4. On Personality card PC3, adjust pot. P1 fully anti-clockwise.
5. Check all four printed circuit boards are correctly fitted.
6. Apply power and check the following voltages:

PC3:TP1 - -12v ( PERSONALITY CARD )

PC3:TP3 - +12v " "

PC1:TP2 - + 5v ( INTERFACE CARD )

PC2:TPA - -8v ( SERVO CARD )

PC2:TPB - +8v " "

**B. ADJUST ACCEL/DECEL RAMP RATE**

1. Set PC2:P4 (servo:ramp rate) fully clockwise (= 0.5 sec. ramp).  
(fully anti-clock = 5 sec. ramp).  
Note potr. setting (1).

**C. SET SPEED REFERENCE SPAN**

1. Monitor the voltage at PC3:TP4 (personality:ref hi) and adjust PC3:P2 (personality:ref hi) for the appropriate maximum voltage as shown in Table 2.  
Note this voltage (3).
2. Monitor the voltage at PC3:TP6 (personality:ref lo) and adjust PC3:P3 (personality:ref lo) for the appropriate minimum voltage as shown in Table 2.  
Note this voltage (4).

**D. CALIBRATE DISPLAY**

1. Turn the front panel speed control potr. to maximum and ensure that PC3:SW1 (display switch) is set to REF. Adjust PC3:P4 (personality:display ref) until display reads the maximum speed for the machine.
2. Set PC3:SW1 (display switch) to F/B. Start the hydraulic pump and adjust PC2:P3 (servo:balance) so that the feedworks runs at approximately half of full speed. Measure the actual speed at the feed rolls using the hand tacho. Adjust PC3:P5 (personality:display f/b.) until the display reads the same as the hand tacho.

**E. SET ZERO SPEED**

1. Insert the ammeter in place of the upper link on the rear connector panel with the positive lead to the upper socket.  
Adjust PC2:P3 (servo:balance) so that the feed is running and the current is positive.  
Adjust PC2:P3 (servo:balance) until the feed just stops running. Note the current (9).  
Adjust PC2:P3 (servo:balance) until the current is zero.



F. CALIBRATE TACHO FEEDBACK

1. Set PC3:SW1 (display:switch) to F/B. and front panel potr. to max. Press **RUN** button. Adjust PC3:P1 (personality:tacho f/b) until the display reads the maximum speed correctly. Note the following measurements:

- |                                  |     |                           |
|----------------------------------|-----|---------------------------|
| Max speed from Table 2           | (5) |                           |
| Voltage on PC3:TP8 (servo:T +ve) | (6) |                           |
| Voltage on PC3:TP7 (servo:T f/b) | (7) |                           |
| Solenoid current                 | (8) | Press <b>STOP</b> button. |

G. SET SERVO ZERO THRESHOLD

1. Ensure PC3:SW1 (display switch) is set to F/B. and front panel speed potr. to minimum. Monitor PC2:TP9 (servo:output) and press **RUN** pushbutton. Adjust PC2:P3 (servo:balance) until the voltage on PC2:TP9 (servo:output) is zero. Press **STOP** pushbutton.

NB Feed may creep with link LK1 (on personality card) set to Test position. This should not happen once the link is returned to the normal position (furthest from edge connector) - see I. "Leave unit ready for use".

H. SET INCH SPEED

1. Ensure PC3:SW1 (display switch) is set to F/B. Monitor the voltage on PC2:TP3 (servo:inch). Press INCH FOR pushbutton and adjust PC2:P7 (servo:inch) until display reads the appropriate speed from Table 2. Press INCH REV and check speed is the same.

2. Note the inch speed (12) and the voltage (13).

I. LEAVE THE UNIT READY FOR USE

1. Remove the ammeter and replace the upper link.
2. Replace link LK1 on PC1 (interface) in posn. furthest from the edge connector.
3. Ensure PC3:SW1 (display:switch) is set to REF.

J. FINAL CHECK

1. Check that feed is smooth over the entire speed range.
2. Ensure that the feed starts smoothly at both minimum and maximum speeds and that the tacho failure light remains off when starting at minimum speed.
3. Ensure that if the tacho is disconnected whilst the feed is running continuously, then the feed is shut down and the tacho failure warning light is illuminated.

TABLE 1 - POWER SUPPLY LINKS

N.B. These links are fitted on the mother board.

## SUPPLY VOLTAGE LINK POSITIONS

|      |         |
|------|---------|
| 110v | 1 3 5 7 |
| 120v | 2 3 5 8 |
| 220v | 1 4 6 7 |
| 240v | 2 4 6 8 |

TABLE 2 - SPEED RANGES

| SPEED       | VOLTAGE ON<br>PC3:TP4 | VOLTAGE ON<br>PC3:TP6 | INCH SPEED |
|-------------|-----------------------|-----------------------|------------|
| 6-60 m/min  | 8.0v                  | 0.8v                  | 15m/min    |
| 10-100m/min | 8.0v                  | 0.8v                  | 15m/min    |

| <b><u>HYDRAULIC FEED CONTROL TEST REPORT</u></b> |                    |   |                          |                               |
|--|--------------------|---|--------------------------|-------------------------------|
| MACHINE TYPE :                                   |                    | MACHINE No:   | DATE                     |                               |
| CUSTOMER :                                       |                    |   |                          |                               |
| SPEED RANGE :                                    |                    | M/MIN   |                          |                               |
| UNIT REFERENCE :                                 |                    |   |                          |                               |
| CALIBRATED BY :                                  |                    |   |                          |                               |
| TEST   | PARAMETER MEASURED | REF   | READING                  | UNITS                         |
| B.   | Acc/Dec ramp       | PC2:P4 setting  | (1)                      |                               |
| C  | Reference Span     | Voltage on PC3:TP4<br>Voltage on PC3:TP6  | (3)<br>(4)               | volts<br>volts                |
| F  | At max speed       | Speed of feed rolls<br>Tacho volts at PC3:TP8<br>Scaled tacho volts PC3:TP7<br>Solenoid current | (5)<br>(6)<br>(7)<br>(8) | m/min<br>volts<br>volts<br>mA |
| E  | At zero speed      | Solenoid current  | (9)                      | mA                            |
| H  | At inch speed      | Speed at feed rolls<br>Voltage on PC2:TP3   | (12)<br>(13)             | m/min<br>volts                |

CNR1 - PUSHBUTTONS  
 CNR2 - TACHO  
 CNR3 - SOLENOIDS  
 CNR4 - MAINS SUPPLY

RL1.4 RUN  
 RL6 TACHO FAIL  
 RLT1 RUN TIMER  
 RL3 INCH REV  
 RL2 INCH

P3 BALANCE  
 P4 RAMP  
 P7 INCH

P1 TACHO F/B  
 P2 REF HI  
 P3 REF LO  
 P4 DISPLAY REF  
 P5 DISPLAY F/B

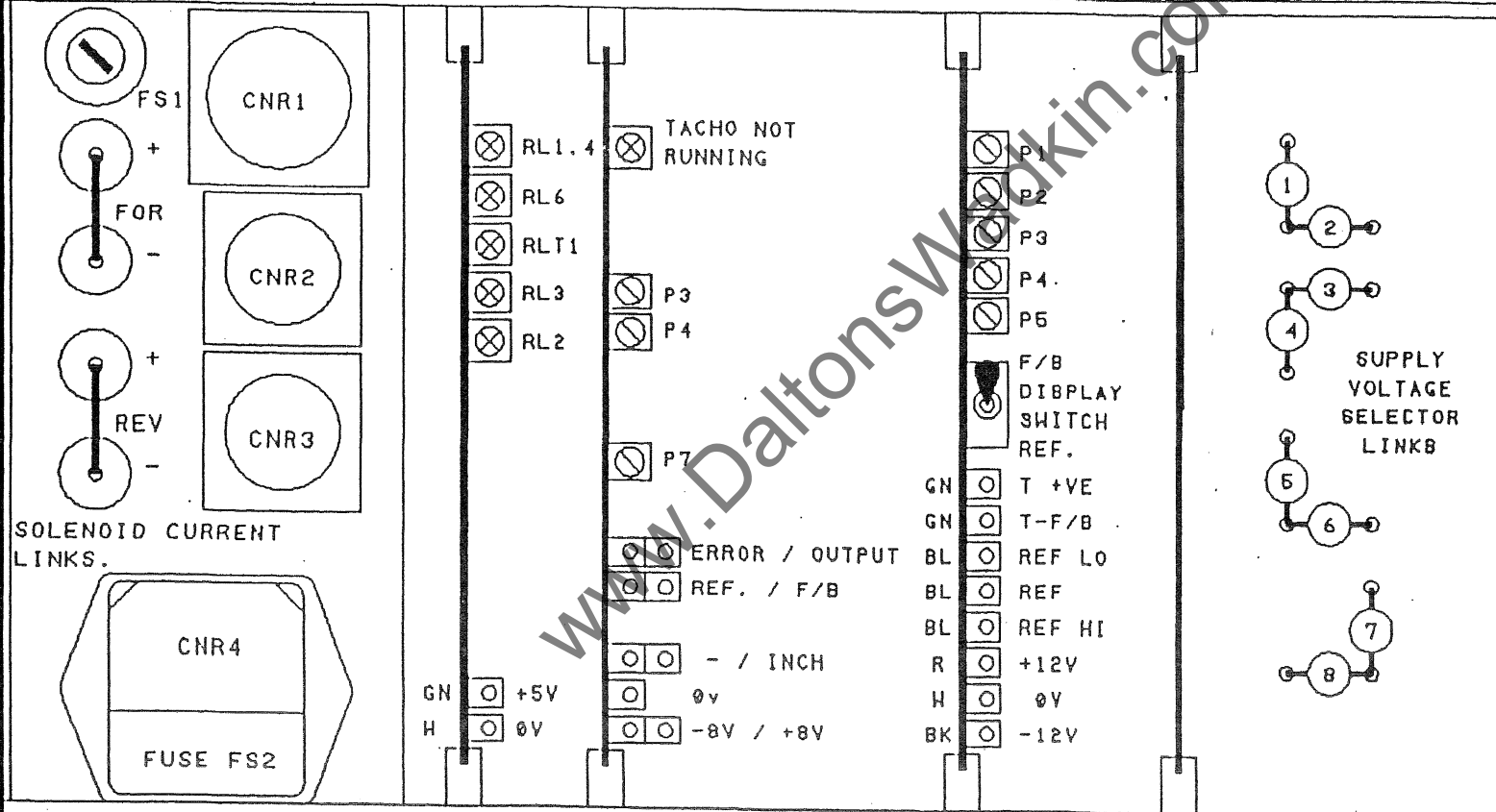
SUPPLY VOLTAGE SELECTOR LINKS  
 110V - 1 3 5 7  
 120V - 2 3 5 8  
 220V - 1 4 6 7  
 240V - 2 4 6 8

FBI  
 1A 5x20mm 24V DC  
 SUPPLY TO  
 PUSHBUTTONS

INTERFACE SERVO  
 CARD CARD

PERSONALITY  
 CARD

POWER  
 SUPPLY



SOLENOID CURRENT LINKS.

FS2 - 1A 5x20mm  
 MAINS SUPPLY TO  
 POWER SUPPLY BOARD.

KEY :



- LED INDICATOR TEST POINT

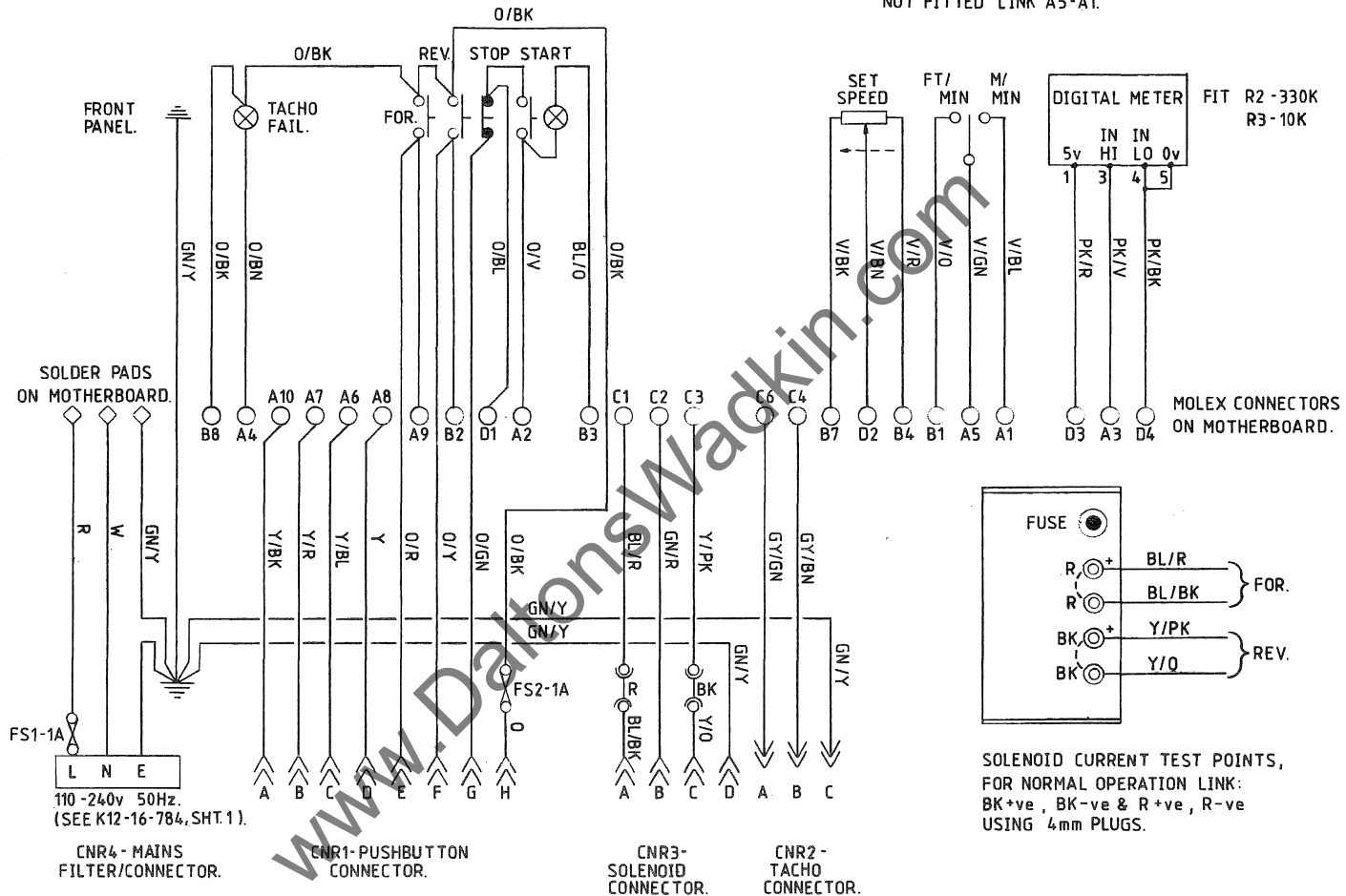


- TEN TURN POTR.

|                                     |        |           |          |                           |
|-------------------------------------|--------|-----------|----------|---------------------------|
| REAR GA DMC<br>HYDRAULIC SERVO RACK |        | QC-E-4174 |          | QUINTON CRANE ELECTRONICS |
| DRAWN                               | T.J.R. | DATE      | 18.04.88 | ISSUE                     |
|                                     |        |           |          | 2                         |

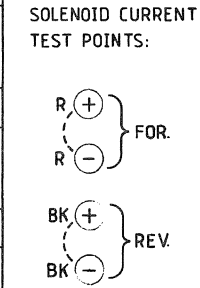
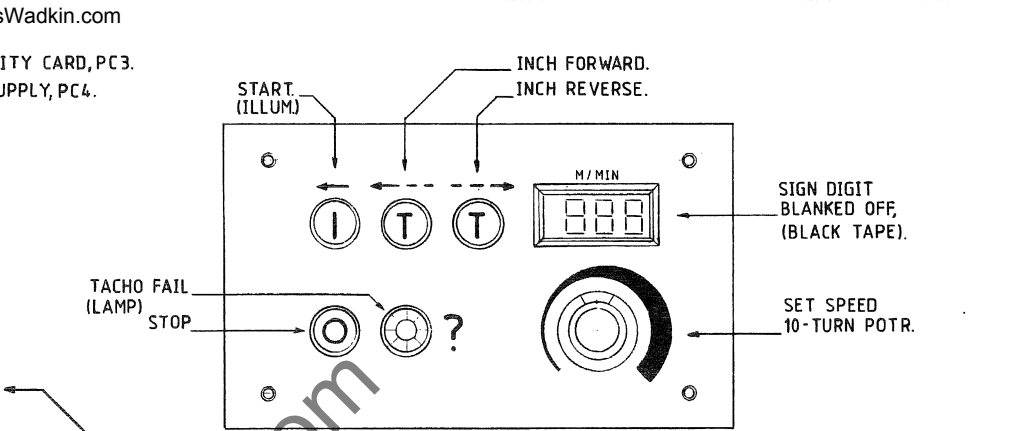
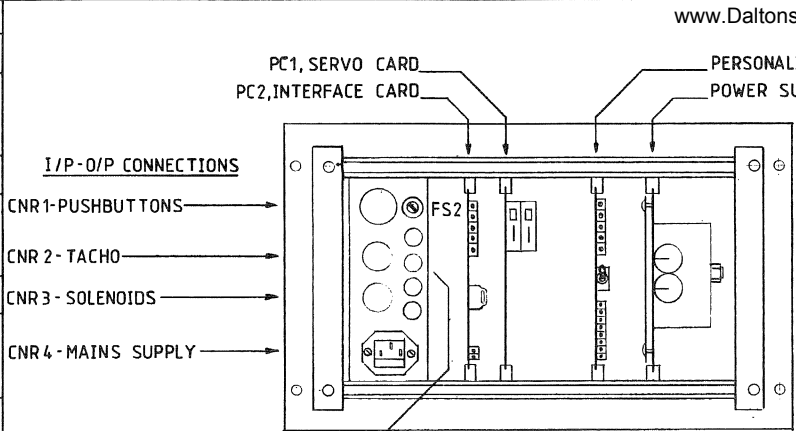


|   |  |              |   |   |   |    |
|---|--|--------------|---|---|---|----|
| ALTERATIONS   | 5  | 6            | 7 | 8 | 9 | 10 |
| DATE<br>ALT. No.  | SIG.   |              |   |   |   |    |
|   | H  |              |   |   |   |    |
|   | G  |              |   |   |   |    |
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|   | C  |              |   |   |   |    |
| T.J.R. 29/7/86  | B  |              |   |   |   |    |
| ADDITIONAL<br>INFORMATION DETAILS.  |  |              |   |   |   |    |
| GENERAL TOLERANCES, LIMITS<br>& SURFACE FINISH, UNLESS STATED   |  |              |   |   |   |    |
| FLATNESS  | 0.04 IN ANY LENGTH UP<br>TO 300, PLUS 0.04/300 |              |   |   |   |    |
| STRAIGHTNESS  | 0.02mm MAX.                                    |              |   |   |   |    |
| SQUARENESS  | 0.02mm MAX.                                    |              |   |   |   |    |
| PARALLELISM   | 0.02mm MAX.                                    |              |   |   |   |    |
| RUN OUT   | 0.08mm T.I.R. MAX.                             |              |   |   |   |    |
| CYLINDRICITY  | 0.02mm MAX.                                    |              |   |   |   |    |
| ANGULARITY  | 0.25° MAX.                                     |              |   |   |   |    |
| SYMMETRY  | 0.02mm MAX.                                    |              |   |   |   |    |
| WHOLE NUMBERS   | ± 1mm  | NON          |   |   |   |    |
| 1 DECIMAL PLACE   | ± 0.1mm  | ACCUMULATIVE |   |   |   |    |
| 2 DECIMAL PLACE   | ± 0.01mm                                       |              |   |   |   |    |
| V   | 6.3-25.0 MICRONS, ROUGH M/C                    |              |   |   |   |    |
| VV  | 1.6-3.2 MICRONS, FINISH M/C                    |              |   |   |   |    |
| VVV   | 1.6-3.2 MICRONS, ROUGH GRD.                    |              |   |   |   |    |
| VVVV  | 0.4-0.8 MICRONS, FINISH GRD.                   |              |   |   |   |    |
| ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED   |  |              |   |   |   |    |
| MACHINE SHOP NOTE:-<br>INSPECTION MUST PASS THE FIRST COMPONENT OF A BATCH BEFORE STARTING THE SECOND.<br>REMOVE ALL SHARP EDGES AND BURRS. |  |              |   |   |   |    |

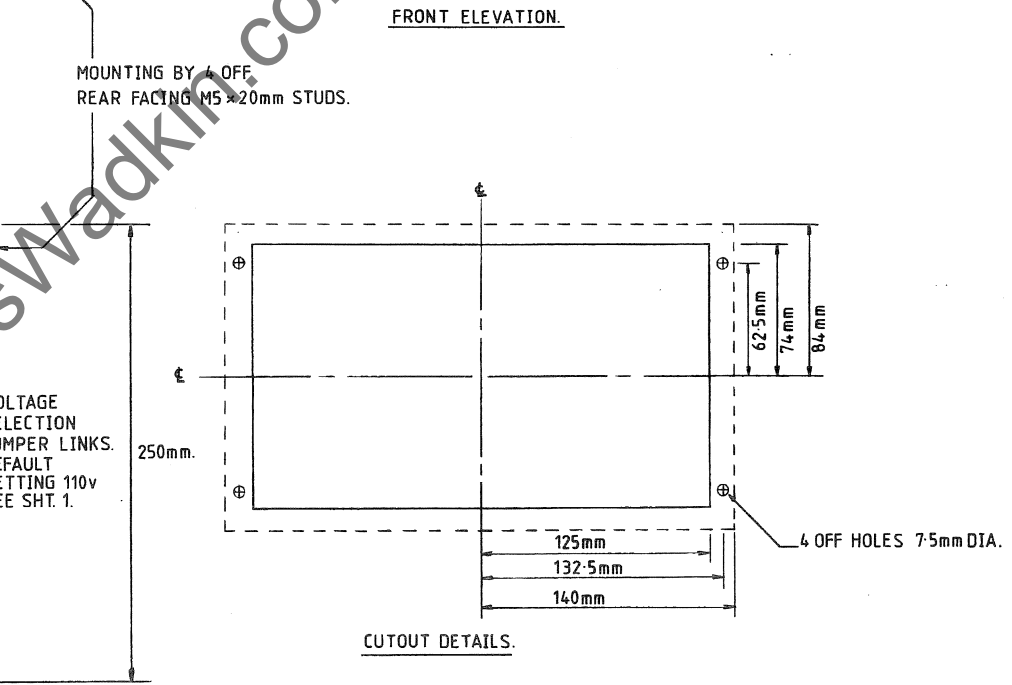
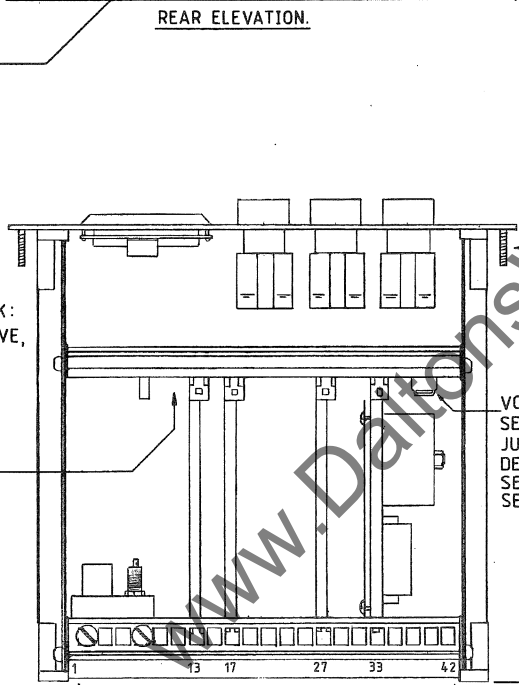


|                        |                     |         |                       |   |          |
|------------------------|---------------------|---------|-----------------------|---|----------|
| THIRD ANGLE PROJECTION | DATE 30/6/86        | A       | WADKIN PLC. LEICESTER | QTY.  | MATERIAL |
| SIMILAR TO             | DRAWN T.J.R. (Q.C.) | CHECKED |                       | DESCRIPTION INTERNAL CONNECTION DIAGRAM, HYDRAULIC SERVO. | SCALE    |

| ALTERATIONS  |      |
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| T.J.R. 29/7/86   | C    |
| VOLTAGE SELECTION LINKS ADDED, SOLENOID TEST POINTS REVERSED.  |      |
| T.J.R. 11/7/86   | B    |
| REAR FACING STUDS WERE M6x20mm.  |      |
| <b>GENERAL TOLERANCES LIMITS &amp; SURFACE FINISH, UNLESS STATED</b><br>FLATNESS $\square$ 0.04 IN ANY LENGTH UP TO 300, PLUS 0.04/300<br>STRAIGHTNESS $\parallel$ TREATED<br>SQUARENESS $\perp$ TO 300, PLUS 0.04/300<br>PARALLELISM $\parallel$<br>RUN OUT $\curvearrowright$ 0.05mm T.I.R. MAX.<br>CYLINDRICITY $\text{---}$ 0.02mm MAX.<br>ANGULARITY $\text{---}$ $\pm 0.25^\circ$ MAX.<br>SYMMETRY $\text{---}$<br>WHOLE NUMBERS $\pm 1\text{mm}$ } NON ACCUMULATIVE<br>1 DECIMAL PLACE $\pm 0.1\text{mm}$<br>2 DECIMAL PLACE $\pm 0.1\text{mm}$<br>V - 6.3-25.0 MICRONS, ROUGH M/C<br>VF - 1.6-3.2 MICRONS, FINISH M/C<br>VV - 1.6-3.2 MICRONS, ROUGH GRD.<br>VVV - 0.4-0.8 MICRONS, FINISH GRD.<br>ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.<br>MACHINE STOP NOTE -<br>INSPECTION MUST PASS THE FIRST COMPONENT OF A BATCH BEFORE STARTING THE SECOND.<br>REMOVE ALL SHARP EDGES AND BURRS. |      |



FOR NORMAL OPERATION LINK: BK+VE, BK-VE & R+VE, R-VE, USING 4mm PLUGS.



|                        |                    |         |  |         |                            |
|------------------------|--------------------|---------|--|---------|----------------------------|
| THIRD ANGLE PROJECTION | DATE 1/7/86        | A       | <b>WADKIN PLC. LEICESTER</b><br>DESCRIPTION GENERAL ARRANGEMENT OF HYDRAULIC SERVO ASSEMBLY. | QTY. —  | MATERIAL —                 |
| SIMILAR TO             | DRAWN T.J.R (D.C.) | CHECKED |  | SCALE — | PART No. K12-16-784 SHT 3. |

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| ALTERATIONS  |      |
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| <b>GENERAL TOLERANCES, LIMITS &amp; SURFACE FINISH, UNLESS STATED</b><br>FLATNESS $\square$ 0.04 IN ANY LENGTH UP TO 300, PLUS 0.04/300 THEREAFTER<br>SQUARENESS $\perp$ 0.02mm T.I.R. MAX.<br>PARALLELISM $\parallel$ 0.02mm T.I.R. MAX.<br>RUN OUT $\curvearrowright$ 0.02mm MAX.<br>CYLINDRICITY $\text{○}$ 0.02mm MAX.<br>ANGULARITY $\sphericalangle$ 0.25° MAX.<br>SYMMETRY $\equiv$ 0.02mm MAX.<br>WHOLE NUMBERS $\pm$ 1mm NON<br>1 DECIMAL PLACE $\pm$ 0.1mm } ACCUMULATIVE<br>2 DECIMAL PLACE $\pm$ 0.01mm }<br>Y - 6.3-25.0 MICRONS, ROUGH M/C<br>VV - 1.6-3.2 MICRONS, FINISH M/C<br>VVV - 1.6-3.2 MICRONS, ROUGH GRD.<br>VVVV - 0.4-0.8 MICRONS, FINISH GRD.<br>ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED<br>MACHINE SHOP NOTE -<br>INSPECTION MUST PASS THE FIRST COMPONENT OF A BATCH BEFORE STARTING THE SECOND.<br>REMOVE ALL SHARP EDGES AND BURRS. |      |

| COMPONENT REFERENCE.               | WADKIN PART No. | DESCRIPTION             | MANUFACTURER/SUPPLIER | MANUFACTURES PART No. | Q.T.Y. |
|------------------------------------|-----------------|-------------------------|-----------------------|-----------------------|--------|
|                                    |                 | KM6 RACK                | VERO                  | 223-12662C            | 1      |
|                                    |                 | " CARD GUIDES           | "                     | 173-12553G            | 8      |
|                                    |                 | CODING STRIP            | "                     | 17-2856E              | 4      |
|                                    |                 | FRONT PANEL             | Q.C.                  | QC-A3-3933/3938       | 1      |
|                                    |                 | CONNECTOR MTG. BKT.     | "                     | QC-A3-3923            | 1      |
|                                    |                 | BOFORS SERVO MODULE     | BOFORS ELEC.          |                       | 1      |
|                                    |                 | POWER SUPPLY            | VERO                  | 89-2671K              | 1      |
|                                    | K12-16-790      | PERSONALITY CARD        | Q.C.                  | WM 2118               | 1      |
|                                    | K12-16-787      | INTERFACE (RELAY)CARD.  | "                     | WM 2117               | 1      |
|                                    | K12-16-785      | MOTHERBOARD             | "                     | WM 2119               | 1      |
| CNR 1                              |                 | 8WAY FEMALE, P/B'S      | VERO                  | 229-22120F            | 1      |
| CNR 2                              |                 | 4WAY MALE, TACHO        | "                     | 229-26044L            | 1      |
| CNR 3                              |                 | 4WAY FEMALE, SOL.       | "                     | 229-22119E            | 1      |
| CNR 4                              |                 | FUSED 1A MAINS FILTER   | "                     | 228-40940H            | 1      |
| FS 2                               |                 | FUSEHOLDER 5x20mm       | "                     | 228-23435G            | 1      |
|                                    |                 | FUSE 5x20mm 1A          | Q.C.                  | 07/100                | 2      |
|                                    |                 | 4mm TERMINAL RED        | R.S.                  | 444-646               | 2      |
|                                    |                 | " " BLACK               | "                     | 444-618               | 2      |
|                                    |                 | " PLUG RED              | "                     | 444-208               | 2      |
|                                    |                 | " " BLACK               | "                     | 444-179               | 2      |
|                                    |                 | 10 TURN POTR. 50K       | COLVERN               | CLR 2901              | 1      |
|                                    |                 | " DIAL 46mm             | SPECTROL              | 21-1-11               | 1      |
|                                    |                 | 3 1/2 DIGIT LED DPM     | VERO                  | 89-37504G             | 1      |
| START                              |                 | ILLUM.P/B,W,GY RING '1' | KLÖCKNER-M.           | LT2-vs/KFb/GL24V-gr   | 1      |
| STOP                               |                 | P/B, RED,GY RING '0'    | "                     | D-r-gr-K              | 3      |
| INCH                               |                 | 'T' SYMBOL              | "                     | 100/103K              | 2      |
| TACHO FAIL                         |                 | LAMP, RED,GY. RING      | "                     | L2-rH/Fb/GL24V-gr     | 1      |
|                                    |                 | FEMALE HSG. 10 WAY      | MOLEX                 | 22-01-1103            | 1      |
|                                    |                 | " " 8 "                 | "                     | 22-01-1083            | 1      |
|                                    |                 | " " 6 "                 | "                     | 22-01-1063            | 1      |
|                                    |                 | " " 5 "                 | "                     | 22-01-2055            | 1      |
|                                    |                 | " " 4 "                 | "                     | 22-01-1043            | 1      |
| <b>MATING PLUGS &amp; SOCKETS.</b> |                 |                         |                       |                       |        |
| CNR 2                              |                 | 4WAY MALE               | VERO                  | 229-22125B            | 1      |
| CNR 3                              |                 | 4WAY FEMALE             | "                     | 229-26050H            | 1      |
|                                    |                 | SR CLAMP                | "                     | 229-22131K            | 2      |
| CNR 1                              |                 | 8WAY MALE CONNECTOR     | "                     | 229-22126K            | 1      |
|                                    |                 | SR CLAMP                | "                     | 229-22132G            | 1      |
| CNR 4                              |                 | IEC MAINS PLUG & LEAD   | "                     | 251-26395K            | 1      |

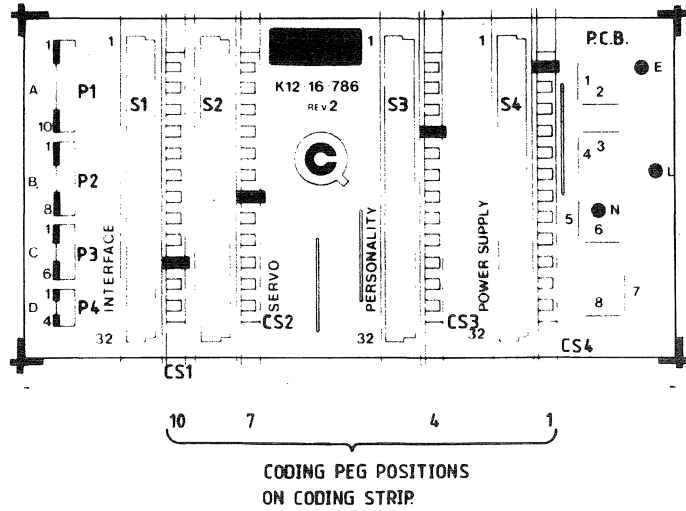
PLUG/SOCKET CONTACTS.

| 0.5mm        |             | 1mm         |             |
|--------------|-------------|-------------|-------------|
| PIN          | SKT         | PIN         | SKT         |
| 229-22139H   | 229-22140 J | 229-22141 F | 229-22142 C |
| 1 PACK = 100 |             |             |             |

|                        |                     |         |                              |  |       |     |          |                 |
|------------------------|---------------------|---------|------------------------------|--|-------|-----|----------|-----------------|
| THIRD ANGLE PROJECTION | DATE 23,6,86        | A       | <b>WADKIN PLC. LEICESTER</b> |  | QTY.  | --- | MATERIAL | ---             |
| SIMILAR TO             | DRAWN T.J.R. (Q.C.) | CHECKED | DESCRIPTION                  | HYDRAULIC SERVO RACK ASSEMBLY PARTS LIST | SCALE | --- | PART No. | K12-16-784 SHT4 |



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| T.J.R. 29/7/86   |       |
| CODING PEG POSN.<br>ADDED.   |       |
| <small>GENERAL TOLERANCES LIMITS<br/>&amp; SURFACE FINISH UNLESS STATED</small><br><small>FINISH: RAUGHNESS: SURFACES: PARALLELISM: RUN IN: CYLINDRICITY: ANGULARITY: SYMMETRY: DIMENSIONAL PLACES: DIMENSIONAL PLACES</small><br><small>W = 0.050mm (0.0020in) MAXIMUM PERMISSIBLE<br/>                 WW = 0.025mm (0.0010in) MAXIMUM PERMISSIBLE<br/>                 WWW = 0.0125mm (0.0005in) MAXIMUM PERMISSIBLE</small><br><small>ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED<br/>                 UNLESS OTHERWISE SPECIFIED</small><br><small>WADKIN GROUP LTD</small><br><small>WADKIN MUST PASS THE FIRST<br/>                 COMPONENT TO BE MANUFACTURED TO THE<br/>                 DRAWING</small><br><small>WADKIN GROUP LTD</small> |       |



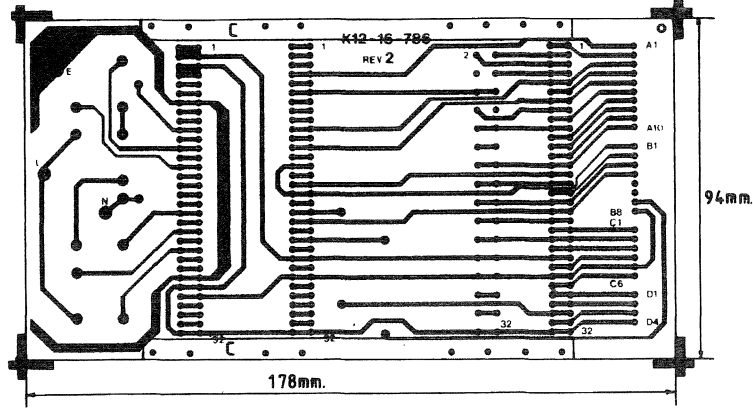
| COMPONENT REFERENCE | QC STORES No | DESCRIPTION          | MANUFACTURER/SUPPLIER | MANUFACTURES PART No | QTY. |
|---------------------|--------------|----------------------|-----------------------|----------------------|------|
| S1,3,4              | S/O          | DIN 41612 'C' SOCKET | VERO                  | 17-2624C             | 3    |
| S2                  | "            | " " 'D' "            | "                     | 17-41585H            | 1    |
| CS1-4               | "            | CODING STRIP         | "                     | 17-2856E             | 4    |
| P1                  | 08/154       | 10WAY POL. HEADER    | MOLEX                 | 22-04-1101           | 1    |
| P2                  | S/O          | 8WAY " "             | "                     | 22-04-1081           | 1    |
| P3                  | "            | 6WAY " "             | "                     | 22-04-1061           | 1    |
| P4                  | 08/155       | 4WAY " "             | "                     | 22-04-1041           | 1    |
| LINK1-8             | 13/311b      | 0-5" JACK LINK       | FARNELL               | 103-263              | 4    |
|                     | 13/311a      | LINK SOCKET          | "                     | 103-258              | 12   |
| P.C.B.              | S/O          | P.C.B. K12-16-786    | —                     | —                    | 1    |

S/O - SPECIAL ORDER.

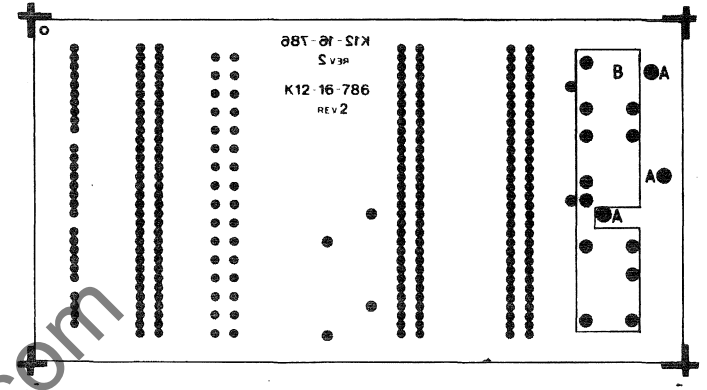
WADKIN PLC. LEICESTER

|                        |                   |             |
|------------------------|-------------------|-------------|
| THIRD ANGLE PROJECTION | DATE 23,6,86      | A           |
| SIMILAR TO             | DRAWN T.J.R. (QC) | DESCRIPTION |
| CHECKED                |                   |             |

|                              |  |       |            |
|------------------------------|--|-------|------------|
| MOTHERBOARD ASSEMBLY DRAWING |  | QTY   | MATERIAL   |
| HYDRAULIC SERVO.             |  | —     | —          |
|                              |  | SCALE | PART No    |
|                              |  | —     | K12-16-785 |



TRACK.



SOLDER RESIST &  
DRILLING DETAILS.

| HOLE | SIZE  | QTY. |
|------|-------|------|
| A    | 1.4mm | 3    |
| B    | 2.0mm | 12   |
| C    | 3.2mm | 16   |

258 OFF UNMARKED HOLES TO BE 10mm.

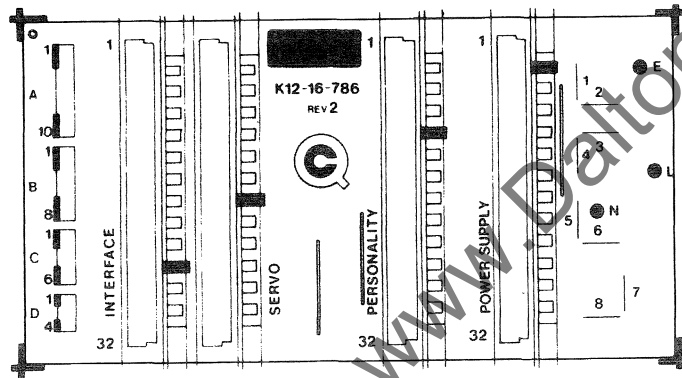
MATERIAL:

1/16 INCH FIBREGLASS.  
1oz COPPER.

o - ALIGNMENT GUIDE.

USE THE FOLLOWING FILMS TO PRODUCE BOARD:

TRACK - REV 2.  
SILK SCREEN - REV 2.  
SOLDER RESIST - REV 2.



SILK SCREEN.

ALTERATIONS

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T.J.R. 29/7/86  
FILM NOTE ADDED.

GENERAL TOLERANCES - LIMITS & SURFACE FINISH, UNLESS STATED

| UNIT | DIMENSION  | TOLERANCE | LIMITS     | SURFACE FINISH |
|------|------------|-----------|------------|----------------|
| mm   | 0.25 - 10  | ±0.10     | 0.25 - 10  | RA 0.8         |
|      | 10 - 25    | ±0.15     | 10 - 25    | RA 1.6         |
| mm   | 10 - 25    | ±0.10     | 10 - 25    | RA 0.8         |
|      | 25 - 50    | ±0.15     | 25 - 50    | RA 1.6         |
| mm   | 50 - 100   | ±0.20     | 50 - 100   | RA 3.2         |
|      | 100 - 250  | ±0.30     | 100 - 250  | RA 6.3         |
| mm   | 250 - 500  | ±0.40     | 250 - 500  | RA 12.5        |
|      | 500 - 1000 | ±0.50     | 500 - 1000 | RA 25.0        |
| mm   | 10 - 25    | ±0.10     | 10 - 25    | RA 0.8         |
|      | 25 - 50    | ±0.15     | 25 - 50    | RA 1.6         |
| mm   | 50 - 100   | ±0.20     | 50 - 100   | RA 3.2         |
|      | 100 - 250  | ±0.30     | 100 - 250  | RA 6.3         |
| mm   | 250 - 500  | ±0.40     | 250 - 500  | RA 12.5        |
|      | 500 - 1000 | ±0.50     | 500 - 1000 | RA 25.0        |

DATE 23.6.86 A

WADKIN PLC. LEICESTER

DRAWN T.J.R (QC) DESCRIPTION MOTHERBOARD - HYDRAULIC SERVO RACK.

BOARD DETAIL DRAWING.

SCALE

K12-16-785

K12-16-784

QTY

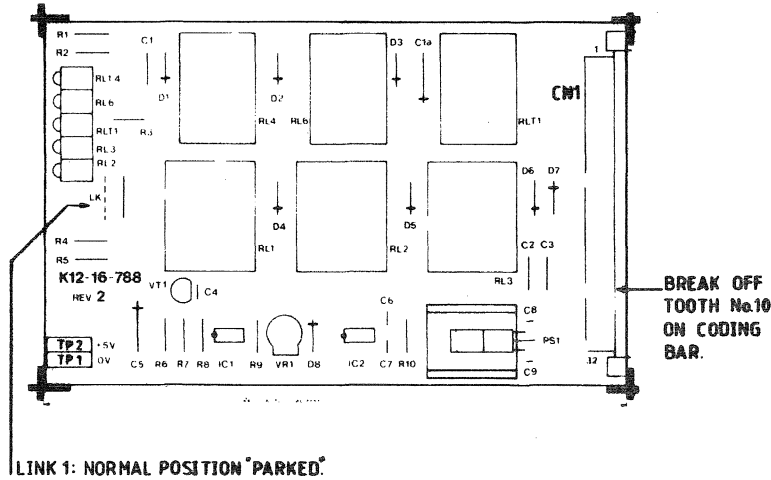
MATERIAL

SHEET

PART No

K12-16-786.

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| T.J.R. 29/7/86  |          |
| CODING BAR & DETAILS ADDED.   |          |
| <p>GENERAL TOLERANCES, LIMITS &amp; SURFACE FINISH UNLESS STATED</p> <p>FLATNESS 0.04 IN ANY LENGTH UP TO 300 PLUS 0.04/300</p> <p>STRAIGHTNESS 0.04 IN ANY LENGTH UP TO 300 PLUS 0.04/300</p> <p>SQUARENESS 0.04 IN ANY LENGTH UP TO 300 PLUS 0.04/300</p> <p>PARALLELISM 0.04 IN ANY LENGTH UP TO 300 PLUS 0.04/300</p> <p>RUN OUT 0.08mm T.Y. MAX</p> <p>CYLINDRICITY 0.08mm MAX</p> <p>ANGULARITY 0.25° MAX</p> <p>SYMMETRY</p> <p>WELD NUMBERS</p> <p>1 DECIMAL PLACE ± Min. / NON</p> <p>2 DECIMAL PLACE ±0.1mm / ALTERNATIVE</p> <p>0 - 0.25 MICRONS ROUGH M.T.</p> <p>VF - 1.0 MICRONS FINISH M.T.</p> <p>WV - 1.5 MICRONS ROUGH GRD</p> <p>WWW - 0.4 MICRONS FINISH GRD</p> <p>ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED</p> <p>MACHINE SHOP NOTE -</p> <p>INSPECTION MUST PASS THE FIRST COMPONENT IF A BATCH DEFECT IS DETECTED REMOVE ALL SHARP EDGES AND BURNS</p> |          |

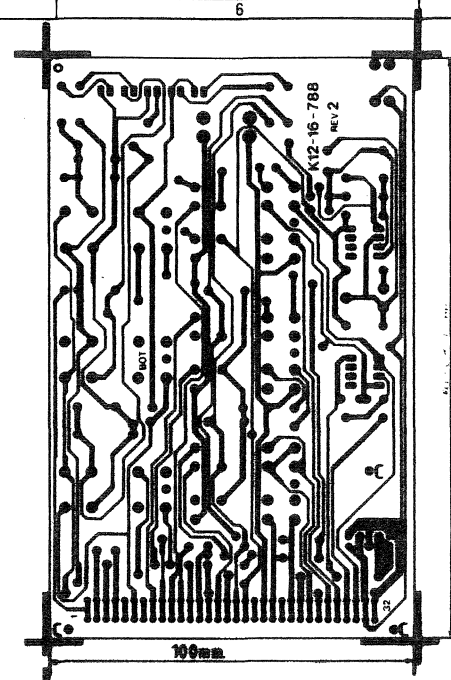


| COMPONENT REFERENCE. | Q.C. STORES No | DESCRIPTION              | MANUFACTURER/SUPPLIER. | MANUFACTURES PART No | QTY. |
|----------------------|----------------|--------------------------|------------------------|----------------------|------|
| R1-5                 | 01/306         | RESISTOR 1/4W MF 2K7     | WELWYN                 | MF4 - 2K7            | 5    |
| R6                   | 01/309         | " " 4K7                  | "                      | " - 4K7              | 1    |
| R7,8                 | 01/305         | " " 2K2                  | "                      | " - 2K2              | 2    |
| R9                   | 01/397         | " " 22K                  | "                      | " - 22K              | 1    |
| R10                  | 01/393         | " " 10K                  | "                      | " - 10K              | 1    |
| C1                   | 02/93          | CAPACITOR 344 0.1µF 100v | MULLARD                | 344 - 25104          | 1    |
| C1a                  | 02/65          | " ELEC 47µF 40v          | "                      | 030 - 37479          | 1    |
| C2,3                 | 02/61          | " 344 0.22µF 100v        | "                      | 344 - 25224          | 2    |
| C4                   | 02/68          | " CER 0.1µF              | "                      | CZ20C - 1042         | 1    |
| C5                   | 02/147         | " ELEC 33µF 40v          | "                      | 030 - 37339          | 1    |
| C6-9                 | 02/68          | " CER 0.1µF              | "                      | CZ20C - 1042         | 4    |
| RL1-3                | S/O            | RELAY 24v 4POLE          | OMRON                  | LZN04                | 3    |
| RL4,6,RLT1           | 25/401         | " " 2POLE                | "                      | LZN203               | 3    |
| PS1                  | S/O            | VOLTAGE REG. 5v          | NATIONAL               | LM340T-5             | 1    |
|                      | S/O            | HEATSINK                 | REDPOINT               | TV50                 | 1    |
| IC1,2                | 03/243         | IC DUAL OP AMP           | NATIONAL               | LM358N               | 2    |
| VT1                  | 03/222         | TRANSISTOR BC 327        | MOTOROLA               | BC 327               | 1    |
| D1-8                 | 25/353         | DIODE 1N4002             | "                      | 1N4002               | 8    |
| VT1                  | 05/90          | POTR. 100K               | PIHER                  | PT 10V               | 1    |
| LK                   | 13/311b        | 0.5" JACK LINK           | FARNELL                | 103 - 263            | 1    |
|                      | 13/311a        | LINK SOCKET (4 OFF)      | "                      | " - 250              | 4    |
| TP 2                 | S/O            | TEST POINT GREEN         | VERO                   | 63 - 1937K           | 1    |
| TP 1                 | "              | " " WHITE                | "                      | 63 - 1934C           | 1    |
| LED'S                | "              | L.E.D. RED 90° MTG.      | HEWLETT P              | HLMP 5000            | 5    |
| CN1                  | "              | DIN 41612 'C' PLUG       | VERO                   | 17 - 2876D           | 1    |
| P.C.B.               | "              | P.C.B. K12-16-788        | "                      | "                    | 1    |
| CODING BAR           | "              | UNIVERSAL 41612          | VERO                   | 17 - 2856E           | 1    |

S/O - SPECIAL ORDER.

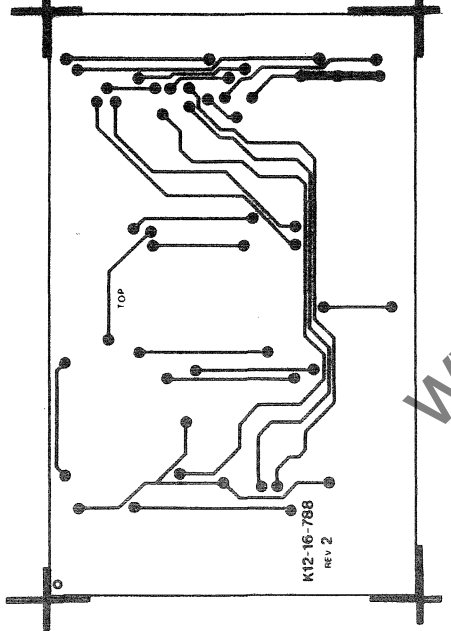
|                        |                   |         |  |  |       |                    |
|------------------------|-------------------|---------|--|--|-------|--------------------|
| THIRD ANGLE PROJECTION | DATE 23,6,86      | A       | WADKIN PLC. LEICESTER  |  | QTY   | MATERIAL           |
| SIMILAR TO             | DRAWN T.J.R. (QC) | CHECKED | DESCRIPTION INTERFACE BOARD ASSEMBLY DRAWING. HYDRAULIC SERVO. |  | SCALE | PART No K12-16-787 |

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| 3  | E        |
|  | D        |
|  | C        |
| 2  | B        |
| T.J.R. 29/7/86   |          |
| FILM DETAILS ADDED.  |          |
| <p>GENERAL TOLERANCES LIMITS &amp; SURFACE FINISH, UNLESS STATED</p> <p>FLATNESS <math>\pm 0.04</math> IN ANY LENGTH UP TO 300. PLUS <math>0.04/300</math> THEREAFTER</p> <p>STRAIGHTNESS <math>\pm 0.05</math> MAX</p> <p>SQUARENESS <math>\pm 0.05</math> MAX</p> <p>PARALLELISM <math>\pm 0.05</math> MAX</p> <p>RUN OUT <math>\pm 0.05</math> MAX</p> <p>CYLINDRICITY <math>\pm 0.05</math> MAX</p> <p>ANGULARITY <math>\pm 0.25</math> MAX</p> <p>SYMMETRY <math>\pm 0.05</math> MAX</p> <p>WHOLE NUMBERS <math>\pm 0.1</math>mm</p> <p>1 DECIMAL PLACE <math>\pm 0.05</math>mm</p> <p>2 DECIMAL PLACE <math>\pm 0.02</math>mm</p> <p>NDR ACCURATIVE</p> <p>▽ - 6.3-25.0 MICRONS ROUGH MFC</p> <p>WV - 1.6-3.2 MICRONS FINISH MFC</p> <p>WVW - 1.6-3.2 MICRONS ROUGH GRD</p> <p>WVWV - 0.8-1.6 MICRONS FINISH GRD</p> <p>ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED</p> <p>MACHINE SHOP NOTE -</p> <p>INSPECTION MUST PASS THE FIRST COMPONENT OF A BATCH BEFORE STARTING THE SECOND</p> <p>REMOVE ALL SHARP EDGES AND BURRS</p> |          |
| 1  |          |

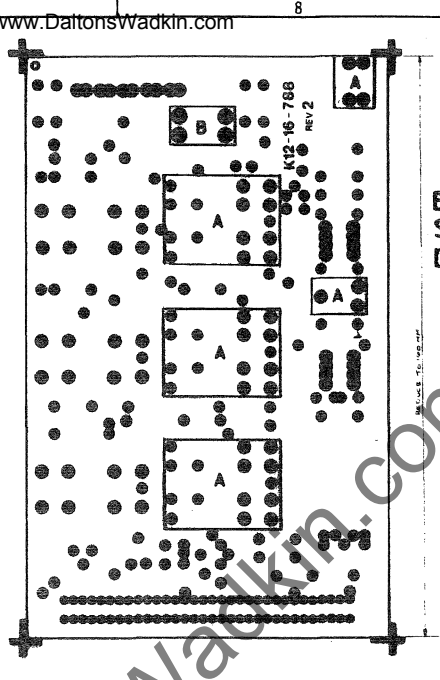


BOTTOM TRACK.

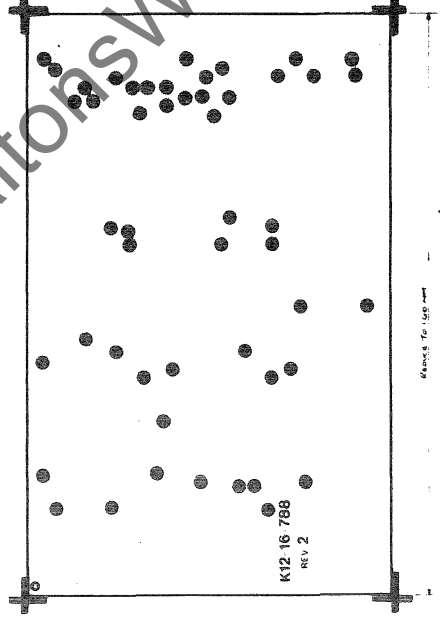
160mm.



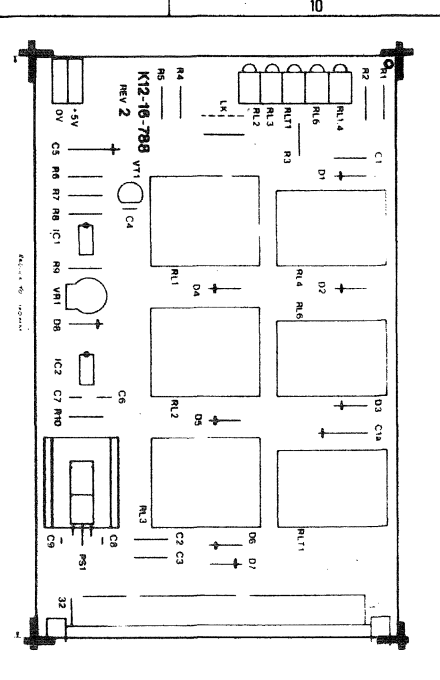
TOP TRACK.



BOTTOM SOLDER RESIST & DRILLING DETAILS.



TOP SOLDER RESIST.



SILK SCREEN.

| HOLE | SIZE  | QTY. |
|------|-------|------|
| A    | 14mm  | 52   |
| B    | 20mm  | 4    |
| C    | 3-2mm | 3    |

219 OFF UNMARKED HOLES TO BE 10mm.

MATERIAL:  
 1/16 INCH FIBREGLASS.  
 1oz COPPER.

o- ALIGNMENT GUIDE.  
 USE THE FOLLOWING FILMS TO PRODUCE BOARD:  
 TOP: TRACK - REV 2  
 SILK SCREEN - REV 2  
 SOLDER RESIST - REV 2  
 BOTTOM: TRACK - REV 2  
 SOLDER RESIST - REV 2

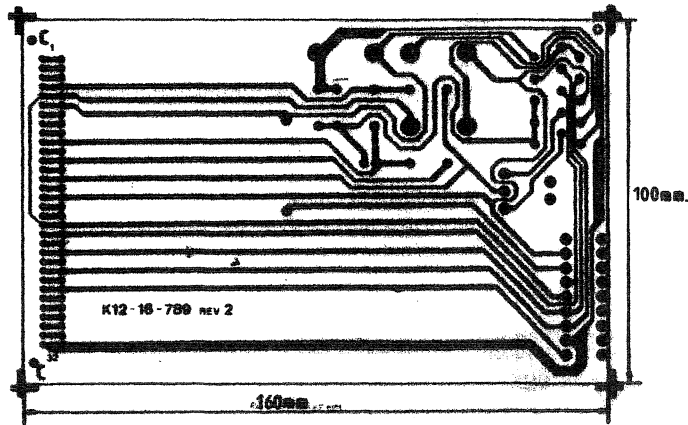
WADKIN PLC. LEICESTER

|                        |                   |  |
|------------------------|-------------------|--|
| THIRD ANGLE PROJECTION | DATE 23,6,86      | A  |
| SIMILAR TO             | DRAWN T.J.R. (QC) | DESCRIPTION  |
| CHECKED                |                   | INTERFACE CARD - HYDRAULIC SERVO RACK. BOARD DETAIL DRAWING. |

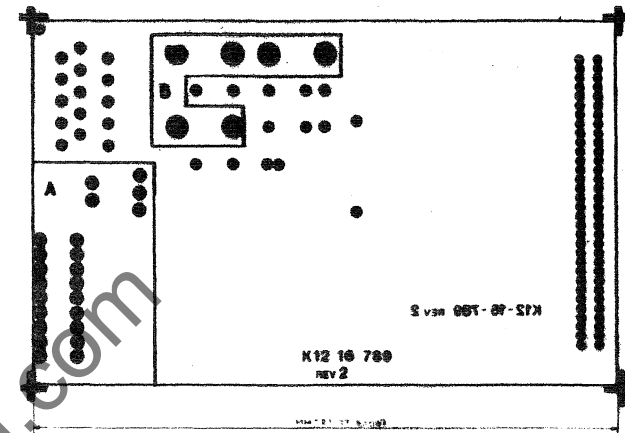
|       |  |            |            |
|-------|--|------------|------------|
|       |  | K12-16-787 | K12-16-784 |
| QTY   |  |            |            |
| SCALE |  |            |            |
|       |  |            |            |

|          |            |
|----------|------------|
| MATERIAL |            |
| PART No  | K12-16-788 |

|  |      |
|--|------|
| ALTERATIONS  |      |
| DATE<br>ALT. No.   | SIG. |
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|  | E    |
|  | D    |
|  | C    |
| T.J.R. 29/7/86   | B    |
| FILM NOTE ADDED.   |      |
| <p><b>GENERAL TOLERANCES, LIMITS &amp; SURFACE FINISH UNLESS STATED</b></p> <p>FLATNESS 0.04 IN ANY LENGTH UP</p> <p>STRAIGHTNESS 1 TO 300, PLUS 0.04/300</p> <p>SQUARENESS 0.025 MAX</p> <p>PARALLELISM 0.025 MAX</p> <p>FINISH 0.025 MAX</p> <p>CYLINDRICITY 0.025 MAX</p> <p>ANGULARITY ±0.25° MAX</p> <p>SYMMETRY</p> <p>WHOLE NUMBERS ±0.1mm NON</p> <p>1 DECIMAL PLACE ±0.05mm ACCUMULATIVE</p> <p>2 DECIMAL PLACE ±0.025mm ACCUMULATIVE</p> <p>FINISH</p> <p>▽ — 3.25 MICRONS ROUGH M/C</p> <p>▽▽ — 1.6 MICRONS FINISH M/C</p> <p>▽▽▽ — 0.8 MICRONS ROUGH GRD</p> <p>▽▽▽▽ — 0.4 MICRONS FINISH GRD</p> <p>ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.</p> <p>MACHINE SHOP NOTE -</p> <p>INSPECTION MUST PASS THE FIRST COMPONENT OF A BATCH BEFORE STARTING THE SECOND</p> <p>REMOVE ALL SHARP EDGES AND BURRS</p> |      |



TRACK.



SOLDER RESIST & DRILLING DETAILS.

| HOLE | SIZE  | QTY. |
|------|-------|------|
| A    | 1.4mm | 23   |
| B    | 3.0mm | 6    |
| C    | 3.2mm | 2    |

93 OFF UNMARKED HOLES TO BE 10mm.

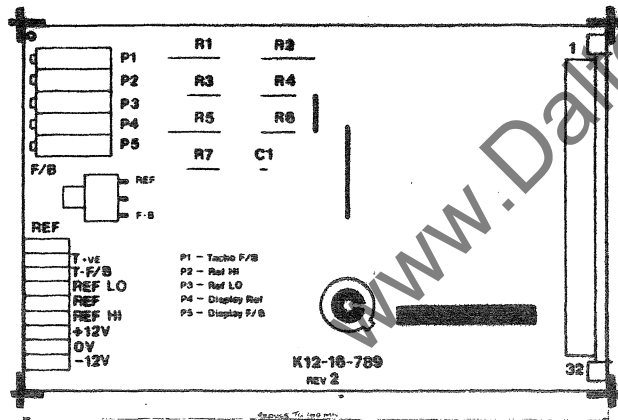
MATERIAL:

1/16 INCH FIBREGASS.  
1oz COPPER.

o-- ALIGNMENT GUIDE.

USE THE FOLLOWING FILMS TO PRODUCE BOARD:

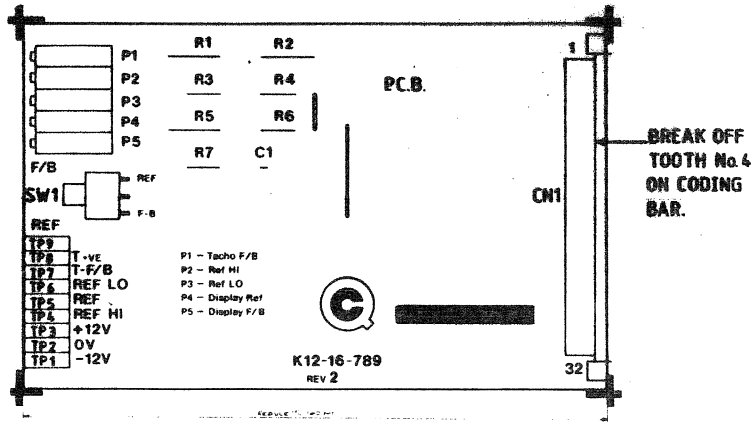
- TRACK - REV 2.
- SILK SCREEN - REV 2.
- SOLDER RESIST - REV 2.



SILK SCREEN.

|                        |                   |         |                       |   |         |                     |
|------------------------|-------------------|---------|-----------------------|---|---------|---------------------|
| THIRD ANGLE PROJECTION | DATE 23,6,86      | A       | WADKIN PLC. LEICESTER |   | QTY. —  | MATERIAL —          |
| SIMILAR TO             | DRAWN T.J.R. (QC) | CHECKED | DESCRIPTION           | PERSONALITY CARD ARTWORKS - HYDRAULIC SERVO RACK. BOARD DETAIL DRAWING. | SCALE — | PART No. K12-16-789 |
|                        |                   |         |                       | K12-16-790  |         |                     |
|                        |                   |         |                       | K12-16-784  |         |                     |

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|---|-------------------|
| ALTERATIONS   |                   |
| DATE  | SIG.              |
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|   | C                 |
| 2   | B                 |
| T.J.R. 29/7/86  |                   |
| CODING BAR & TP9 ADDED.   |                   |
| <p><b>GENERAL TOLERANCES, LIMITS &amp; SURFACE FINISH, UNLESS STATED</b></p> <p>FLATNESS <math>\nabla</math> 0.04 IN ANY LENGTH UP TO 300. PLUS 0.04/300 THEREAFTER</p> <p>SQUARENESS <math>\nabla</math> 0.04 IN ANY LENGTH UP TO 300. PLUS 0.04/300 THEREAFTER</p> <p>PARALLELISM <math>\nabla</math> 0.04 IN ANY LENGTH UP TO 300. PLUS 0.04/300 THEREAFTER</p> <p>RUN OUT <math>\nabla</math> 0.08mm TIR MAX</p> <p>CYLINDRICITY <math>\nabla</math> 0.02mm MAX</p> <p>ANGULARITY <math>\nabla</math> ± 0.25° MAX</p> <p>SYMMETRY <math>\nabla</math> 0.04 IN ANY LENGTH UP TO 300. PLUS 0.04/300 THEREAFTER</p> <p>WHOLE NUMBERS 0.1mm   NON ACCUMULATIVE</p> <p>DECIMAL PLACE 0.05mm   ACCUMULATIVE</p> <p>FINISHES</p> <p>∇ - 3.2-25.0 MICRONS ROUGH M/C</p> <p>∇∇ - 1.6-12.5 MICRONS FINISH M/C</p> <p>∇∇∇ - 0.8-6.3 MICRONS ROUGH GRD</p> <p>∇∇∇∇ - 0.4-3.2 MICRONS FINISH GRD</p> <p>ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED</p> <p>MACHINE SHOP NOTE - INSPECTION MUST PASS THE FIRST COMPONENT OF A BATCH BEFORE STARTING THE SECOND REMOVE ALL SHARP EDGES AND BURRS</p> |                   |
| THIRD ANGLE PROJECTION  | DATE 23,6,86 A    |
| SIMILAR TO  | DRAWN T.J.R. (QC) |
| CHECKED   |                   |

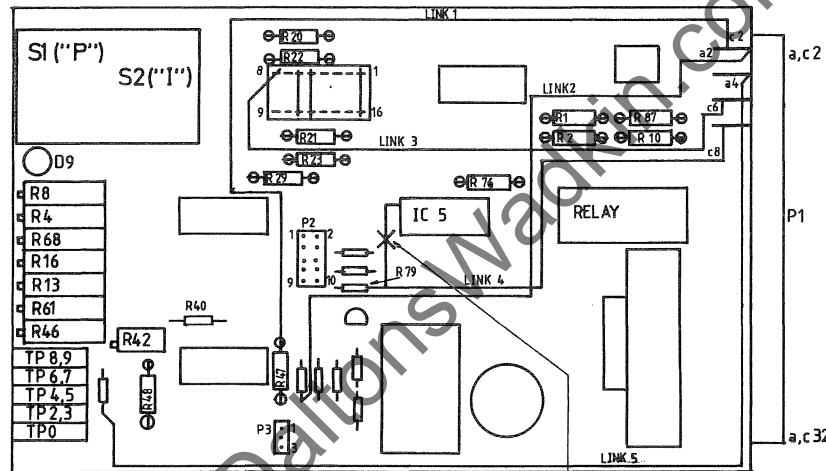


| COMPONENT REFERENCE. | Q.C. STORES No. | DESCRIPTION             | MANUFACTURER/SUPPLIER | MANUFACTURES PART No. | QTY. |
|----------------------|-----------------|-------------------------|-----------------------|-----------------------|------|
| R1                   | 01/398          | RESISTOR 1/4W 27K       | WELWYN                | MFR4 - 27K 2%         | 1    |
| R2                   | 01/397          | " " 22K                 | "                     | " - 22K               | 1    |
| R3                   | 01/293          | " " 75K                 | "                     | " - 75K               | 1    |
| R4                   | 01/399          | " " 33K                 | "                     | " - 33K               | 1    |
| R5                   | 01/393          | " " 10K                 | "                     | " - 10K               | 1    |
| R6                   | -               | NOT FITTED              | -                     | -                     | -    |
| R7                   | -               | LINK                    | -                     | -                     | -    |
| C1                   | 02/80           | CAPACITOR CER. 0.01µF   | THOMSON               | GFO 606C              | 1    |
| P1                   | S/O             | POTR. CERMET 200K       | VERO                  | 90-4912J              | 1    |
| P2                   | -               | " " 2K                  | "                     | 90-4906F              | 1    |
| P3                   | -               | " " 500R                | "                     | 90-4904E              | 1    |
| P4,P5                | -               | " " 10K                 | "                     | 90-4908G              | 2    |
| TP7,8                | -               | TEST POINT GREEN        | "                     | 63-1937K              | 2    |
| TP4-6                | -               | " " BLUE                | "                     | 63-1941A              | 3    |
| TP3                  | -               | " " RED                 | "                     | 63-1935J              | 1    |
| TP2                  | -               | " " BLACK               | "                     | 63-1936D              | 1    |
| TP1                  | -               | " " WHITE               | "                     | 63-1934C              | 1    |
| SW1                  | -               | S.P.C.D. SW. 90° MTG.   | "                     | 63-30241G             | 1    |
| CN1                  | -               | DIN 41612 'C' TYPE PLUG | "                     | 17-2076D              | 1    |
| PC.B.                | -               | PC.B. K12-16-789        | -                     | -                     | 1    |
| CODING BAR           | -               | UNIVERSAL 41612         | VERO                  | 17-2056E              | 1    |
| TP9                  | -               | TEST POINT YELLOW       | "                     | 63-1939L              | 1    |

S/O - SPECIAL ORDER.

|   |  |       |                     |
|---|--|-------|---------------------|
| WADKIN PLC. LEICESTER                               |  | QTY.  | MATERIAL            |
| PERSONALITY CARD ASSEMBLY DRAWING, HYDRAULIC SERVO. |  | SCALE | PART No. K12-16-790 |

| ALTERATIONS   |      |   |
|---|------|---|
| DATE<br>ALT. No.  | SIG. | I |
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|   |      | D |
|   |      |   |
|   |      | C |
|   |      |   |
|   |      | B |
|   |      |   |
| <b>GENERAL TOLERANCES, LIMITS &amp; SURFACE FINISH, UNLESS STATED</b><br>FLATNESS $\square$ 0.04 IN ANY LENGTH UP TO 300, PLUS 0.04/300<br>STRAIGHTNESS $\parallel$ 0.04 IN ANY LENGTH UP TO 300, PLUS 0.04/300<br>SQUARENESS $\perp$ 0.04 THEREAFTER<br>PARALLELISM $\parallel$ 0.04 THEREAFTER<br>RUN OUT $\curvearrowright$ 0.08mm T.I.R. MAX.<br>CYLINDRICITY $\text{⌀}$ 0.05mm MAX.<br>ANGULARITY $\sphericalangle$ $\pm 0.25^\circ$ MAX.<br>SYMMETRY $\equiv$<br>HOLE NUMBERS $\left. \begin{array}{l} \text{1 DECIMAL PLACE } \pm 0.1\text{mm} \\ \text{2 DECIMAL PLACE } \pm 0.1\text{mm} \end{array} \right\} \text{NON ACCUMULATIVE}$<br>V - 6.3-25.0 MICRONS, ROUGH M/C<br>W - 1.6-3.2 MICRONS, FINISH M/C<br>VVV - 1.6-3.2 MICRONS, ROUGH GRD<br>VVVV - 0.4-0.8 MICRONS, FINISH GRD<br>ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED<br><b>MACHINE SHOP NOTE -</b><br>INSPECTION MUST PASS THE FIRST COMPONENT OF A BATCH BEFORE STARTING THE SECOND. |      |   |

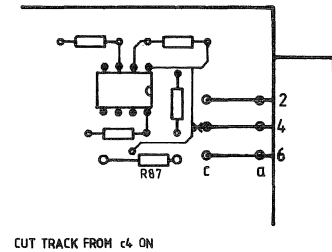


SECURE ALL LINKS TO BOARD

COMPONENT VALUES

- R1 - LINK
- R 2,10,20-23, 87 - OPEN Ckt.
- R40 - 330K
- R47 - 4.3K
- R48 - 270K // 270K
- R76 - 1.5K

CUT TRACK FROM IC 5 PIN 2 TO R79 (33-2K). LINK END OF R79 TO c8 ON EDGE CONNECTOR



CUT TRACK FROM c4 ON EDGE CONNECTOR ALSO BOTH SIDES OF c2 ON THE UNDERSIDE

|                        |                        |   |                              |       |                        |
|------------------------|------------------------|---|------------------------------|-------|------------------------|
| THIRD ANGLE PROJECTION | DATE 23/7/86           | A   | <b>WADKIN LTD. LEICESTER</b> | QTY.  | MATERIAL<br>K12-16-791 |
| SIMILAR TO             | DRAWN C.R.S<br>CHECKED | DESCRIPTION<br>HYDRAULIC CONTROL CARD - MODIFICATIONS |                              | SCALE | PART No.<br>K12-16-792 |

