Wadkin

NV

PROFILE GRINDER

INSTRUCTION MANUAL No. 4012/1

Wadkin

NV

PROFILE GRINDER

CE

MACHINE No.	
TEST No.	

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Wadkin

MANUFACTURERS E.C. DECLARATION OF CONFORMITY

The following machine has undergone "Conformity Assessment" and is "self" certificated in accordance with:-

Supply of Machinery (Safety) Regulations 1992
and Amendment No. 2063

COMPANY

WADKIN LTD
Green Lane Road
Leicester
LE5 4PF

RESPONSIBLE PERSON

Mr A Lott (Managing Director)

MACHINE DESCRIPTION

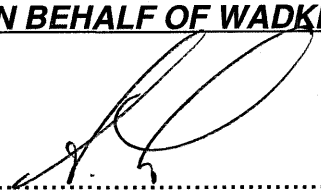
TYPE PROFILE GRINDING MACHINE

MODEL NV

DIRECTIVES COMPLIED WITH

Supply of Machinery (Safety) Regulations 1992
Amendment No. 2063 1994
Draught Proposal CEN/TC 142
ISO 9001 Part 1

SIGNED ON BEHALF OF WADKIN LTD



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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.

THIS MANUAL IS WRITTEN AS A GENERAL GUIDE. A TYPICAL MACHINE IS SHOWN TO ILLUSTRATE THE MAIN FEATURES.

Failure to comply with instructions in this book may invalidate the guarantee.

BE CAREFUL
THIS MACHINE CAN BE DANGEROUS
IF IMPROPERLY USED

Always use guards.
Keep clear until rotation has ceased.
Always operate as instructed
and in accordance with good practice.
Read instruction manual before installing,
operating or maintaining machine.

Manufactured by : WADKIN PLC
Green Lane Road
Leicester
LE5 4PF
England

Telephone No.: 0116 276 9111
Fax No. : 0116 274 2389

CE

HEALTH AND SAFETY

The CE mark on this machine signifies that an EC declaration of conformity is drawn up indicating that the machine is manufactured in accordance with the Essential Health and Safety Requirements of the 'Supply of Machinery (Safety) Regulations 1992'.

The 'requirements for supply of relevant machinery' in the General Requirement of the Regulations are not only that the machine satisfies the relevant essential health and safety requirements, but also that 'the manufacture ..... carries out the necessary research or tests on components, fittings or the complete machine to determine whether by its design or construction the machine is capable of being erected and put into service safely'.

Persons who install this machine have duties under the 'Provision and use of Work Equipment Regulations 1992'. An indication of these duties is given in the following extracts, but the user should be familiar with the full implications of the regulations.

REGULATION 5 requires that;

Every employer shall ensure that work equipment is so constructed or adapted as to be suitable for the purpose for which it is used or provided.

In selecting work equipment, every employer shall have regard to the working conditions and to the risks to health and safety of persons which exist in the premises or undertakings in which that work equipment is to be used and any additional risk posed by the use of that work equipment.

Every employer shall ensure that work equipment is used only for the operations for which, and under conditions for which, it is suitable.

In this regulation 'suitable' means suitable in any respect which it is reasonably foreseeable will affect health or safety of any person.

The Provision and Use of Work Equipment Regulations also include requirements as follows:-

regulation 6 - maintenance

regulation 7 - specific risks

regulation 8 - information and instructions

regulation 9 - training

Note :-

Attention is drawn to those requirements of the 'Woodworking Machines Regulations 1974' which are not replaced by the Supply of Machinery (Safety) Regulations or other, e.g; Regulation 13 of the Woodworking Machinery Regulation, - 'Training', still applies.

Whilst the prime duty for ensuring health and safety rests with employers, employees too have legal duties, particularly under sections 7 and 8 of the Health and Safety at Work Act. They include :-

Taking reasonable care for their own health and safety and that of others who may be affected by what they do or don't do;

co-operating with their employer on health and safety;

not interfering with or misusing anything provided for their health, safety and welfare.

These duties on employees have been supplemented by regulation 12 of the Management of Health and Safety at Work Regulations 1992. One of the new requirements is that employees should use correctly all work items provided by their employer in accordance with their training and the instructions they receive to enable them to use the items safely.

Noise

Noise levels can vary widely from machine to machine depending on the conditions of use. Persons exposed to high 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 Noise at Work Regulations 1989 place legal duties on employers to prevent damage to hearing.

There are three levels of noise defined in regulation 2;

The first action level :-

a daily personal noise exposure ($L_{EP,d}$) of 85dB(A)

HEALTH AND SAFETY

The second action level :-

a daily personal noise exposure ($L_{EP,d}$) of 90dB(A)

The peak action level :-

a peak sound pressure of 200 pascals (140dB re 20pa)

The exposure level is obviously influenced by the emission level of all the equipment in use.

Emission levels for machines are provided in the particular machine instruction manual.

These levels are measured in accordance with ISO 7960 under certain specified test conditions, they do not necessarily represent the highest noise level, which is influenced by many factors, eg number of spindles in operation, type and condition of work piece, spindle speeds etc.

For regulations and information on relevant personal protective equipment i.e. ear defenders, employers should refer to the Personal Protective Equipment at Work Regulations 1992.

Dust

Wood dust can be harmful to health by inhalation and skin contact and concentrations of small particles in the air can form an explosive mixture.

The Control of Substances Hazardous to Health Regulations (COSHH) 1989 place legal duties on employers to ensure that :-

the exposure of his employees to substances hazardous to health is either prevented or, where this is not reasonably practicable, adequately controlled.

..... adequate control to exposure of employees to a substance hazardous to health shall be secured by measures other than the provision of personal protective equipment.

where the measures taken in accordance with the paragraph above do not prevent or provide adequate control of exposure to substances hazardous to the health of employees, then in addition to taking those methods, the employer shall provide those employees with such suitable personal protective equipment as will adequately control their exposure to substances hazardous to health.

Instructions for Use

Machinery manufacturers are required by the Supply of Machinery Safety Regulations to provide comprehensive 'Instructions for Use' of equipment, it is important that this information is transmitted to the person using the machine.

IMPORTANT

SAFETY PROCEDURES AND CONSIDERATIONS

To ensure safe working conditions, persons operating and assisting with the operation of this machine must ensure that they read and fully understand the instructions given within this manual and have received sufficient training in the use of the machine and the safety aspects to be observed.

Grinding wheels that are damaged or improperly used are dangerous. All users should take sensible precautions in their handling, storage mounting and use.

If a grinding wheel breaks whilst running, pieces fly from the wheel. The wheel guard must always be used.

The grinding process produces sparks and dust. Eye protection must always be used. Coolant should always be used to prevent airborne dust.

Safety requirements for installing, operating and maintaining the machine are described in the relevant sections of this manual.

Keep the floor area around the machine clean and free from refuse. Do not allow the floor around the machine to become slippery.

Stop the machine and report immediately to a person in authority any actual or potential malfunction or operator hazard. Do not attempt to repair or rectify the machine unless qualified and authorised to do so.

The operator must not leave the machine running whilst unattended.

Never by-pass interlocks.

Note :-Persons under the age of 18 years must not operate the machine except during a course of training under the supervision of a trained operator.

WARNING :-

Failure to observe correct operating procedures prior to and during operation of this machine can result in severe injury.

DO NOT attempt to operate the machine while under the influence of anything that reduces your alertness.

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SECTION 1 : GENERAL DESCRIPTION

1.1 MACHINE LAYOUT

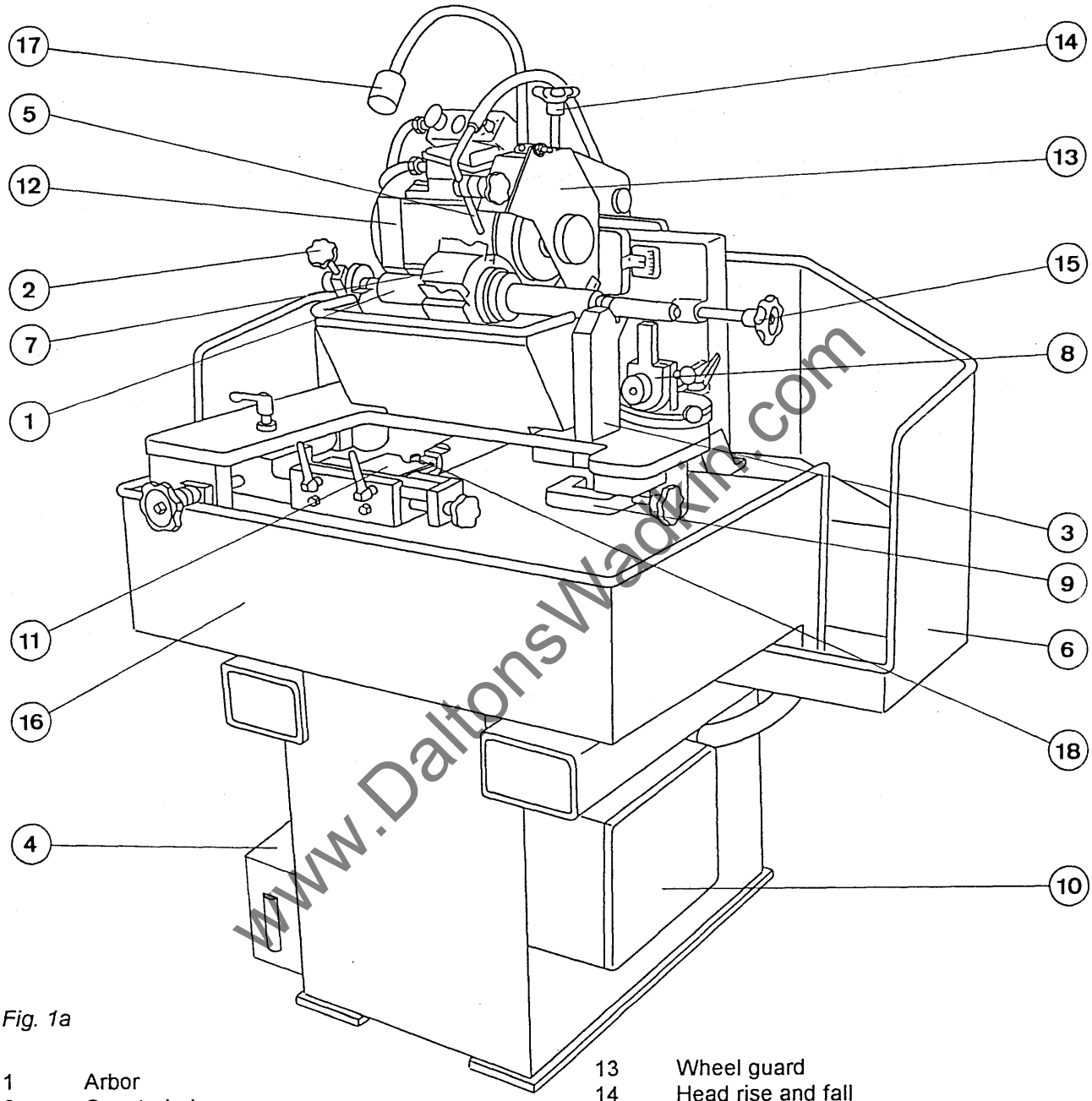

Fig. 1a

1	Arbor
2	Counterbalance
3	Arbor support
4	Coolant tank
5	Coolant nozzle
6	Coolant drip tray
7	Cutterhead
8	Dresser
9	Dresser location
10	Electrical cabinet
11	Template slide
12	Head motor
13	Wheel guard
14	Head rise and fall
15	Head tilt
16	Carriage
17	Worklamp
18	Stylus

1.2 INTENDED USES

The Wadkin profile grinding machine type NV is a tool grinding machine designed for the grinding and re-grinding of various types of cutters used primarily in the woodworking industry.

Profile grinding is used for the grinding and re-grinding of shaped profiles onto cutters used for producing timber mouldings.

The blank cutters are set into the cutterhead prior to profile grinding, and the cutterhead mounted onto the grinder. A 'mirror image' template, made 1 : 1, ensures that all the cutters are not only ground to the same shape, but they are also in the same position laterally, and as near as possible radially. The finished ground block containing 2, 4, 6, 8 or more knives is transferred to the machine on which it is to be used, without further movement of the cutters.

A bi-linear carriage is used to support the cutterhead on a free rotating arbor, together with the template and dresser unit. A cutter rest and stylus are mounted off the grinding head in front of the wheel.

The template is made to match the required timber profile, and the grinding wheel is dressed to match the form of the stylus.

Grinding is a manual operation requiring the operator to keep the cutter in contact with the cutter rest and move the carriage to keep the template in contact with the stylus.

A wet grinding coolant system is provided to prevent burning of the cutters and to remove the dust and debris generated during the grinding process.

Note: This machine is not designed for the grinding of aluminium, magnesium or other materials which might create risks of fire or explosion. It is not designed for use in an explosive atmosphere.

1.3 TECHNICAL SPECIFICATION

MACHINE CAPACITY

Maximum length of cutter profile :

Model NV230	230 mm	(9")
Model NV300	310 mm	(12.25")
Maximum cutting circle :	300 mm	(11.8")
Minimum cutting circle :	75 mm	(3")
Maximum depth of profile :	40 mm	(1.57")

GRINDING WHEELS

Diameter	230 mm	(9")
Width	5 mm	(0.197")
Dressed width	4.7 mm or 3.0 mm	
Bore	31.75 mm	(1.25")

SPINDLE SPEED :

With 50 Hz supply	3000 rpm
With 60 Hz supply	3600 rpm
Variable speed (option)	1500 - 3000 rpm

MOTOR OUTPUTS

Profile grinding spindle	1.5 Kw	(2 h.p.)
Coolant pump	0.06 Kw	(0.08 h.p.)

COOLANT SYSTEM

Tank capacity - maximum	36 litre	(8 galls)
- minimum	18 litre	(4 galls)

WORKLAMP ..... 24v / 20w Halogen

MACHINE DIMENSIONS

Height	1500 mm	(59")
Width	1270 mm	(50")
Depth	1100 mm	(43")
Weight (nett)	450 kg	(990 lbs)

Note

This unit will operate between 41 & 104 Deg. F (5 to 40 Deg. C); upto 3300ft (1000m); 20% to 95% RH (non condensing); and transportation and storage conditions of –13 to 131 Deg. F (-25 to 55 Deg. C).

NOISE EMISSION VALUES

MACHINE CRITERIA :

The machine was free standing on a concrete floor, not bolted down and not on any vibration dampening.

GRINDING CRITERIA :

Knives : Solid HSS 8 mm x 60 mm serrated back

Wheel :	GW 203, 230 mm dia.
Speed :	3000 rpm
Depth of cut :	0.3 mm

The figures quoted in the noise emission chart are emission levels and not necessarily safe working levels.

Whilst there is a correlation between emission levels and exposure levels, this cannot be used reliably to determine whether or not further precautions are required to achieve safe working levels.

Factors that influence the actual level of exposure to the work force include the duration of exposure, the characteristics of the work room, sources of noise etc. i.e. the number of machines and other adjacent processes, also the permissible exposure levels can vary from country to country.

Emission levels, however will enable the user of the machine to make a better evaluation of the 'hazard and risk'.

NOISE EMISSION CHART

MODEL :- *NV*

TYPE :- *NV 300 50Hz 415v*

DECLARED NOISE EMISSION VALUE in accordance with ISO 4871

	Idling	Operating
Declared A-weighted sound power level L_{WAd} ,in dB re 1 pW:	74	85
Declared A-weighted emission sound level (L_{pAd}) in dB re 20 µPa at the operator's position	61	72
Environmental correction factor (K)	3	

values determined according to specific test code ISO 3744

VIBRATION LEVEL

At carriage ..... Less than 2.5 m/s²

Values determined using the machine and grinding criteria described above.

1.4 PROFILE GRINDING THEORY

PROFILE DEVELOPMENT

The profile ground on a cutter is a geometrically developed shape of that profile which is to be machined onto the timber.

If the cutting action of a shaped cutter is examined, *Fig. 1b*, it will be observed that the outer cutting edge reaches the maximum depth of cut before the inner, and that the maximum depth of cut for both edges occurs when the edge passes a line drawn through the horizontal plane of the cutterhead, (X - X).

If the cutting angle (A) was 0^{o}, the cutter would be ground in the horizontal plane (X - X) and the finished profile would match the template. However, most cutterheads have a cutting angle (A) of between 15^{o} and 45^{o}. This necessitates the use of the cutter rest, to allow rotation of the cutterhead whilst grinding.

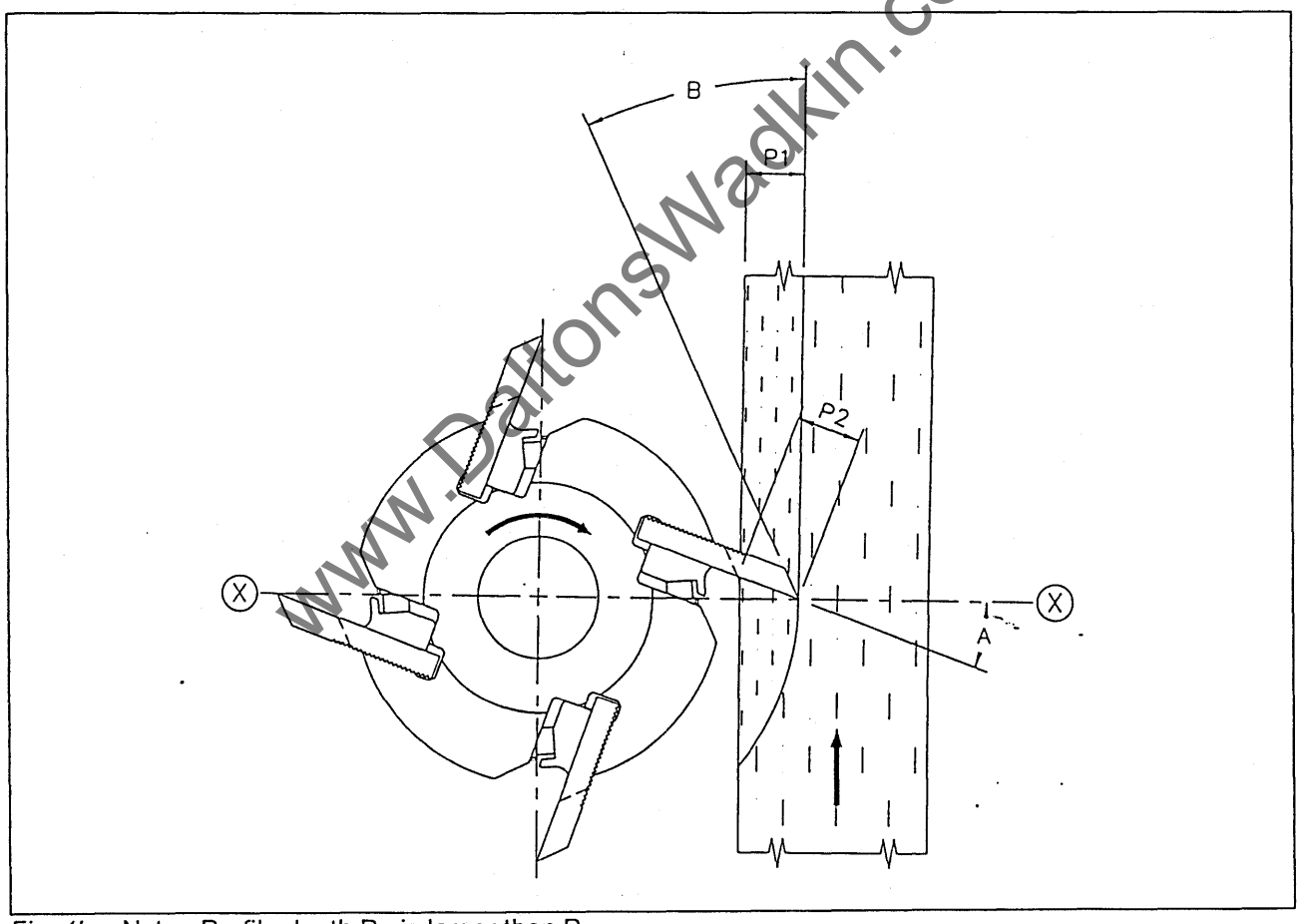

Fig. 1b Note : Profile depth P_2 is larger than P_1.

GRINDING THE DEVELOPED PROFILE

On the grinder the cutterhead is rotated so that the cutter comes into contact with a fixed height rest, so ensuring that the cutter is brought into the same plane (X - X) and angle (A) as it is when cutting. This means that although the template is an exact 1 : 1 mirror image of the finished article (P_1), because the grinding occurs at the same angle at which cutting takes place, a 'developed' shape (P_2) is actually ground onto the cutter. This automatically elongates the profile so that it produces the correct depth of mould on the finished article.

The cutter rest also ensures that each cutting edge ground is in the same plane as the template.

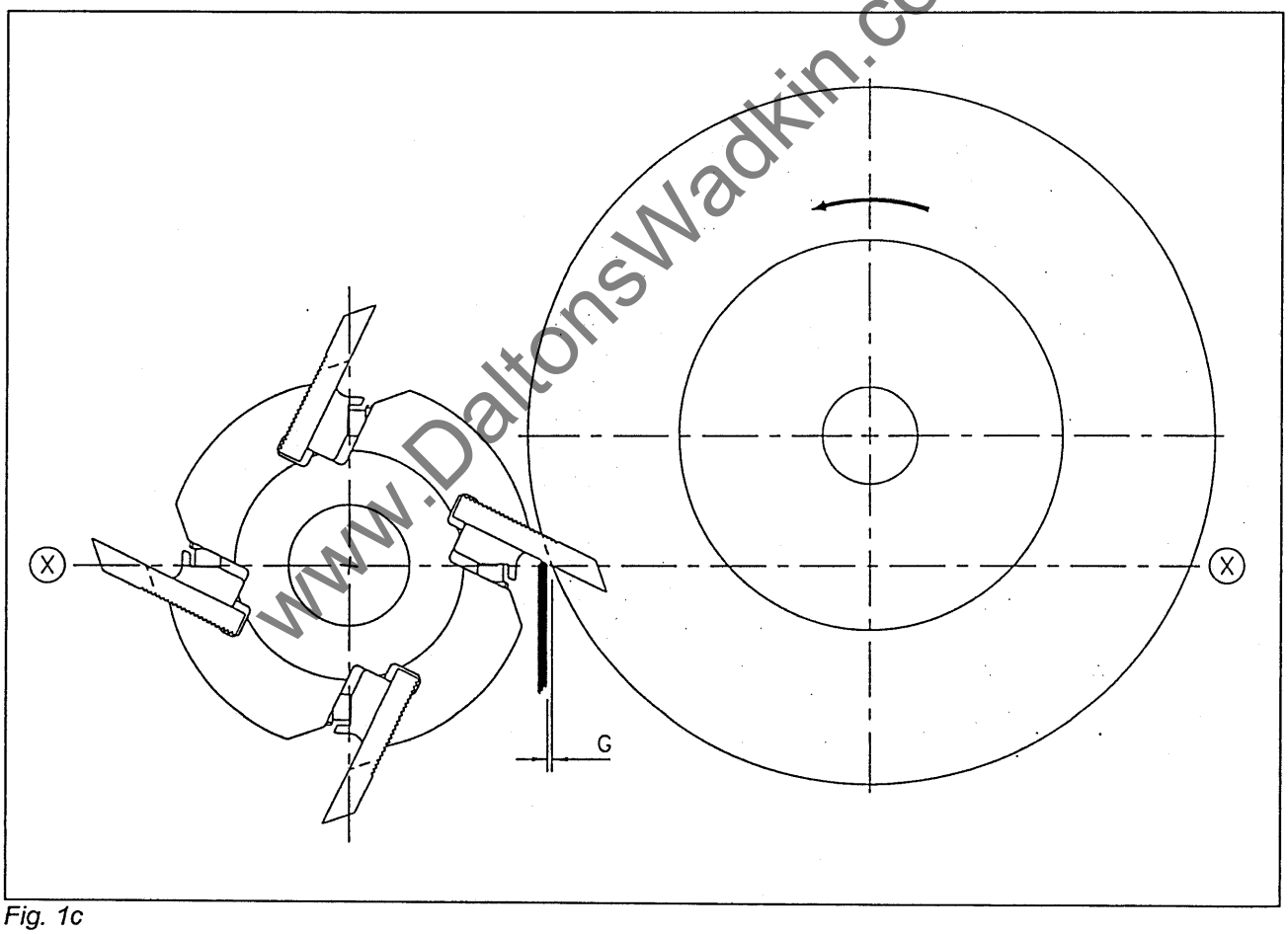

Fig. 1c

CUTTER REST GAP

Theoretically the cutter rest and the ground edge of the cutter should be at the same point, [the theoretical grinding point], however for practical considerations there must be a gap (G) between the cutter rest and the wheel. *Fig. 1c.*

There should be a gap of about 0.5 mm for finish grinding to achieve the best accuracy of profile shape. The gap can be increased up to 2 mm when roughing out blank cutters to allow greater coolant flow for cooling and washing away debris.

The height of the cutter rest is also important to maintain the theoretical grinding point level with the horizontal plane (X - X) of the cutterhead. Deviations will create inaccuracies in depth of profile and require compensation when grinding side relief. The cutter rest should be kept in good condition and replaced when worn.

CUTTING AND CLEARANCE ANGLES

The cutting angle (A) (*Fig. 1b*) theoretically varies from the top to the bottom of the profile as the cutterhead rotates. The angle is however determined by the particular cutterhead and cannot be altered on the profile grinder.

The clearance angle (B) (*Fig. 1b*) is set on the grinder by raising or lowering the position of the grinding wheel. The angle chosen will depend on the type of cutter, type of timber, jointing requirements etc. for the job in hand.

SIDE RELIEF

Side relief (or side clearance) may be necessary to prevent rubbing or burning of the cutters when machining timber, depending on the profile shape.

When the profile has been finish ground the head (wheel) is tilted to the left or right to grind side relief using the same template setting. The objective is to grind clearance without altering the shape of the ground profile. This is achieved in practice by leaving a small land or unground portion of the ground profile. The smaller the land, the longer the cutter will perform without burning.

The machine is arranged such that the wheel tilts about the theoretical grinding point and a minimum land is produced. In practice however factors such as worn cutter rests, cutter rest gap, etc. may cause a larger land or alteration of the ground profile to occur. This should be compensated for by adjustment of the left / right template position.

Normally a relief angle of about 5^{0} is sufficient but can be increased up to as much as 15^{0} if required. Some profiles such as grooving cutters require both left and right side relief.

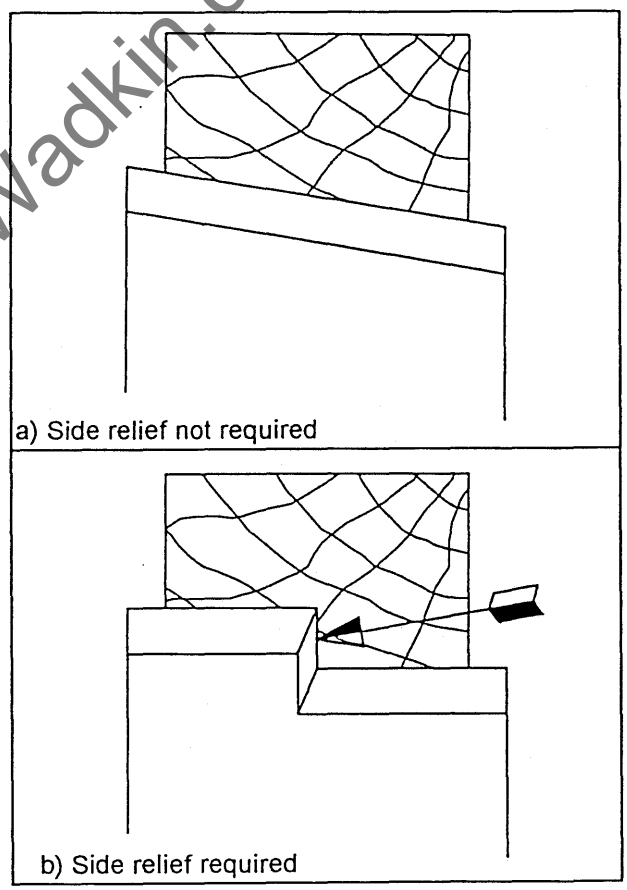

Fig. 1d

SECTION 2 : INSTALLATION

2.1 MOVING THE MACHINE

Verify the weight of the machine which is given in the Technical Specification (see section 1.3). Ensure that all lifting equipment used is capable of lifting this weight as a minimum.

Always use the lifting points provided. Lifting using other parts of the machine can be dangerous and can cause damage to the machine.

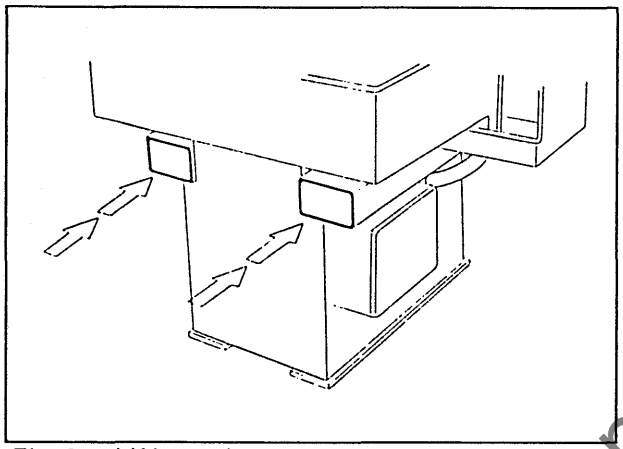

Fig. 2a Lifting points

The machine is designed to be easily lifted and manoeuvred using a fork lift truck. The forks should be at least 850 mm (34") long, not more than 125 mm (5") x 63 mm (2 1/2") in section, and capable of lifting the machine weight.

Carefully slide the forks directly into the rectangular hollow steel lifting sections and lift ensuring that the machine body remains parallel with the floor.

If slings are used to move the machine, place a suitable sling through each of the rectangular hollow steel sections of the machine base and bring one end of each up behind the rear coolant tray and the other end of each up the front of the machine.

It is very important to ensure that the lifting slings are suitably arranged to enable the machine to be lifted so that the body is parallel to the floor prior to its siting. Take care to ensure that the slings do not cause damage to the sheet metal covers etc. during lifting.

Note: Transit clamps are fitted by Wadkin to prevent damage to the machine during transit. If the machine is moved at a later date it is important that the transit clamps are re-fitted before the machine is moved.

2.2 SPACE REQUIREMENTS

The foundation plan *Fig. 2b* shows minimum distances for positioning the machine near to walls etc. It should be noted that these are minimum distances and more space should be provided if possible for ease of access during routine maintenance.

It is recommended that a workbench or table be located within easy reach of the machine for loading cutterheads onto arbors etc. An area should also be provided for work in progress.

The operator's working area at the front of the machine should allow sufficient space for safe loading and unloading of the machine. The actual size will depend on the layout of the toolroom, location of workbench etc. The working area should not be cramped.

2.3 FOUNDATIONS

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

A good wooden floor should provide adequate foundation for the machine provided that it does not transmit vibration from adjacent machinery.

The machine should be bolted down before use. Final bolting down is carried out during final levelling.

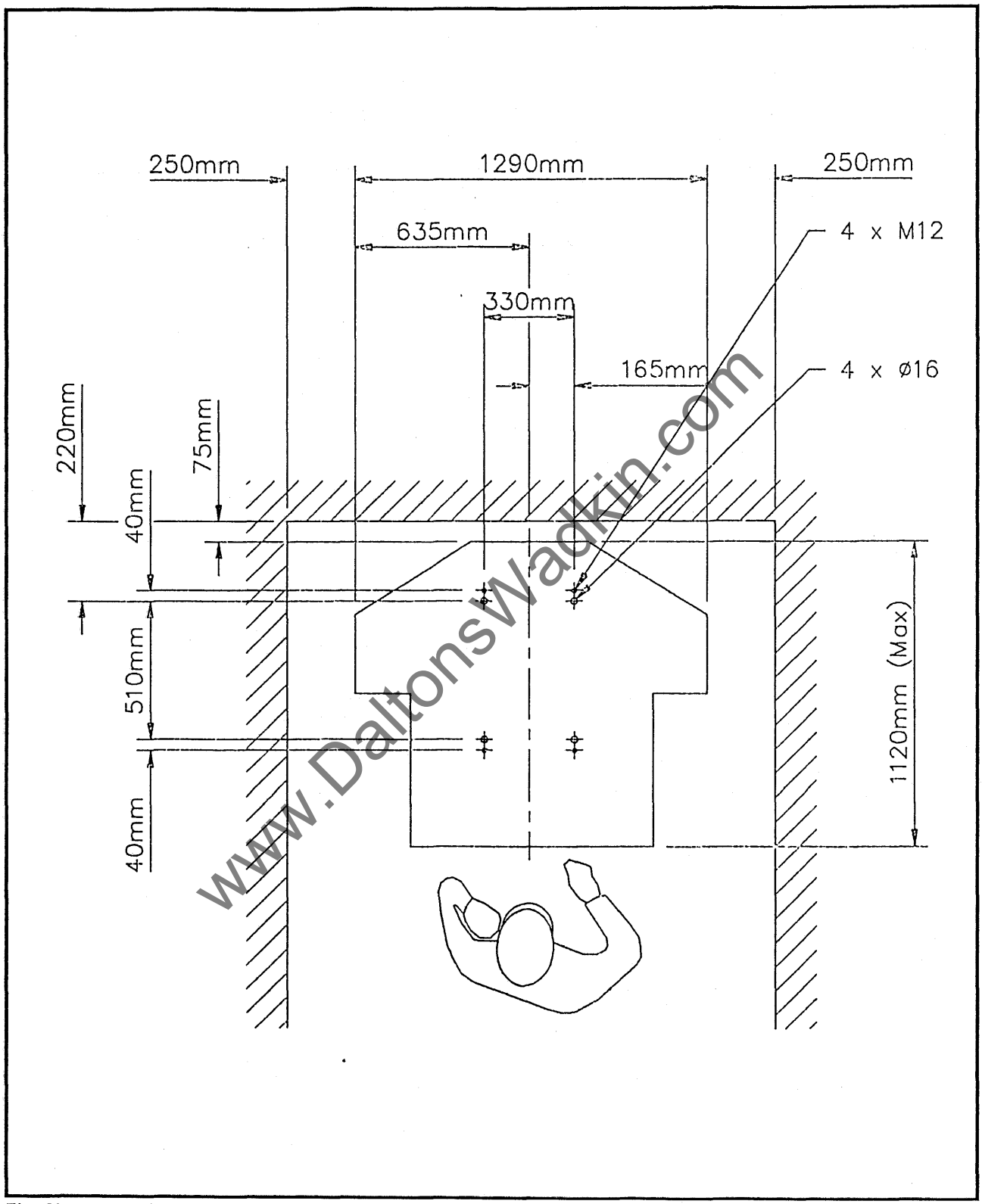

Fig. 2b Foundation plan

2.4 LEVELLING

IMPORTANT : THIS MACHINE MUST BE CORRECTLY LEVELLED.

The machine should be set to a spirit level by adjusting the four levelling screws on the machine base. At this point the transit clamps should be removed and final levelling carried out.

Level the machine such that the carriage will slide with equal ease to either the left or the right. The carriage must not have a tendency to slide towards the grinding wheel. It should be neutral, or tend to slide towards the operator to prevent unintentional contact with the grinding wheel when released.

2.5 TRANSIT CLAMPS

The transit clamps must only be removed from the machine after it has been finally sited and should be kept safe for possible future use if it ever becomes necessary to move the machine again.

The transit clamps (*Fig. 2c*) consist of a central clamp bar assembly [5] and four clamp bolt / stud assemblies [4] which should be released in the following sequence :-

(Refer to *Fig. 2d, e, f*)

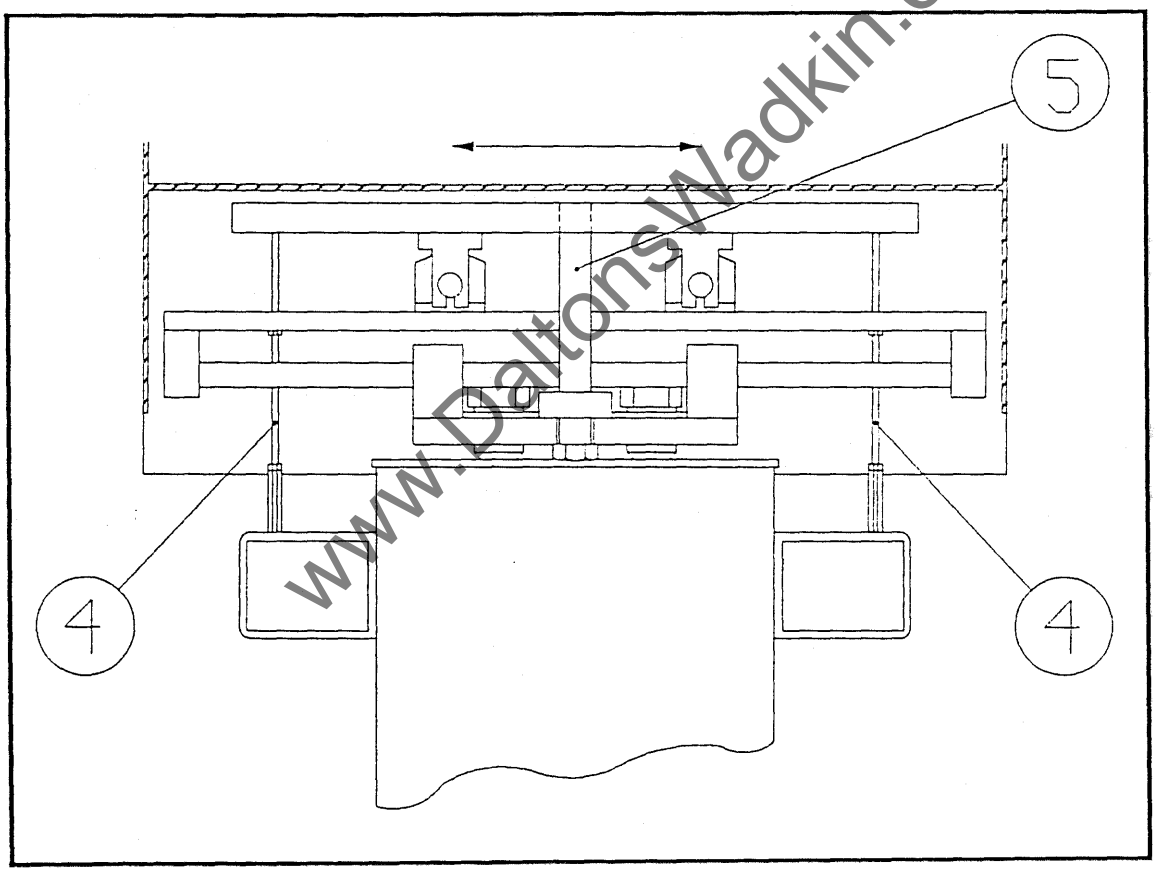

Fig. 2c Transit clamps

1) Release the locknut [1] and nut [2] and screw upwards, well clear of the machine base. Repeat at all four positions.

2) Undo the two M8 hexagon socket screws holding the restraining collar [6] at the front of the bottom carriage plate of the machine.

3) Pull the machine carriage forward so that the transit clamp bar [5] and restraining collar [6] clear the bottom carriage plate. (*Fig. 2e*)

4) Slide the restraining collar off the transit clamp bar.

5) Unscrew the transit clamp bar from the top carriage plate. (*Fig. 2f*)

6) Move the machine carriage carefully to the left so that the transit clamp bolts clear the machine base.

7) Release locknut [3] and unscrew the stud [4] from the machine carriage plate. Repeat for second stud.

8) Move machine carriage carefully to the right so that the transit clamp bolts clear the machine base and remove the final two studs.

To refit the transit clamps, simply follow this procedure in reverse order.

NOTE : DO NOT ATTEMPT TO UNSCREW THE TRANSIT CLAMP BAR WHILST IT IS STILL HELD BY THE RESTRAINING COLLAR. FAILURE TO OBSERVE THIS PRECAUTION WILL LEAD TO DAMAGE BEING INCURRED TO THE MACHINE CARRIAGE.

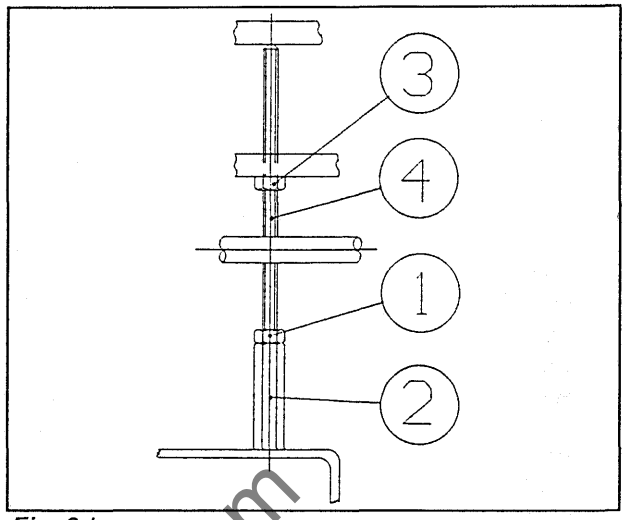

Fig. 2d

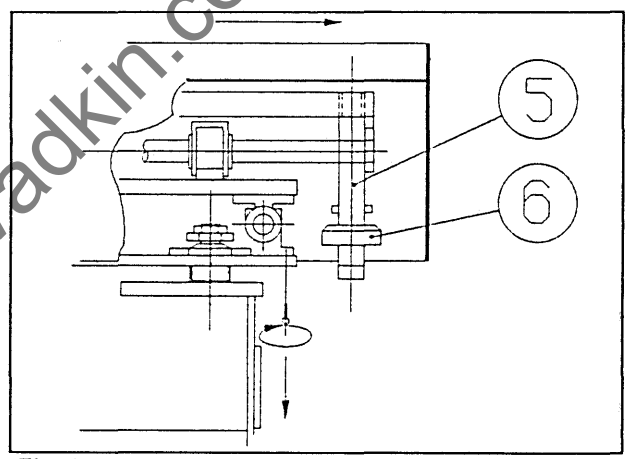

Fig. 2e

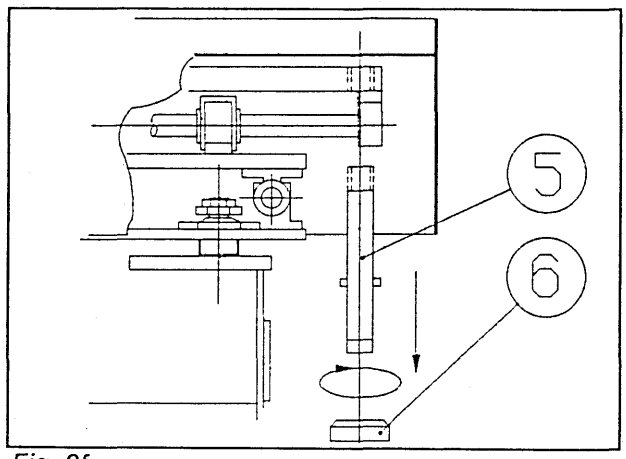

Fig. 2f

2.6 ELECTRICAL SUPPLY

IMPORTANT : ELECTRICAL WORK SHOULD BE CARRIED OUT BY A COMPETENT ELECTRICIAN

US & Canada - All supply wiring and conduit sizes must be sized in accordance with the NEC (National Electric Code – NPFA 70) and applicable state, county or jurisdictional codes, or CEC (Canadian Electric Code)

The customer is responsible for an adequate electrical supply. Details of the power requirements are provided on the machine nameplate. The electrical cabling between the motor and the attendant control gear has been carried out by Wadkin prior to despatch. It will only be necessary to connect the 3 - phase power supply to the incoming terminals L1, L2 and L3 at the disconnect switch which is mounted on the rear of the coolant tray.

ENSURE THAT THE MACHINE IS CONNECTED SOLIDLY TO EARTH.

1) Check that the electrical supply details on the machine nameplate correspond to the electrical supply available and select the size of main cable to correspond to the current indicated on the machine nameplate.

2) Check that the fuses at the electrical supply distribution board are correct.

3) Check that all connections are sound.

Power line to machine should be protected with in-line fuses, rated as listed below, or with equivalent fuses to meet local requirements.

Fuse Details :

	GEC Spec.	Fuse Size
575v	NIT 16 BS 88	16 Amp
460v	NIT 16 BS 88	16 Amp
415v	NIT 16 BS 88	16 Amp
380v	NIT 16 BS 88	16 Amp
230v	NIT 20 BS 88	20 Amp

2.7 LIGHTING

The area where the machine is installed should be provided with ambient lighting of normal intensity. The machine is equipped with a worklamp for illumination of the immediate working area around the grinding wheel. Adequate lighting is essential for safe operation of this machine.

2.8 CLEANING

The machine is despatched from Wadkin with all bright surfaces covered with a rust preventative. This must be carefully removed with a cloth damped with paraffin or diesel.

Ensure that the area around the machine is clean, free from oil, and anything that is likely to cause tripping or slipping.

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SECTION 3 : PREPARATION FOR USE

3.1 TRAINING

Grinding operators should be trained in the safe use of each machine which they operate. They must also be given instructions in the safe use of grinding wheels.

It is recommended that personnel involved with the machine are aquainted with the Woodworking Machines Regulations 1974 and also Booklet Number 14 'Safety In The Use Of Woodworking Machines', issued by the Department of Employment and available from Her Majesty's Stationary Office. Also Code of Practice 'Safeguarding Woodworking Machines' Part1 BS6854.

Personnel involved with the use of grinding wheels should be aquainted with the Abrasive Industries Association leaflets 'Safety In The Use Of Abrasive Wheels (General)' and 'DO'S and DONT'S - Safety Guide For Grinding Wheel Users'. Also the Health and Safety Series Booklet HS(G)17, FEPA Safety Code 12-GB-1987 and HSE Guidance Book Note PM22.

In the U.K., the Health and Safety at Work Act (1974) requires that :-

NO PERSON SHALL MOUNT ANY GRINDING WHEEL UNLESS HE HAS BEEN TRAINED AND APPOINTED IN ACCORDANCE WITH THE ABRASIVE WHEELS REGULATIONS 1970 No.535 (REGULATION 9).

It is a statutory requirement that the person who mounts grinding wheels onto the grinding machine shall be a trained and competent person appointed by the factory occupier, and whose name must be registered in an appropriate register.

In other areas local regulations should be checked and adhered to.

In-house training courses for grinding machine operators are run by Wadkin at the Green Lane Road works in Leicester. Demonstrations can also be arranged, contact Wadkin for further details.

3.2 COOLANT SYSTEM

Before handling coolant fluids all operators should be familiar with the appropriate Health and Safety precautions - see Appendix A2.

Refer to *Fig. 3a*

The coolant tank [1] should be withdrawn from the left of the machine base. The coolant fluid supplied with the machine should be mixed in the tank according to instructions. The tank is then repositioned in the machine base.

Check that the drain pipe [2] is correctly positioned over the tank.

The metal filtration magnet [3] should be placed in the coolant tray [4] close to the drain hole outlet. Take care to ensure that fingers are not 'nipped' - the magnet is very strong. (The magnet should not be placed in the tank.)

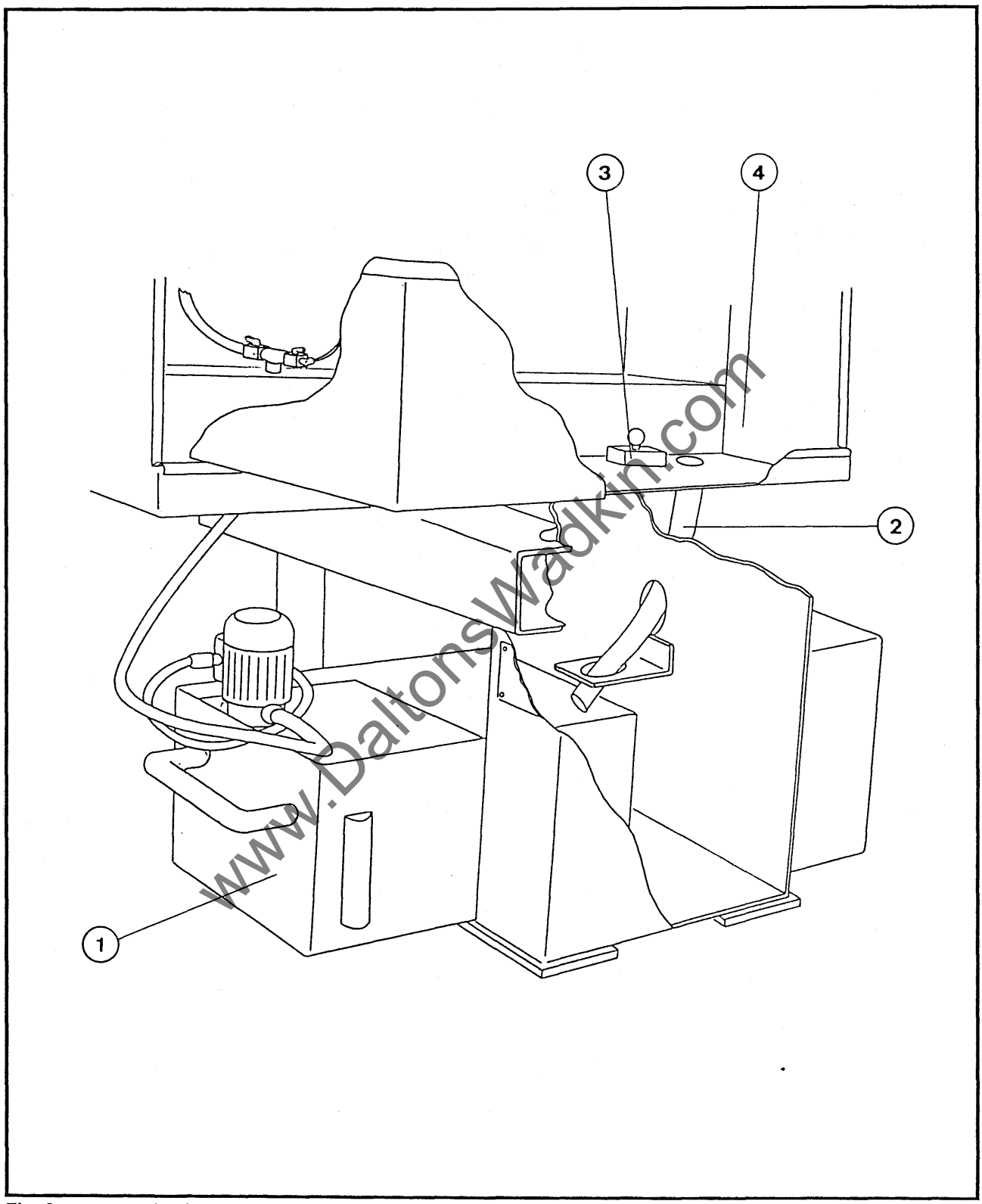


Fig. 3a Coolant system

3.3 CONTROLS

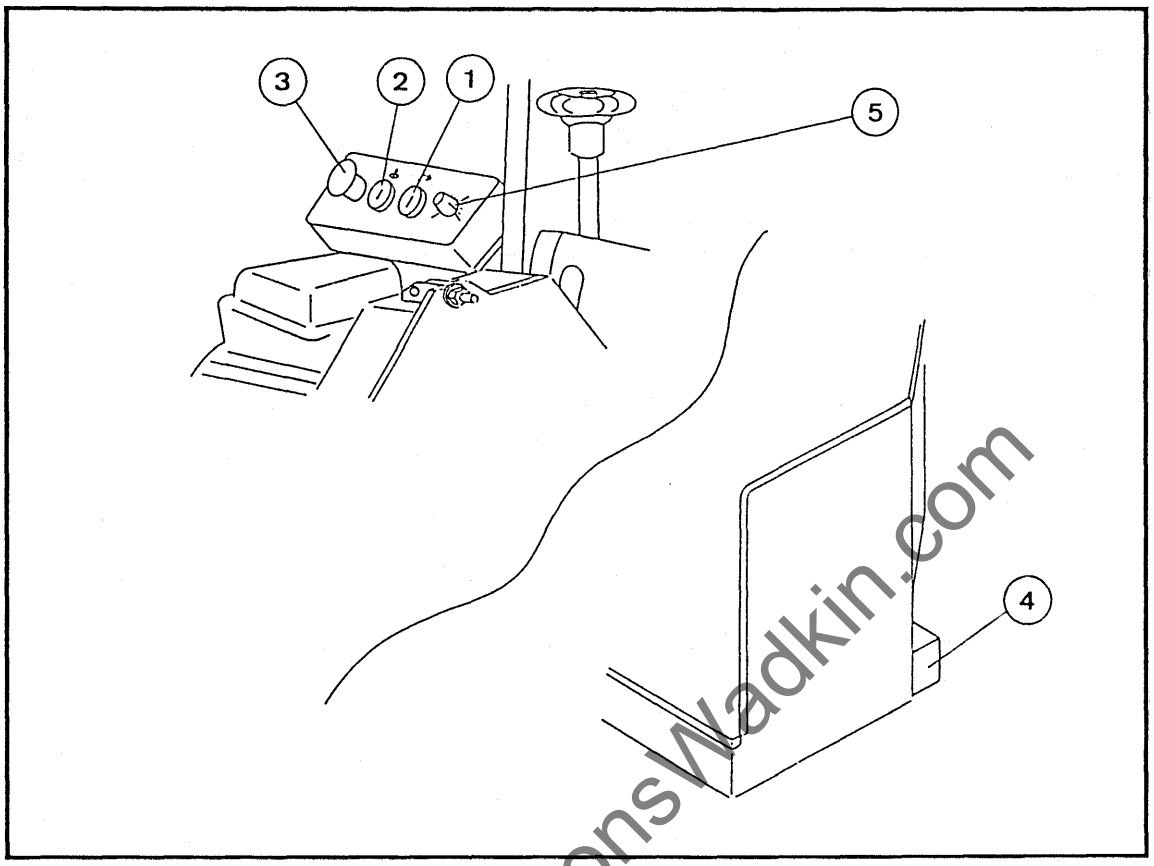
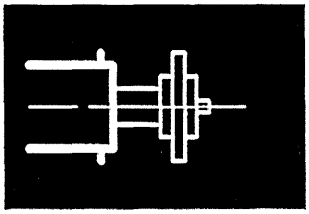


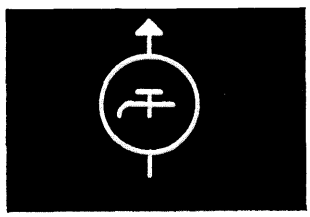
Fig. 3b

The operator should be familiar with the electrical controls before the machine is used. The main controls are positioned above the grinding spindle motor.

1) The grinding spindle start button is marked with the symbol :-



2) The coolant pump start button is marked with the symbol :-



3) The Master / Emergency stop button.

4) The Isolator (disconnect) switch located at rear of the coolant tray.

5) The variable speed control (optional extra).

3.4 TEMPLATE MAKING

Both steel templates made by hand and plastic templates made by machine are suitable for use on this grinding machine.

HAND MADE TEMPLATES

Steel templates should be made from blanks (NXT 6) as supplied with the machine. They should always be made at least 20 mm wider than the cutter [1] and should have at least two fixing holes.

An exact mirror image of the finished moulding [2] is drawn on to the template [3]. If the cutter projects [P] beyond the moulding, a similar projection should be included on the template. The blank is then cut out using a hacksaw and filed very accurately to shape. Due to the relatively thin steel used, this is easily achieved, although it still produces a stiff and stable template. The template should fit precisely on to the moulding.

Note : Detailed instructions are provided as part of the Wadkin in-house training course on profile grinding. In addition an instruction manual is included in the Wadkin template making toolkit (see Appendix A5).

TEMPLATE MAKING MACHINE

Template making machines which produce plastic templates suitable for this grinding machine can be supplied by Wadkin. Contact Wadkin for full details.

Using CNC technology, complex profiles can be drawn on screen and downloaded to the machining unit for rapid template production. Some of the benefits of this method are :-

Consistent accuracy guaranteed
The facility to scale down existing profiles to suit variations in timber sizes.
Profiles can be stored on file for immediate production of duplicate templates
Finish component checking gauges can also be made.

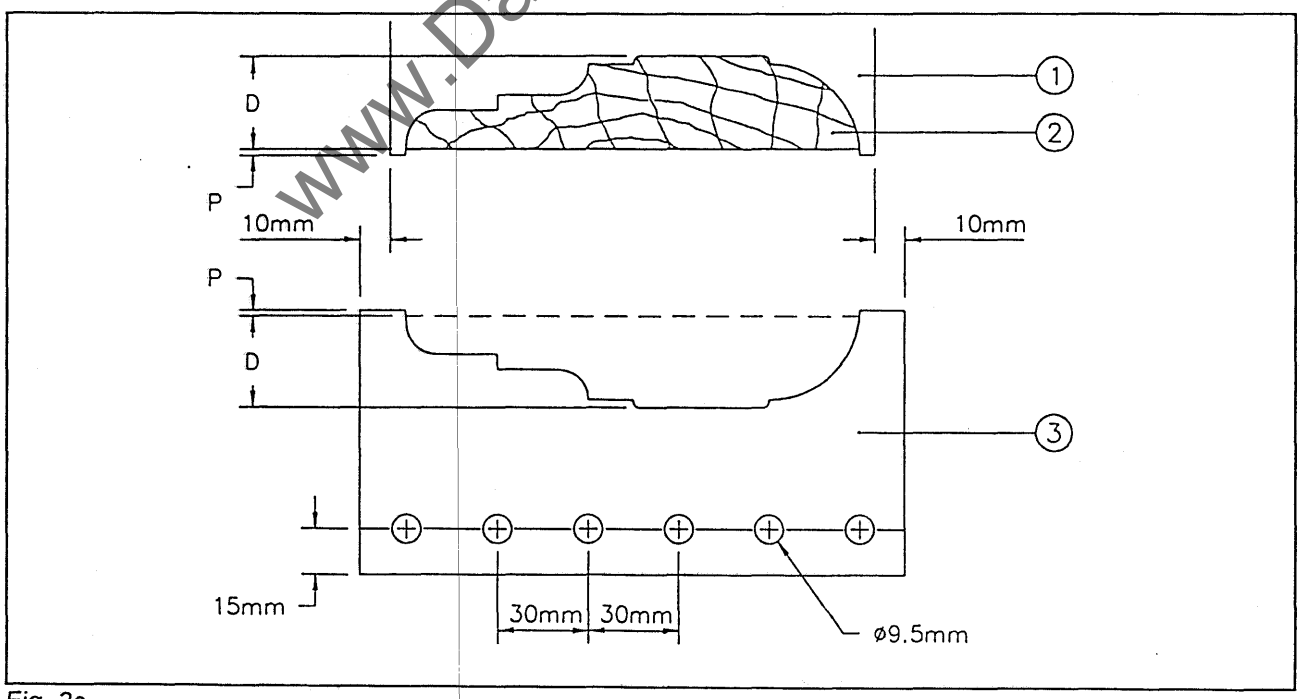


Fig. 3c

3.5 WORKING HEIGHT

The machine has been designed to suit operators of average height. A comfortable posture should be adopted when operating the machine. Short operators may require a duckboard to stand on to avoid excessive reaching.

3.6 TOOLS AND ACCESSORIES

The tools and accessories supplied with the machine should be unpacked and checked (Appendix A4) to ensure that the machine is complete. Hand tools should be conveniently placed for use by the operator as and when required.

Grinding wheels should be stored carefully to avoid damage.

3.7 TESTING THE MACHINE

Check that all guards and covers are correctly fitted - particularly the wheel guard.

Check that the carriage movement is free and does not tend to move towards the grinding wheel when released.

Switch power on and check that the worklamp is working correctly.

Ensure that there are no loose items on the grinding spindle. Start and stop the grinding spindle and check the direction of rotation. The spindle should rotate anti-clockwise when viewed from the right hand side of the machine. If the rotation is wrong, any two of the line lead connections at the incoming supply should be reversed by a competent electrician.

Start the grinding spindle and check the variable speed function (if fitted).

Start the coolant pump and ensure that there is a good flow of coolant. (Do not run coolant on to a stationary wheel.) The flow control taps are located in the main coolant tray to the left of the grinding head.

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SECTION 4 : OPERATION

4.1 SAFETY

Wheel Guard - The Wheel guard serves two purposes :

1) To avoid, as far as possible, the chance of an operator coming into contact with the wheel.

2) The guard should contain the majority of wheel fragments if it shatters.

The wheel guard should ALWAYS be in the correct position.

Safety Goggles - Eye protection is of the utmost importance in the presence of sparks and flying particles caused during grinding. Safety goggles should be worn at all times in the grinding area.

Protective clothing - Safety aprons, gloves and safety shoes should be worn particularly when handling woodworking cutters.

Dust protection - A coolant flow from above aids the cooling of the cutter, but more importantly it washes away all the wheel and grinding dust. Always use coolant when grinding or dressing the wheel.

Note : Dry grinding requires extraction.

Grinding wheels - Must always be correctly mounted, and only by suitably trained personnel.

Personal items - such as jewellery, rings, watches, bracelets etc. should be removed. Remove or fasten loose articles of clothing such as neckties, and confine long hair to avoid risk of entanglement.

Barrier cream - the use of a barrier cream is recommended when working with coolant fluids.

Stop the machine - before making adjustments, measuring, loading or unloading, etc. to avoid unintentional contact with the grinding wheel.

Keep clear until rotation has ceased.

Lighting - Always ensure adequate lighting. Areas of poor lighting or shadow can create unnecessary risks for the operator.

Care of the machine - Clean down regularly and ensure that the machine is kept in good condition.

Safe operation - of machinery requires constant alertness and close attention to the work in hand.

Materials - This machine is not designed for the grinding of aluminium, magnesium, or other materials which might create risks of fire or explosion.

4.2 THE GRINDING WHEELS

In the U.K., the Health and Safety at Work Act (1974) requires that :-

NO PERSON SHALL MOUNT ANY GRINDING WHEELS UNLESS HE HAS BEEN TRAINED AND APPOINTED IN ACCORDANCE WITH THE ABRASIVE WHEELS REGULATIONS 1970 No.535 (REGULATION 9).

It is a statutory requirement that the person who mounts grinding wheels onto the grinding machine shall be a trained and competent person appointed by the factory occupier, and whose name must be registered in an appropriate register.

In other areas local regulations should be checked and adhered to.

CHOOSING THE WHEEL

Aluminium oxide vitrified bonded grit wheels are normally used for profile grinding solid H.S.S. and H.S.S. on iron cutters. The various wheel options are listed in Appendix A5

As a general guide, the wheels used for profile grinding are coarser and softer than those used for hand grinding, so a much faster grind is possible. A 60 grit wheel is normally used for roughing out and a 220 grit wheel for finishing.

New wheels should always be 5 mm wide. Subsequent dressing will bring the wheel to the required width and form to match the stylus.

The wheel speed should be checked. Grinding wheels should never be operated at a speed in excess of the permissible speed (r.p.m.) marked on the wheel. The speed of the grinding spindle is marked on the machine.

CHECKING THE WHEEL

The wheel should be closely inspected for any signs of damage (e.g. chips, cracks, discolouration, etc.) which may have occurred in storage, or in transit. The 'Ring Test' should be carried out in a place where the 'ring' may be easily heard.

The ring test depends on the fact that the damping characteristics of a cracked wheel alters the sound emitted when a wheel is lightly tapped. It is subject to interpretation by the operator and is primarily applicable to vitrified bonded wheels. To perform the ring test, wheels should be tapped gently with a light non-metallic implement such as the plastic handle of a screwdriver.

Tap the wheel approximately 45 degrees each side of the vertical centre line and approximately 1 or 2 inches from the periphery, then rotate the wheel 45 degrees and repeat the test.

A sound, undamaged wheel will give a clear tune. If cracked, there will be a dead sound and not a clear ring, and the wheel must NOT be used.

DAMAGED WHEELS MUST NOT BE USED.

MOUNTING THE WHEEL

The machine should be electrically isolated to prevent unexpected start-up of the spindle whilst mounting the wheel.

When the spindle rotation has ceased the wheel guard should be opened. Note : The wheel guard is designed to be opened by the use of a spanner to deter unauthorised access.
If a wheel is already fitted it should be gripped to prevent it rotating whilst the spindle nut is loosened. The nut [1], washer [2], outer flange [3] and wheel [4] can then be removed. The rear flange [6] can be left in position on the spindle.

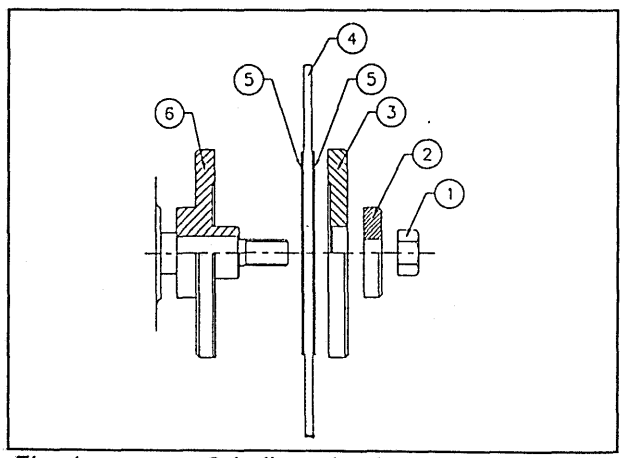

Fig. 4a Grinding wheel mounting

Check that the wheel flanges are in good condition, free from burrs, and seat correctly on the grinding spindle. Wipe the spindle and flanges clean before re-assembly.

When fitting a new wheel, one side of the wheel should be marked as datum.

Whenever a wheel is fitted the marked (datum) side should always be brought up against the rear flange [6].

It is most important that soft card washers (blotters) [5] are fitted between the wheel and the wheel flanges. These ensure that the tightening stresses are evenly distributed around the inner and outer flanges, prevent slipping at lower clamping pressures and reduce wear on the flanges.
Note : Wadkin wheels are normally supplied with the blotters already fitted to the wheel.

The wheel bore should always give a good location fit. Do not attempt to force a wheel on or modify the bore size. With the wheel and blotters correctly seated, re-fit the outer flange [3], washer [2] and nut [1]. The wheel should be gripped to prevent rotation and the spindle nut tightened. Excessive clamping of the spindle nut should be avoided to prevent damage to the wheel.

Note : The method of gripping the wheel by hand when tightening the locknut ensures that only a limited amount of torque can be applied. The correct tightening torque required is 12 Nm (9 ft lbs).

RUNNING THE WHEEL

The wheel guard must be closed and securely locked before the wheel is started.

A newly mounted wheel and a wheel being re-mounted, should run free for a short period (1 minute is recommended) before it is used, and everyone should stand clear. Note : A re-mount should always be treated as a new wheel. If damage to the wheel has gone undetected it is possible that the wheel could disintegrate when it is started up.

IMPORTANT

SHOULD A WHEEL DISINTEGRATE, ALWAYS CAREFULLY EXAMINE THE SPINDLE, THE GUARDS AND THE FLANGES TO ENSURE THAT THEY ARE NOT DAMAGED.

A small amount of unevenness is not uncommon on new wheels, but any high spots are normally removed when the wheel is dressed.

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Grinding wheel DOs and DON'Ts

DO

1) HANDLE and STORE wheels in a safe manner.

2) VISUALLY INSPECT and RING all wheels before mounting, for possible damage.

3) MAKE SURE OPERATING SPEED established for machine does not exceed speed marked on wheel.

4) CHECK MOUNTING FLANGES for equal and correct diameter and that they are clean, free from burrs and recessed where applicable.

5) USE MOUNTING BLOTTERS where required.

6) Be sure CUTTER REST is not more than 2 mm away from the periphery of the wheel.

7) Always USE THE WHEEL GUARD.

8) Allow NEWLY MOUNTED WHEELS to run at operating speed with guard in place for at least one minute, with ALL PERSONNEL STANDING CLEAR before grinding.

9) Always WEAR SAFETY GLASSES or some type of eye protection and protective clothing, where necessary, when grinding.

10) TURN OFF COOLANT when stopping wheel to avoid creating an out-of-balance condition.

11) DRESS the wheel regularly to avoid loading.

DON'T

1) Use a wheel that HAS BEEN DROPPED.

2) FORCE a wheel onto the machine spindle OR MODIFY size of the mounting hole.

3) EVER EXCEED MAXIMUM OPERATING SPEED established for the wheel.

4) Use mounting flanges on which the bearing surfaces ARE NOT CLEAN AND FLAT.

5) TIGHTEN the mounting nut EXCESSIVELY

6) TRAP the workpiece between the wheel and cutter rest.

7) Start the machine until the WHEEL GUARD IS IN PLACE.

8) Grind on the SIDE OF THE WHEEL

9) STAND DIRECTLY IN FRONT OF a grinding wheel whenever a machine is started.

10) Grind material for which the WHEEL IS NOT DESIGNED.

11) ROLL WHEELS ALONG THE FLOOR.

12) BANG THE WORKPIECE AGAINST THE WHEEL.

DIAMOND WHEELS

Diamond wheels are normally used for profile grinding T.C.T. cutters. The various wheel options are listed in Appendix A5.

Diamond profile grinding wheels have a relatively thin layer of diamond abrasive bonded onto a solid aluminium core.

DIAMOND WHEELS SHOULD NOT BE DRESSED.

Because dressing is not used, the correct width and form of wheel must be selected to match the stylus used. Diamond wheels are mounted using the normal wheel flanges, but blotters should not be used.

A small amount of unevenness is not uncommon when these wheels are started up, but the wheel should quickly bed down as any high spots are worn down during grinding.

4.3 DRESSING THE WHEEL

The purpose of dressing the wheel is :-

1) To produce a wheel profile identical to the stylus.
2) To compensate for wheel wear.
3) To 'open up' the wheel for free cutting by presenting new sharp grains of abrasive to the surface.

A full width rounded wheel should be dressed for most cutter profiles as this wears down more or less evenly. It may be used to rough and finish grind external corners, external curves, bevels, straight sections and internal curves with a radius larger than that of the wheel.

A suitable small radius or sharp edged wheel should be used to complete those parts that the half-round wheel cannot finish. The contact area of small radius and corner grinding wheels is small, so it is advisable to use a harder wheel. When changing the grinding wheel shape it is essential to make sure that it matches the stylus and that it is aligned correctly.

THE DRESSER

The dressing diamond is mounted onto the end of a screw [1] which allows for initial alignment, compensation for diamond wear and can provide for variations in radius of dressing.

The dresser has two basic movements. One is a rotary movement about a vertical axis, which is used to dress a radius on the periphery of the wheel (rounded). A lock [3] is provided for this movement.

The second is a swivel movement about a horizontal axis which is used to dress the sides of the wheel and to dress the periphery to a square edge or angle. A locking knob [5] and vertical location pin [2] are provided for this movement.

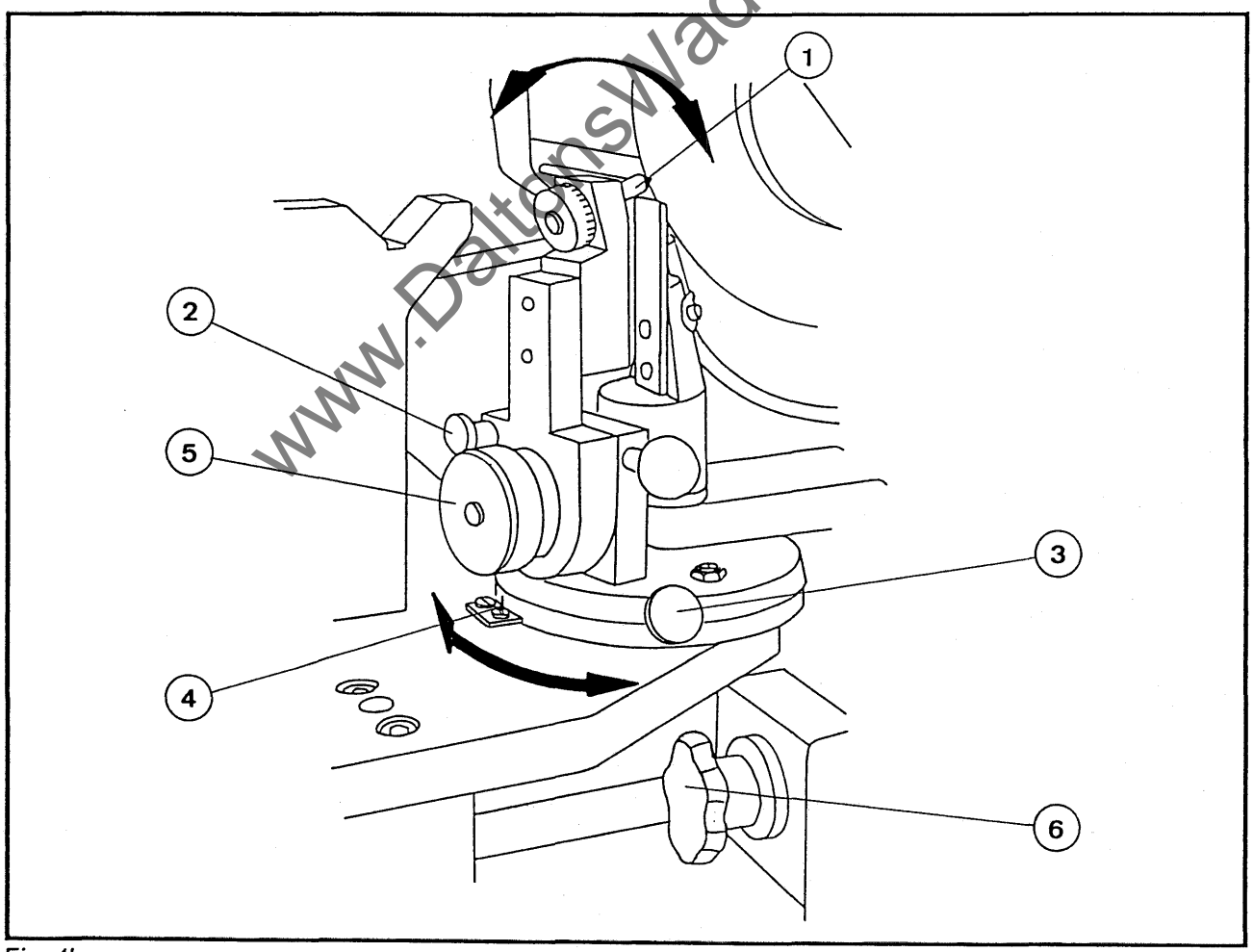


Fig. 4b

DRESSER LOCATION

The positioning of the dresser relative to the grinding wheel is determined by the anchor bracket [12] to the right of the carriage which should be engaged with the location point on the stylus mounting bar [7].

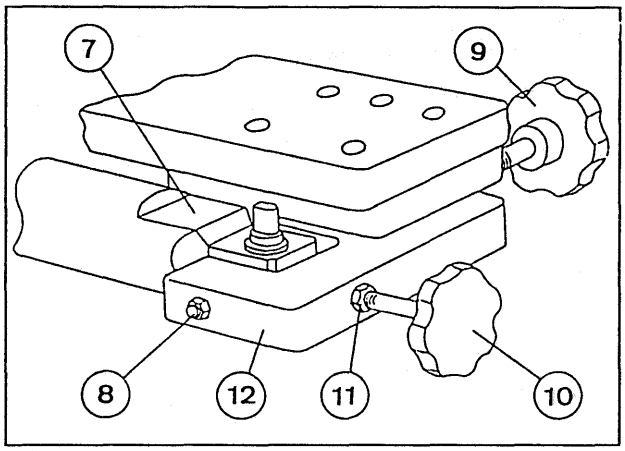


Fig. 4c

The lateral adjustment screw [8] on the right hand side of the dresser fork is factory set, such that the dresser rotates symmetrically about the grinding wheel and should not be tampered with unless necessary due to change in blotter thickness.

A handwheel [9] is provided on the right hand side of the bracket which is used to secure the dresser in position.

The adjustment handwheel [10] on the front of the bracket positions the dresser relative to the cutter rest and hence determines the gap between the grinding wheel and the cutter rest. Winding the handwheel in will reduce this gap whilst winding it out will increase it. The gap should be set between 0.5 mm and 2 mm as described in section 1.4.

The locking nut [11] should always be secured after making this adjustment.

With the dresser securely located, the set relationship between the stylus, dresser, template and wheel ensures that, when dressing is carried out, the wheel is automatically re-aligned to the stylus. As the wheel reduces in diameter no additional adjustment is needed for re-alignment.

DRESSER OPERATION

IMPORTANT :

The dressing movement should be un-hurried and the cut light to avoid ripping out and wasting grit, to achieve a good surface finish from the single point diamond, and to avoid unintentional contact with the wheel.

Coolant should be used whilst dressing to prevent dust formation, and to prolong the life of the diamond.

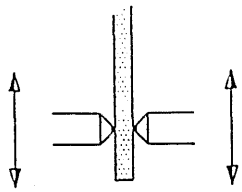
Eye protection must be used.

The wheel guard should be closed.

WIDTH DRESSING

Because of the firing process in the manufacture of vitrified wheels, the wheel cannot be guaranteed to be perfectly flat and the right thickness. Although dressed and sized wheels may be purchased, truing is best carried out on the grinding machine.

Wheels are generally supplied at 5.0 mm width and so the wheel must be sized to the selected stylus width (generally 4.7 mm or 3.0 mm wide).



The dresser should be rotated to the stop position at the right hand side of the wheel and locked [3] in position. When the lock [5] and pin [2] are released the vertical location is released and the dressing diamond can be moved along the side of the wheel.

The dressing diamond [1] should be screwed in until it touches the side of the wheel and the locknut locked. The wheel and coolant are then started and the side of the wheel dressed.

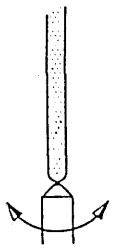
Stop the wheel and rotate the dresser through 180^{o} to the opposite side.

Lock [3] in position and dress the left hand side of the wheel.

With both sides dressed and the wheel stopped, the width of the wheel should be measured using a micrometer or vernier calliper, and compared to the stylus width. The difference between the two measurements is halved and this distance is the amount the dressing diamond will need to be moved in, in order to size the wheel. Successive dressings may be required from both sides of the wheel to bring it to the required width. A maximum dressing cut of 0.1 mm (0.004") is recommended. Each graduation on the dressing diamond scale represents 0.05 mm (0.002").

Note : Machines are often despatched from Wadkin with the dresser set to suit a 4.7 mm stylus and a wheel which has been dressed to width during machine testing.

DRESSING A RADIUS

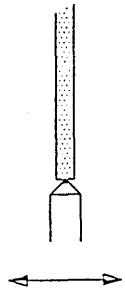


The dresser should be brought up to the wheel and secured in the vertical position with the pin [2] engaged and the knob [5] locked. With the wheel running and lock [3] released, the dresser is rotated through 180^{o} to form the radius on the wheel.

Successive dressing cuts are taken by moving the stylus / cutter rest assembly towards the wheel using the hand wheel [6] (*Fig. 4b*)

Note : When dressing a radius on a new wheel or changing shape, the dresser should be backed off from the wheel and then advanced taking a series of small cuts. Regular changing of shapes by dressing can be wasteful on wheels. It may be preferable to change wheels.

DRESSING SQUARE

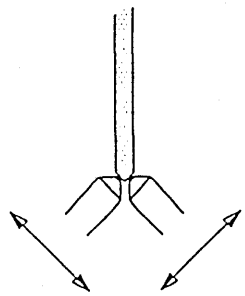


The dresser is brought up to the front of the wheel and set at 0^{o} using the scale [4] (*Fig. 4b*). The rotation should then be locked [3]. With the pin [2] and locking knob [5] released, the dresser is moved from side to side across the running wheel to form the square edge.

ADDITIONAL WHEEL FORMS

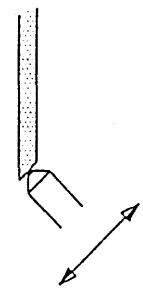
The wheel should always be dressed to match the stylus form. Various optional stylus shapes can be supplied by Wadkin (see Appendix A5), some of which require angled or 'V' form dressing.

DRESSING A 'V' FORM



The dresser is used as for square dressing but with the required angle set on the scale to suit the stylus shape. A series of cuts should be used if changing the wheel shape.

DRESSING AN ANGLE



Dressing is again carried out as for square or 'V' dressing but in this case the dresser location position must be changed by adjustment of handwheel [10] (*Fig 4e*) and the cutter rest gap reset. Note : If the dresser location position is changed part way through a cutter grind, the automatic datum is lost and must be compensated for by adjustment of the template slide.

4.4 MOUNTING THE CUTTERHEAD

IMPORTANT : The grinding wheel must be stationary when loading or unloading the machine to avoid unintentional contact with the wheel.

Hydro-lock type cutterheads should be pressurised to lock the block onto the arbor. All other cutterheads should be locked to the arbor using the locking collars supplied.

One half of the locking collar set [6] is clamped either side of the cutterhead. To lock the cutterhead in position, the lock nut [7] of the larger collar is wound firmly against the cutterhead using the tommy bar provided.

Fit the cutterhead onto the arbor or, if the same arbor has been used on the setting stand, simply transfer it over to the grinder. The arbor should be loaded onto the grinder with the knurled grip to the right and the flange at the other end locating between the clamp washer [9] and the arbor post.

The cutterhead should not be locked to the arbor until the template and stylus are fitted. The cutterhead is positioned along the length of the arbor to align the position of the cutter with that of the template and stylus. When in approximately the correct position the cutterhead should be locked to the arbor.

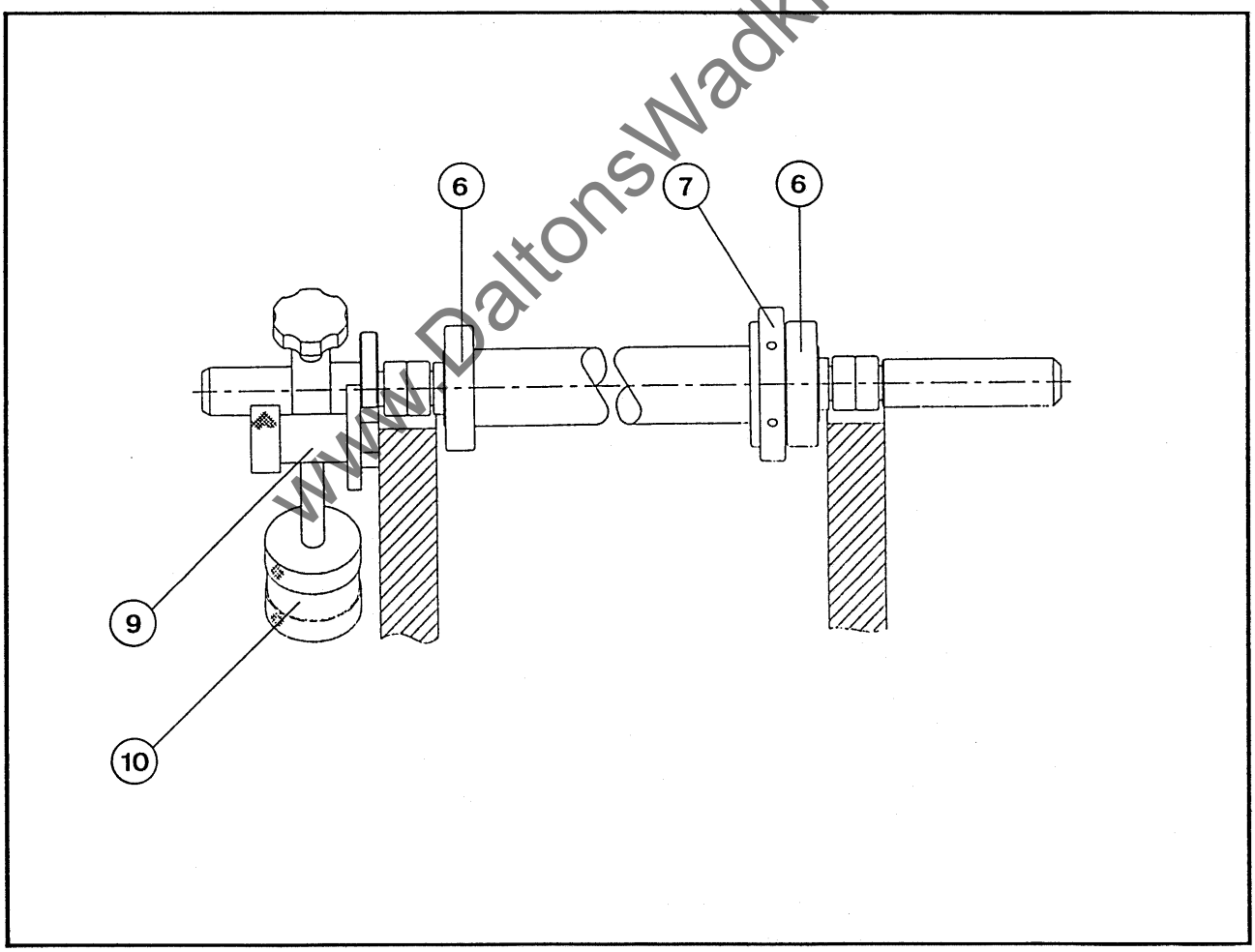


Fig. 4d Arbor assembly

The clamp washer on the left hand arbor post may be used to lock the arbor in any position as an aid to setting or to assist inspection of the cutting edges. When actually grinding the clamp washer is left unlocked but remains spring loaded against the arbor flange to prevent any lateral movement of the arbor during grinding.

The arbor counter balance [10] should be fitted onto the plain arbor handle. During grinding, the counter balance weight is positioned just below the height of the cutter to maintain the cutter in contact with the cutter rest.

4.5 STYLUS

The standard stylus [1] supplied with the machine is 4.7 mm wide, half round at one end and square at the other. The stylus can be rotated in its holder to present either of these forms to the template. For the majority of profiles the radiused form is used throughout the grinding process. If features such as square corners are contained within the profile then it will be necessary to turn the stylus round. More intricate profile shapes may require the use of the alternative stylii listed in Appendix A5.

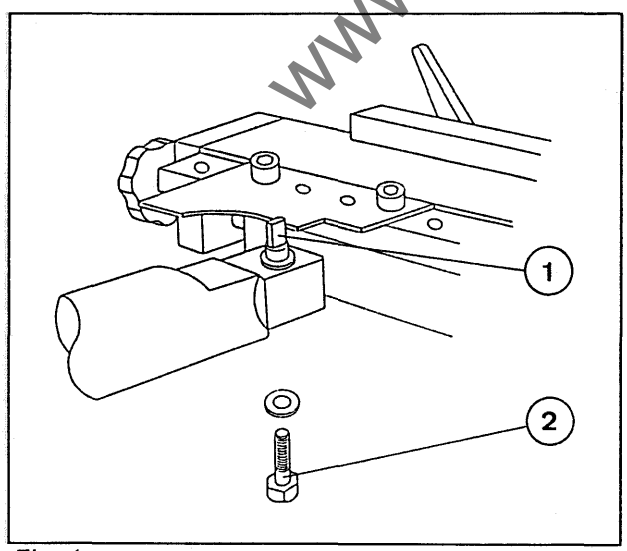


Fig. 4e

Before using any particular stylus it will be necessary to square it up to the template location using either a template with a square end, or an engineers square. The stylus is locked in position using the locking screw [2].

Note : Whenever the stylus is changed it will be necessary to redress the wheel.

4.6 POSITIONING THE TEMPLATE

The grinding wheel must be stationary whilst positioning the template. Ensure that both the template and the template carrier are clean and that the location edges are free of bumps or bruises. The template is fixed in position [6] (*Fig. 4f*) on the carrier using two M8 screws in the tapped holes provided. Ensure that the template seats correctly.

The template position must be set to bring the cutter into the correct position relative to the grinding wheel.

When the stylus has been locked in position, adjustment is made by moving the template slide in or out. The lock [2] should be released and adjustments made using the handwheel [1].

The axial (left / right) position of the template is adjusted by unlocking the handlevers [5] and adjusting the handwheel [8]. It may be necessary to make repeated adjustments of the in / out and axial windings before the template is positioned sufficiently accurately relative to the cutter when regrinding existing profiles.

When grinding, the depth of cut is controlled by movement of the template slide using handwheel [1]. Locks [2] and [5] should always be secured whilst grinding is carried out.

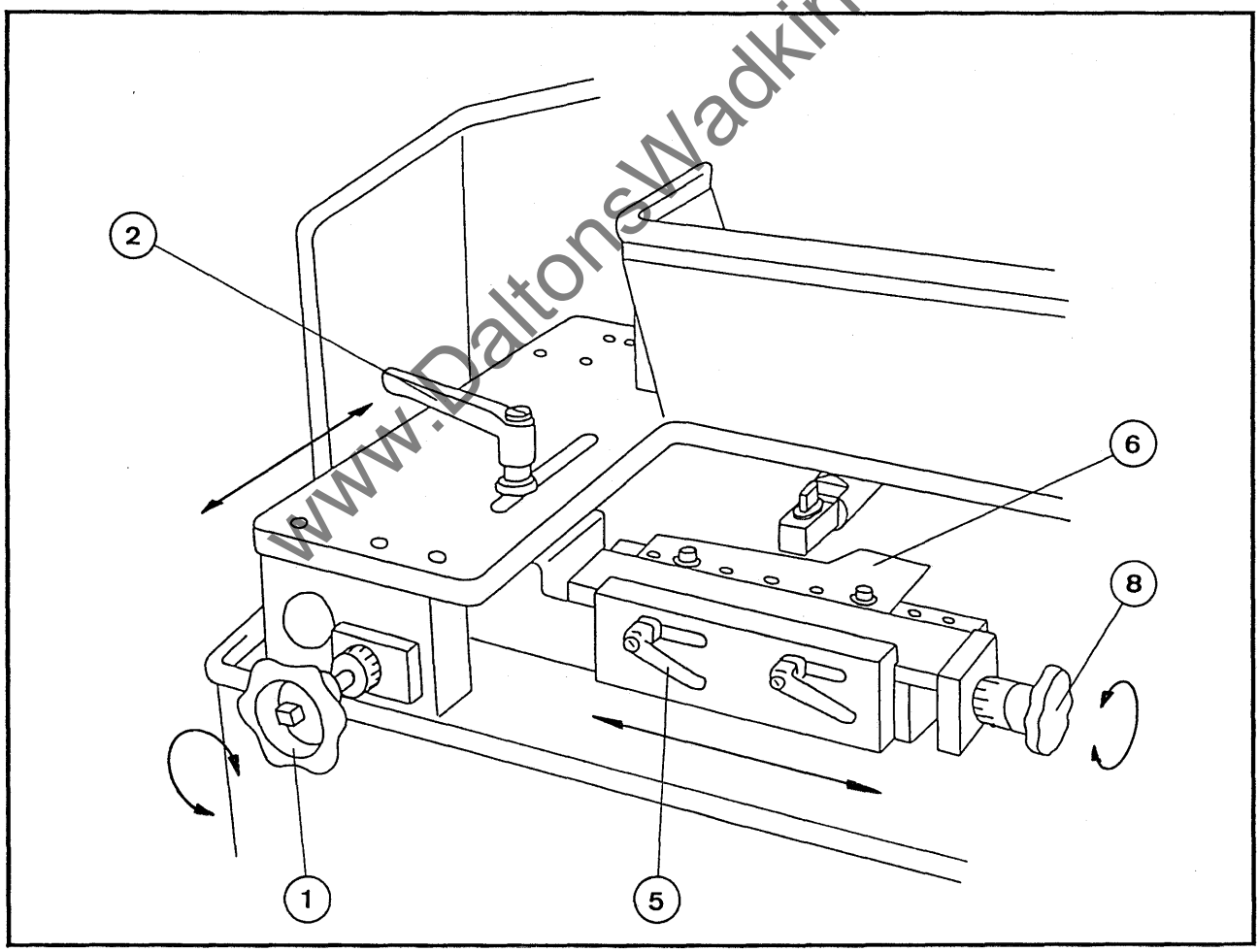


Fig. 4f

4.7 HEAD ADJUSTMENT

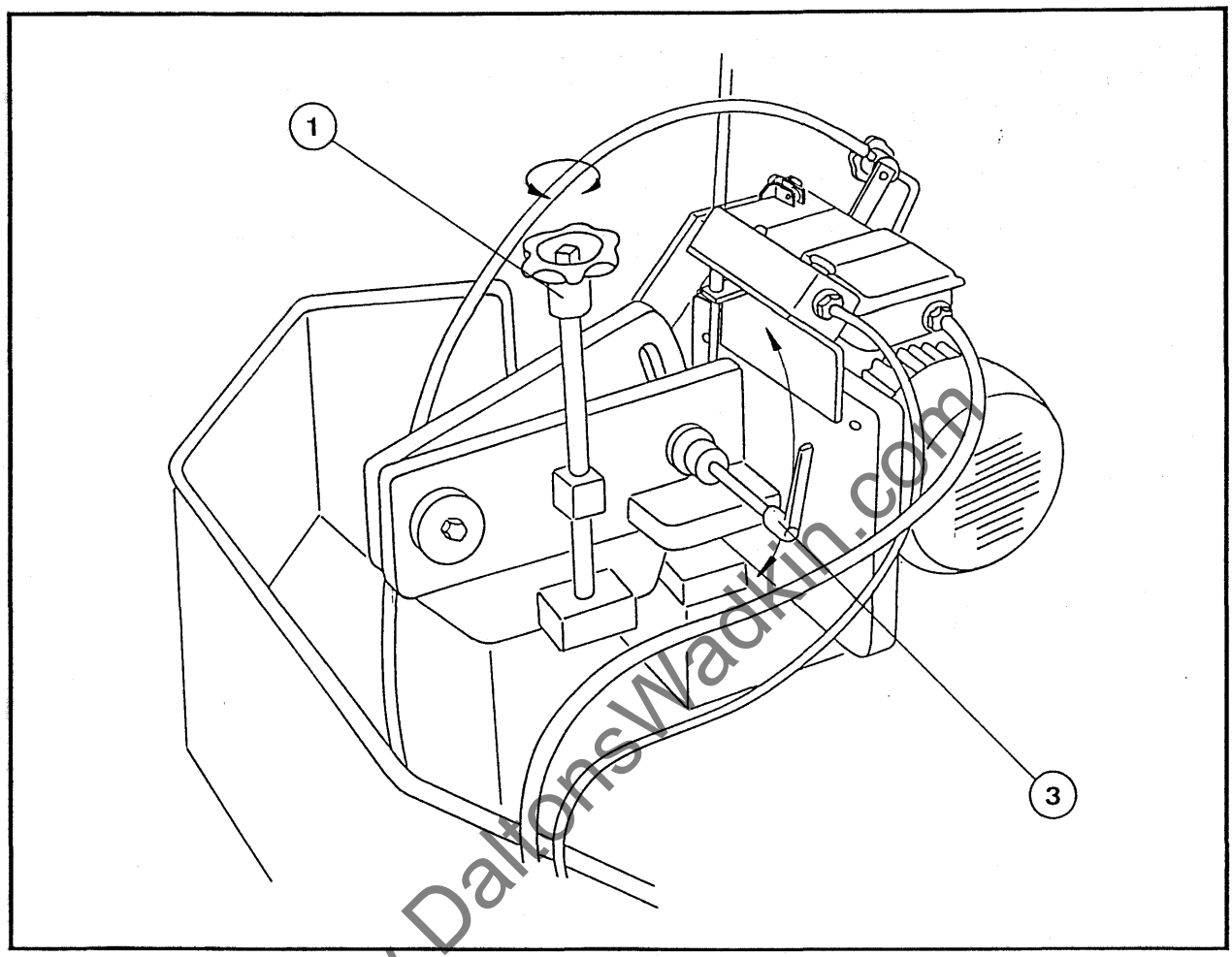


Fig. 4g

To set the cutter clearance angle, the grinding wheel is wound up or down in relation to the cutter rest. The rise and fall handwheel [1] is located at the top of the machine. By winding the head up the clearance angle is increased and by lowering it is reduced. The lock for this movement is at position [3].

Whenever the cutter clearance angle is varied it will be necessary to re-dress the wheel to restore the automatic datum and cutter rest gap.

4.8 COOLANT APPLICATION

IMPORTANT : Coolant must always be used when grinding;

a) It prevents overheating of the cutters which may lead to loss of hardness or even cracking of the cutting edges. If this should occur, cutters would need to be replaced.

b) It washes away grinding dust and debris.

c) It prevents the formation of airborne dust.

The coolant taps are fitted on the splash guard to the left of the grinding head. These are used to control the flow of coolant above and below the cutter. The position of the top coolant pipe is adjustable so that coolant can be directed as near as possible to the grinding point. Both flows of coolant should be as large as possible and directed as close as possible to the grinding point.

Prolonged immersion of a stationary wheel can create an out of balance condition. Coolant should never be left to run onto a stationary wheel. When starting up :-

1) Start wheel
2) Start coolant

4.9 CARRIAGE CONTROL

The machine carriage may be moved around in order to reproduce the cutter profile to the depth allowed by the stylus and template. The arbor counterbalance is used to keep the cutter in contact with the cutter rest. The best control may be achieved by keeping both elbows close to the body whilst holding the template slide lock [2] (*Fig. 4f*) with one hand and the template axial movement handwheel [8] with the other. Controlling the machine in this way will aid operator comfort by keeping hands away from the grinding area thereby reducing contact with the grinding coolant.

Once the cutter is firmly in contact with the cutter rest watch the template and stylus (NOT the cutter) so as to anticipate the carriage movements needed. Grinding progress can then be gauged by the sound and feel of grinding. Grinding pressure should be light enough to allow the grinding wheel to cut freely. If necessary let the cutter ride lightly on the grinding wheel, leaving a gap between the template and stylus, which is narrowed during repeated grinding passes until the cutter is ground away. Keep the cutter moving at all times and in the smoothest possible manner.

Side grinding should only be performed with wheels designed for the purpose. Grinding on the flat sides of wheels designed for peripheral grinding may be dangerous and cause broken wheels. This does not preclude their use for applications such as shoulder and form grinding where it is recognised that a limited amount of side grinding is performed. Extreme caution should be exercised not to use excessive pressure.

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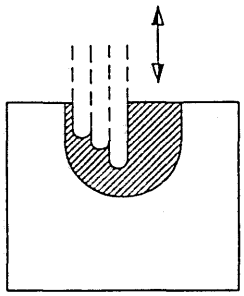
4.10 ROUGH GRINDING

When a profile is first ground into a set of cutter blanks, it is necessary to 'rough out' in order to remove the majority of the material.

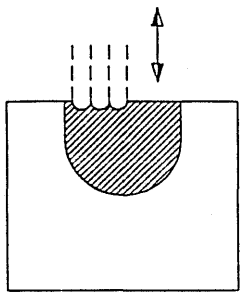
Always set the grinding wheel vertical when grinding out large amounts so that pressure is applied only to the rim of the grinding wheel.

When roughing out a nibbling action is adopted, i.e. a series of parallel plunging cuts directly into the grinding wheel, to form a series of close slots. Avoid unnecessary sideways movement as excessive side pressure can cause wheel breakage.

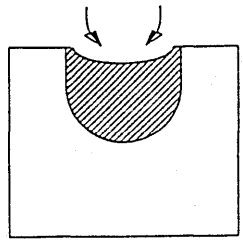


When grinding solid H.S.S. or T.C.T. cutters deep plunge grinding can cause excessive burning of the cutters. In addition, it can cause wear to the side of the wheel, causing it to become thinner than the stylus, resulting in insufficient material being ground off the cutters.

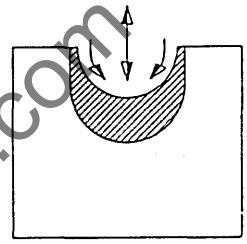
A combination of plunging and nibbling movements can therefore be used :



1) Shallow plunge grind.



2) Nibble across.



3) Continue with a combination of plunging and nibbling until the full profile depth is achieved.

For deep shoulder sections it is advisable to rough out the majority of the material before grinding the profile to its full width.

When first using the profile grinder it may be an advantage to set the template to small grinding depth (say 3mm). Grind this out, then step back the template by a further 3 mm to allow more grinding. Continue this procedure until the cutter is fully profiled. By using the template in this way a grind limiter is set, so allowing only a small amount to be ground off the cutter at any setting. This allows for more control so enabling confidence to be gained quickly.

Note : In cases where a cutterhead has several knives it is advantageous to 'rough out' all the knives at a single template setting. This procedure will necessitate frequent wheel dressing.

All the knives on the cutterhead should be roughed out and the wheel re-dressed to re-establish the fixed datum. A small amount is then ground from each knife without adjusting the template position to ensure that all the knives are ground equally prior to finish grinding.

4.11 FINISH GRINDING

Once the rough grinding is completed on all of the cutters, the wheel should be dressed again to re-establish the datum. If desired, the template may be wound slightly back off the stylus to increase the amount to be ground off the cutters. The cutter can be finish ground using the soft roughing wheel (usually a 60 grit). As the finish cut is very small almost no wear will take place, therefore, all of the cutters are of the same shape and as near as possible in the same projection radially.

A finishing wheel (usually a 220 grit) is harder and less free cutting than a roughing wheel, however, they are less subject to wear and so retain their shape much longer. They are therefore ideally suited for producing very fine detail, or square corners, on the cutter.

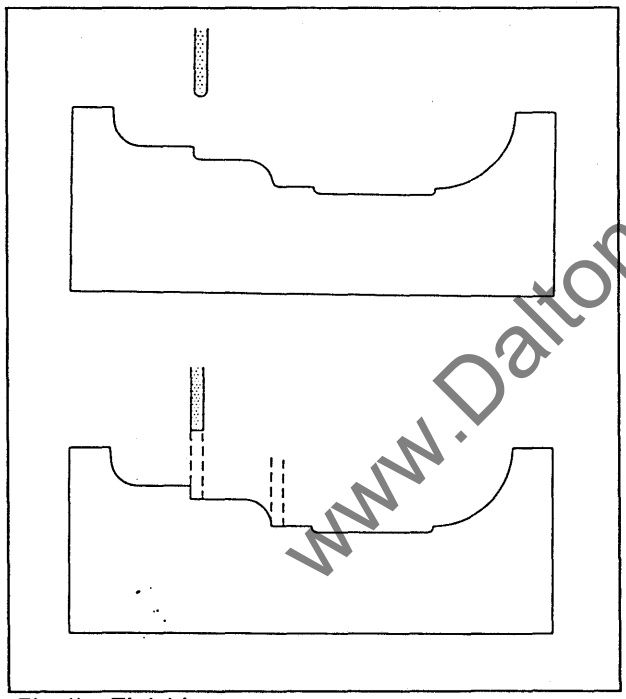


Fig.4h Finishing square corners

Generally, a round nosed shape will be used for grinding operations, however, any square corners which are required on the cutter will need the use of a squared off face on the stylus. The stylus is thus reset and the 60 grit wheel replaced with a 220 grit finishing wheel. By dressing the wheel square the fixed datum point is achieved, and this allows the stylus to be just touched into the square corners on the template, and the wheel only removes the small radii in the corner left by the round nosed wheel. By dressing the wheel the depth of cut is automatically aligned to the previous depth, so ensuring that neither a small step nor an undercut is left on the previously ground edge.

This procedure applies to all fine detailed work. The only point to remember is to ensure that the wheel is dressed to the exact shape and size of the stylus selected.

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4.12 SIDE RELIEF

The grinding of the cutters should now be complete except where side relief is required.

The head should be tilted, either to the left or the right, using the handwheel [1] to the right of the head, and set to the scale [2] which is graduated from 0^{o} to 15^{o} in both directions.

The wheel should be dressed to suit the stylus shape and to restore the automatic datum.

Note : When dressing the wheel for side relief :

a) A bull nose should be shaped BEFORE the wheel is tilted over to the left or right.

b) A square face should be shaped AFTER tilting.

The areas requiring side relief should be located on the template and the back of the knife ground away without grinding deeper at the cutting edge. It will be found that the side relief will only be formed part way down the back of the knife. This is to prevent inadvertently removing material from the cutting edges. If side clearance is required to be generated right up to the cutting edges then this can be achieved by sideways adjustment of the template.

All knives are ground to give clearance on, say, the right hand side and then the whole operation is repeated with the wheel tilted to the left hand side. This ensures all areas of the profile at 90^{o} to the cutting action are given the required relief.

The cutters should now be complete. Any grinding burr should be removed from the cutters to achieve the best cutting edge. The cutterhead, complete with profiled cutters, can now be mounted directly onto the moulding machine and run without further operation.

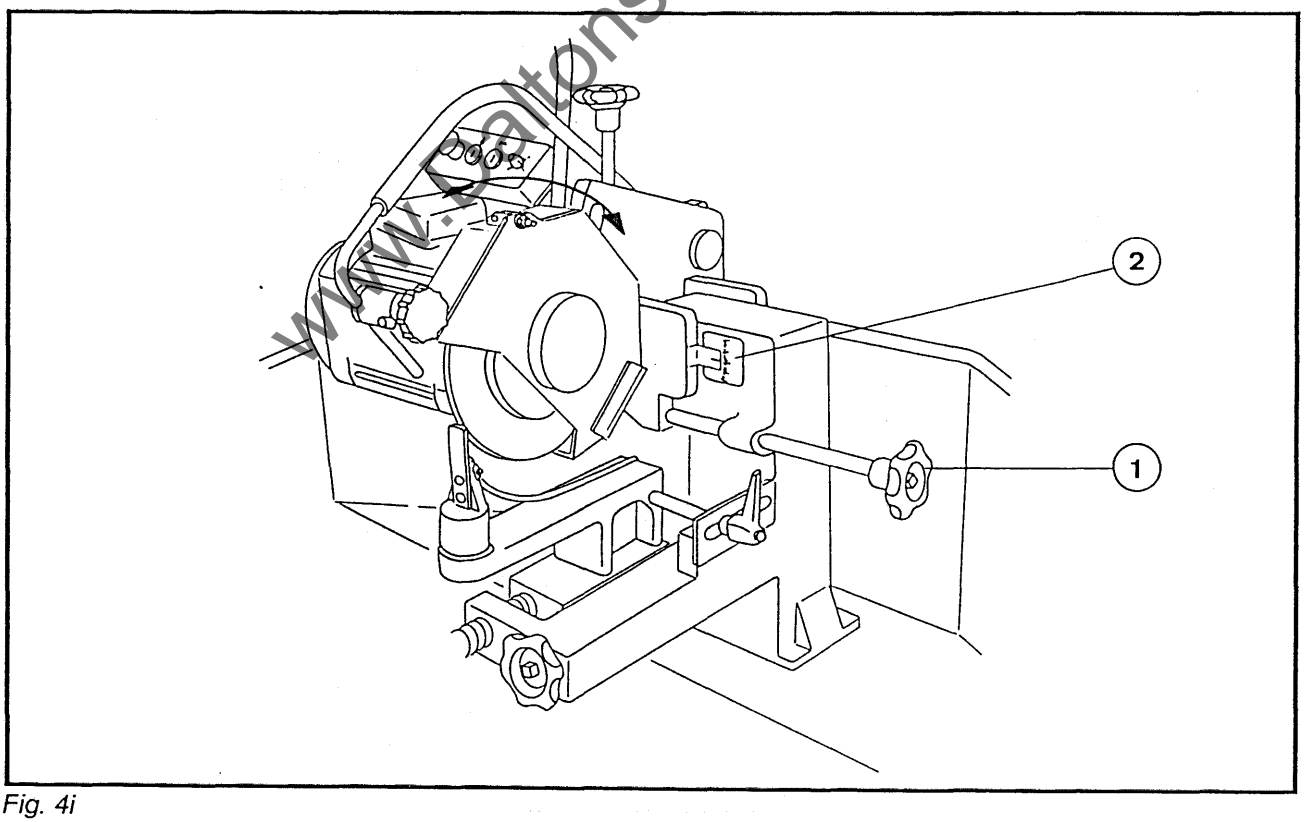

Fig. 4i

4.13 MEASURING

If measurement of the ground cutters is necessary with the cutterhead still on the machine, the carriage should be moved to a position well away from the grinding wheel. The machine should be switched off and the wheel allowed to come to a standstill before measuring is carried out.

It may be necessary to 'stone' the cutter to remove grinding burrs in order to achieve an accurate measurement.

Setting and measuring stands are available from Wadkin which are designed to accept the grinding machine arbor. This allows the cutterhead to be quickly transferred from machine to stand and visa-versa without removing the cutterhead from the arbor. Contact Wadkin for full details.

4.14 VARIABLE SPEED GRINDING SPINDLE (OPTIONAL EXTRA)

The variable speed option is factory fitted and allows for infinitely variable grinding speeds between 1500 - 3000 rpm. The large variation in speeds allows for manual compensation for grinding wheel speed as the wheel diameter wears from its maximum to minimum diameter. As the diameter reduces the spindle speed can be increased to maintain a constant surface speed at the point of grind and so maintain constant cutting conditions.

The facility of variable grinding speed enables the optimum grinding speed to be found for any type of tool steel. By increasing the grind speed, a given composition of grinding wheel will seem to behave harder and be less likely to breakdown. This can be useful when grinding delicate profiles where good form retention by the grinding wheel is required. Similarly, by reducing the grind speed the wheel will seem softer and breakdown more quickly, thereby being less prone to glazing.

4.15 GRINDING SEGMENTAL TOOLING

Segmental and tena-disc tooling can be ground using the same method as that used for profile grinding.

In some cases the standard 25 mm wide cutter rest will be too wide for these types of cutterheads. Special narrow cutter rests are available from Wadkin to overcome this problem. See Appendix A5.

Some segmental blocks include overlapping profiles which cannot be ground in situ. In these cases a longer sleeve can be used with spacing collars [S] to make up the additional length. When grinding is carried out, the spacing collars are used to spread the block segments apart by a known amount thereby eliminating the overlap.

The template is made to suit [X+S] and may include undercuts as shown to allow square shoulders to be ground using the round nosed wheel.

4.16 GRINDING PLANERHEADS

Straight knife grinding of planerheads can be carried out on the NV profile grinder. The method used is exactly the same as that used for profile grinding, except that in this case, the template profile is straight.

The accuracy of this method depends on the straightness of the template. A special 'trued' template is available from Wadkin together with a ball bearing stylus which reduces wear on both the template and stylus.

A special wide C.B.N. (Borazon) grinding wheel is also available for straight knife grinding which eliminates any inaccuracies due to wheel wear that can occur when using the normal softer aluminium oxide bonded grit wheels. See Appendix A5.

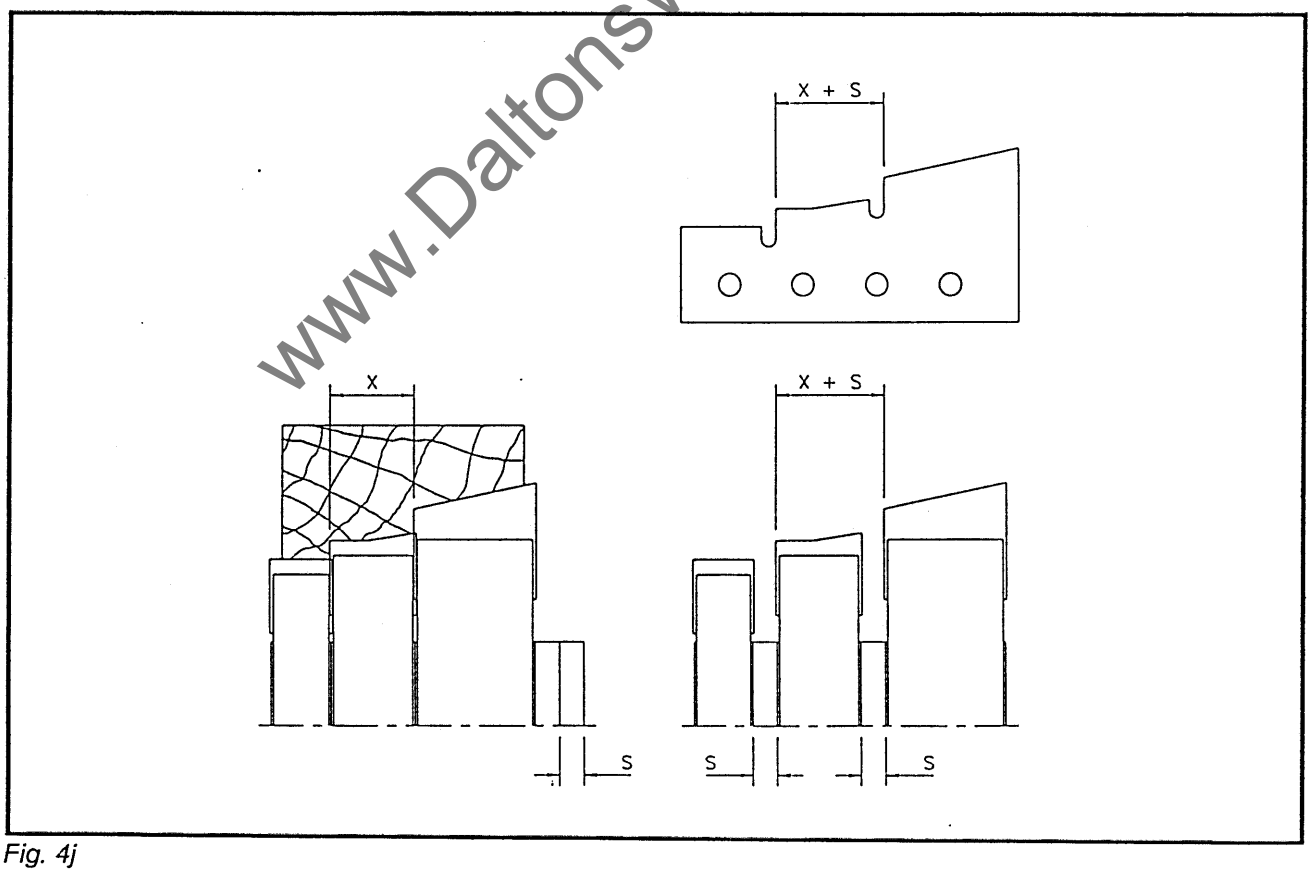

Fig. 4j

4.17 CARE OF THE MACHINE

The machine should be cleaned down when grinding is finished. The abrasive dust produced by the grinding operation can cause damage to moving parts and slideways if cleaning is not carried out correctly.

COMPRESSED AIR SHOULD NOT BE USED

to assist cleaning. It can cause abrasive dust and coolant to be forced into slides, screws and bearing surfaces. It can also be dangerous to other people.

A flow of coolant can be used to wash the machine but ONLY ON THE AREAS WHERE COOLANT NORMALLY FLOWS during grinding. If a coolant flow is used, the following guidelines must be observed :-

- Coolant must not be sprayed onto electric motors. These are splashproof but are not designed to withstand constant jets of coolant.
- Coolant must not be sprayed under covers or into slides, screws, bearings etc.
- Coolant should not be used to simply wash all the grinding debris down into the tank - this only leads to more frequent cleaning of the tank.

Accumulations of grinding debris should be scooped out of the coolant trays. It is a matter of personal choice as to whether this is better done with the debris wet or dry.

If the metal filtration magnet is correctly placed in the coolant tray, it should be visible to the operator. It should be cleaned when necessary.

The level of coolant in the system should be 'topped up' as necessary. (See Appendix A2.) A level indicator is fitted to the coolant tank. The coolant should be allowed time to drain into the tank before the reading is taken. Note : Different types of coolant fluid should not be mixed together, see maintenance section 5.

SECTION 5 : MAINTENANCE

5.1 SAFETY

The machine should always be electrically isolated when maintenance is carried out unless specifically required otherwise.

Maintenance personnel should be familiar with the Health and Safety precautions for handling coolant fluids. See Appendices A2 and A3.

Maintenance personnel should not mount grinding wheels unless specifically trained to do so.

5.2 CLEANING THE MACHINE

Cleaning should be carried out on a regular basis as part of the normal operation of the machine (see section 4.17). During machine maintenance any shortcomings should be made good by thorough cleaning.

COMPRESSED AIR SHOULD NOT BE USED ...

for cleaning the machine. It can cause the abrasive dust and grit produced during grinding to be forced into slides, screws and bearings etc. A flow of coolant can be used to wash the machine but ONLY ON THE AREAS WHERE COOLANT NORMALLY FLOWS. (See section 4.17).

5.3 LUBRICATION

The machine is designed to require minimum lubrication. The grinding spindle, motor, coolant pump and carriage slideways are fitted with sealed bearings which require no additional lubrication.

The template slide has one lubrication point [1] (*Fig. 5a*) which should be lubricated weekly with Wadkin grade L4 oil.

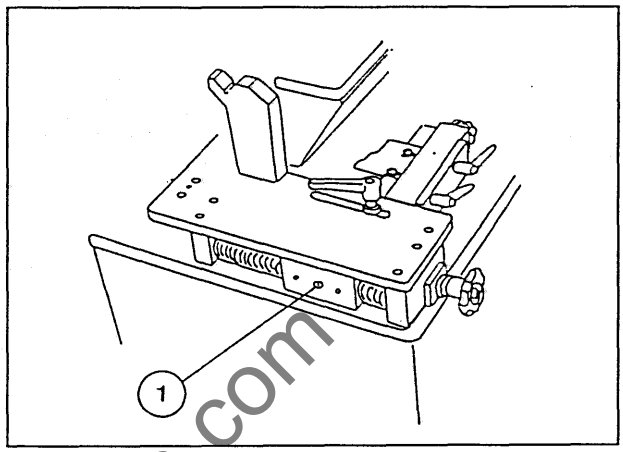

Fig. 5a

All bushes employed are of the 'bronze oil retaining type'. Slides and screws should be examined periodically with careful attention paid to any moving parts that become stiff.

Accessible slides, screws, bushes etc. should be lubricated weekly with Wadkin grade L4 oil. A list of approved lubricants is given in Appendix A1.

5.4 WHEEL MOUNTINGS AND GUARD

It is essential for the safe operation of this machine that the wheel mountings and wheel guard are maintained in good condition. The grinding spindle end should run true and be free from burrs. The wheel flanges should be flat and free from burrs. The spindle nut should be in good condition.

The wheel guards must be intact with no cracked welds. The profile guard door including the hinge and latch should be in good condition and the fixing of the guards should be solid.

These items should be checked whenever wheels are mounted but particularly if a wheel should disintegrate. If any of these items are worn or damaged they should be replaced.

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5.5 COOLANT SYSTEM

Topping up of the coolant system and evaporation over a period of time can affect the dilution of the mixture. This should be checked using a refractometer, which can be supplied by Wadkin (see Appendix A5). As a general guide the mixture should be checked and corrected if necessary every 1 to 2 months.

The useful life of the coolant mixture is dependent on various factors such as the amount of use, type of wheels used, cleaning down practice etc. As a general guide the coolant should be replaced every 4 to 6 months.

The machine should be thoroughly cleaned down and drained of coolant. The tank should be emptied and the coolant disposed of as per Appendix A2.

The system should be cleansed with an anti-bacterial cleaning fluid when required. Details of the anti-bacterial solution supplied by Wadkin are given in Appendix A3.

Important : If coolant fluids are used other than those supplied by Wadkin, the Health and Safety recommendations supplied with the fluid should be strictly followed.

Different types of coolant fluid should not be mixed together. When changing supply, the system should be thoroughly drained and cleaned before refilling with the new coolant.

5.6 ELECTRICAL SYSTEM

All electrical maintenance work should be carried out by a competent electrician.

The electrical circuit diagram is included at the end of this manual - see Appendix A7. A copy of the circuit diagram for the machine should be enclosed with the machine documentation inside the electrical control cabinet.

If the machine is fitted with a variable speed grinding spindle (optional extra), a separate instruction manual and wiring diagram for the inverter should also be enclosed.

Routine maintenance of the electrical system is not necessary other than to check the condition of the controls and worklamp. Any damaged control buttons etc. or defective bulbs should be replaced.

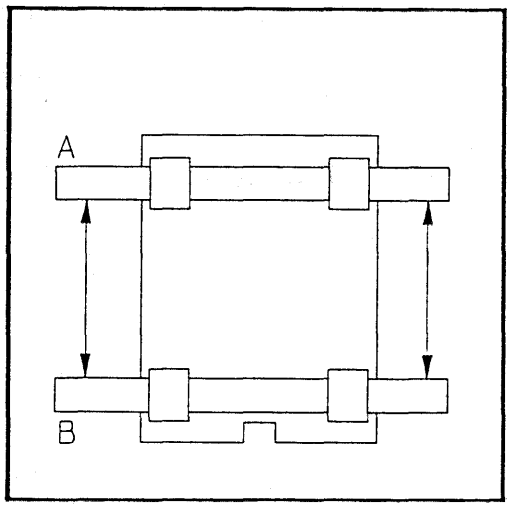
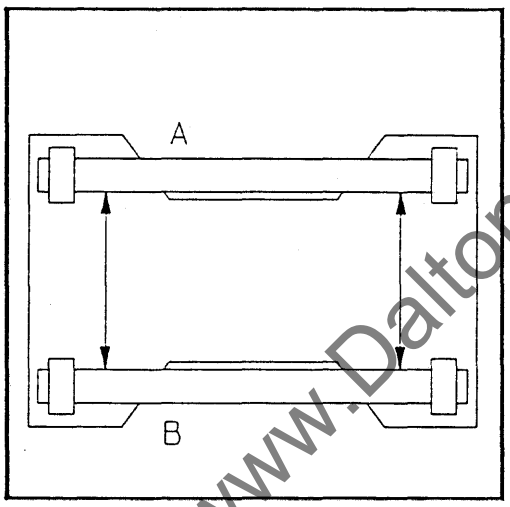
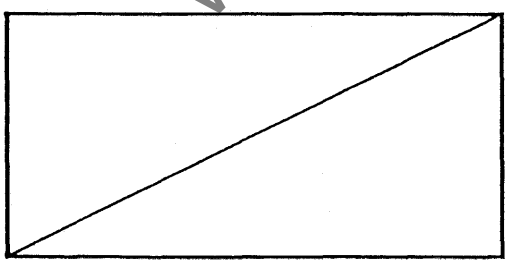
5.7 MACHINE ALIGNMENTS

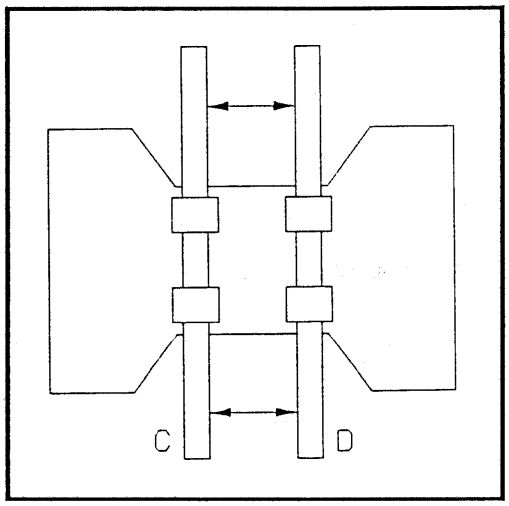
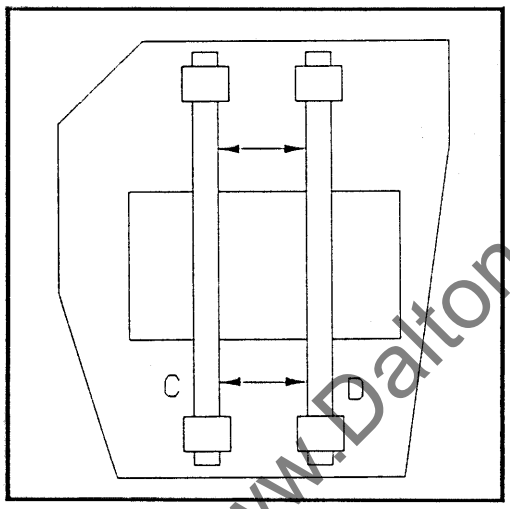
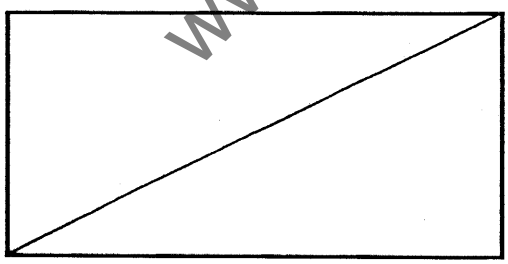
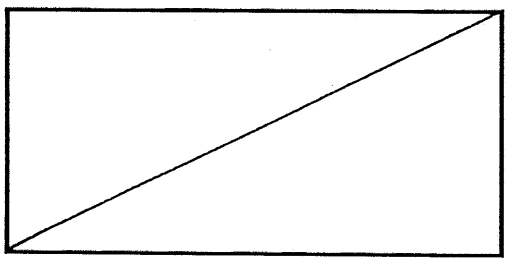
There are a number of alignments and checks which are built into the machine from new and MUST be re-set whenever parts are dismantled and re-built. The following alignments should be set by a competent engineer.

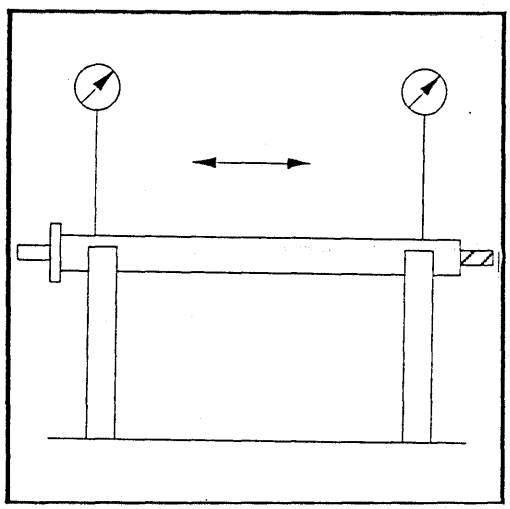
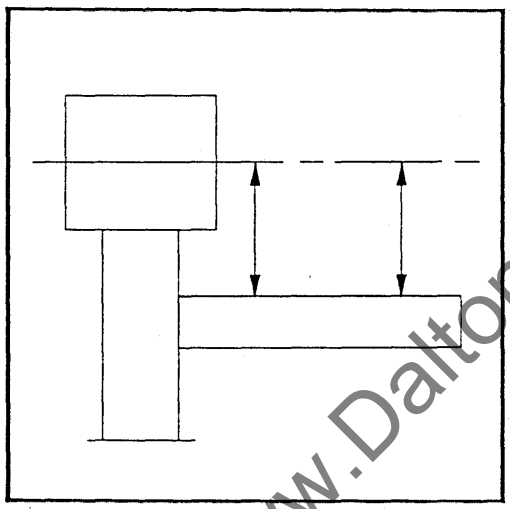
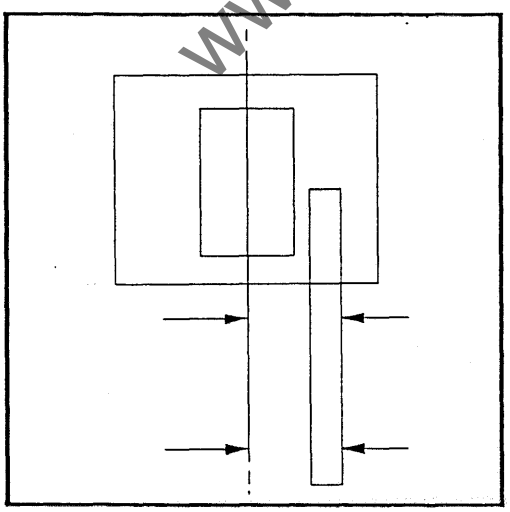
TEST EQUIPMENT

Some of the tests involve the use of special test equipment which can be supplied by Wadkin if required.

Part No.	Description	For test no.
MPG 201	Steel test wheel (230 dia. x 6)	25,26.
MPG 202	Setting plate	17.
MPG 203	Bi-Gwylie	16
T3005334	Ground bar (25 dia. x 470)	9,10,16,18,19,20,21

Test No.	Test diagram	Test	Permissible Error mm | inch
1		Parallelism of carriage bottom slide rods A and B fitted in bearing housing.	0.013 / 0.0005
2		Parallelism of carriage bottom slide rods A and B fitted in support pillars	0.013 / 0.0005
3		Variation in separation of rods A and B in tests No's 1 and 2 above	0.025 / 0.001

Test No.	Test diagram	Test	Permissible Error mm / inch
4		Parallelism of carriage top slide rods C and D fitted in bearing housings.	0.013 / 0.0005
5		Parallelism of carriage top slide rods C and D fitted in support pillars.	0.013 / 0.0005
6		Variation in separation of rods C and D in tests No's 4 and 5 above	0.025 / 0.001
7		Check lubrication and smooth running of bearings.	--- / ---

Test No.	Test diagram	Test	Permissible Error mm | inch
8		Parallelism of arbor height to carriage left / right movement. Check at mid position : Check at front and back positions :	 0.025 / 0.001 0.13 / 0.005
9		Parallelism of cutter rest slide way shaft to pivot axis. Position 1 :	 0.05 / 0.002
10		Parallelism of cutter rest slide way to pivot axis. Position 2 :	 0.05 / 0.002

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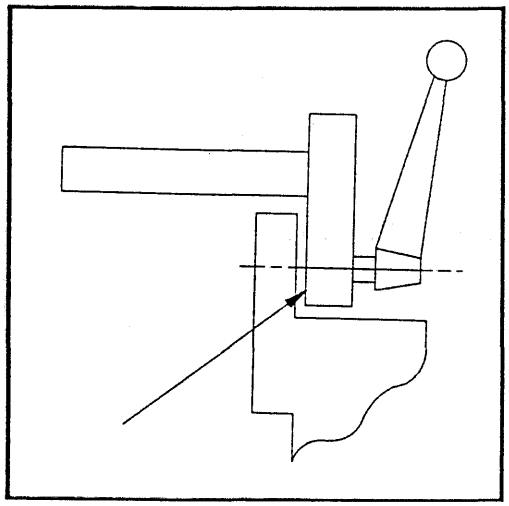
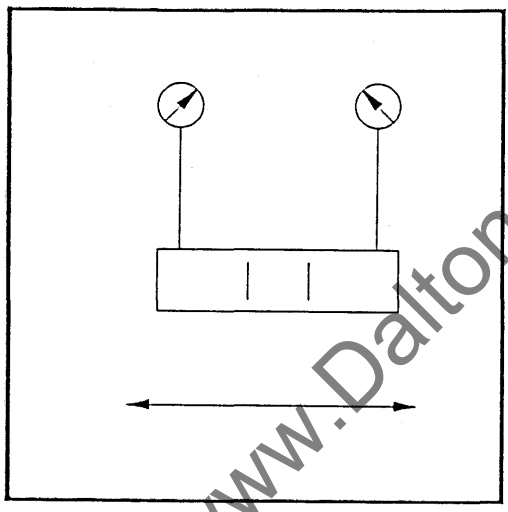
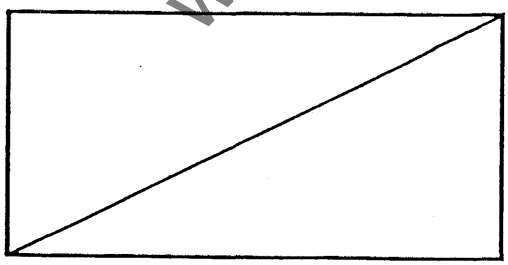
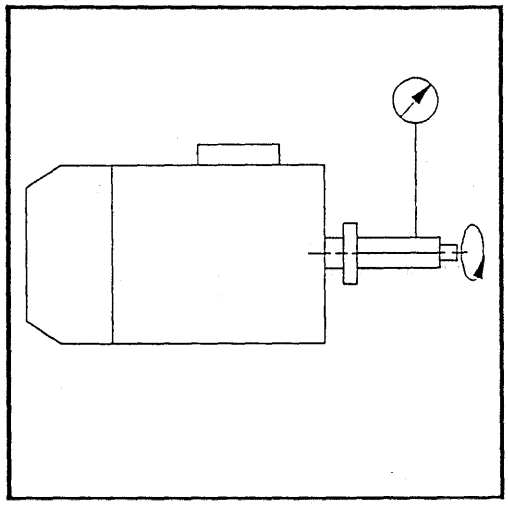
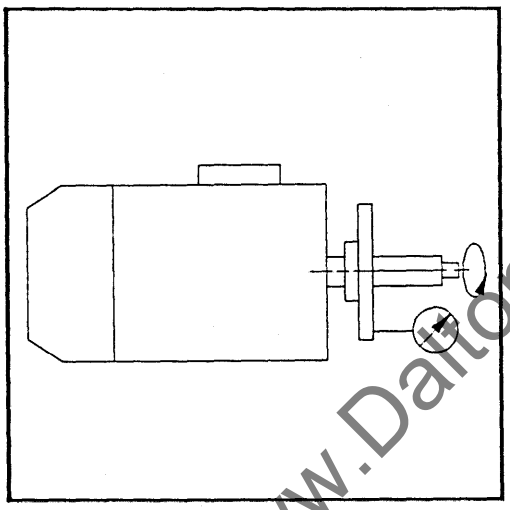
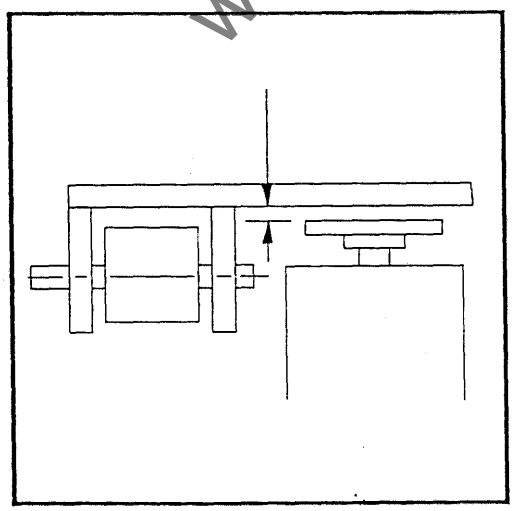
Test No.	Test diagram	Test	Permissible Error mm / inch
11		Cutter rest lock operational and feeler tight at front, mid and back position of slide way.	0.04 / 0.0015
12		Parallelism of cutter rest location face to carriage left / right movement.	0.05 / 0.002
13		Check slide way lubricated and operates smoothly throughout traverse. Check all dowels fitted.	--- / ---

Test No.	Test diagram	Test	Permissible Error mm | inch
14		Runout of grinding motor spindle	0.013/ 0.0005
15		Runout of grinding wheel flange at maximum radius	0.04 / 0.0015
16		Parallelism of grinding wheel flange to pivot axis	0.04 / 0.0015
		Distance from grinding wheel flange to centreline of pivot axis to be 3mm	0.05 / 0.002

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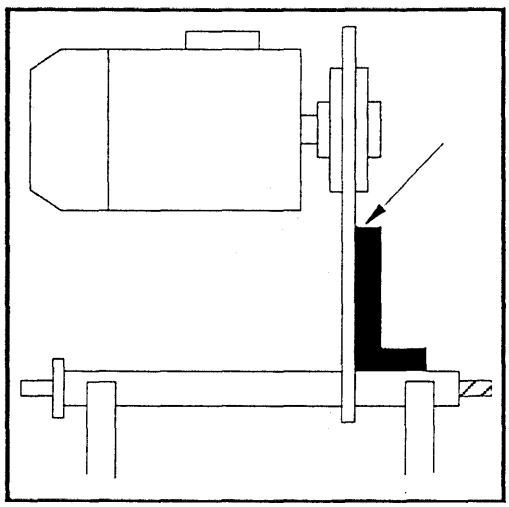
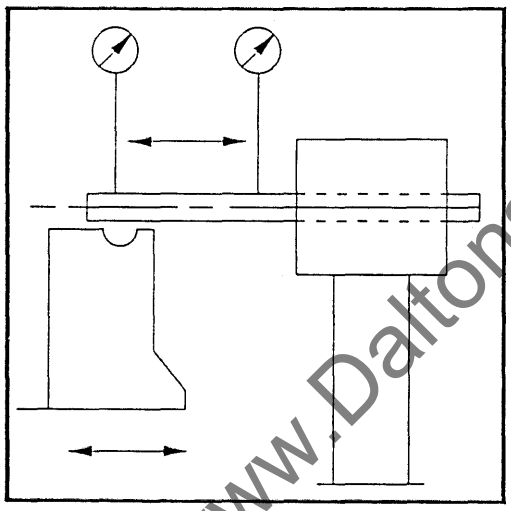
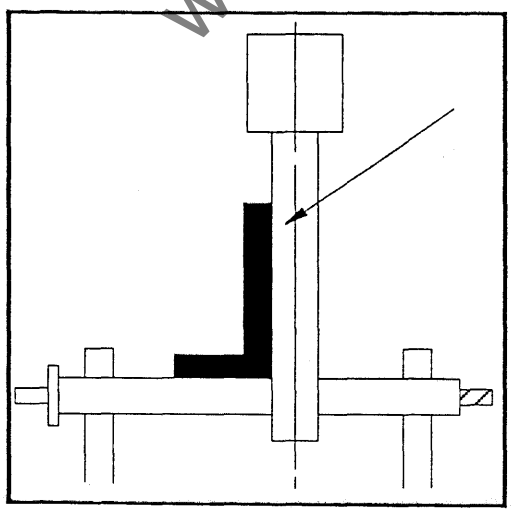
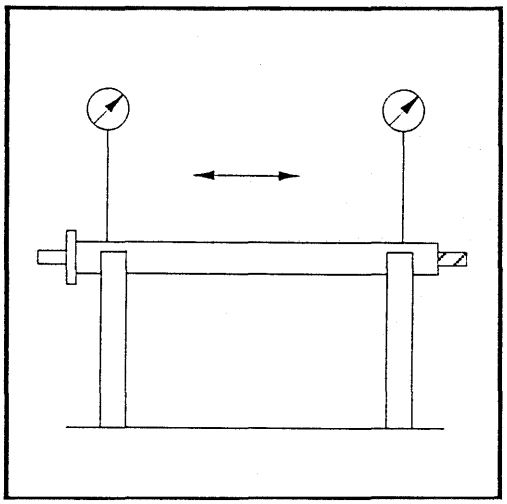
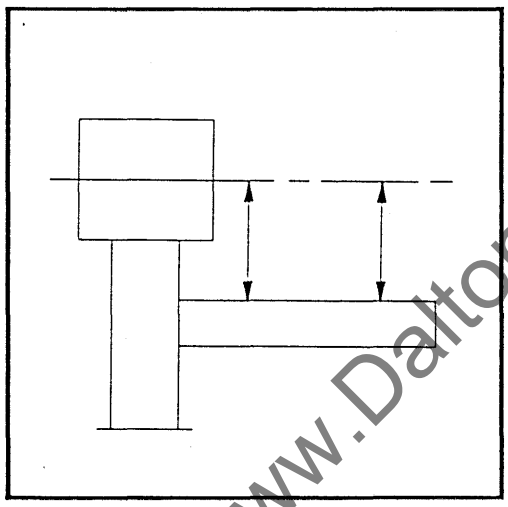
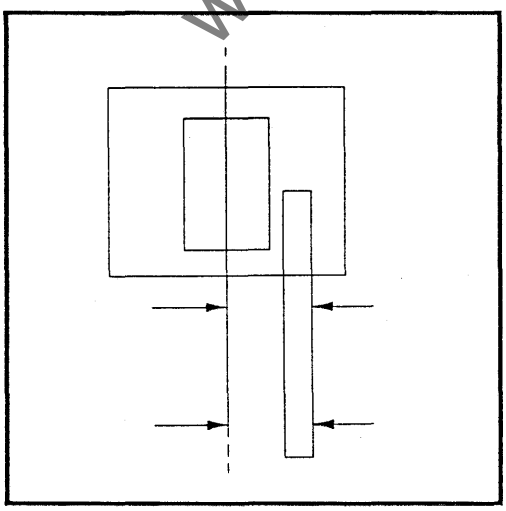
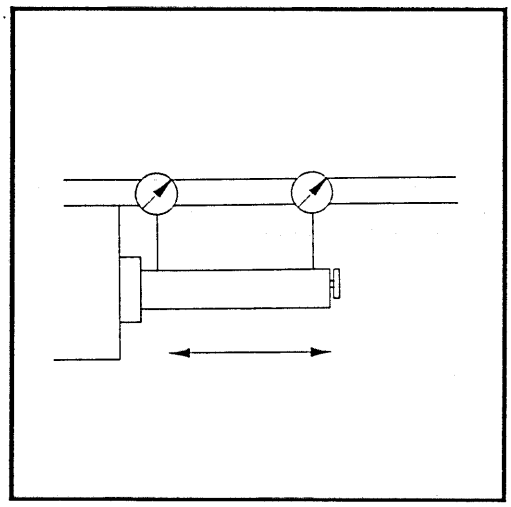
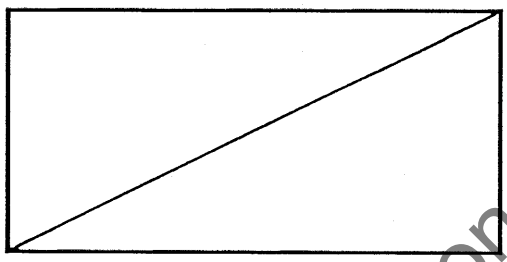
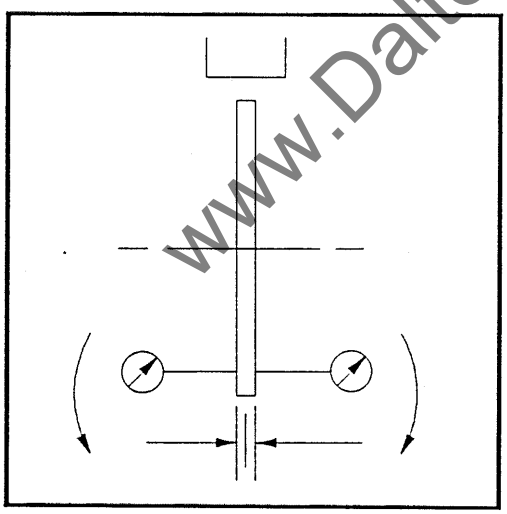
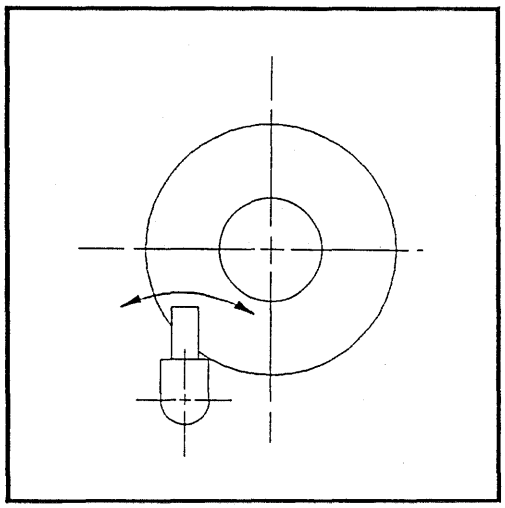
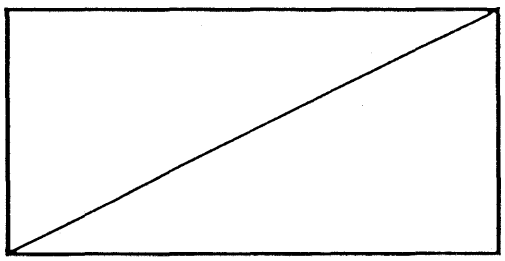
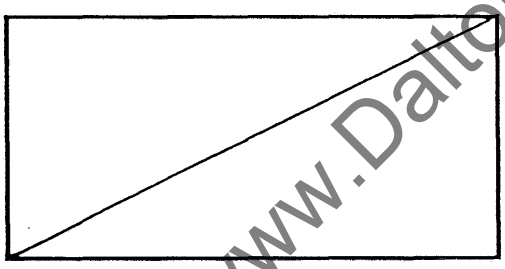
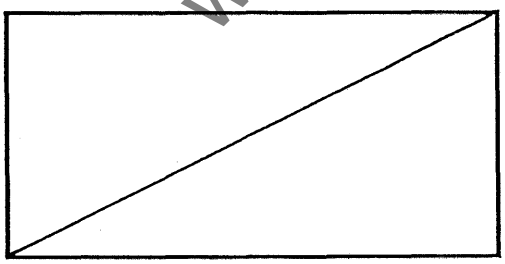
Test No.	Test diagram	Test	Permissible Error mm | inch
17		Squareness of grinding wheel flanges to arbor. Using test plate clamped in flanges, engineer's square mounted off arbor and feeler gauge.	0.04 / 0.0015
18		Parallelism of pivot axis to carriage in / out movement. Using test bar and dial indicator at front and back positions.	0.13 / 0.005
19		Squareness of pivot axis to arbor. Using test bar, engineer's square mounted off arbor, and feeler gauge.	0.04 / 0.0015

Test No.	Test diagram	Test	Permissible Error mm | inch
20		Arbor centreline to be 0.20 mm above pivot axis. Using test bar and height gauge	0.13 / 0.005
21		Cutter rest to be 0.7 mm above pivot axis Using test bar and height gauge	0.05 / 0.002
22		Parallelism of template location edge to arbor	0.013 / 0.0005

Test No.	Test diagram	Test	Permissible Error mm | inch
23		Parallelism of template location height to carriage left / right movement.	0.13 | 0.005
24		Check template slide way lubricated and operates smoothly throughout traverse. Check locks operational. Check all dowels fitted.	--- / ---
25		Check set-screw on dresser anchor bracket locates dresser rotary axis about pivot axis Using steel test wheel and dial indicator mounted off diamond dresser.	0.025 / 0.001

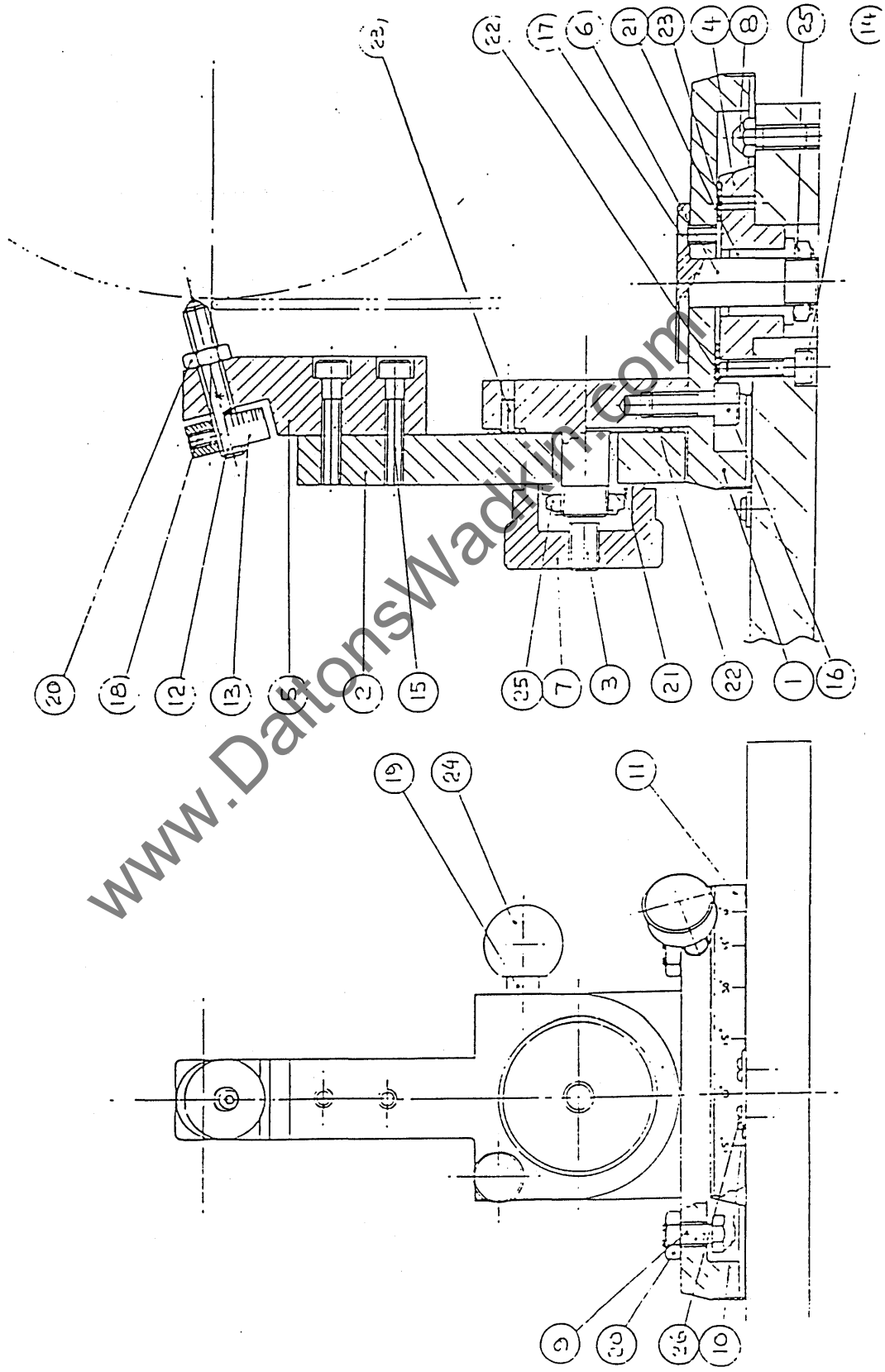
Test No.	Test diagram	Test	Permissible Error mm | inch
26		Check dresser 180° rotation stop screw positions using steel test wheel and dial indicator mounted off diamond dresser. At 180° positions swivel dial indicator across sides of test wheel	0.025 / 0.001
27		Check dresser rotation scale set at zero degrees when square to grinding wheel.	--- / ---
28		Check dresser vertical position	--- / ---
29		Check locks operational on lower dresser rotation and dresser swivel motions	--- / ---

SECTION 6 : ILLUSTRATED PARTS LIST

Should it become necessary to replace worn or damaged parts of the machine, it is essential that the work is carried out by a competent engineer in order to maintain the grinding accuracy of the machine. Alignments MUST be re-set as described in section 5.7.

Always quote the Machine No. and Test No. when ordering spare parts from Wadkin. This information is marked on the machine nameplate.

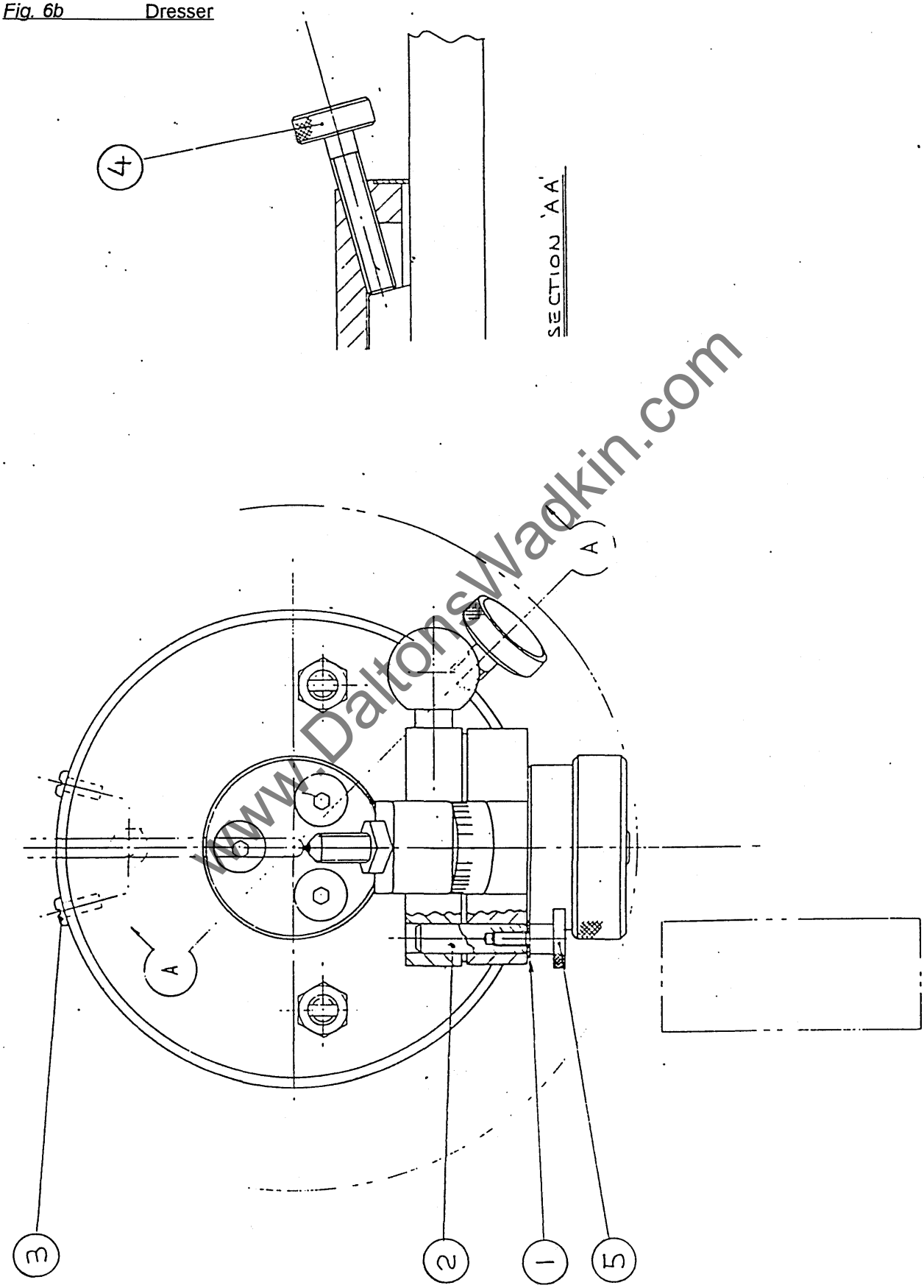
Fig. 6a Dresser



DRESSER *(Fig. 6a)*

ITEM	QTY	PART No.	DESCRIPTION
1	1	MPG 151	Rot.pivot plate - dresser
2	1	MPG 152	Pivot arm - dresser
3	1	MPG 153	Pivot block dresser
4	1	MPG 154	Seating bung - dresser
5	1	MPG 155	Extension arm - dresser
6	1	MPG 156	Rotary pivot pin - dresser
7	1	MPG 157	Locking knob - dresser
8	1	MPG 158	Stop screw - dresser
9	2	MPG 159	Adj. stop screw - dresser
10	1	MPG 175	Scale indicator
11	1	NXU 520	Scale for dresser
12	1	NXU 522	Diamond dresser
13	1	NXU 523	Graduated dial - dresser
14	3	T05 25166	Hex Skt capscrew M6 x 20 mm
15	2	T05 25168	Hex Skt capscrew M6 x 30 mm
16	2	T05 25187	Hex Skt capscrew M8 x 20 mm
17	3	T05 25324	Hex Skt csk screw M6 x 12 mm
18	1	T05 26103	Hex Skt grubscrew M5 x 10 mm
19	1	T05 26264	Screwed stud M10 x 35 mm
20	3	T05 27109	Hex lock nut M8
21	2	T30 05120	27FI bush 15 ID x 21 OD x 20 lg
22	2	T30 05341	Thrust washer 62 OD x 38 B
23	2	T30 13158	Dowel pin M4 x 10
24	1	T30 41252	Elesa ballknob 10 mm thread
25	2	T30 53109	Fuji locknut M15 x 1.0
26	2	T30 73132	Slotted pan head screw M4 x 10 mm

Fig. 6b Dresser



DRESSER *(Fig. 6b)*

ITEM	QTY	PART No.	DESCRIPTION
1	1	T05 28100	Washer 4 mm
2	1	T30 13160	Retractable dowel 8 x 30
3	2	T30 73132	Slotted pan head screw M4 x 10
4	1	T30 73140	Adjusting screw
5	1	T30 73153	Thumb screw M4 x 10 mm

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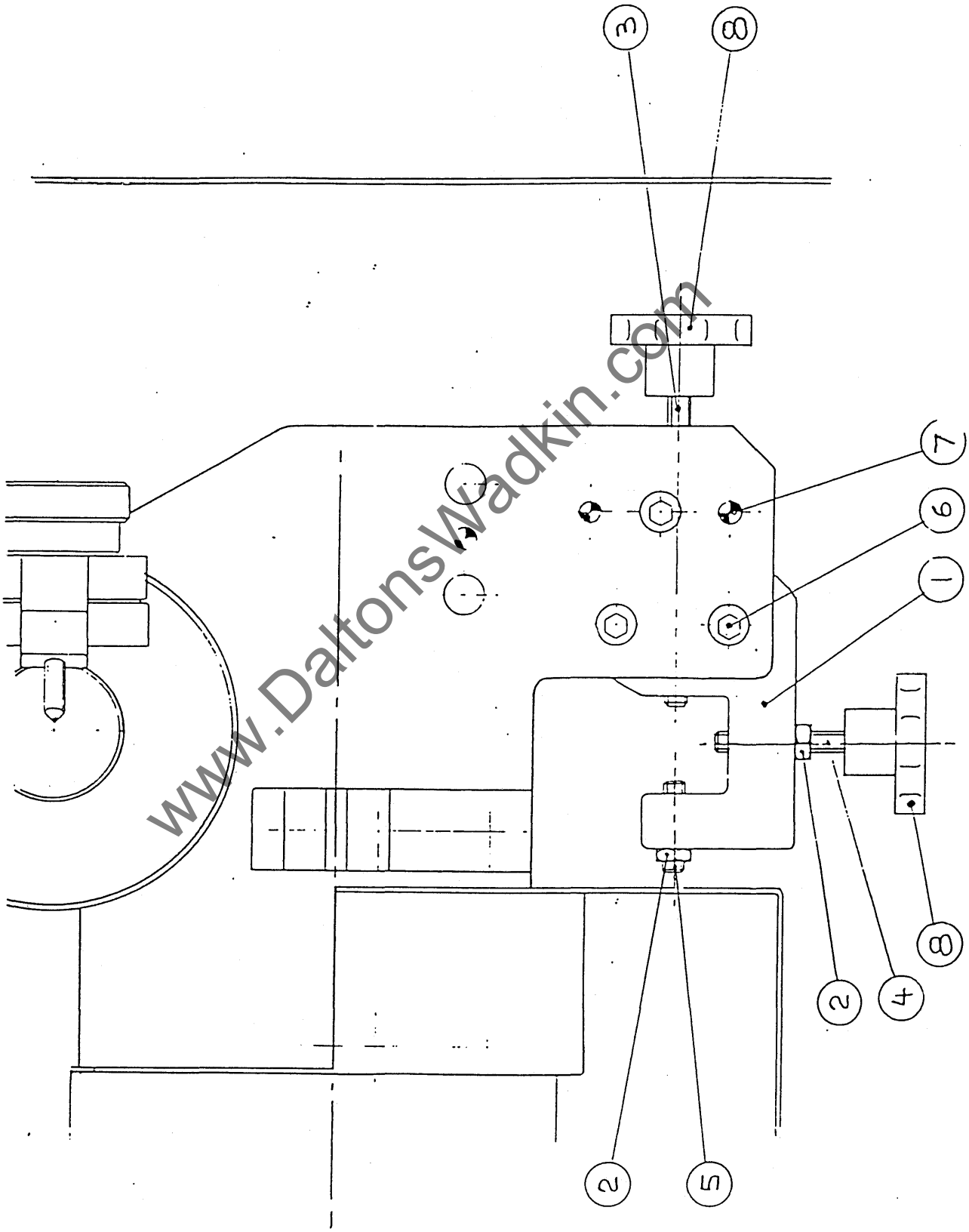
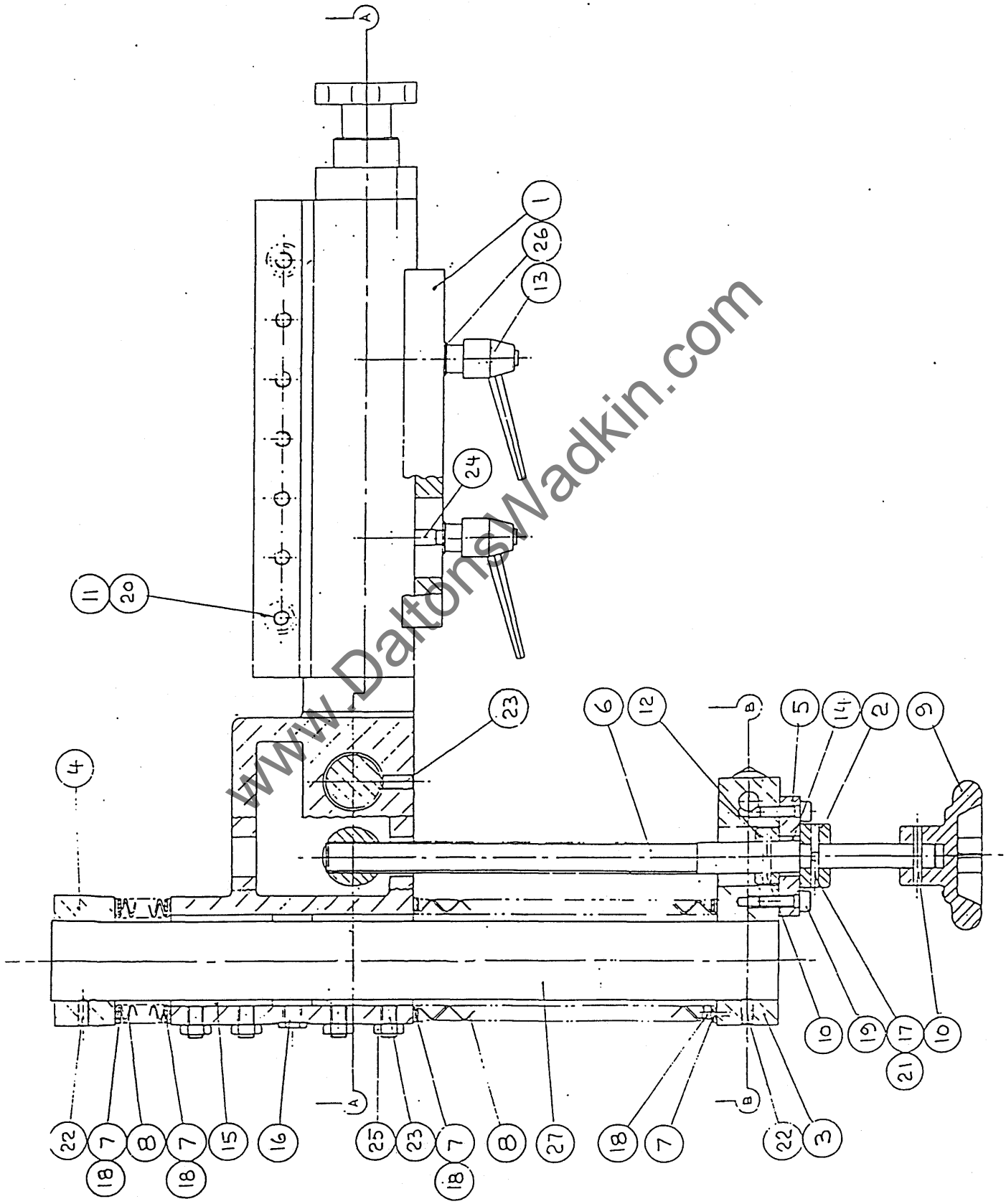
Fig. 6c Dresser location



DRESSER LOCATION *(Fig. 6c)*

ITEM	QTY	PART No.	DESCRIPTION
1	1	MPG 37	Anchor bracket
2	2	K05 27102	Hex full nut 8 mm
3	0.130	K30 73523	M8 x 1.25p x 1M screwed rod
4	0.085	K30 73523	M8 x 1.25p x 1M screwed rod
5	1	T05 26132	Hex skt grubscrew M8 x 40 mm
6	3	T05 25188	Hex skt capscrew M8 x 25 mm
7	2	T30 13156	Retractable dowel 8 mm x 40 mm
8	2	K05 30320	Handwheel M8

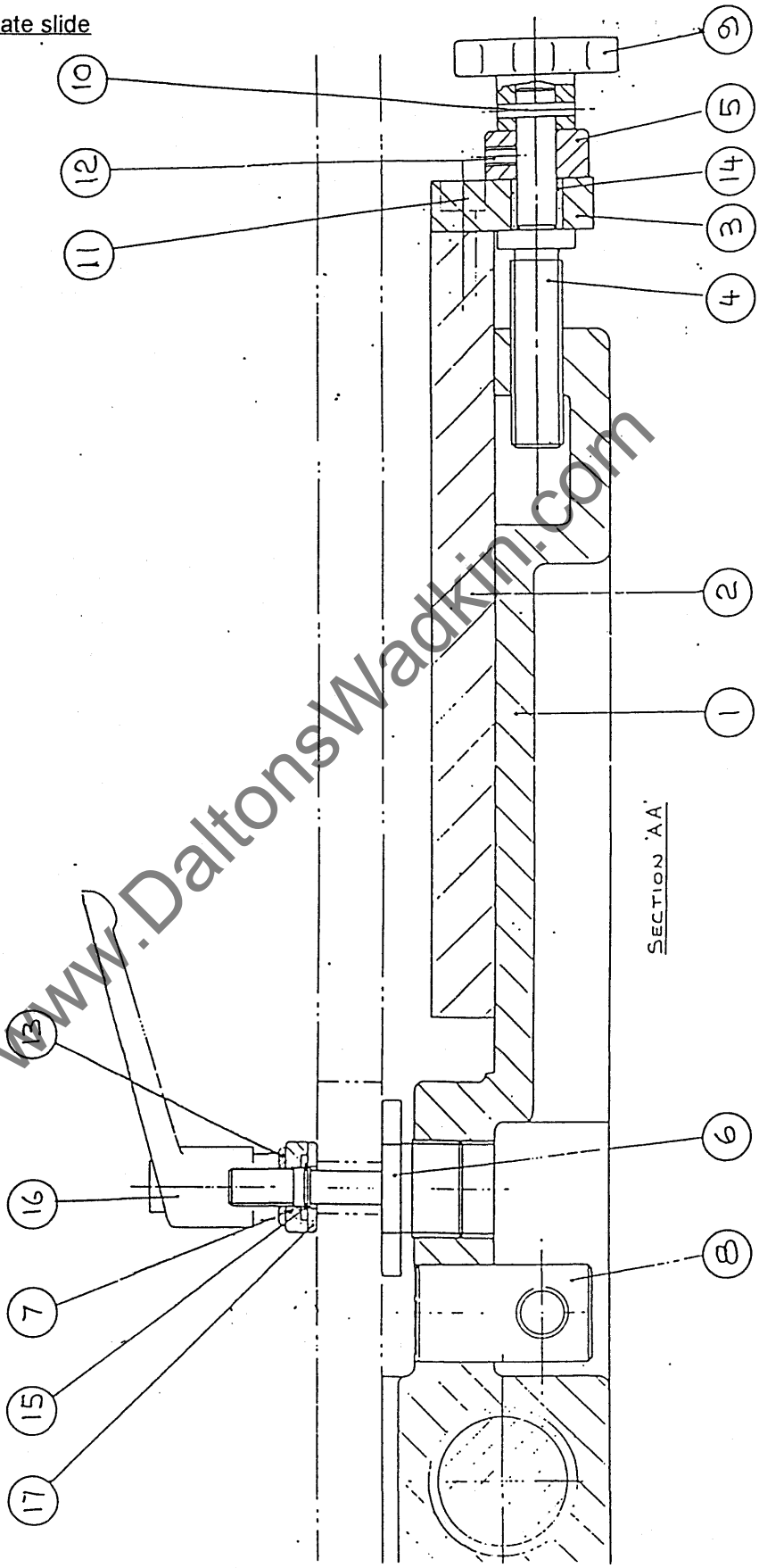
Fig. 6d Template slide



TEMPLATE SLIDE (*Fig. 6d*).

ITEM	QTY	PART No.	DESCRIPTION
1	1	MPG 13	Clamp plate - template holder
2	1	MPG 20	Graduated dial - template
3	1	MPG 30	Front shaft support - template
4	1	MPG 31	Rear shaft support - template
5	1	MPG 44	Plate - template screw
6	1	MPG 45	Adj. screw - template depth
7	4	MPG 119	Bellow clamp plate
8	2	MPG 129	Template bellows
9	1	NXU 424	Handwheel plastic 13 mm Square
10	2	T05 20484	Tension pin 4 mm x 26 mm
11	2	K05 28103	Washer 8 mm
12	1	K05 28209	Loose collar 16 x 28 x 12 lg
13	2	K05 30241	Rachet L/handle M8 x 12.5
14	1	K05 31527	Oil retention bush 16 x 20 x 12 lg
15	2	K05 31640	Bush 40 x 46 x 50
16	1	K09 50102	HF5 Oil nipple str.1/8 BSP
17	1	T05 20485	Tension pin 4 mm x 32 mm
18	16	T05 25121	Hex skt capscrew M4 x 10 mm
19	2	T05 25166	Hex skt capscrew M6 x 20 mm
20	2	T05 25187	Hex skt capscrew M8 x 20 mm
21	1	T05 26114	Hex skt grubscrew M6 x 10 mm
22	2	T05 26115	Hex skt grubscrew M6 x 12 mm
23	5	T05 26127	Hex skt grubscrew M8 x 16 mm
24	2	T05 26235	Screwed stud M8 x 35 mm
25	4	T05 27109	Hex lock nut M8
26	2	T05 28112	Washer 8 mm (large dia.)
27	1	T30 05350	Bearing shaft dia. 40 x 365

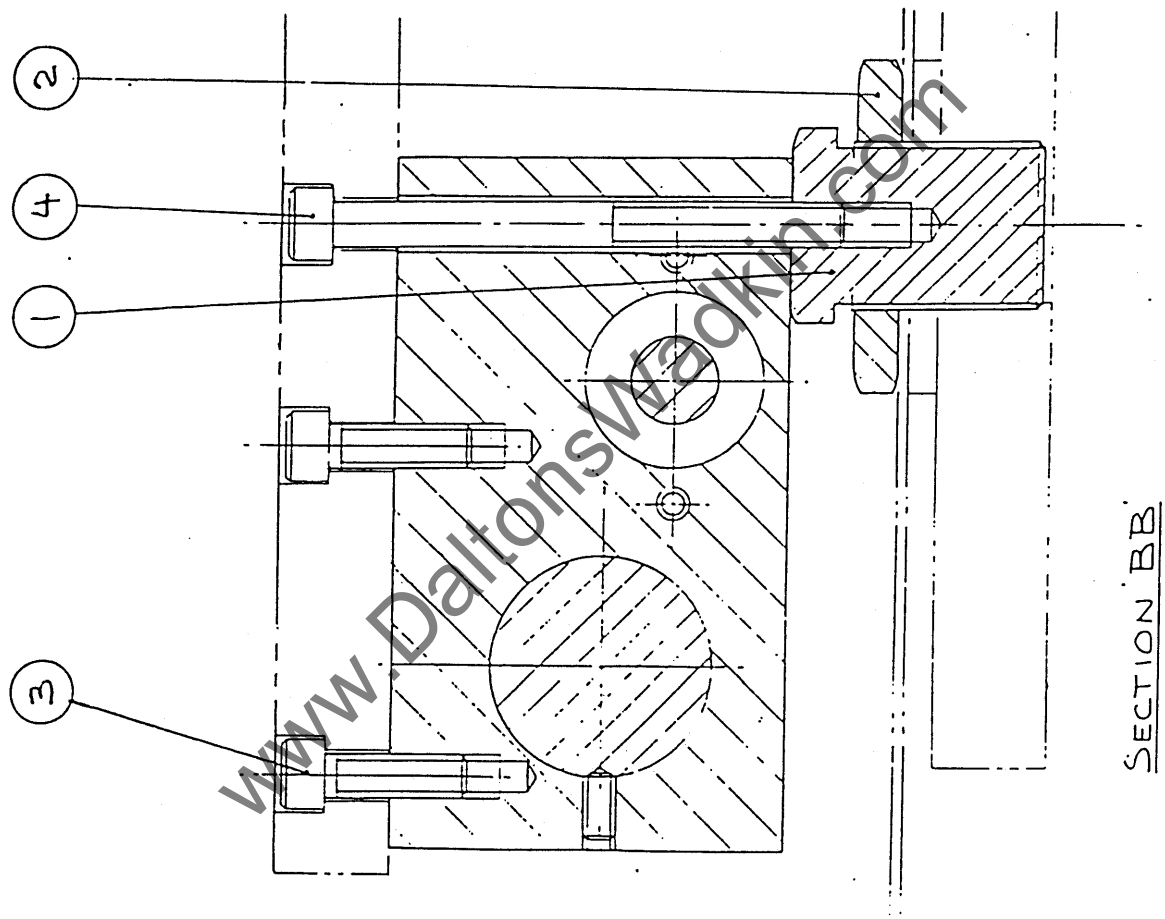
Fig. 6e Template slide



TEMPLATE SLIDE *(Fig. 6e)*

ITEM	QTY	PART No.	DESCRIPTION
1	1	MPG 11	Template slide
2	1	MPG 12	Template holder
3	1	MPG 14	Anchor plate - template adj.
4	1	MPG 15	Side adj. screw - template
5	1	MPG 20	Graduated dial - template
6	1	MPG 22	Levelling stud - template
7	1	MPG 23	Stepped washer - template
8	1	MPG 63	Adjusting nut - template
9	1	K05 30322	Handwheel 50 mm bore 12 mm dia. No.141
10	1	T05 20484	Tension pin 4 mm x 26 mm
11	2	T05 25187	Hex skt capscrew M8 x 20
12	1	T05 26114	Hex skt grubscrew M6 x 10 mm
13	1	T05 28105	Washer 12 mm
14	1	T05 31550	Bush 12 ID x 16 OD x 16 lg
15	1	T30 09102	External circlip 12 mm dia.
16	1	T30 29106	Black adj.handlever - M12
17	1	T30 89106	Jig washer WDS 400-205

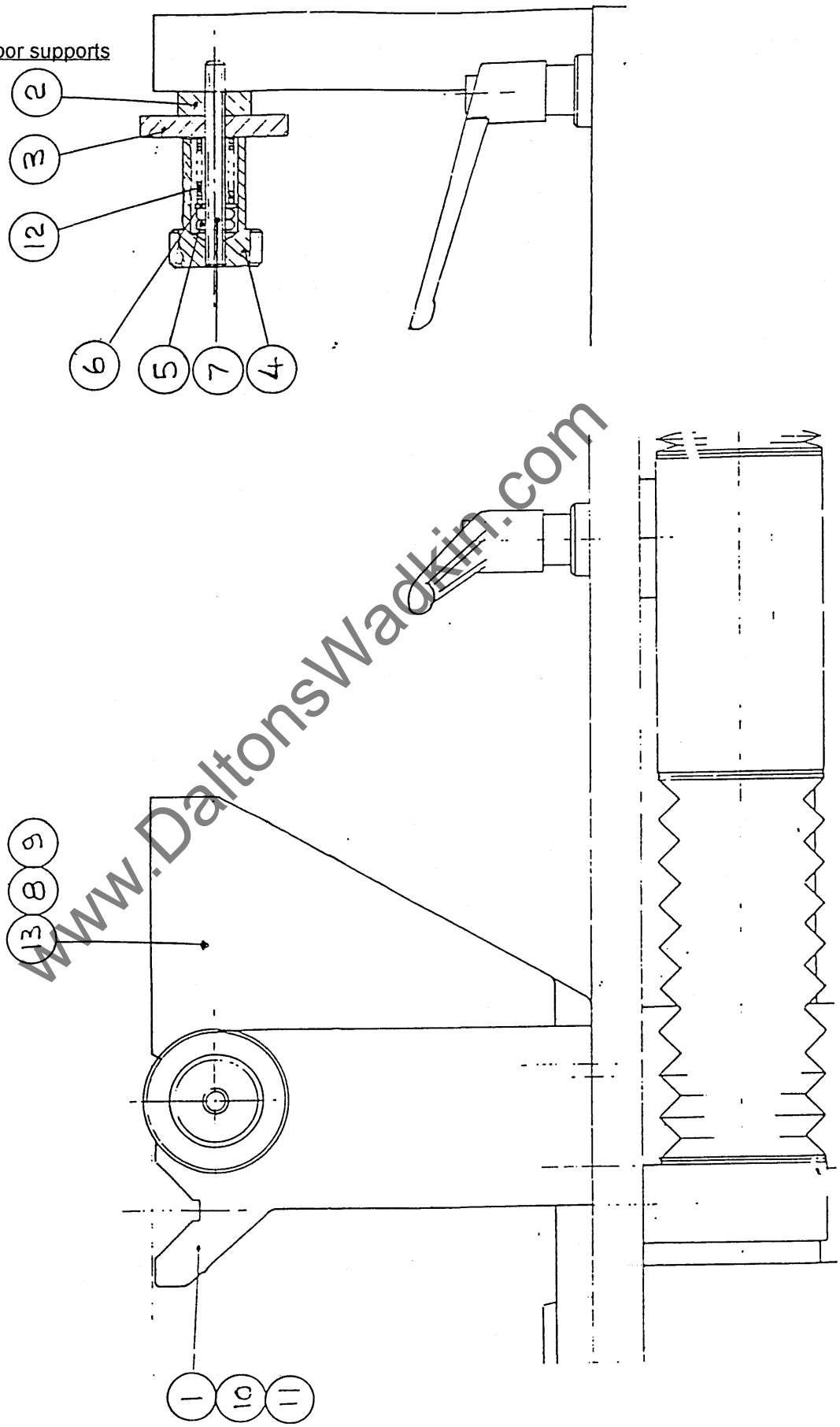
Fig. 6f Template slide mount



TEMPLATE SLIDE MOUNT *(Fig. 6f)*

ITEM	QTY	PART No.	DESCRIPTION
1	1	MPG 21	Adjustable spacer - template
2	1	MPG 62	Locknut - levelling screw
3	4	T05 25188	Hex skt capscrew M8 x 25 mm
4	1	T05 25200	Hex skt capscrew M8 x 90 mm

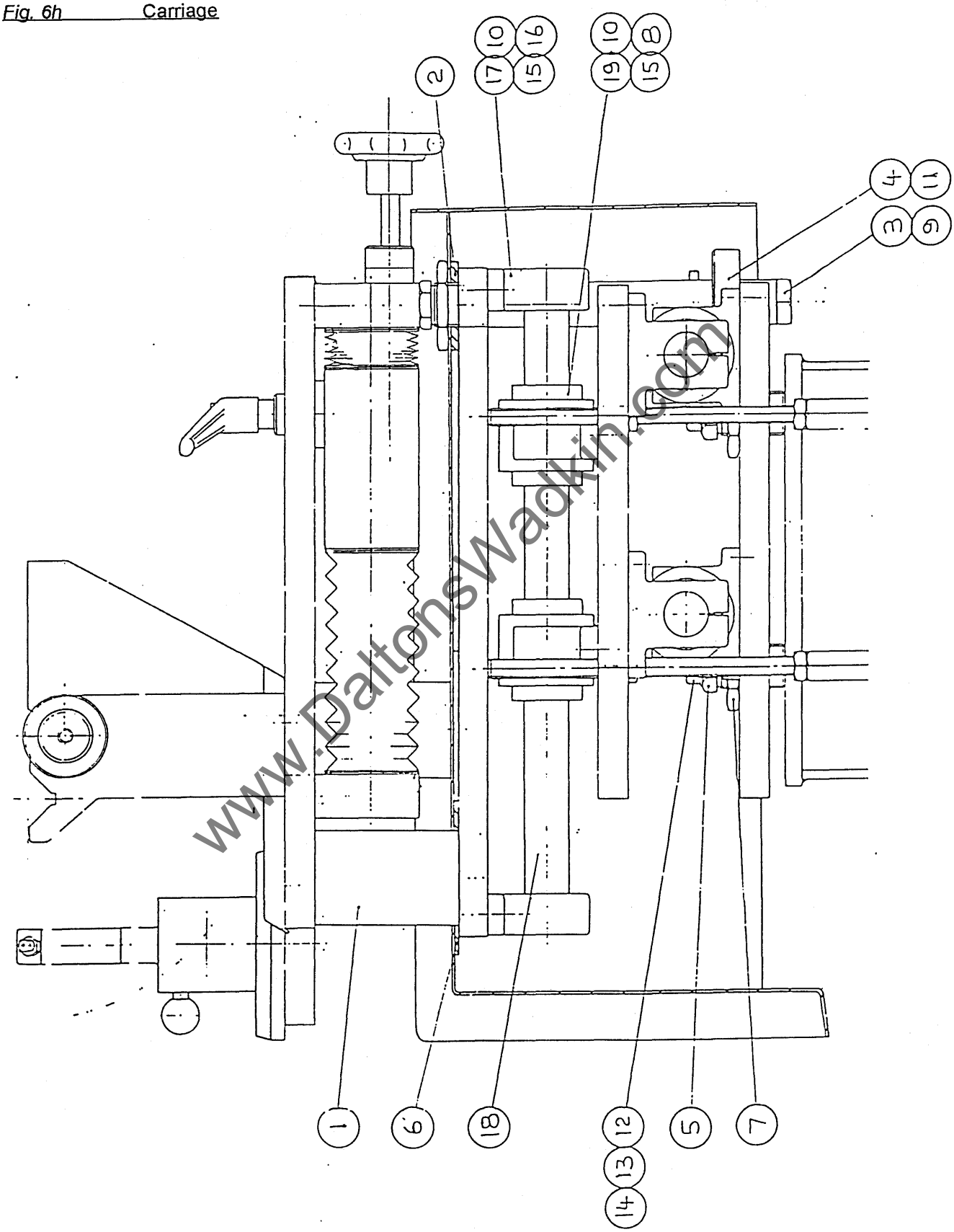
Fig. 6g Arbor supports



ARBOR SUPPORTS *(Fig. 6g)*

ITEM	QTY	PART No.	DESCRIPTION
1	2	MPG 35	Arbor post
2	1	MPG 160	Spacing nut - arbor lock
3	1	MPG 161	Thrust collar - arbor lock
4	1	MPG 167	Locking knob - arbor lock
5	2	K05 27102	Hex full nut M8
6	1	K05 28103	Washer 8 mm
7	0.08	K30 73523	M8 screwed rod
8	4	T05 25424	Pozi pan head screw M6 x 16 mm
9	4	T05 28102	Washer 6 mm
10	4	T05 25188	Hex skt capscrew M8 x 25
11	4	T05 29132	Plain dowel 6 mm x 30 mm
12	1	T30 73807	Compression spring
For NV 230 :			
13	1	MPG 48	Splash guard (230 capacity)
For NV 300 :			
13	1	MPG 40	Splash guard (300 capacity)

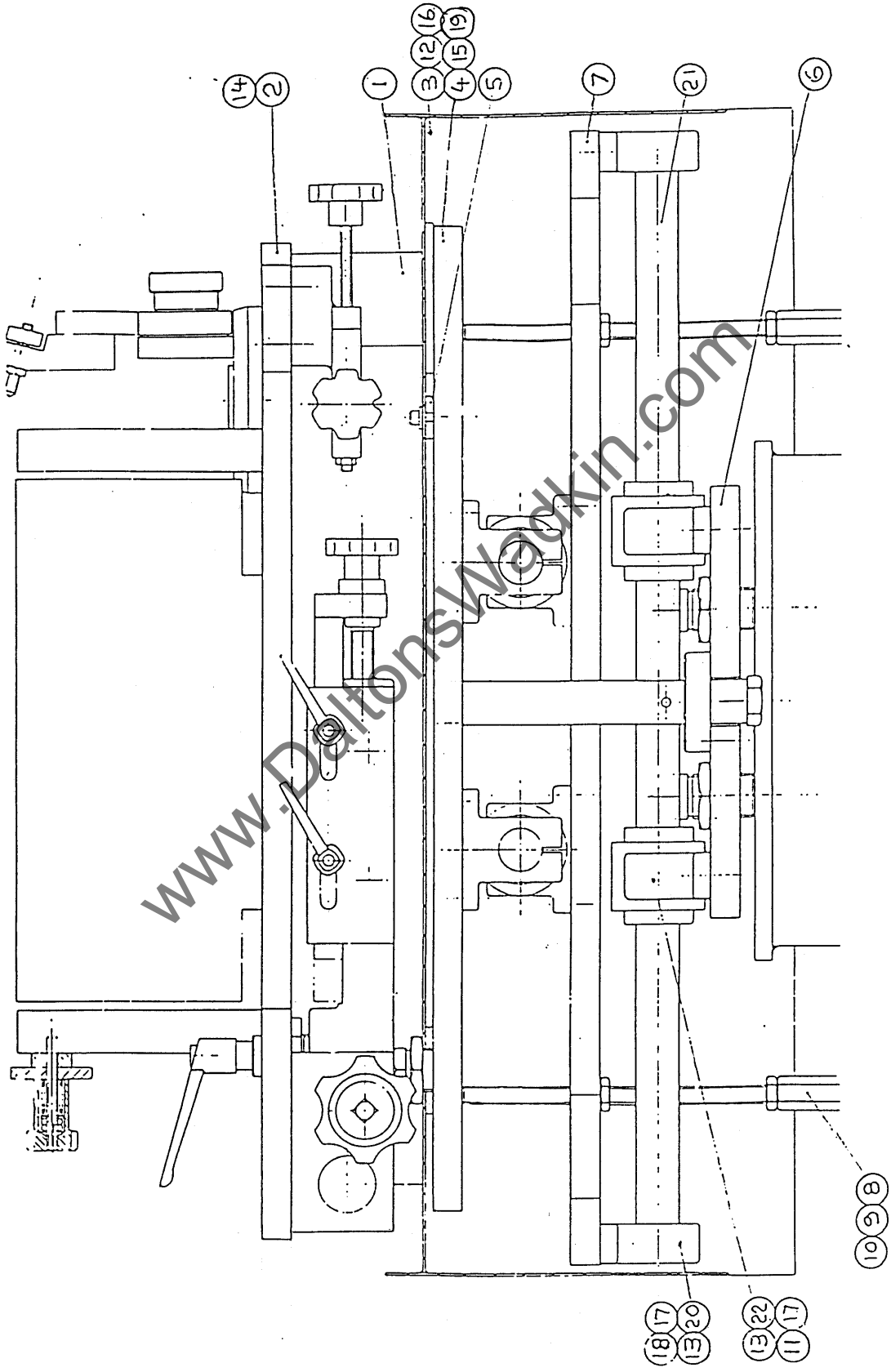
Fig. 6h Carriage



CARRIAGE (*Fig.6h*)

ITEM	QTY	PART No.	DESCRIPTION
1	1	MPG 29	Pillar - bridge plate
2	1	MPG 53	Seal bridge plate pillar
3	1	MPG 59	Carriage transit bolt
4	1	MPG 60	Collar - transit bolt
5	4	MPG 61	Levelling screw
6	2	MPG 64	Seal - bridge plate pillar
7	4	K05 27207	Notch nut M30 x 1.5
8	8	K05 29144	Plain dowel 8 mm x 25 mm
9	1	T05 20527	Tension pin 6 mm x 40 mm
10	16	T05 25167	Hex skt capscrew M6 x 25 mm
11	2	T05 25190	Hex skt capscrew M8 x 35 mm
12	4	T05 26305	Screwed stud M12 x 95 mm
13	4	T05 27104	Hex full nut M12
14	4	T05 28105	Washer 12 mm
15	16	T05 28153	Spring washer 6 mm
16	4	T05 29131	Plain dowel 6 mm x 25 mm
17	4	T30 05304	Shaft support block GW30
18	2	T30 05368	Stainless steel bearing shaft
19	4	T30 05371	Bearing and housing 4 hole

Fig. 6i Carriage



CARRIAGE *(Fig. 6i)*

ITEM	QTY	PART No.	DESCRIPTION
1	1	MPG 29	Pillar - bridge plate
2	1	MPG 34	Bridge plate
3	1	MPG 39	Carriage cover
4	1	MPG 57	Top carriage plate
5	1	MPG 68	Sealing washer / packer
6	1	MPG 92	Carriage levelling plate
7	1	MPG 93	Bottom carriage plate
8	4	MPG 177	Transit stud M12 x 250 mm
9	4	MPG 178	Transit nut
10	8	K05 27111	Hex lock nut 12 mm
11	8	K05 29144	Plain dowel
12	7	T05 25165	Hex skt capscrew M6 x 16 mm
13	16	T05 25167	Hex skt capscrew M6 x 25 mm
14	4	T05 25188	Hex skt capscrew M8 x 25 mm
15	4	T05 25190	Hex skt capscrew M8 x 35 mm
16	7	T05 28102	Washer 6 mm
17	16	T05 28153	Spring washer 6 mm
18	4	T05 29131	Plain dowel 6 mm x 25 mm
19	2	T05 29147	Plain dowel 8 mm x 40 mm
20	4	T30 05304	Shaft support block GW30
21	2	T30 05367	Stainless steel bearing shaft
22	4	T30 05371	Bearing and housing 4 hole

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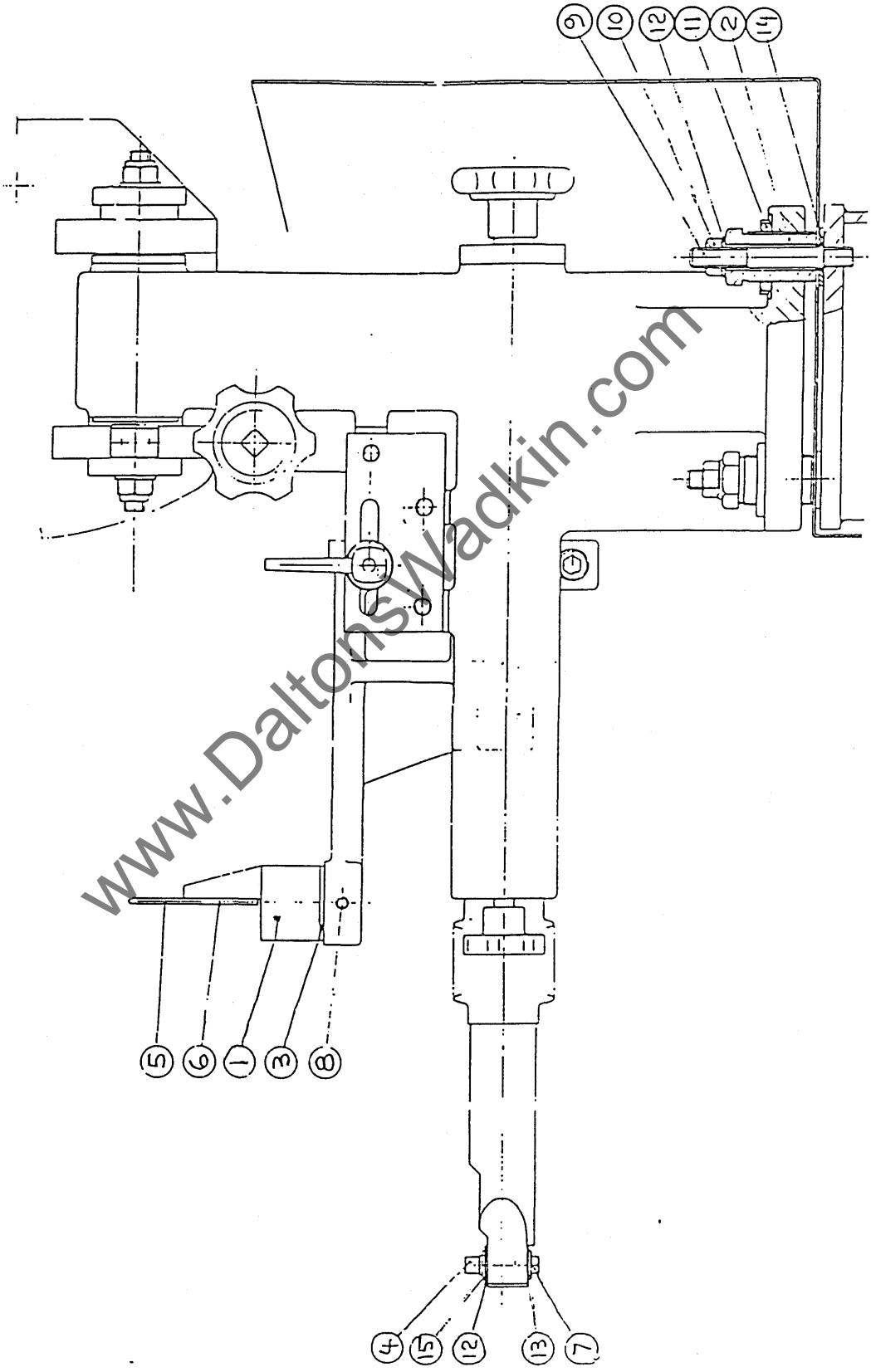
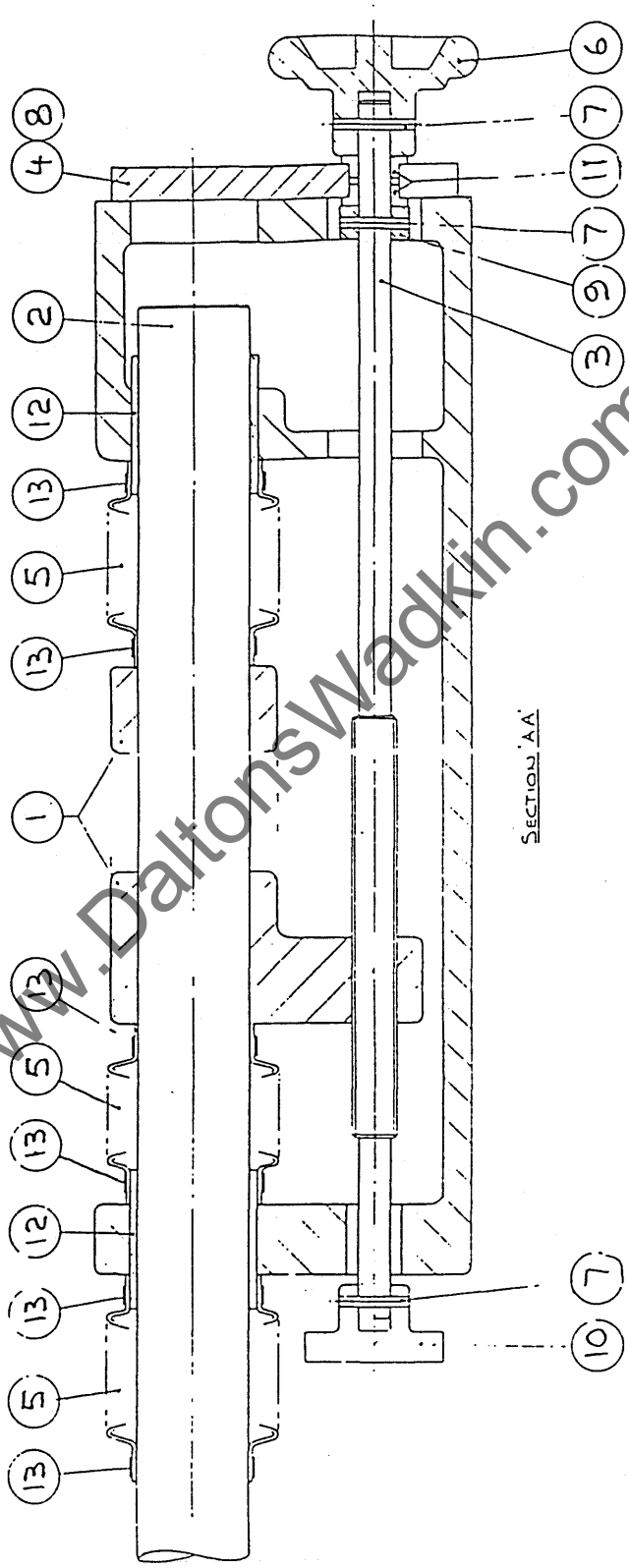
Fig. 6j Stylus / cutter rest slide



STYLUS / CUTTER REST SLIDE *(Fig. 6j)*

ITEM	QTY	PART No.	DESCRIPTION
1	1	MPG 43	Cutter rest mounting base
2	4	MPG 61	Levelling screw
3	1	MPG 70	Cutter rest spacer
4	1	NX 40	Stylus 4.7 mm wide radius and square
5	1	NX 454	25 mm wide NX cutter rest
6	2	K05 25309	Hex skt csk screw M4 x 10 mm
7	1	K05 25501	Hex head screw M6 x 12 mm
8	1	K05 26127	Cup point skt screw M8 x 16 mm
9	4	K05 26305	Screwed stud M12 x 95 mm
10	4	K05 27104	Hex full nut M12
11	4	K05 27207	Notch nut M30 x 1.5
12	5	K05 28105	Washer 12 mm
13	1	K05 28111	Washer 6 mm (large diameter)
14	4	K05 28115	Washer 16 mm (large diameter)
15	1	K30 09931	'E' retainer 7133_090 9 mm

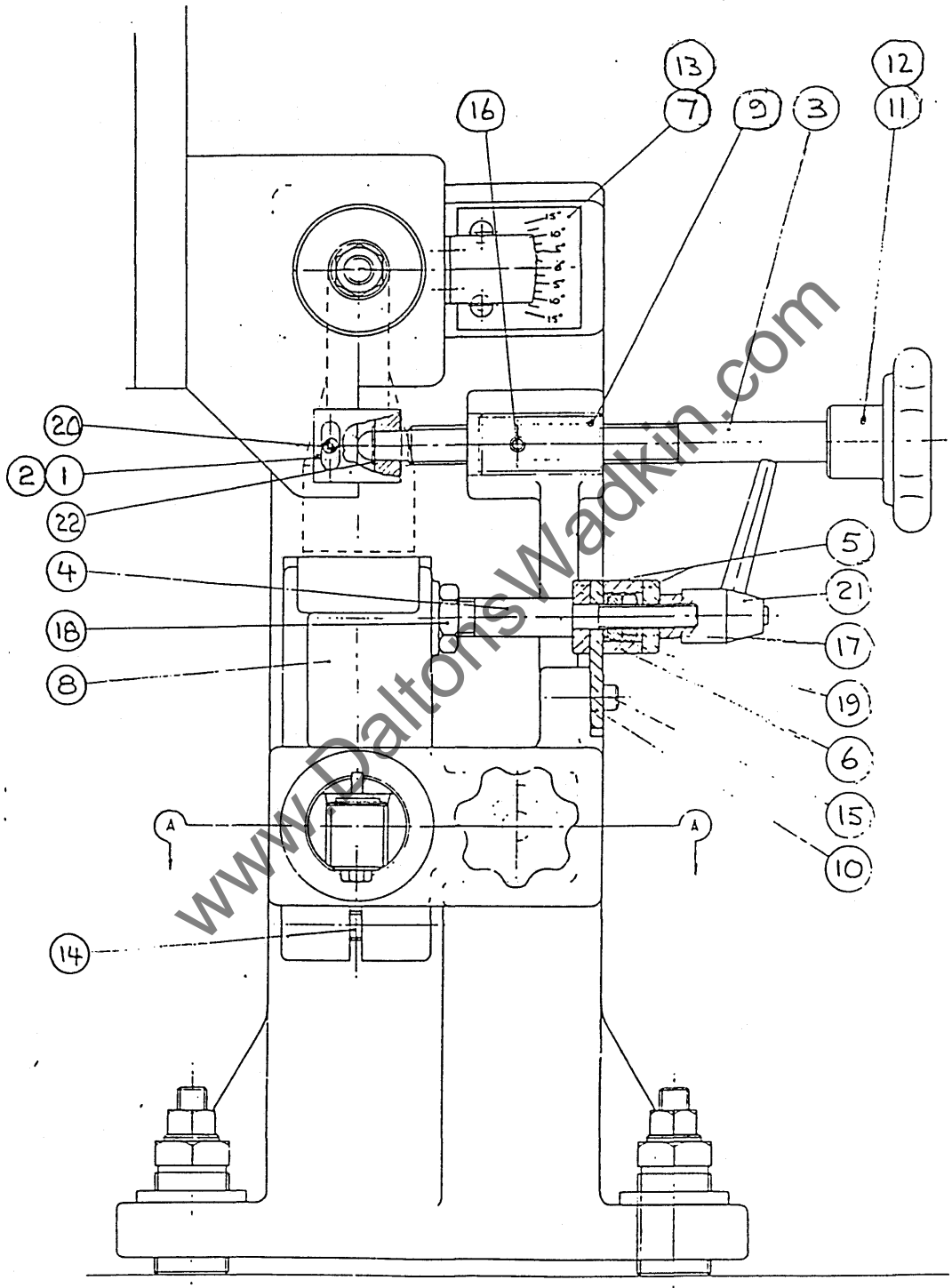
Fig. 6k Stylus / cutter rest slide



STYLUS / CUTTER REST SLIDE *(Fig. 6k)*

ITEM	QTY	PART No.	DESCRIPTION
1	1	MPG 184	Tool rest bracket
2	1	MPG 185	Tool rest / stylus bar
3	1	MPG 186	Adjustment screw
4	1	MPG 187	Screw mounting plate
5	3	MPG 189	Bellows
6	1	NXU 424	Handwheel plastic 13 mm square
7	3	K05 20484	Tension pin 4 mm x 26 mm
8	6	K05 25166	Hex skt capscrew M6 x 20 mm
9	1	K05 28207	Collar 12 mm diameter
10	1	K05 30322	Handwheel 50 mm bore 12 mm dia. No.141
11	2	K05 31302	24 Fl bush, 12 B x 18 OD x 8 lg
12	2	K05 31640	Bush 40 x 46 x 50 lg
13	6	K12 03438	Individual bellows ties

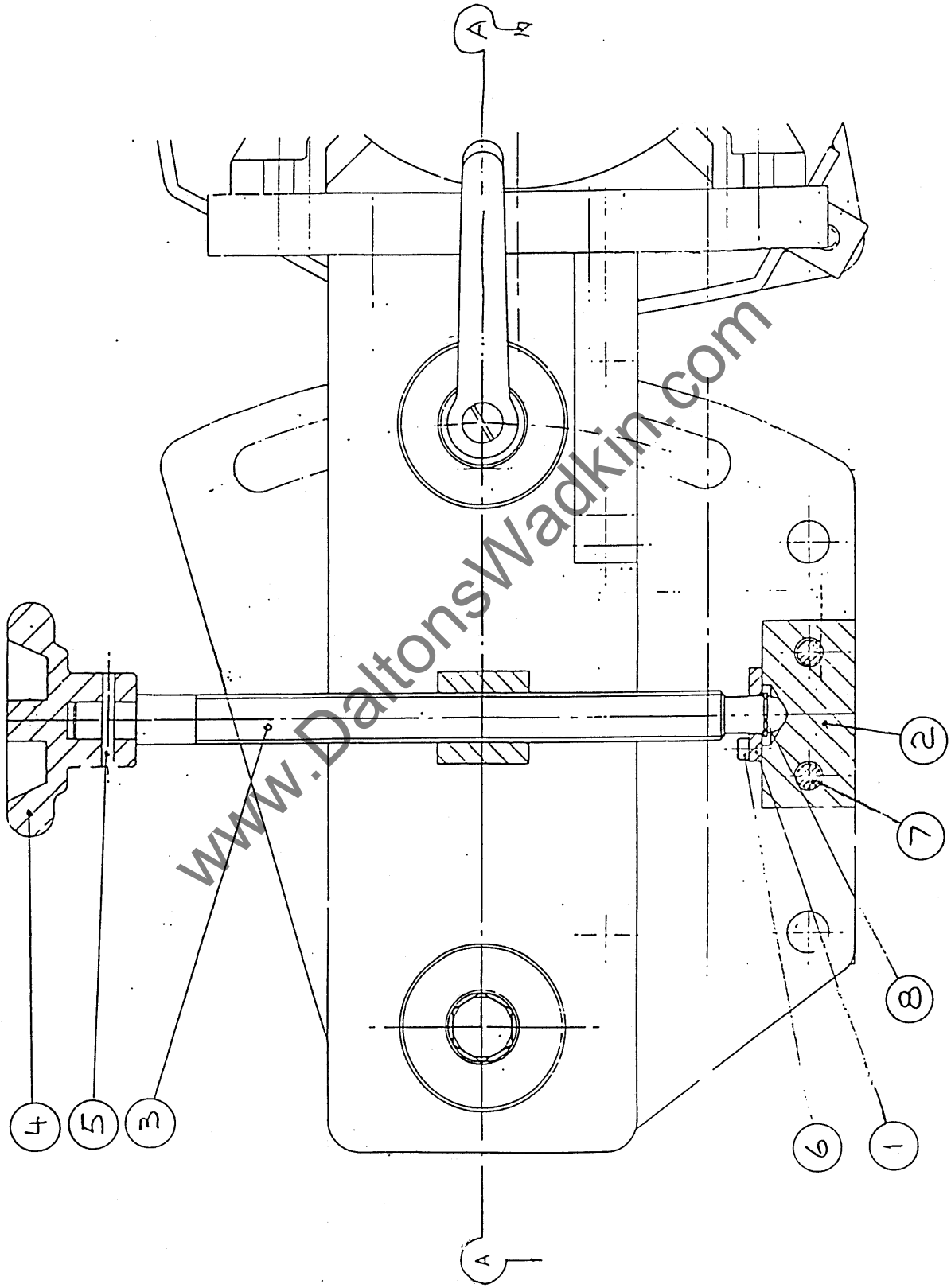
Fig. 6l Stylus slide lock and head tilt



STYLUS SLIDE LOCK AND HEAD TILT *(Fig. 6l)*

ITEM	QTY	PART No.	DESCRIPTION
1	1	MPG 18	Retainer - cant screw
2	1	MPG 123	Blanking plate
3	1	MPG 174	Head cant screw
4	1	MPG 179	Lock stud
5	2	MPG 180	Lock washer
6	2	MPG 181	Lock spacer
7	1	MPG 182	Scale
8	1	MPG 184	Tool rest bracket
9	1	MPG 188	Nut
10	1	MPG 190	Lock plate
11	1	NXU 424	Handwheel plastic 13 mm square
12	1	K05 20484	Tension pin 4 mm x 26 mm
13	2	K05 25309	Hex skt csk screw M4 x 10 mm
14	1	K05 25234	Hex skt capscrew M12 x 45 mm
15	3	K05 25166	Hex skt capscrew M6 x 20 mm
16	1	K05 26114	Grubscrew M6 x 10 mm
17	2	K05 27110	Hex lock nut 10 mm
18	1	K05 27112	Hex lock nut 16 mm
19	1	K05 28104	Washer 10 mm
20	1	K05 29131	Plain dowel 6 mm x 25 mm
21	1	K05 30243	Locking handle M10
22	1	T30 09102	External circlip 12 mm diameter

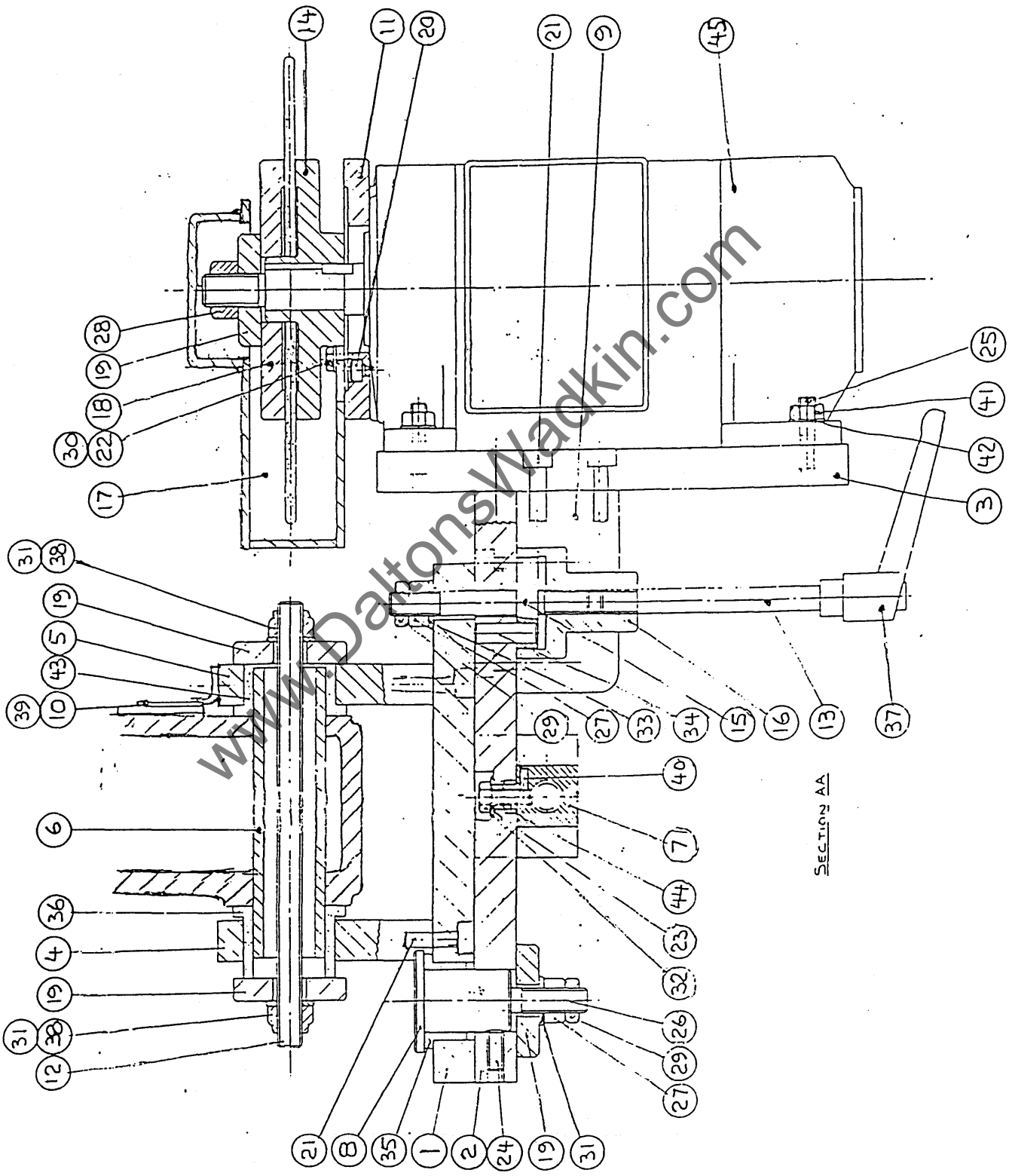
Fig. 6m Head



HEAD *(Fig. 6m)*

ITEM	QTY	PART No.	DESCRIPTION
1	1	MPG 19	Retainer - rise / fall screw
2	1	MPG 109	Jack plate - head rise / fall
3	1	MPG 111	Adj. screw - head rise / fall
4	1	NXU 424	Handwheel plastic 13 mm square
5	1	T05 20484	Tension pin 4 mm x 26 mm
6	2	T05 25121	Hex skt capscrew M4 x 10 mm
7	2	T05 25195	Hex skt capscrew M8 x 60 mm
8	1	T30 09102	External circlip 12 mm diameter

Fig. 6n Head



HEAD (*Fig. 6n*)

ITEM	QTY	PART No.	DESCRIPTION
1	1	MPG 101	Pivot plate - head
2	1	MPG 102	Swinging arm - head
3	1	MPG 103	Motor mounting plate
4	1	MPG 104	Rear cant plate
5	1	MPG 105	Front cant plate
6	1	MPG 107	Head cant shaft
7	1	MPG 108	Nut - head rise / fall
8	1	MPG 110	Pivot - head rise / fall
9	1	MPG 112	Rib - swinging arm
10	1	MPG 121	Indicator - head cant scale
11	1	MPG 125	Motor flange
12	1	MPG 128	Stud for head pivot
13	1	MPG 132	Stud for head lock
14	1	NN 290	Fixed wheel flange
15	1	MPG 134	Head clamp bolt
16	1	MPG 135	Head clamp nut
17	1	NV D04	Wheel guard
18	1	NN 291	Front wheel flange
19	4	NXU 341	Locking washer
20	3	T05 25164	Hex skt capscrew M6 x 12 mm
21	8	T05 25188	Hex skt capscrew M8 x 25 mm
22	2	T05 25502	Hex hd screw M6 x 16 mm
23	1	T05 25516	Hex hd screw M8 x 20 mm
24	1	T05 26129	Hex skt grubscrew M8 x 25 mm
25	4	T05 26235	Screwed stud M8 x 35 mm
26	1	T05 26297	Screwed stud M12 x 55 mm
27	6	T05 27104	Hex full nut M12
28	1	T05 27105	Hex full nut M16
29	2	T05 27111	Hex lock nut M12
30	2	T05 28102	Washer 6 mm

Continued :-

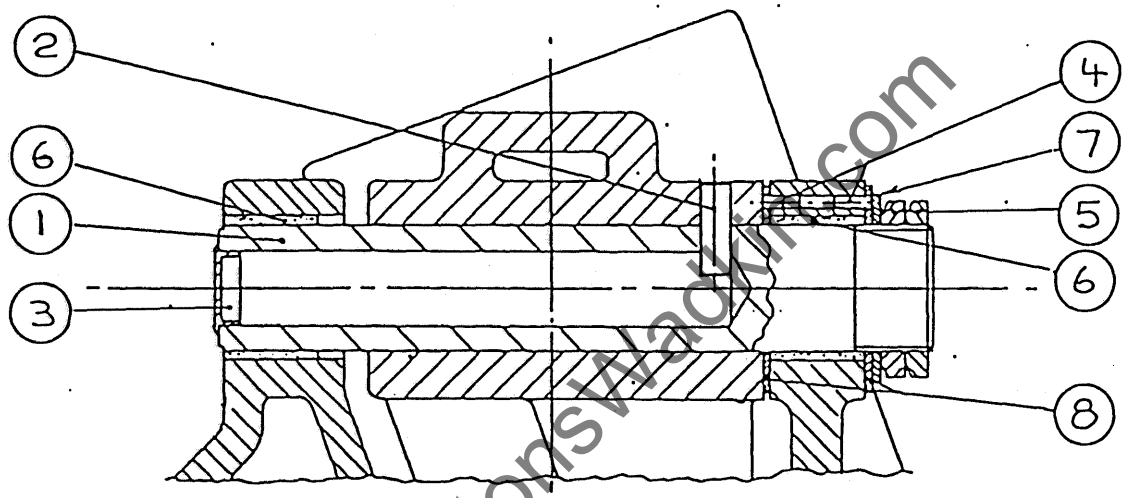
HEAD (Continued) *(Fig. 6n)*

ITEM	QTY	PART No.	DESCRIPTION
31	7	T05 28105	Washer 12 mm
32	1	T05 28112	Washer 8 mm (large diameter)
33	1	T05 28114	Washer 12 mm (large diameter)
34	1	T05 29158	Plain dowel 10 mm x 30 mm
35	1	T30 05118	46FI bush 30 ID x 38 OD x 20 lg
36	1	T30 05119	55FI bush 35 ID x 45 OD x 35 lg
37	1	T30 29106	Black adj. handlever - M12
38	2	T30 53102	M12 Self-locking nut
39	2	T30 73132	Slotted pan head screw M4 x 10 mm
40	1	T30 73157	Grubscrew M4 x 10 mm
41	4	K05 27102	Hex full nut 8 mm
42	4	K05 28103	Washer 8 mm
43	1	K05 31361	55 FI bush 45 OD x 35 ID x 25 lg
44	1	K05 31526	Bush 12 x 16 x 12 lg
45	1	K13 04129	Motor / spindle unit

HEAD MOUNT TAIL BEARING AND VALVE *(Fig. 6o)*

ITEM	QTY	PART No.	DESCRIPTION
1	3	K05 25516	Hex hd screw M8 x 20 mm
2	1	K30 62728	ABS - RB 3400 3/8" Ball valve
3	1	K06 07178	RHP.SLFE 35 Flange bearing

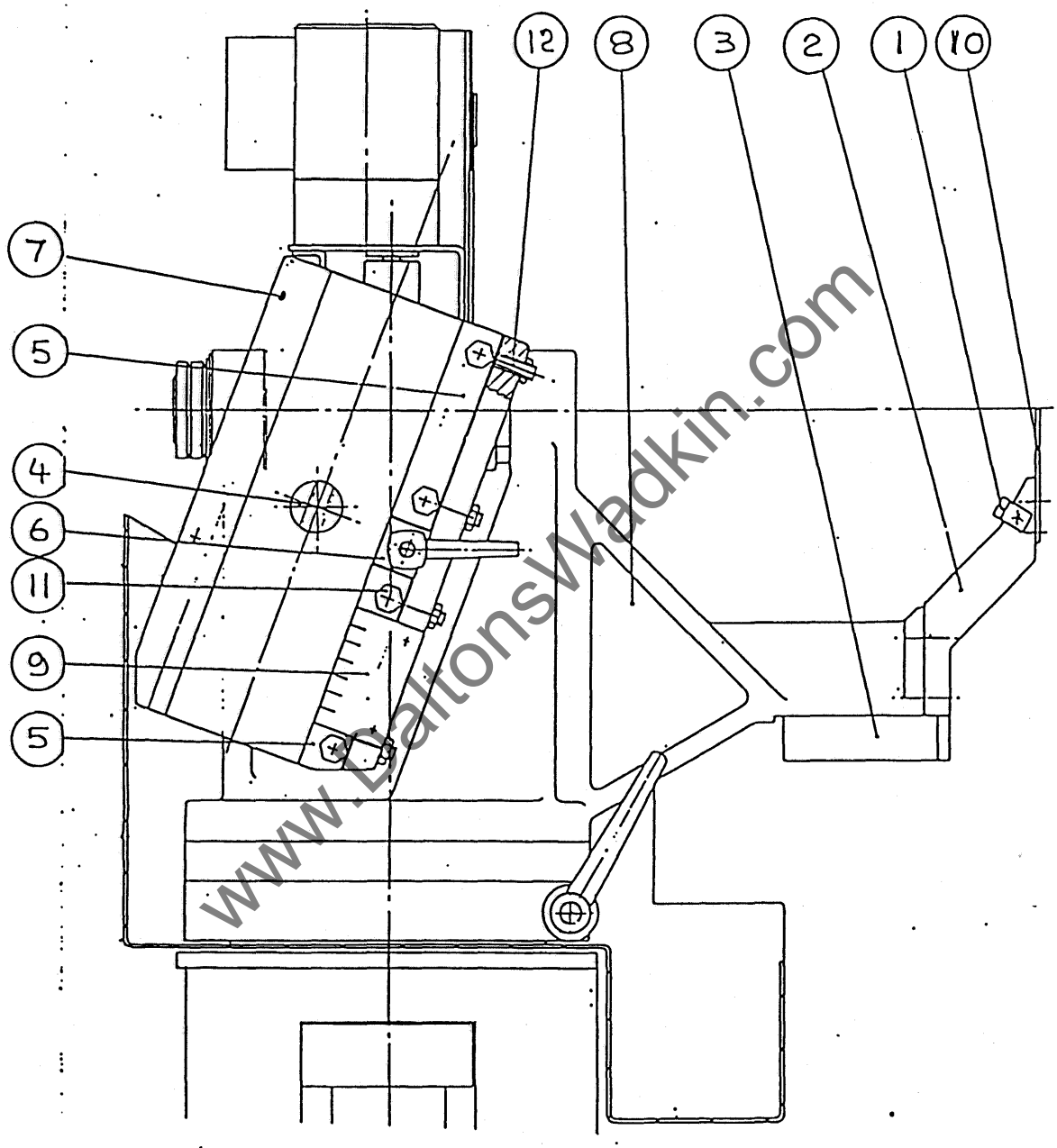
Fig. 6p Head main pivot shaft



HEAD MAIN PIVOT SHAFT *(Fig. 6p)*

ITEM	QTY	PART No.	DESCRIPTION
1	1	NN 226	Pivot shaft for head
2	1	T30 13157	Retractable dowel 10 x 30
3	1	T30 62303	Nylon hole plug 25.5 mm
4	2	K05 20480	Tension pin 4 x 12
5	2	K05 27209	Notch nut M40 x 1.5
6	2	K05 31592	Bush 40 x 46 x 30
7	1	K06 10256	AS-4060 INA Thrust washer
8	2	K30 05328	SKF GLYPX G426601.5 bearing

Fig. 6q Head slide and cutter rest



HEAD SLIDE AND CUTTER REST *(Fig. 6q)*

ITEM	QTY	PART No.	DESCRIPTION
1	1	NE 79	Coolant pipe clip
2	1	NN 215	Tool rest mounting
3	1	NN 216	Dresser location
4	1	NN 225	Head vertical adj. nut
5	2	NN 227	Slide strip
6	1	NN 228	Slide lock strip
7	1	NN 268	Main pivot slide
8	1	NN 270	Main head mount
9	1	NN 286	Clearance angle scale
10	1	NX 454	25 mm wide NX cutter rest
11	4	K05 25518	Hex hd screw M8 x 30 mm
12	4	K05 26128	Skt set screw M8 x 20 mm cup

APPROVED LUBRICANTS

Wadkin	B.P.	Caltex	Castrol	Esso	Gulf	Mobil	Shell
L1	Energol HLP 32	Rando	Hyspin AWS 32	Nuto H32 43 AW	Harmony Oil HDA	DTE oil Light 24	Tellus 37
L2	Energol HP 150	URSA P40	Alpha ZN 150	Spartan EP 150 Heavy	Service 13	Vactra Extra	Vitrea 150 or CS 150
L4	Energol HP 68	URSA P20	Magna 68	Nurray 68 Heavy Medium	Service 51	Vactral Oil	Vitrea 68 or CS 68
L6	Energrease LS 3	Regal Startak Premium 3	Spheerol AP3	Beacon 3	Gulfcrown Grease No. 3	Mobilplex Grease No. 48	Alvania Grease No. 3

L1 Oil Hydraulic oil with anti-corrosion, anti-oxidation, anti-wear, anti-foam performance.

L2 Oil Gear oil (viscosity 150 centi-stokes at 40 degrees C).

L3 Oil Plain mineral oil (viscosity 68 centi-stokes at 40 degrees C.)

L6 Grease Grease NLG1 No.3 consistency lithium bearing grease.

NXT 138 GRINDING COOLANT

IMPORTANT : The following information is reproduced for reference only. When handling coolant from ANY supplier ALWAYS use the data sheets provided with the product.

APPLICATION.

The recommended dilution for use on this machine is 2% by volume (i.e. 50 : 1 water to coolant ratio).

Measure (do not guess) the required volume of water into a clean coolant tank or other suitable container.

Calculate the volume of coolant concentrate required. For example 30 litres of water would require 0.6 litres of coolant concentrate.

Always mix the emulsion by introducing the concentrate gradually to water. Continuously paddle the emulsion during mixing, circulating the fluid from bottom to top. Care should be taken to ensure that the emulsion is properly formed. Failure to do so may result in an emulsion of water in oil rather than oil in water. If an emulsion of water in oil is formed then it will have none of the properties normally expected of the coolant, and will lead to rapid rusting.

POINTS TO REMEMBER :-

- Always add the coolant to water - NEVER vice versa.
- DON"T prepare coolant mixtures by guesswork - measure all quantities.
- NEVER pour the coolant concentrate into the water too quickly. It must be mixed in at a steady rate to achieve a stable emulsion.
- DON'T use dirty, saline, or hard water. Rain water is only acceptable if clean and free from debris.
- DON'T use dirty, rusted, galvanised or "old-oil" contaminated buckets etc.
- NEVER try to mix the coolant using the coolant pump.

TYPICAL PHYSICAL CHARACTERISTICS		
Concentrate :		
Appearance	-	Amber
Relative density at 20° C	-	1.002 gm/cm^3
Emulsion :		
Appearance	-	Translucent / white liquid.
pH at 3% concentration	-	9.1 - 9.4
Refractometer Factor	-	1.4

TOPPING UP

If it is found necessary to 'top up' the coolant tank at a later stage, allowance should be made for water evaporation. This is necessary to prevent a gradual increase in fluid concentration. An approximate dilution of 1% by volume when 'topping up' will normally achieve this.

NEVER ADD NEAT COOLANT TO STRENGTHEN, OR JUST WATER TO WEAKEN, EMULSIONS THAT ARE ALREADY IN USE IN THE MACHINE.

Incorrect coolant strength MUST ALWAYS be compensated for by adding either a stronger or weaker EMULSION to the existing mix. Failure to observe this criteria is the cause of most aspects of poor coolant performance.

Remember to multiply direct refractometer readings by the refractive index of the product to gain the true coolant concentration figure.

NOTE : If the concentration should become too high, above a maximum of 10%, not only will the emulsion become unstable, but there is also the possibility of skin complaints among operators.

NOTE : Wadkin Plc reserve the right to change the type of cutting fluid supplied to our customers at any time. However, any changes of supply will be accompanied by the necessary safety data sheets.

Castrol (U.K.) Limited

The Leading Lubricant Specialist

SAFETY DATA SHEET

1: IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name: **Hysol G** Code: 7040-UK

Application: Metalworking fluid - Soluble

Company: Castrol (U.K.) Limited

Address: Burmah Castrol House, Pipers Way, Swindon, Wiltshire, SN3 1RE

Telephone (24 hours): 0793 512712 Fax: 0793 432872

2: COMPOSITION/INFORMATION ON INGREDIENTS

Composition: Highly refined mineral oil, emulsifiers and additives

Hazardous Ingredient(s)	Symbol	Risk Phrases	Other Information	%
This product contains ingredients classified as hazardous. However, they are NOT present in sufficient quantities to warrant classifying the product as hazardous				

All constituents of this product are listed in EINECS (European Inventory of Existing Commercial Chemical Substances) or ELINCS (European List of New Chemical Substances) or are exempt.

Refer to Section 8 for Occupational Exposure Limits.

3: HAZARDS IDENTIFICATION

This product is NOT classified as hazardous

4: FIRST AID MEASURES

Eyes: Irrigate immediately with copious quantities of water for several minutes
Obtain medical attention if irritation persists

Skin: Wash thoroughly with soap and water or suitable skin cleanser as soon as possible

Inhalation: Remove from exposure

Ingestion: Obtain medical attention urgently. Do NOT induce vomiting. Wash out mouth with water.

5: FIRE FIGHTING MEASURES

Suitable Extinguishing Media: Carbon dioxide, powder,foam or water fog - Do not use water jets

Special Exposure Hazards: Nitrogen compounds

Special Protective Equipment: Self-contained breathing apparatus

6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Spilt product presents a significant slip hazard
Environmental Precautions:	Prevent entry into drains, sewers and water courses
Decontamination Procedures:	Soak up with inert absorbent or contain and remove by best available means

7: HANDLING AND STORAGE

Handling: To avoid the possibility of skin disorders, repeated or prolonged contact with products of this type must be avoided. It is essential to maintain a high standard of personal hygiene
Avoid breathing spray mist

Storage: Protect from frost. Store out of direct sunlight. Store between (°C): 5-50

8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Limits:-

Substance	8 Hr.TWA	STEL	Source/Other Information
Mineral oil (see Oil mist, mineral)	5mg/m^3	10mg/m^3	EH40

Engineering Control Measures: Local exhaust ventilation is recommended. Mechanical methods to minimise exposure must take precedence over personal protective measures.

Personal Protective Equipment: Safety glasses. Plastic apron. Wear impervious gloves (eg of PVC), in case of repeated or prolonged contact.
Change contaminated clothing and clean before re-use

9: PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Colour:	Amber
Odour:	Mild
pH(concentrate):	Not applicable
pH(working dilution):	9 (5%)
Boiling Point/Range (°C):	Above 100
Flash Point (closed, °C):	Above 100
Autoignition (°C):	Not determined
Relative Density (at 20°C):	Below 1.0
Water Solubility:	Emulsifiable
Fat Solubility:	Not determined

10: STABILITY AND REACTIVITY

Stability: Stable, will not polymerise

Conditions to Avoid:	Temperatures (°C) above 60
Materials to Avoid:	Strong oxidising agents. Strong acids.
Hazardous Decomposition Products:	Nitrogen compounds

11: TOXICOLOGICAL INFORMATION

The following toxicological assessment is based on a knowledge of the toxicity of the product's components.
Expected oral LD_{50}, rat > 2g/kg. Expected dermal LD_{50}, rabbit > 2g/kg.
Not classified as an eye or skin irritant

Health Effects

On Eyes:	May cause transient irritation
On Skin:	May defat the skin
By Inhalation:	Mist and vapours may cause irritation to nose and respiratory tract
By Ingestion:	May cause nausea, vomiting and diarrhoea
Chronic:	Repeated and prolonged skin contact may lead to skin disorders
Other:	None known

12: ECOLOGICAL INFORMATION

Environmental Assessment:	May cause significant ecological damage in aquatic systems and must be used and disposed of in accordance with the recommendations made in this safety data sheet
Mobility:	Mobile liquid. Emulsifiable in water.
Persistence and Degradability:	Not readily biodegradable
Bioaccumulative Potential:	Not determined
Ecotoxicity:	Not determined

13: DISPOSAL CONSIDERATIONS

Disposal must be in accordance with local and national legislation.

Unused Product:	Dispose of through an authorised waste contractor to a licensed site
Used/Contaminated Product:	Diluted product may be separated by chemical means before removal by an authorised waste contractor For further information see Section 16
Packaging:	Must be disposed of through an authorised waste contractor May be steam cleaned and recycled

14: TRANSPORT INFORMATION

This product is NOT classified as dangerous for transport

15: REGULATORY INFORMATION

Hazard Label Data:-

This product is NOT classified as dangerous for supply in the UK

EC Directives:	Framework Waste Directive, 91/156/EEC Waste Oil Directive, 87/101/EEC

Statutory Instruments:	Health & Safety at Work, etc. Act 1974 Consumer Protection Act 1987 Environmental Protection Act 1990
Codes of Practice:	Waste Management. The Duty of Care
Guidance Notes:	Occupational skin diseases: health and safety precautions (EH 26) Occupational exposure limits (EH 40) Carcinogenicity of mineral oils (EH 58) Metalworking fluids - health precautions (EH 62) Skin cancer caused by oil [MS(B)5] Save your skin! - Occupational Contact Dermatitis [MS(B)6] Dermatitis - cautionary notice [SHW 367] Effects of mineral oil on the skin [SHW 397]

The above publications are available from HMSO or HSE

16: OTHER INFORMATION

Castrol publication: Talking about Cutting Fluids
Castrol Advice Sheet: The Disposal of Used Metalworking Fluids
Castrol publication: Talking About Health and Safety - Lubricants and Allied Products

The data and advice given apply when the product is sold for the stated application or applications. The product is not sold as suitable for any other application. Use of the product for applications other than as stated in this sheet may give rise to risks not mentioned in this sheet. You should not use the product other than for the stated application or applications without seeking advice from us.

If you have purchased the product for supply to a third party for use at work, it is your duty to take all necessary steps to secure that any person handling or using the product is provided with the information in this sheet.

If you are an employer, it is your duty to tell your employees and others who may be affected of any hazards described in this sheet and of any precautions which should be taken.

Further copies of this Safety Data Sheet may be obtained from Castrol (U.K.) Limited.

NXT 145 ANTI-BACTERIAL SOLUTION

IMPORTANT : The following information is reproduced for reference only. When handling anti-bacterial solutions from ANY supplier ALWAYS use the data sheets provided with the product.

The solution normally supplied by Wadkin is a nitrite-free, medium to heavy duty machine tool cleaner / steriliser based on a powerful detergent. It has been specially formulated to deal with a wide variety of machine tool contaminants and is easy to use, being added directly to the coolant system whilst still in operation.

- Cleans machine tool systems of a wide range of contaminants including fatty build up in pipelines and floor ducts.
- Kills bacteria and emulsifies floating tramp oil.
- Particularly useful in areas of hard water where greater amounts of insoluble material are likely to occur.
- Minimises maintenance downtime.
- Can be used whilst machines are operating normally.
- Helps keep machine tools in a clean and efficient condition.

APPLICATION

- 1) An addition of 0.5% - 2% of System Cleaner is recommended. The amount added depends on the general condition of the coolant system (1% is usually adequate).
- 2) Introduce System Cleaner where there is good coolant movement, e.g. in the main coolant tray near to the drain hole position. This ensures complete mixing with the cutting fluid.
- 3) Add System Cleaner on the day before the coolant is programmed to be discarded. The machine should then be operated normally for a minimum of eight hours.
- 4) Following this period of circulation, empty the entire coolant system and machine, and dispose of the coolant in accordance with local authority regulations.

TECHNICAL DATA

Alkalinity	Medium (contains a small amount of free caustic)
Density @ 20^{0} C	1.080
pH (1% solution)	11.25
Surface tension (1% solution at 20^{0} C)	34mN/m
Appearance	Blue liquid, moderately viscous

NOTE : Wadkin Plc reserve the right to change the type of anti-bacterial solution supplied to our customers at any time. However, any changes of supply will be accompanied by the necessary safety data sheets.

Castrol (U.K.) Limited

The Leading Lubricant Specialist

SAFETY DATA SHEET

1: IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name: System Cleaner Code: 7949-UK

Application: Machine tool coolant system cleaning

Company: Castrol (U.K.) Limited

Address: Burmah Castrol House, Pipers Way, Swindon, Wiltshire, SN3 1RE

Telephone (24 hours): 0793 512712 Fax: 0793 432872

2: COMPOSITION/INFORMATION ON INGREDIENTS

Composition: Aqueous solution of alkalis, surfactants and additives

Hazardous Ingredient(s)	Symbol	Risk Phrases	Other Information	%
Sodium hydroxide	C	R35	CAS No 1310-72-2	0.5 - 2
1,3,5-Tris- (2-hydroxyethyl)-1,3,5-hexahydrotriazine	Xi	R22, 36/38	CAS No 4719-04-4	< 20

All constituents of this product are listed in EINECS (European Inventory of Existing Commercial Chemical Substances) or ELINCS (European List of New Chemical Substances) or are exempt.

Refer to Section 8 for Occupational Exposure Limits.

3: HAZARDS IDENTIFICATION

Irritating to eyes and skin

IRRITANT

4: FIRST AID MEASURES

Eyes: Irrigate immediately with copious quantities of water for several minutes
Obtain medical attention urgently

Skin: Wash immediately with soap and water or suitable skin cleanser
Obtain medical attention if irritation persists

Inhalation: Remove from exposure

Ingestion: Obtain medical attention. Do NOT induce vomiting. Wash out mouth with water.

5: FIRE FIGHTING MEASURES

Suitable Extinguishing Media: Carbon dioxide, powder, foam or water

Special Exposure Hazards:	Nitrogen compounds
Special Protective Equipment:	Self-contained breathing apparatus

6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Spilt product presents a significant slip hazard Wear rubber boots in addition to the recommended protective clothing
Environmental Precautions:	Prevent entry into drains, sewers and water courses
Decontamination Procedures:	Soak up with inert absorbent or contain and remove by best available means. Clean contaminated area with water.

7: HANDLING AND STORAGE

Handling:	Handle and open containers with care. Avoid skin and eye contact. Avoid breathing spray mist.
Storage:	Protect from frost. Store only in hazard labelled containers.

8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Limits:-

Substance	8 Hr.TWA	STEL	Source/Other Information
Sodium hydroxide	-	2mg/m^3	EH40
Formaldehyde (formed in solution)	2ppm (MEL)	2ppm (MEL)	EH40

Engineering Control Measures:	Local exhaust ventilation is recommended. Mechanical methods to minimise exposure must take precedence over personal protective measures.
Personal Protective Equipment:	Goggles. Impervious gloves (eg PVC). Plastic apron. Change contaminated clothing immediately and clean before re-use. An eye wash station must be available.

9: PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Colour:	Blue
Odour:	Sharp
pH(concentrate):	13.3
pH(working dilution):	11.3 (1%)
Boiling Point/Range (°C):	Above 100
Melting Point/Range (°C):	Below 0
Flash Point (closed, °C):	None, as supplied
Relative Density (at 20°C):	Above 1.0
Water Solubility:	Soluble
Fat Solubility:	Not determined

10: STABILITY AND REACTIVITY

Stability:	Stable, will not polymerise
Conditions to Avoid:	Temperatures (°C) above 60

Materials to Avoid: Strong acids

Hazardous Decomposition Products: Irritant fumes. Formaldehyde. Nitrogen compounds.

11: TOXICOLOGICAL INFORMATION

The following toxicological assessment is based on a knowledge of the toxicity of the product's components Classified as an eye and skin irritant. Recommended working concentrations are not classified as eye or skin irritants.

Health Effects

On Eyes: Irritating and may injure eye tissue if not removed promptly

On Skin: Irritation

By Inhalation: Mist and vapours may cause irritation to nose and respiratory tract

By Ingestion: May cause irritation of mouth, throat and digestive tract

Chronic: None known

Other: None known

12: ECOLOGICAL INFORMATION

Environmental Assessment: May cause significant ecological damage in aquatic systems and must be used and disposed of in accordance with the recommendations made in this safety data sheet

Mobility: Mobile liquid. Soluble in water.

Persistence and Degradability: Inherently biodegradable

Bioaccumulative Potential: Not determined

Ecotoxicity: Not determined

13: DISPOSAL CONSIDERATIONS

Disposal must be in accordance with local and national legislation.

Unused Product: Dispose of through an authorised waste contractor to a licensed site

Used/Contaminated Product: As for Unused Product
Diluted product may be separated by chemical means or reverse osmosis

Packaging: Contains hazardous residues, must be disposed of through an authorised waste contractor. May be steam cleaned and recycled.

14: TRANSPORT INFORMATION

This product is NOT classified as dangerous for transport

15: REGULATORY INFORMATION

Hazard Label Data:-

Named Ingredients: Sodium hydroxide 0.5-2.0%

Symbol(s): Xi

Risk Phrases: Irritating to eyes and skin

Safety Phrases:	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice After contact with skin, wash immediately with plenty of soap and water Wear suitable protective clothing, gloves and eye/face protection
EC Directives:	Dangerous Preparations Directive, 88/379/EEC Safety Data Sheets Directive, 91/155/EEC Framework Waste Directive, 91/156/EEC
Statutory Instruments:	Health & Safety at Work, etc. Act 1974 Chemicals (Hazard Information and Packaging) Regs. 1993 (SI 1746) Consumer Protection Act 1987 Control of Substances Hazardous to Health Regs. 1988 (SI 1657) Environmental Protection Act 1990
Codes of Practice:	Classification & labelling of substances dangerous for supply (COP 22) Waste Management. The Duty of Care
Guidance Notes:	Storage of packaged dangerous substances [CS 17 / HS(G)71] Occupational exposure limits (EH 40) Occupational skin diseases: health and safety precautions (EH 26) Classification, Packaging & Labelling of Dangerous Substances Regs. 1984 [HS(R)22] Save your skin! - Occupational Contact Dermatitis [MS(B)6] Dermatitis - cautionary notice [SHW 367]

The above publications are available from HMSO or HSE

16: OTHER INFORMATION

Information approved for the classification, packaging and labelling of dangerous substances for supply and conveyance by road (Third Edition)
Castrol publication: Talking About Health and Safety - Lubricants and Allied Products

The data and advice given apply when the product is sold for the stated application or applications. The product is not sold as suitable for any other application. Use of the product for applications other than as stated in this sheet may give rise to risks not mentioned in this sheet. You should not use the product other than for the stated application or applications without seeking advice from us.

If you have purchased the product for supply to a third party for use at work, it is your duty to take all necessary steps to secure that any person handling or using the product is provided with the information in this sheet.

If you are an employer, it is your duty to tell your employees and others who may be affected of any hazards described in this sheet and of any precautions which should be taken.

Further copies of this Safety Data Sheet may be obtained from Castrol (U.K.) Limited.

TOOLS AND ACCESSORIES SUPPLIED WITH THE NV

Qty	Part No.	Description
5	GW 203	Grinding wheel 230 x 5 x 1 1/4" coarse
		(Note : GW 295 wheels are supplied with machines with 3600 rpm spindles.)
1	K30 41140	Allen key 2.5 mm A/F
1	K30 41141	Allen key 3 mm A/F
1	K30 41142	Allen key 4 mm A/F
1	K30 41143	Allen key 5 mm A/F
1	K30 41144	Allen key 6 mm A/F
1	K30 41145	Allen key 8 mm A/F
1	K30 41146	Allen key 10 mm A/F
1	K30 45280	Oil gun
1	K30 73738	D/ended spanner 17 x 19 A/F
1	K30 73781	D/ended spanner 8 x 10 A/F
1	K30 73782	D/ended spanner 11 x 13 A/F
1	K30 73785	D/ended spanner 24 x 27 A/F
3	NXT 6	Template blank 330 mm long
1	NXT 126	Trued template
1	NXT 138	Grinding coolant conc. 5 litres
1	T30 29105	Crank handle - 13 mm square
1	NXT 556	40 mm dia. Arbor (for NV 300)
		(Note : NXT 506 for NV 230)
1	NXT 301	40 mm bore locking collar
1	NXT 302	40 mm bore threaded collar
1	NXT 303	Clamping nut for collar
1	NXT 304	Tommy bar
1	T30 41110	5mm A/F handled Allen key
1	NV J01	Arbor counterbalance

Note : 40 mm diameter arbor and locking collars are supplied unless specified otherwise.

ACCESSORIES FOR NV GRINDING MACHINES

GRINDING WHEELS

For solid H.S.S. and H.S.S. on iron :-

GW	203	Standard roughing wheel, 5 mm thick, 60 grit, 3000 rpm maximum
GW	202	Finishing wheel, 5 mm thick, 220 grit, 3000 rpm maximum
GW	294	Specially formulated hard wheel for solid H.S.S., 5 mm thick, 3000 rpm max.
GW	295	Specially formulated wheel for 3600 rpm spindles, 5 mm thick
GW	231	8.0 mm thick square edge C.B.N. (Borazon) wheel for straight knife grinding H.S.S. cutters

For Tungsten Carbide (T.C.T.) :-

GW	209	4.7 mm thick square edge diamond grinding wheel
GW	210	4.7 mm thick round edge diamond grinding wheel
GW	211	3.0 mm thick round edge diamond grinding wheel
GW	212	3.0 mm thick square edge diamond grinding wheel

Other profiles are available on request.

GW	232	8.0 mm thick square edge diamond grinding wheel, for straight knife grinding T.C.T cutters

Note : All grinding wheels are 230 mm diameter with a 31.75 mm (1.25") bore and suitable for running at 3600 rpm. except where specified otherwise.

ARBORS

For 230 mm capacity (NV230)

NXT	502	30 mm diameter plain
NXT	504	35 mm diameter plain
NXT	506	40 mm diameter plain
NXT	510	50 mm diameter plain
NXT	528	1 1/4" diameter plain
NXT	538	1 13/16" diameter double keyway
NXT	540	2 1/8" diameter double keyway
NXT	187	1 13/16" diameter
NXT	192	2 1/8" diameter

Note : Each arbor includes one set of locking collars.

For 300 mm capacity (NV300)

NXT	552	30 mm diameter plain
NXT	554	35 mm diameter plain
NXT	526	40 mm diameter plain
NXT	560	50 mm diameter plain
NXT	578	1 1/4" diameter plain
NXT	588	1 13/16" diameter double keyway
NXT	590	2 1/8" diameter double keyway

Note : Each arbor includes one set of locking collars.

NOTE : 40 mm arbor is supplied with the machine as standard unless specified otherwise.

NXT	140	Dummy cutterhead for grinding a pair of square or scribing cutter cartridges as used on the Wadkin SET machine. Mounts direct to standard 40 mm arbor.

PROFILE GRINDING

NX	134	Narrow tool rest (12 mm wide)
NV	E02	Curved narrow tool rest (6 mm wide) for Tena Disc or narrow segmental type circular cutterheads
NX	110	Stylus 4.7 mm wide 90° point
NX	111	Stylus 4.7 mm wide 30° right hand
NX	112	Stylus 4.7 mm wide 30° left hand
NX	131	Stylus 4.7 mm wide 45° chamfer right and left hand
NX	133	Stylus 3 mm wide radius and square

Other profiles are available on request.

NV	F01	Variable speed drive for grinding spindle to give a speed range of 1500 rpm to 3000 rpm. Note : This unit is normally factory fitted.

GRINDING PLANERHEADS

NXT	126	Trued template
NXT	E18	Ball bearing stylus

TEMPLATE MAKING

NXT	6	Template steel 330 mm (13") length
TBO	650	Template making toolkit

Note : The template making toolkit includes ; toolbox with instructions, template steel, and a selection of hand tools required for template making.

NXT	5100	Wadkin Mirage NC template making machine. Contact Wadkin for full details.

COOLANT SYSTEM

NXT	138	Semi-synthetic grinding fluid in concentrate form. Supplied in 5 litre containers Note : To be diluted at 50 : 1 ratio
NXT	145	Anti-bacterial solution concentrate for cleansing coolant system when replacing grinding fluid. Supplied in 5 litre containers

FULL HEALTH AND SAFETY DATA SHEETS ARE AVAILABLE FOR NXT 138 / 145 FLUIDS.

T30	49102	Hand held refractometer for measuring concentration of grinding fluid.

SETTING AND MEASURING

MSS	300	Setting stands, computer aided setting systems, and optical setting and measuring systems. Contact Wadkin for full details.

SUGGESTED SPARES FOR NV GRINDING MACHINES

CONSUMABLE MACHINE PARTS

NX	454	Cutter rest 25 mm
NXU	522	Diamond dresser
NX	40	Stylus 4.7 mm wide radius and square
K12	03418A	Bulb for worklamp

Note : Consumable items such as grinding wheels, template blanks, and coolant fluids are included in Appendix A5.

SERVICE PARTS

Qty	Part No.	Description
Template slide		
1	MPG 15	Side adjusting screw
1	MPG 45	Adjusting screw - depth
1	MPG 63	Adjusting nut
2	MPG 129	Bellows
1	T05 31550	Bush 12 x 16 x 16 long
1	K05 31527	Bush 16 x 20 x 12 long
2	K30 31640	Bush 40 x 46 x 50 long
Dresser		
2	T30 05120	Flanged bush 15 x 21 x 20 long
2	T30 05341	Thrust washer 62 x 38
Carriage		
8	T30 05371	Bearing and housing

Stylus / cutter rest slide

1	MPG 186	Adjusting screw
3	MPG 189	Bellows
2	K05 31302	Flanged bush 12 x 18 x 8 long
2	K05 31640	Bush 40 x 46 x 50 long
6	K12 03438	Individual bellows ties

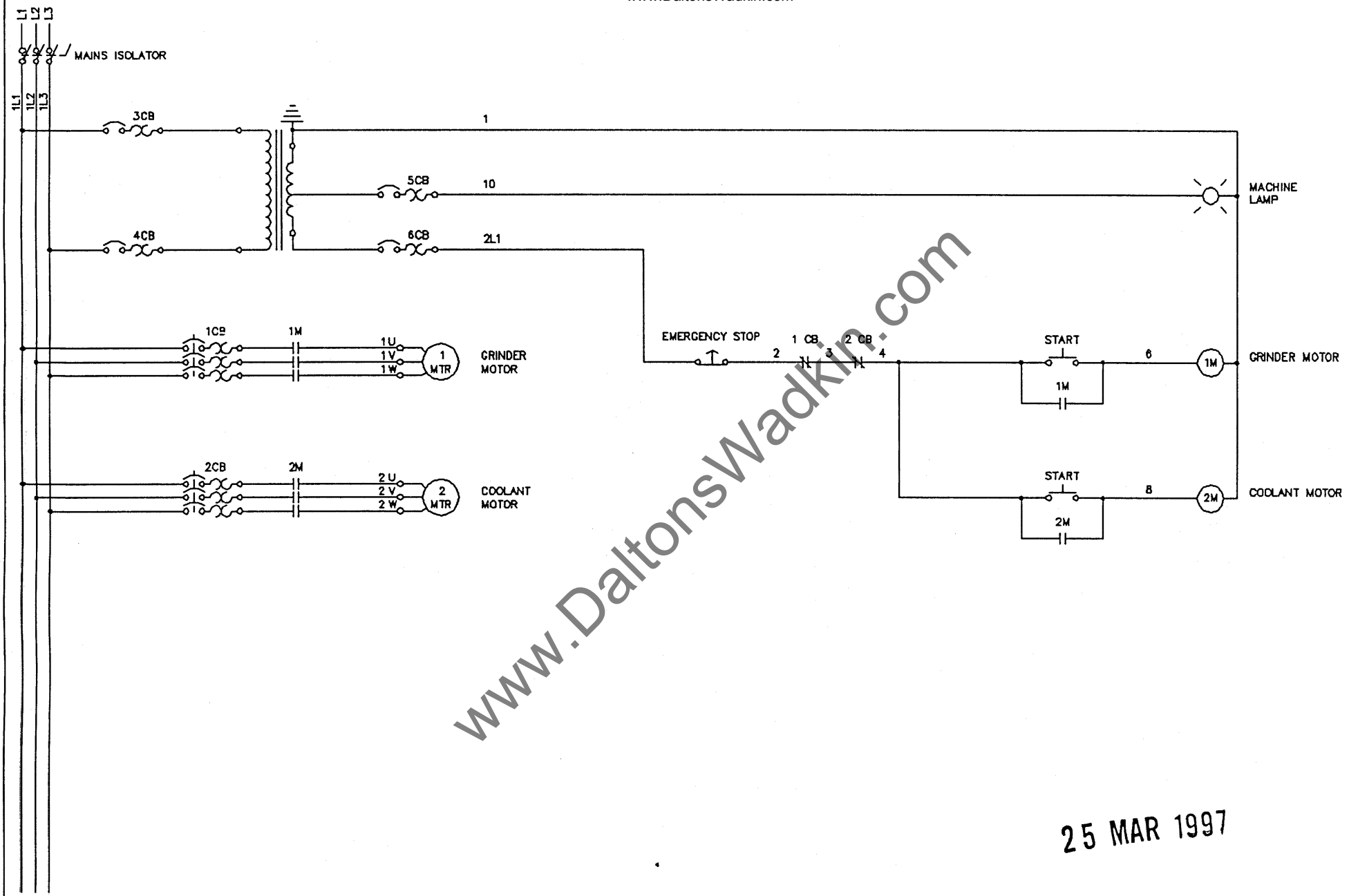
Head

1	MPG 108	Rise and fall nut
1	MPG 111	Rise and fall adjusting screw
1	MPG 174	Tilt adjusting screw
1	MPG 188	Tilt adjusting nut
1	NV D04	Wheel guard
1	NN 290	Fixed wheel flange
1	NN 291	Front wheel flange
1	T30 05118	Flanged bush 30 x 38 x 20 long
1	T30 05119	Flanged bush 35 x 45 x 35 long
1	K05 31361	Flanged bush 35 x 45 x 25 long
1	K05 31526	Bush 12 x 16 x 12 long

Coolant system

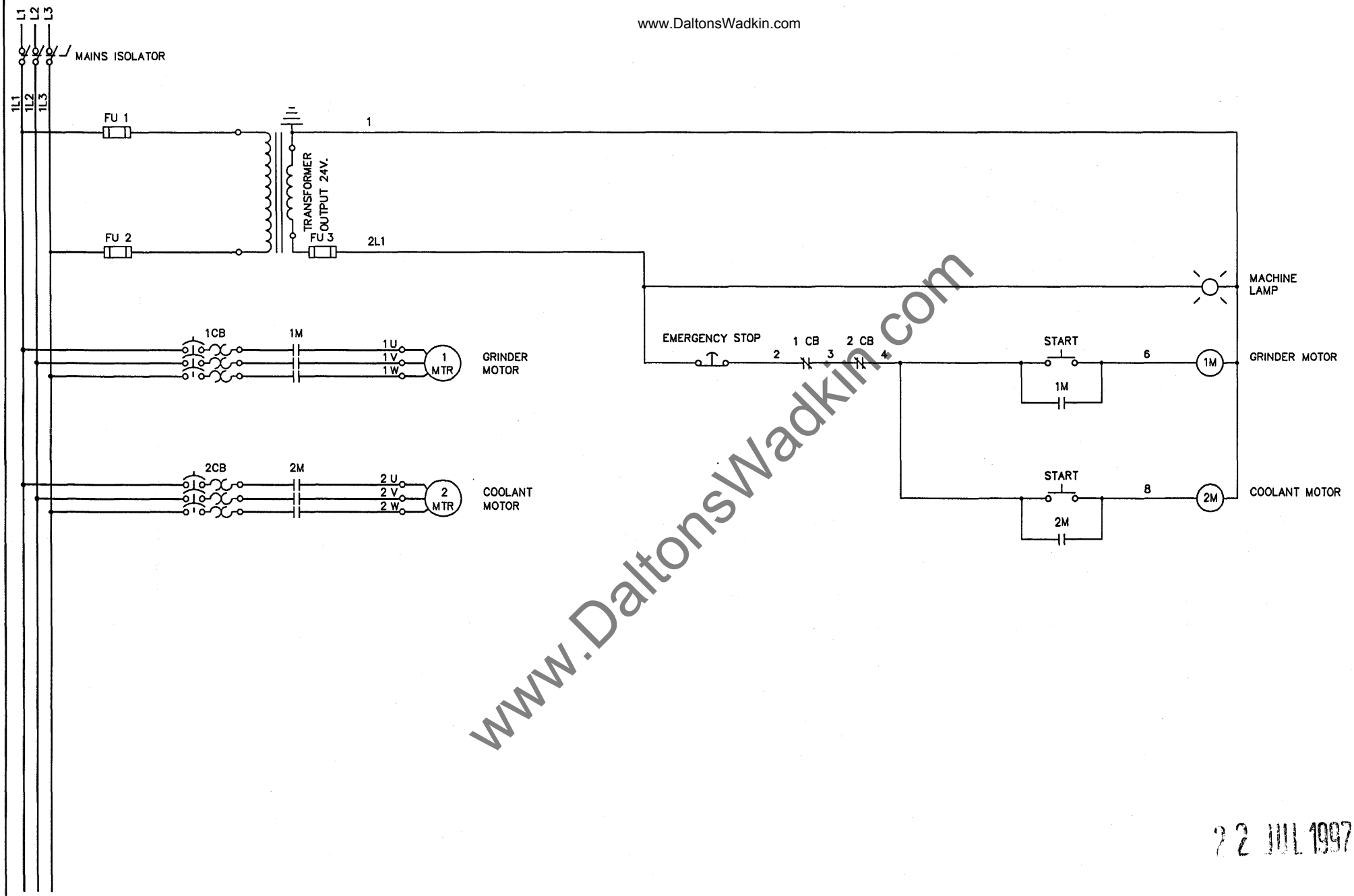
1	T30 49205	Magnet
1	NXU 357	Coolant nozzle(single outlet machine)
		Note : for machines with twin outlets, this item is replaced by :-
		1-off MPG 85 and 1-off MPG 86

ELECTRICAL CIRCUIT DIAGRAM



25 MAR 1997

Wadkin	LEICESTER WOODWORKING DIVISION	Date	Sig.	C	Date	Sig.	B	Date	Sig	A	Description NV GRINDER
											CAD Location N:\ACAD\DR\ELECTDO\ELECSTD\ESTD1942 W.O. No
											Drawn K.MOBBS Aprvd. R.PATEL Date 11/03/97
											Drawing No. D6999 SHEET 01



22 JUL 1997

Wadkin	LEICESTER WOODWORKING DIVISION	Date	Sig.	C	Date	Sig.	B	Date	Sig	A	Description NV CUTTER GRINDER CE 24V COILS
											CAD Location N:\ACAD\DR\ELECTDO\ELECSTD\ESTD0743 W.O. No
											Drawn B.PATEL Aprvd. R.PATEL Date 29/03/95
											Drawing No. D6699 SHEET 01