Wadkin

UX ROUTER

Jig Manual

INSTRUCTION MANUAL No. 5008

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SAFETY OF WOODWORKING MACHINES

Woodworking machines can be dangerous if improperly used. The wide range of work of which they are capable, requires adequate safeguarding arrangements against possible hazards.

Many injuries to machinists are caused by carelessness or failure to use the guards provided or to ajust them correctly.

WADKIN PLC supply machinery designed for maximum safety which they believe, as a result of thorough testing, minimizes the risks inevitable in their use. It is the user's responsibility to see that the following rules are compiled with to ensure safety at work:

1. The operation of the machine should conform to the requirements of the Woodworking Machines Regulations 1974. All guards should be used and ajusted correctly.

2. Only safe methods of working should be adopted as given in the Health & Safety Booklet No. 41, "Safety in the Use of Woodworking Machines", (obtained from Her Majesty's Stationery Office) and as advised by Wadkin plc.

3. Only personnel trained in the safe use of a machine should operate it.

4. Before making adjustments or clearing chips, etc. the machines should be stopped and all movements should have ceased.

5. All tools and cutters must be securely fixed and the speed selected must be appropriate for the tooling.

6. It is not unusual for Routers to operate at noise levels above 90 dB(A) depending on extraction, spindle speed, tool form and type head etc,. We therefore recommend that ear protection is worn by anyone working in close proximity to the machine whilst in use.

SAFETY IS OUR WATCHWORD BUT THE USER MUST COMPLY WITH THE ABOVE RULES IN HIS OWN INTEREST. WE WOULD BE PLEASED TO ADVISE ON THE SAFE USE OF OUR PRODUCTS.

UX ROUTERS

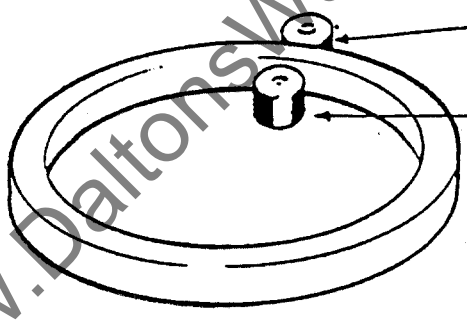
APPLICATION AND LIMITATIONS OF AUTOMATIC FEED

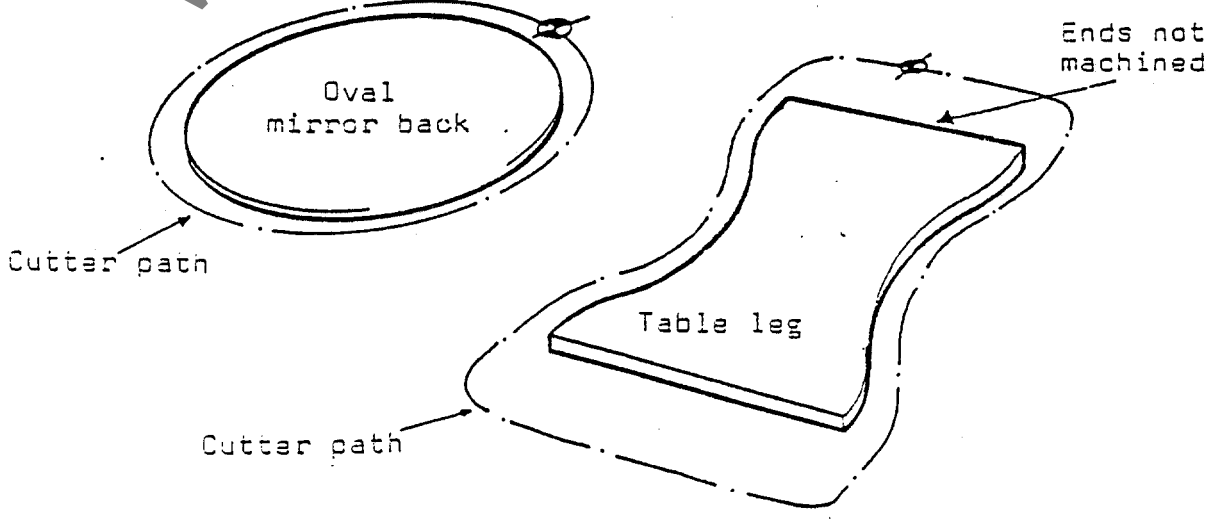
1. REASON FOR ISSUE

To explain the application and limitations of the automatic feed

2. FEATURES

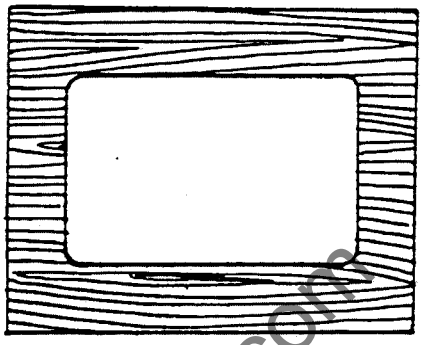
1. TEMPLATES MUST BE CONTINUOUS





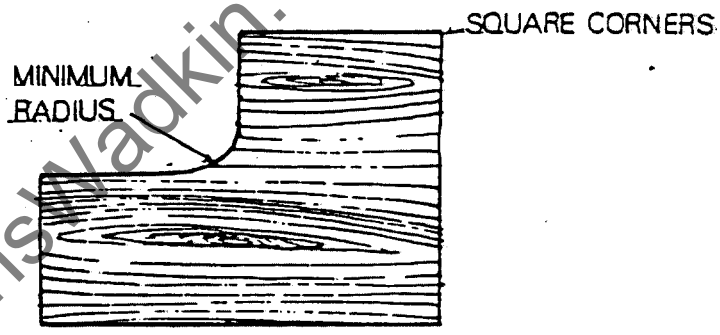
4. INTERNAL WORKING

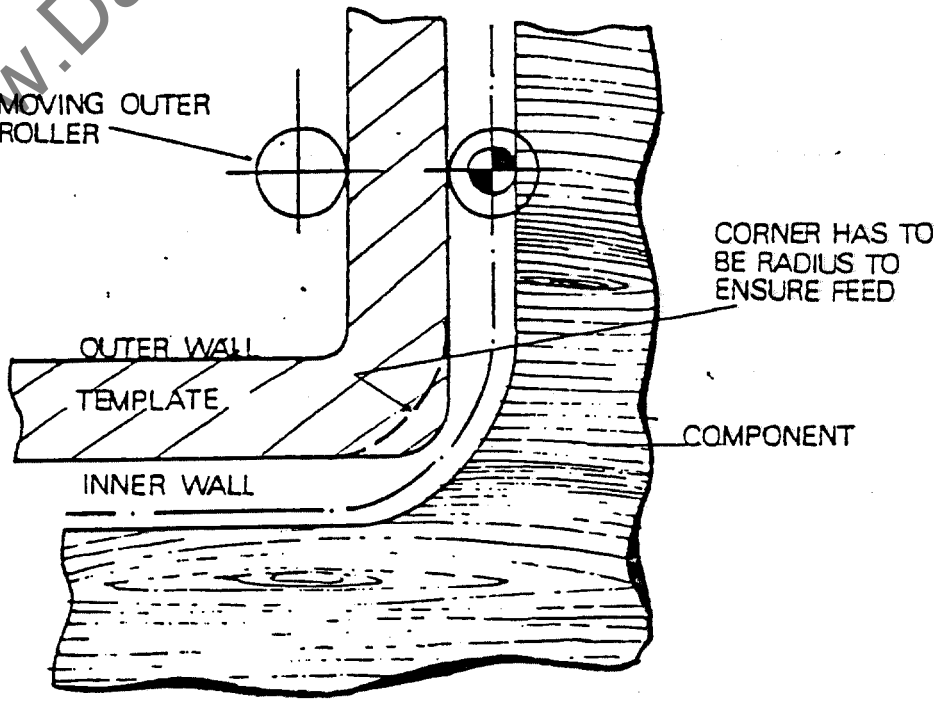
Minimum radius is equal to cutter radius but in order to improve feeding a slightly larger radius is recommended e.g. when 40mm feed roller inside radius on template should be 22mm.



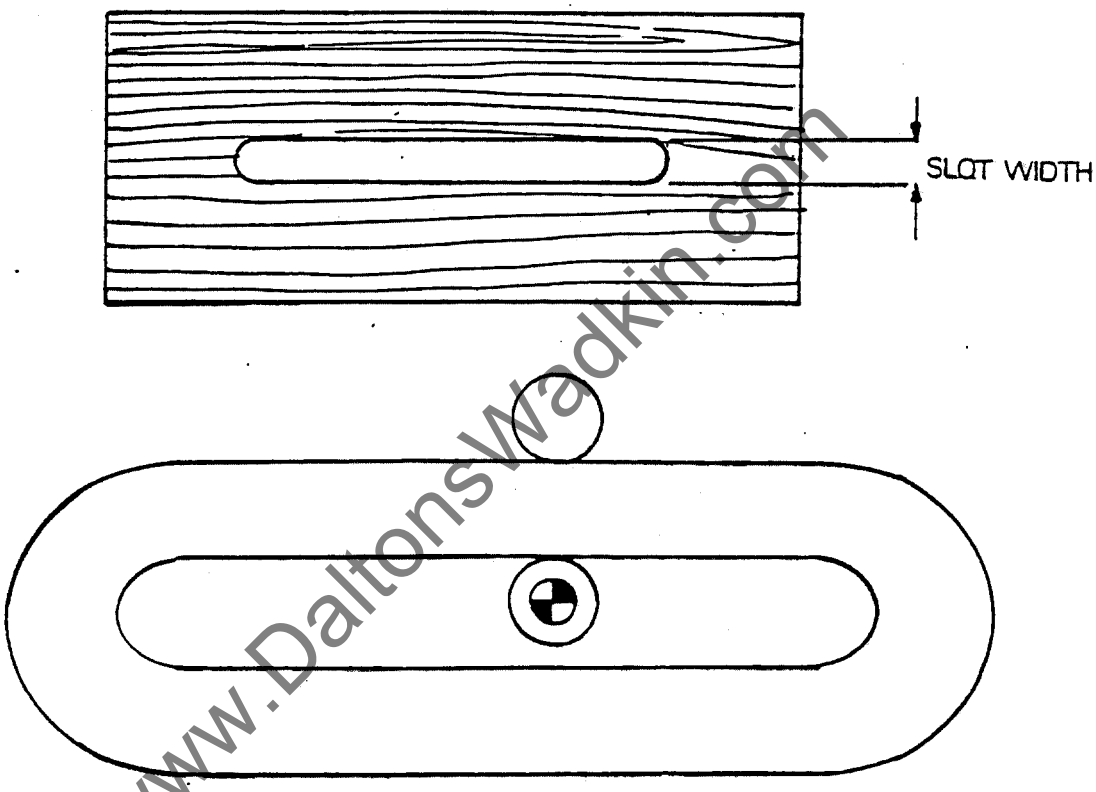
5. EXTERNAL WORKING

a.





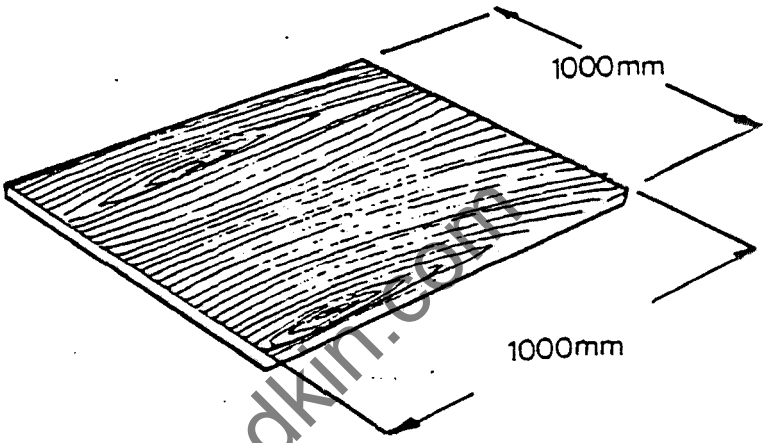
6. SLOTS CAN BE MACHINED, but remember templates must be continuous



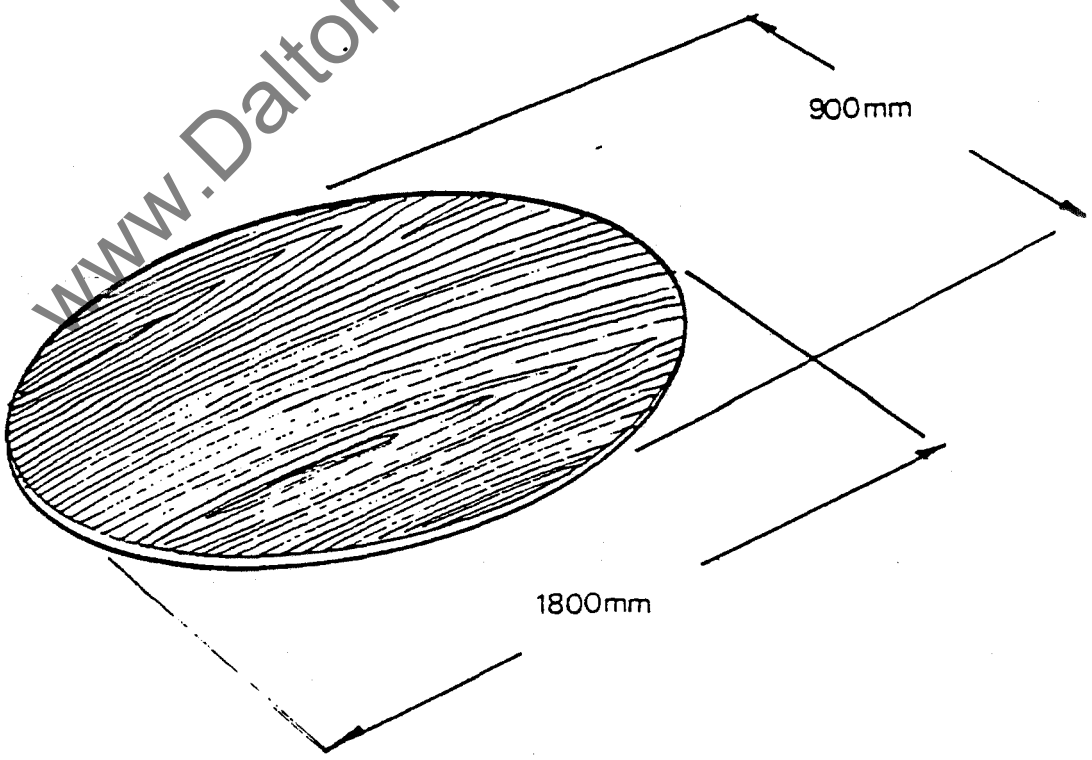
Cutter diameter is necessarily less than slot width. Therefore the ends of the slot are not true radii.

8. SIZE LIMITATIONS ON MODEL UX1A

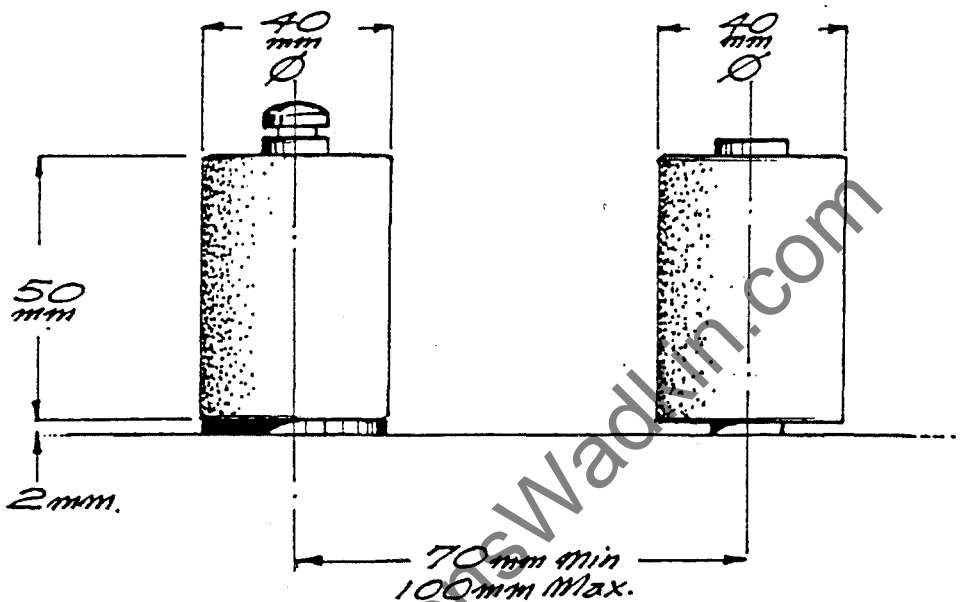
a. Components up to 1 metre square (approximately) can be fed fully automatically.
Larger components can be machined but may need operator assistance.



b. Oval table top as shown below can be fed automatically

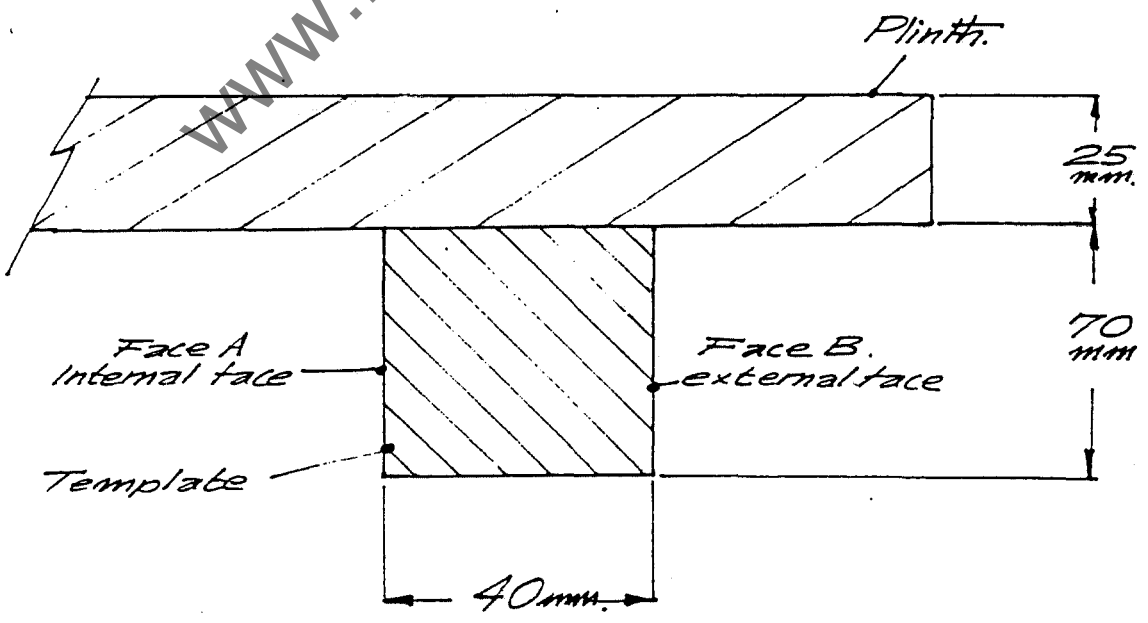


The jigs are powered by two rollers, both driven through a differential gearbox by a D.C. motor. The feed speed is variable between 0 — 15 m/min. using 40 mm dia. rollers, and is reversible. An air cylinder nips the rollers together, the pressure is adjustable. This pressure should normally be about 40 p.s.i.

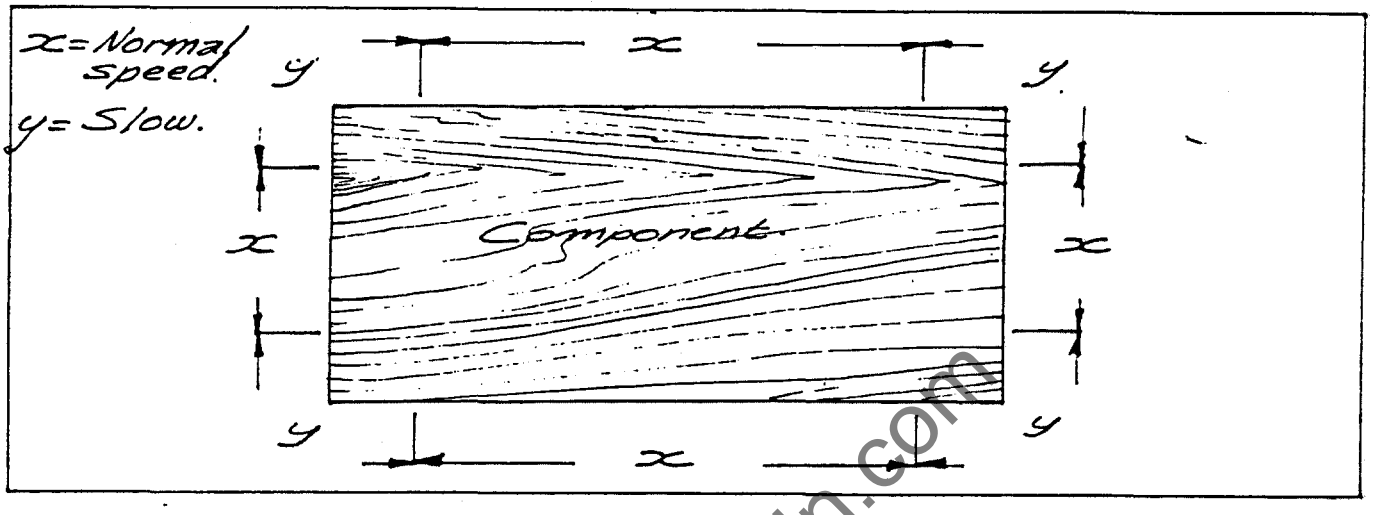


Roller Arrangement.

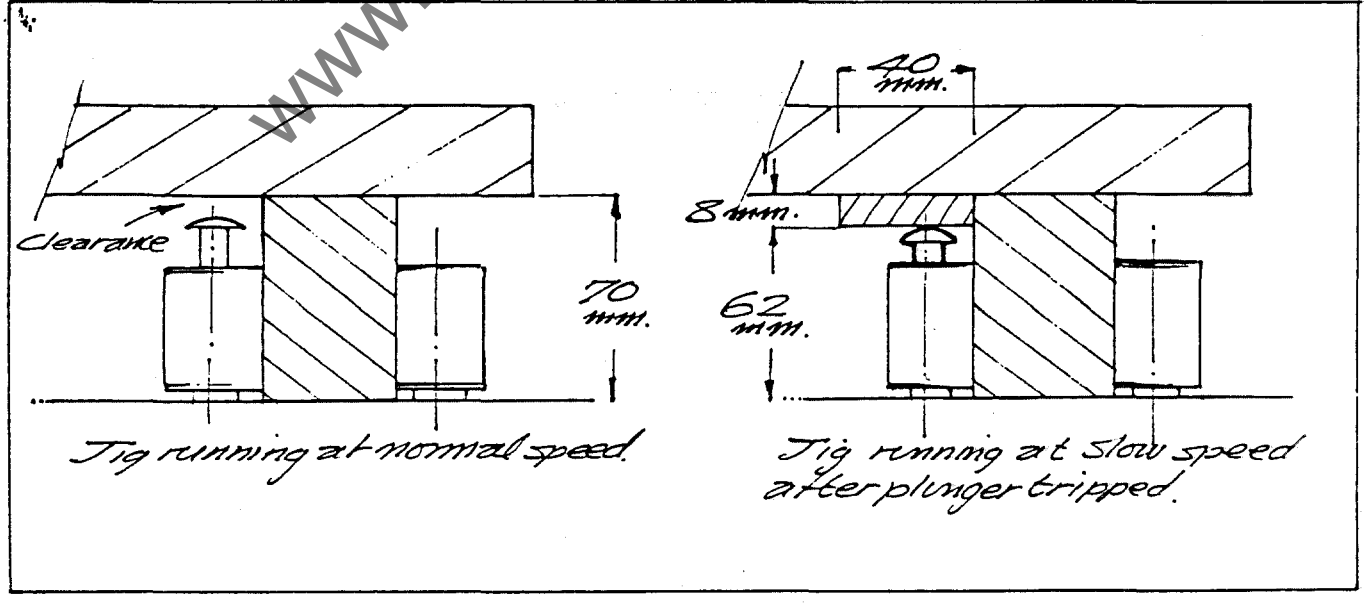
Basic Jig Dimensions + arrangement.

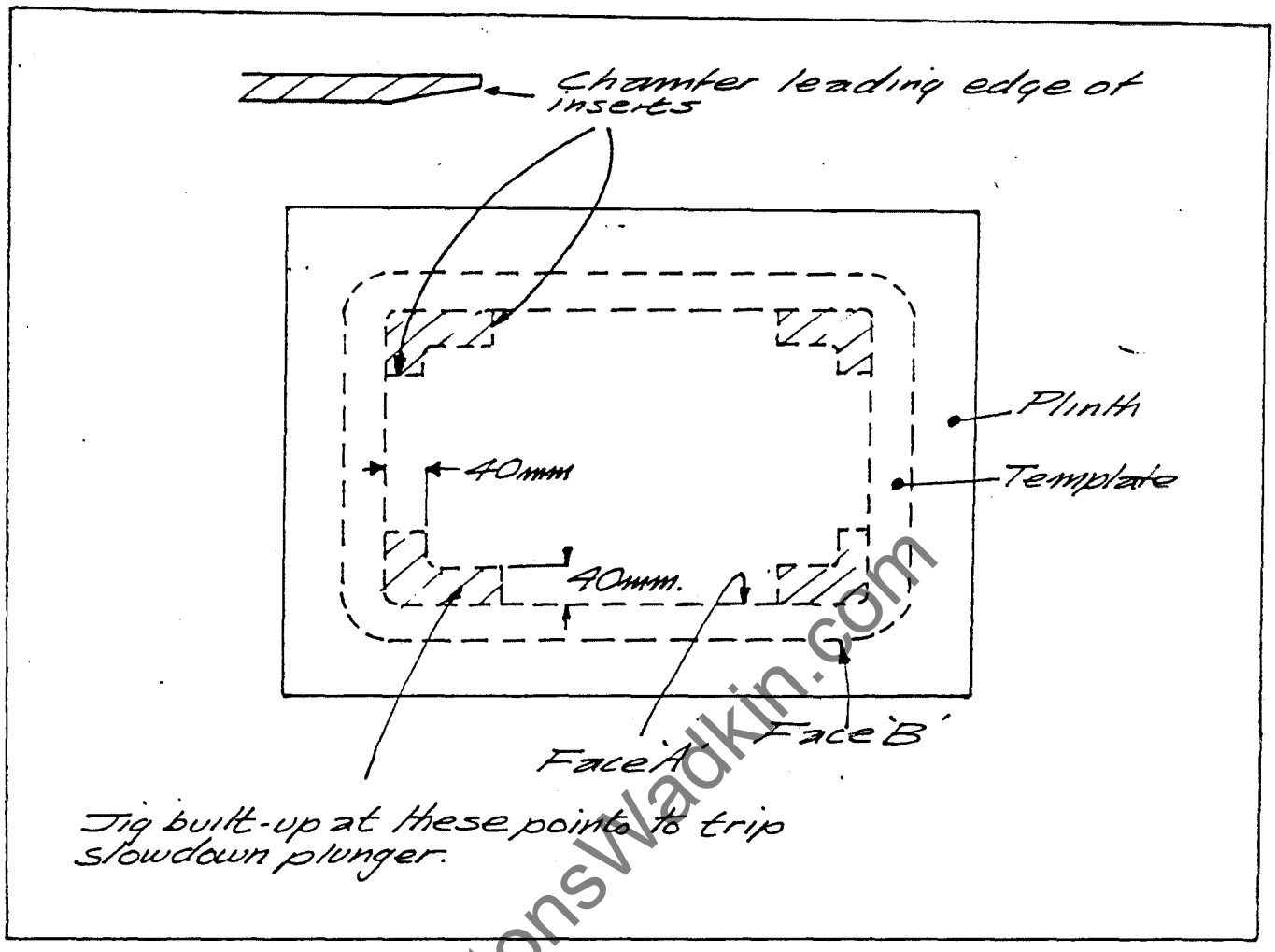


A slow-down feature is available which allows the jig to be fed at the normal speed and then slowed down at corners or any difficult points, or cross grain where it is necessary to produce a good finish.

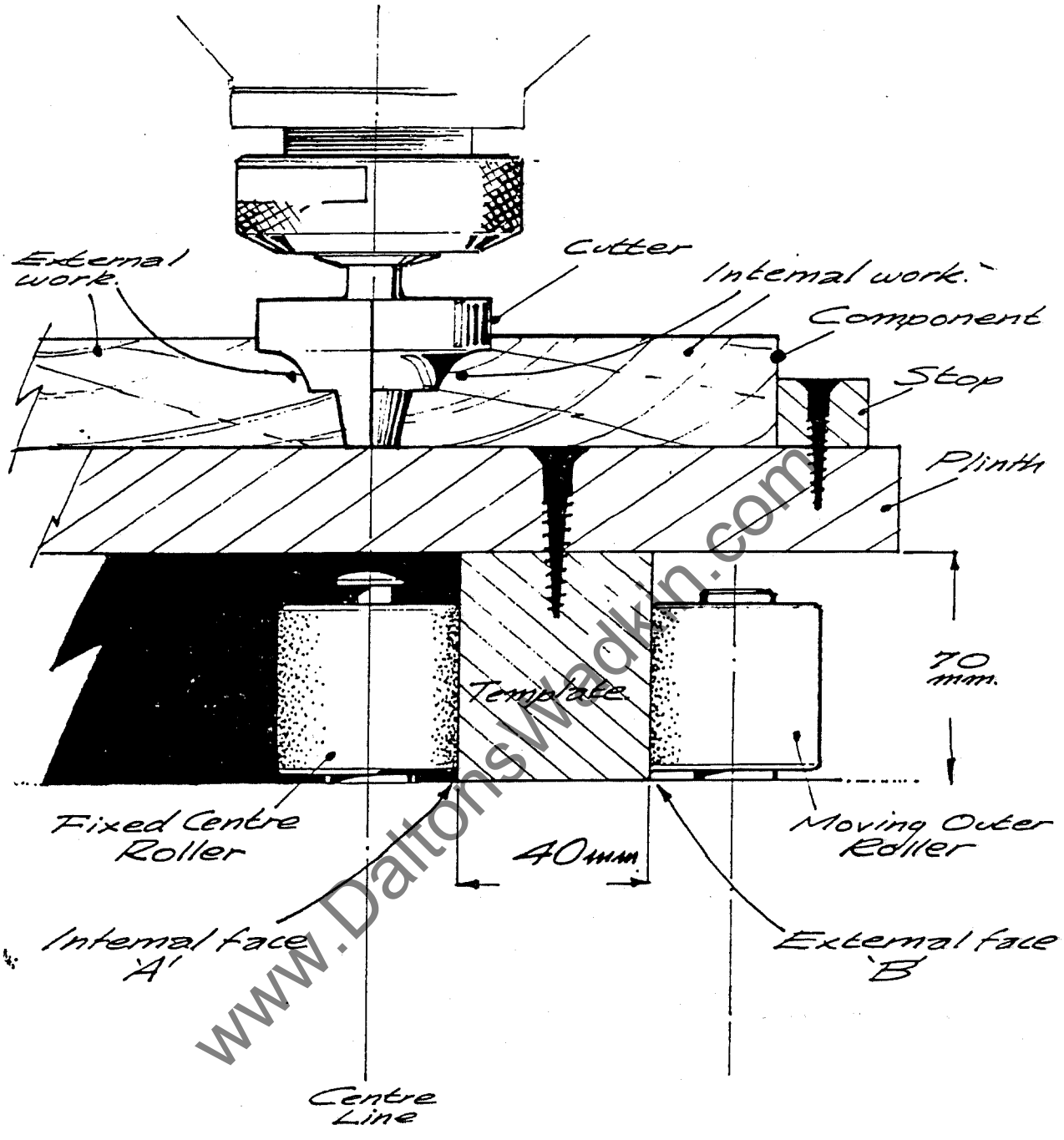


To activate the slow-down the plunger mounted in the top of the centre roller spindle has to be tripped by the jig. To do this the jig has to be built up as shown.



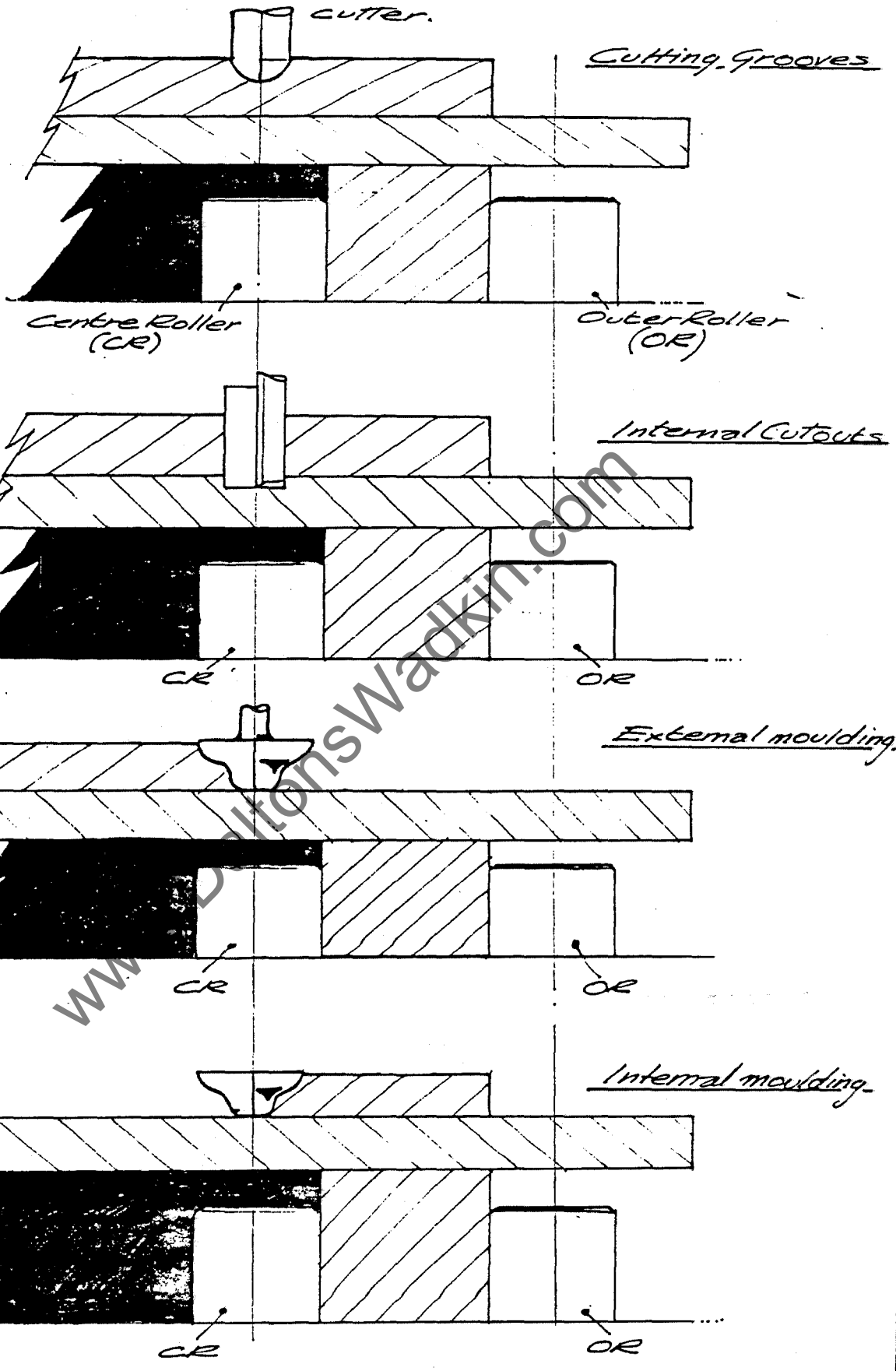


The feed speed of the jig when slow-down plunger has activated is also adjustable by means of a control knob on the main panel.



EXAMPLE OF TERMS USED IN THIS MANUAL.

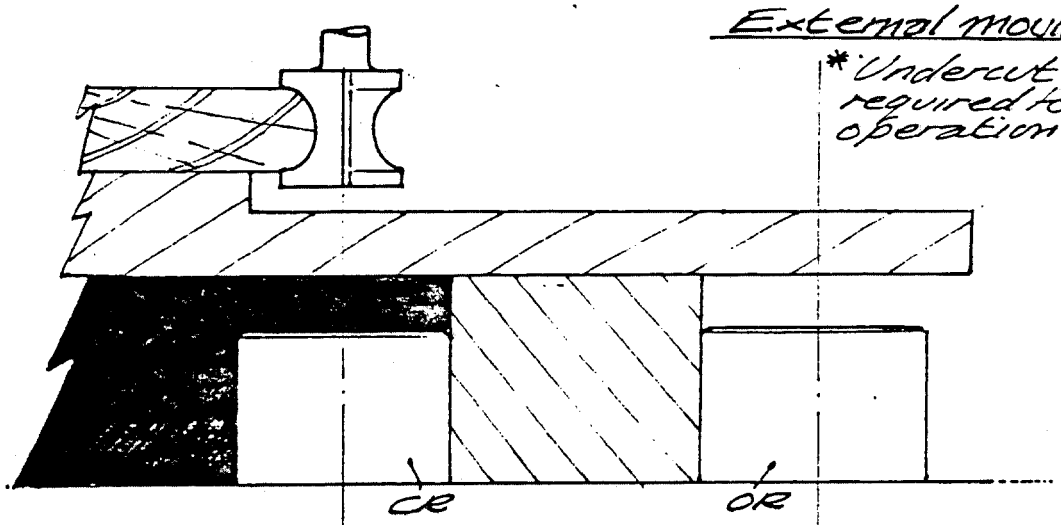
SOME TYPICAL AUTO FEED JIG USES.



(CONTINUED).
P.T.O.

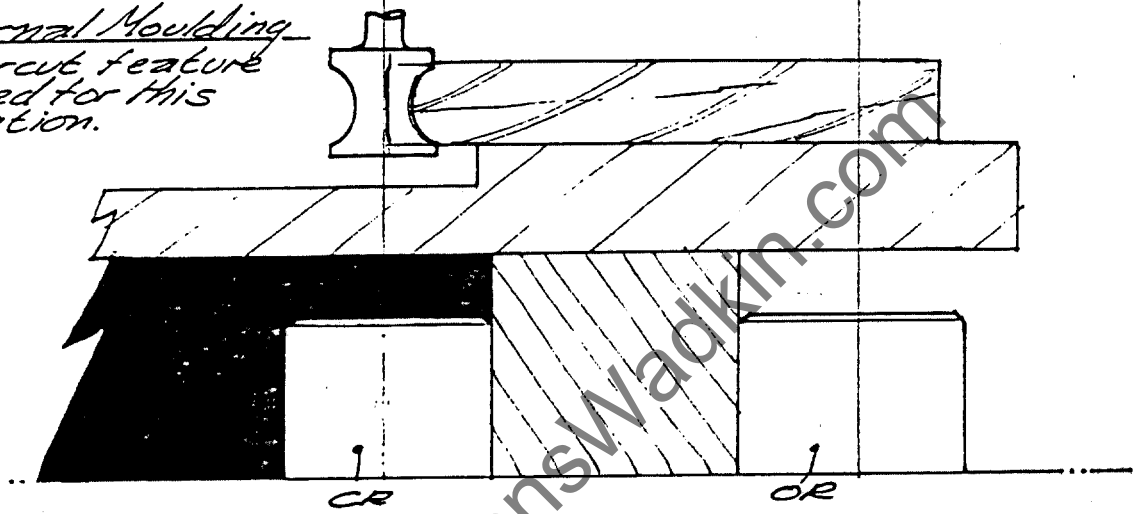
External moulding

* Undercut feature required for this operation



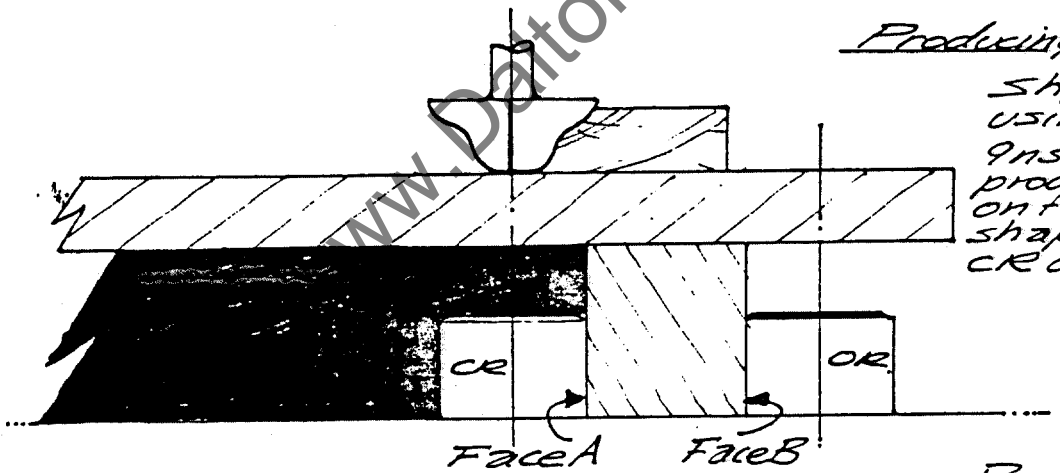
Internal Moulding

Undercut feature required for this operation.



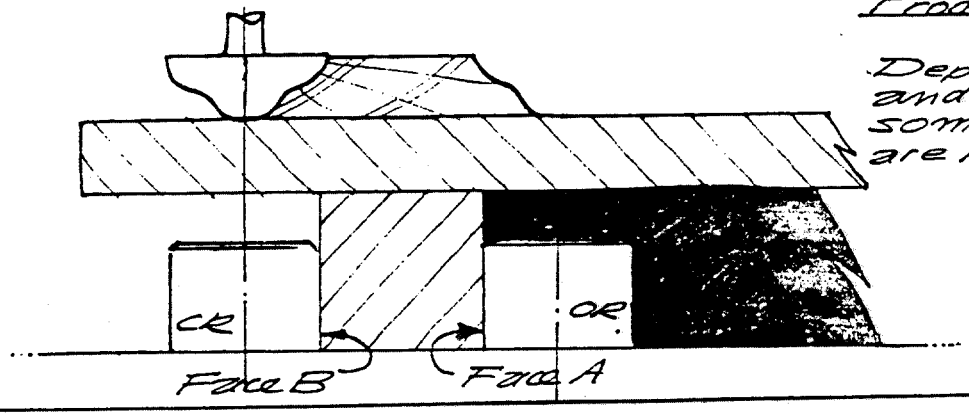
Producing internal mould.

Shaped frames using one jig. Inside shape produced with CR on face A. Outside shape produced with CR on face B.

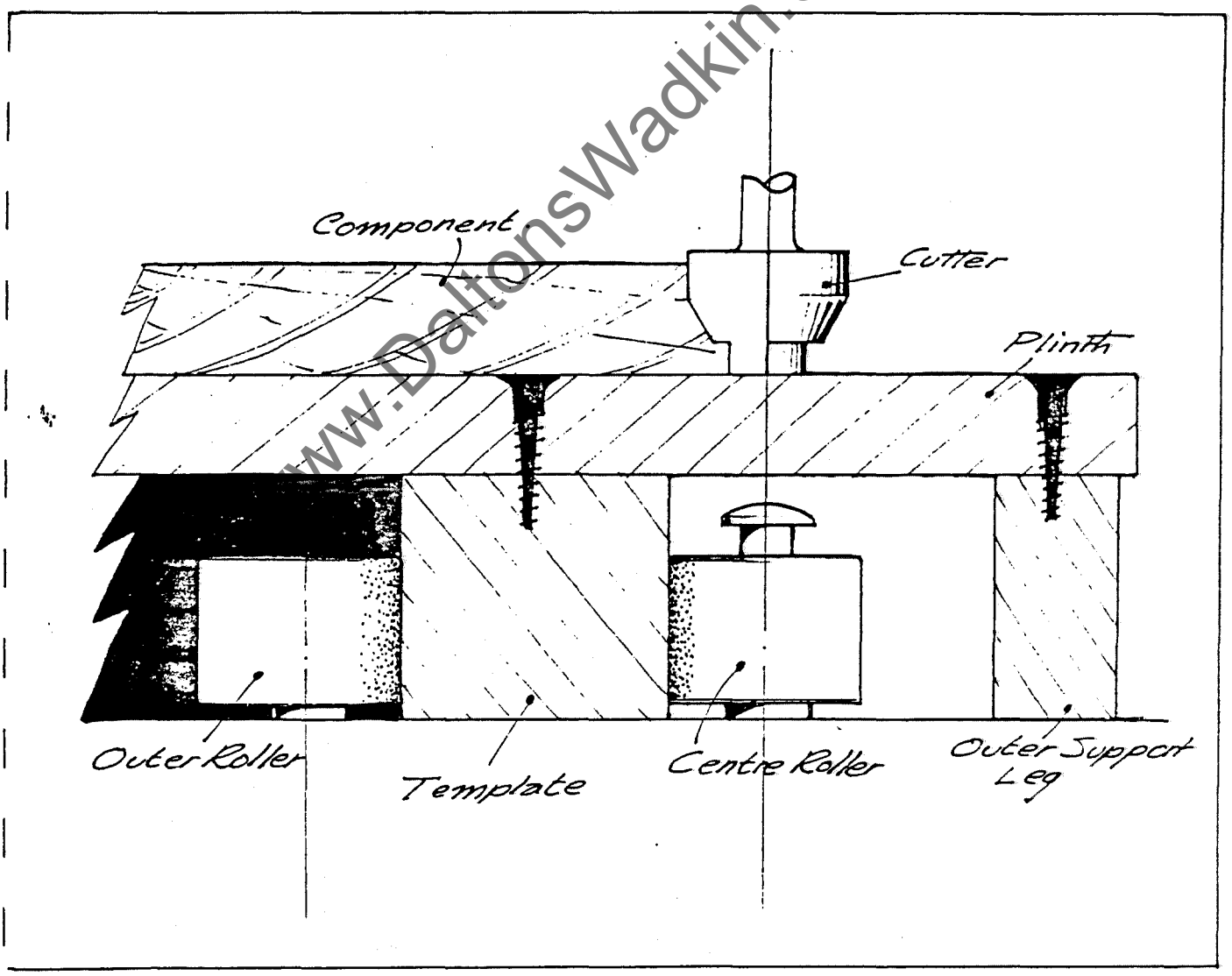


Producing External Mould

Depending on size and shape of frame sometimes two jigs are required



In most cases the centre rollers run on the internal face 'A' of the template. There are times when due to the shape of the component the centre roller can be arranged to run on the external face 'B' with the outer roller running on the internal face 'A'. When this type of jig is made an outer support wall is sometimes necessary to prevent the jig tipping over.



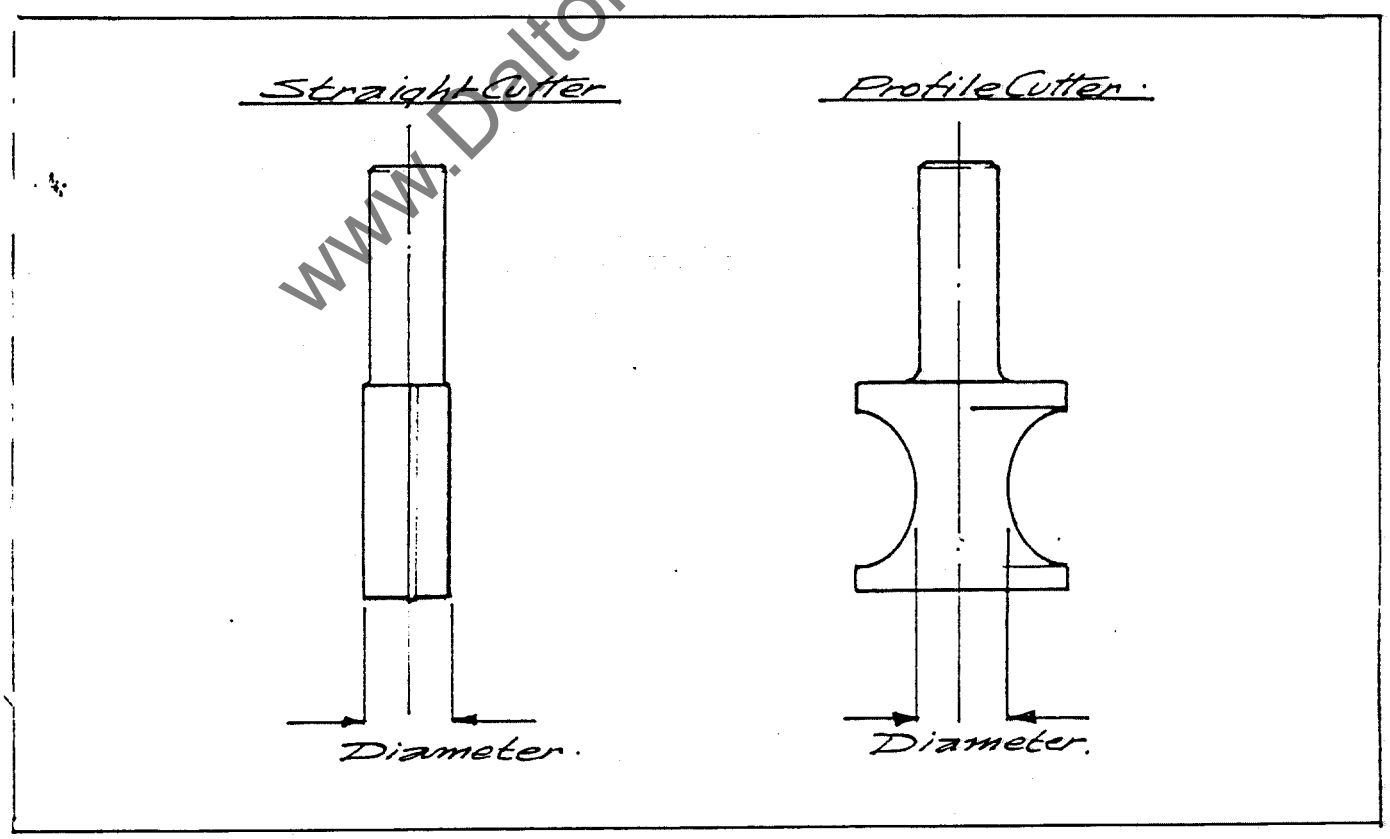
CONSTRUCTION OF TEMPLATES

Templates can be produced by glueing together several sheets of good quality hard plywood to a height of 70 mm.

The face which the centre roller runs on has to be very accurate as any imperfections will be reproduced on the finished component. This face should be sanded. The face which the outer roller runs on is not as critical but should be reasonably smooth to ensure a good roller life. This face should not however be polished or sanded.

PRODUCING TEMPLATE DRAWINGS FOR EXTERNAL SHAPES

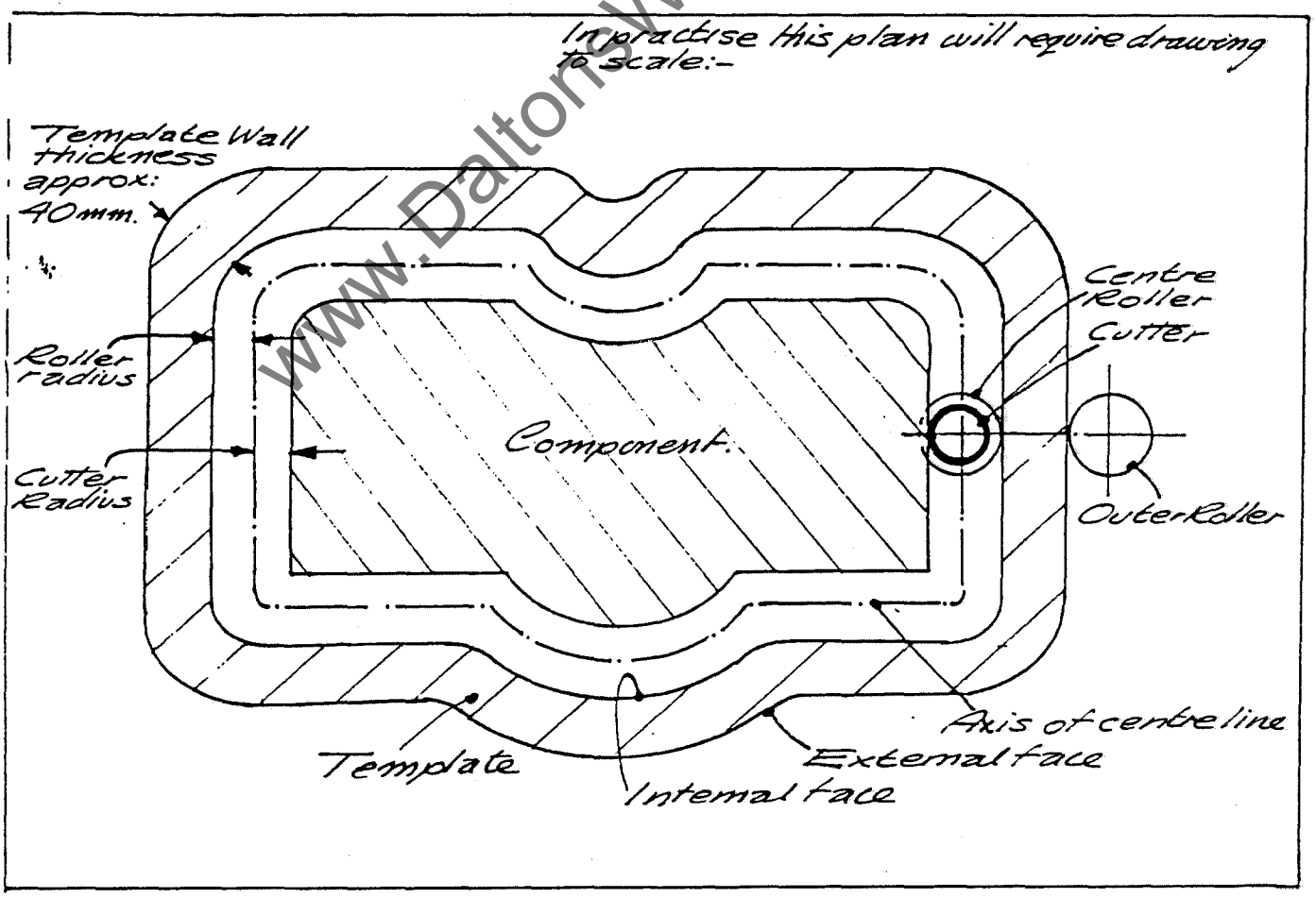
Draw the finished shape of the component full size. Decide on the cutter to be used, if it is a profile cutter its smallest diameter has to be used for the calculations.



Decide the diameter of the fixed roller to be used. (Normally 40 mm dia. as standard but when very intricate shapes are to be produced different roller diameter may be needed).

Draw a line all around the component cutter radius + roller radius away. This gives the internal shape of the template. Draw another line approximately 40 mm further away from component, this gives the external shape of the template. Wherever possible the template wall should be parallel.

The drawing has then to be transferred to the 70 mm hard plywood and accurately machined.



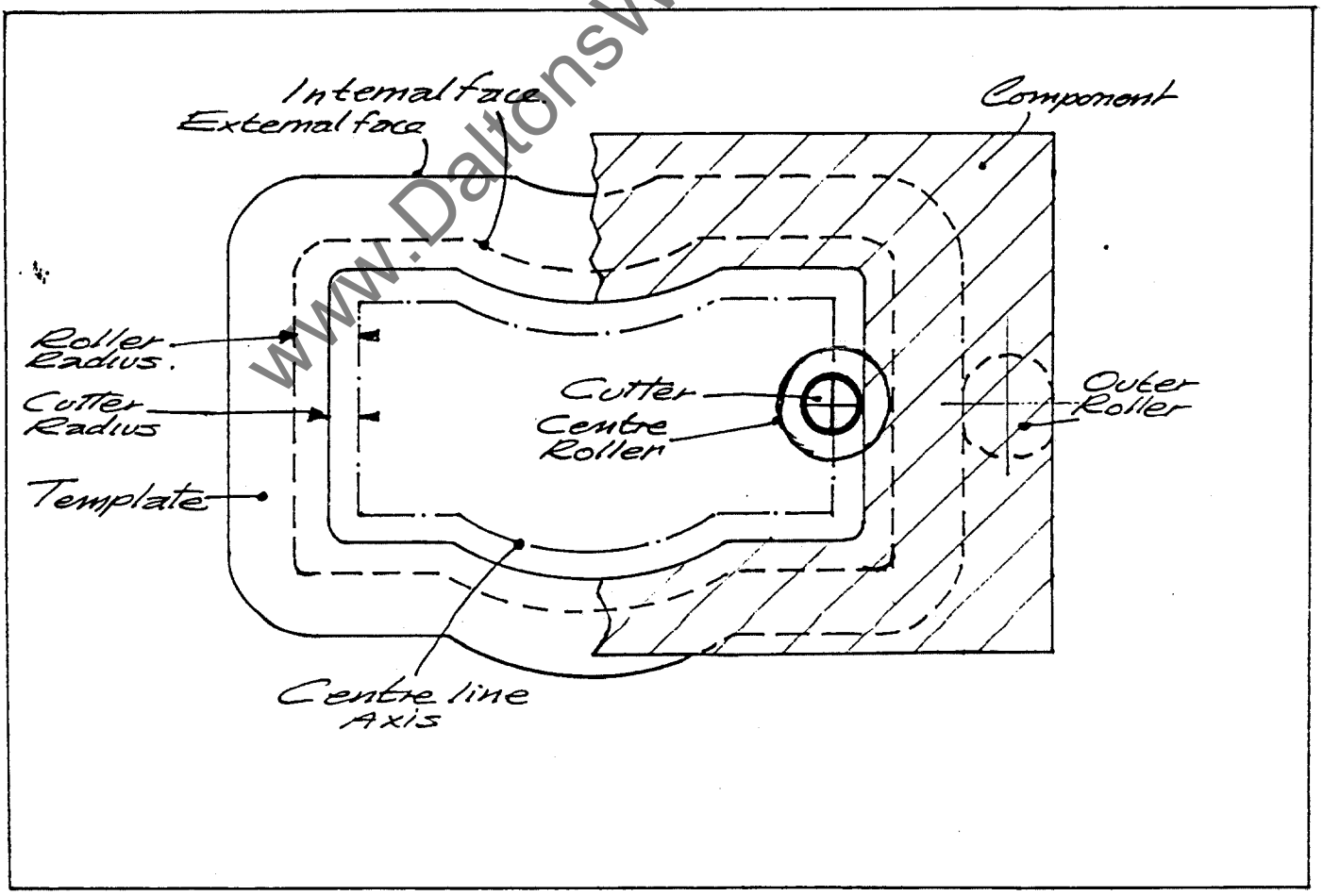
PRODUCING TEMPLATE DRAWINGS FOR INTERNAL SHAPES

Draw the finished shape of the component full size. Decide on the cutter diameter, decide on the fixed roller diameter. Draw line around the component roller radius — cutter radius away. This gives the internal shape of the template. Draw another line approximately 40 mm further away from component, this gives the external shape of the template. Wherever possible the template wall should be parallel.

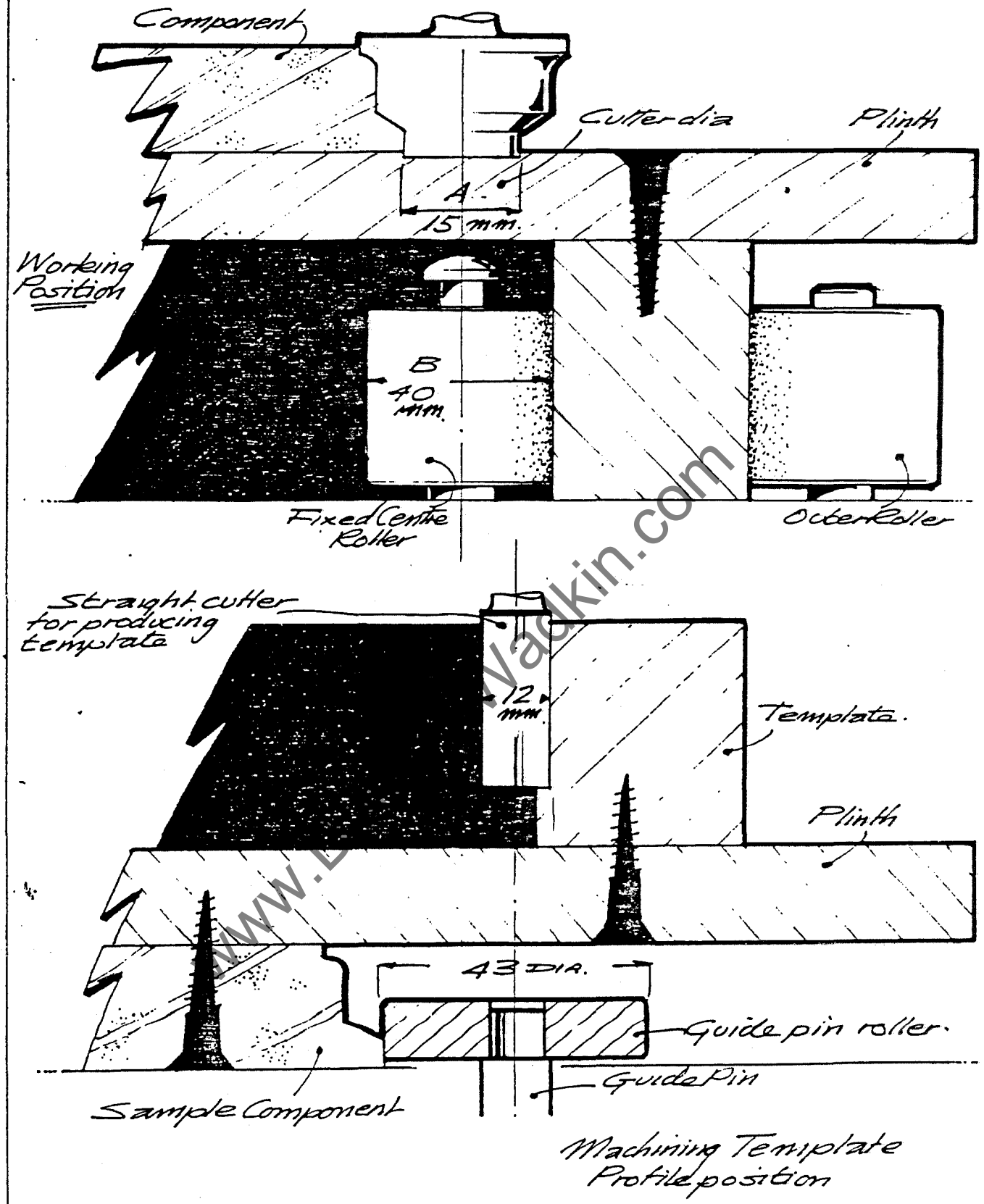
The drawing has then to be transferred to the 70 mm hard plywood and accurately machined.

Note:

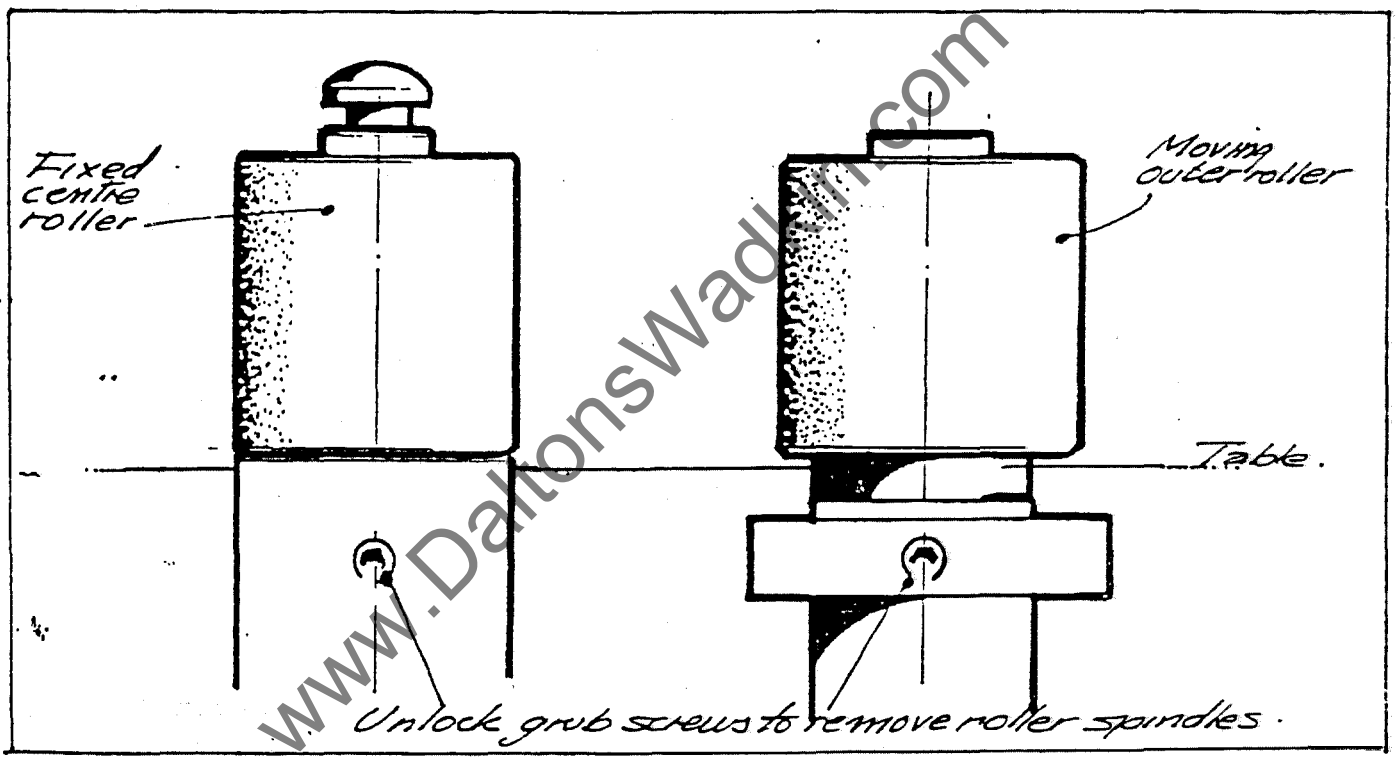
If cutter diameter and the roller diameter are the same then internal shape of template is identical to external shape of the component.



Producing templates for external shapes from sample components.



By using a sample component a template can be machined manually on the UX Router. The fixed centre roller and moving outer roller have to be removed to allow guide pins to be fitted. To remove rollers unlock allen screw and lift roller spindles out, replace large opeing centre ring with one with small hole for guide pin.



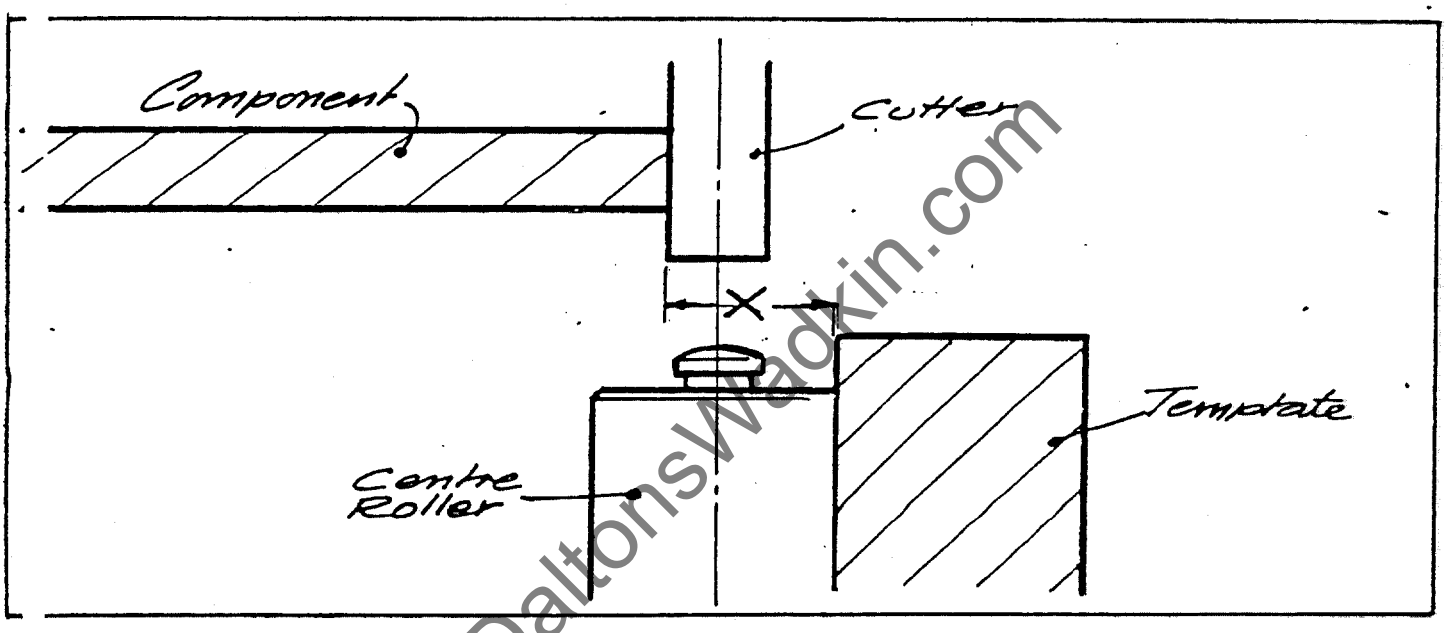
PRODUCING A TEMPLATE FOR EXTERNAL WORK FROM A SAMPLE COMPONENT OF MODEL

To produce such a template it will be required to convert the machine to a pin router simply by substituting the feed rollers with guide pins.

Before work can commence we must first determine the size of cutter that will be used to machine the finished component.

On a template the profile of the inner face will be larger than the finished article by the fixed roller radius + the cutter radius as shown at (X).

NOTE : ALL STANDARD ROLLERS ARE 40MM DIA.



The following formula determines the diameter of guide pin bush required to follow around the sample in order to machine the template face.

A + B = C + D

Where :-

A = FINISHED CUTTER DIA.

B = FIXED CENTRE ROLLER DIA. (40mm)

C = STRAIGHT CUTTER USED TO MACHINE TEMPLATE (WE RECOMMEND 12mm DIA. LSW 3185)

D = GUIDE PIN BUSH DIA.

D Being the unknown the formulae can be transposed to read :-

$$D = A + B - C$$

EXAMPLE :-

If we decide our finished cutter will be 14mm dia. (A), and we know the centre roller is 40mm (B) and we also know the cutter we will be using to produce the template as being 12mm dia. (C), then the guide pin bush required to machine the template inside face will be :

$$D = A + B - C$$

or $$D = 14 + 40 - 12$$

$$D = \underline{42 \text{ MM}} \text{ DIA.}$$

We also require a second guide pin bush to enable the outer face of the template to be machined. This is simply calculated as follows, given that the template wall thickness is 40mm, it can be seen that the outside face has to be 40mm all round larger than the inner face plus allowance for the cutter, thus 2 x 40 + 2 x 12.

Therfore second guide pin bush equals :

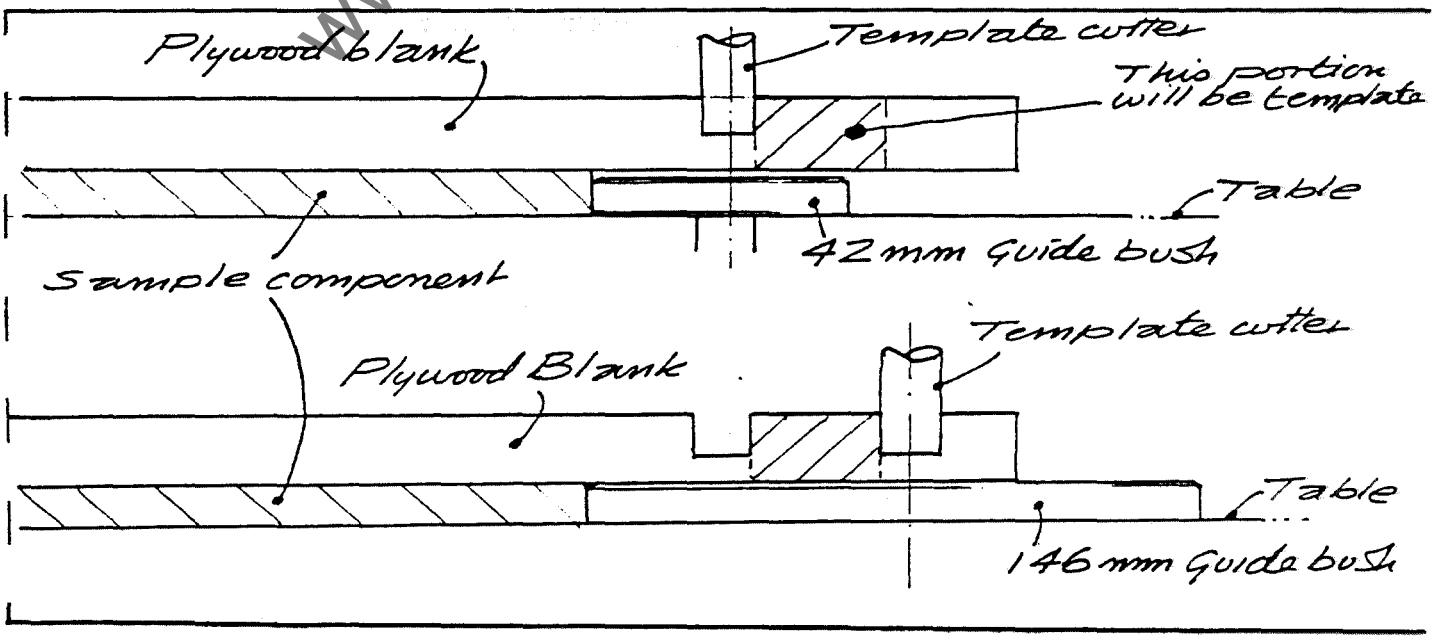
$$\text{FIRST BUSH DIA.} + 2 \times 40 + 2 \times 12$$

$$= 42 + 80 + 24$$

$$= \underline{146 \text{ DIA.}}$$

N.B. 2 x 12 REPRESENTS TWICE THE CUTTER DIA.

THE FOLLOWING DIAGRAMS INDICATE THE FUNCTIONS OF THE TWO BUSHES

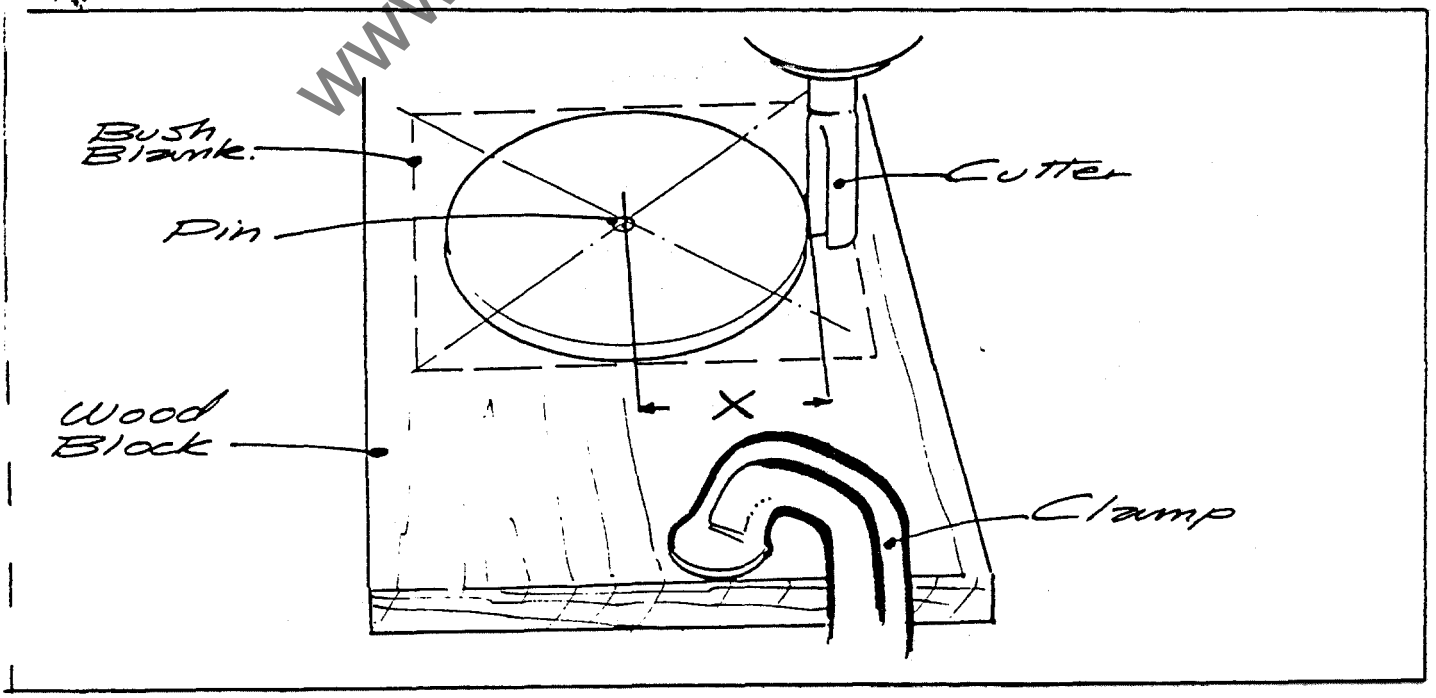


HOW TO MAKE GUIDE PIN BUSHES

The bushes can be made on the router from plywood or similar material of about 6 to 8mm thickness.

To do this simply cut a square of material to suit the disc dia. and mark the centre of the piece.

Clamp a block of wood to the router table and pin the bush blank to this block, ensuring that the block will rotate about the pin freely. Lower the cutter to just above the bush blank and adjust the whole block until the radius of the bush can be measured from the pin centre to the cutter edge, (i.e.) in the case of the 42mm pin, this dimension should be 21mm (X). Check that the clamps are firm, start the cutter and gently lower the cutter into the blank whilst rotating it until cut through. Remove disc blank from pin and drill a 12mm hole on the pin centre to accept a guide pin.



Having now produced suitable guide pin bushes work can now begin on the actual template.

Firstly a suitable piece of 25mm ply should be cut to dimensions which are at least Roller radius + Cutter radius + 40mm all the way round the sample.

Secondly a sample or model component should be provided. This sample should be exact and within your specific tolerances, and should have no irregularities, as these will be reproduced into the template and subsequently onto future components.

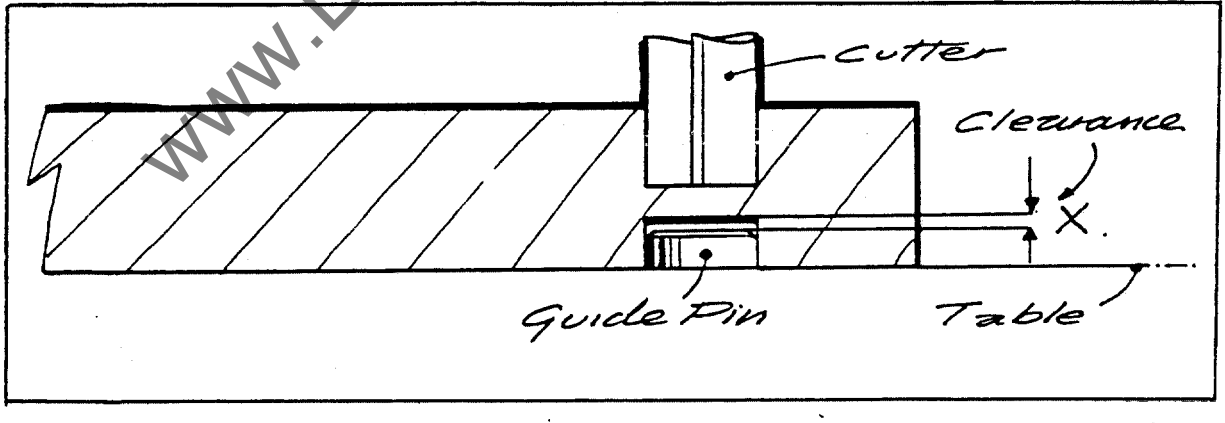
This sample should then be fixed centrally onto one face of the ply block by pins or screws. Then, with feed rollers removed and the appropriate centre table plate fitted, a 12mm guide pin should be located into the centre feed shaft. Place the smaller of the two guide pin bushes onto the centre pin and secure a 12mm T.C.T. panel cutter into the spindle chuck. Place block sample down onto work table and adjust pin and bush height so that they are just clear of the ply block underside. Now feed the block and sample up to the bush and set the cutter to come down just above the workpiece. It will be seen that as the workpiece is rotated against the bush the template shape will be plotted, and as such, after familiarising yourself with the principles of the operation, cutting can commence, remembering that if you leave the guide pin bush you will damage the template face.

Start the head and lower the cutter just enough to cut a shallow path indicating the template shape. Repeat this process gradually until a trough of about 6 - 7mm deep has been produced then retract the head and stop the cutter.

Now replace the small diameter bush with the larger one and repeat the above process exactly until two grooves or tracks are cut into one face, the land between these grooves being the eventual template.

At this stage the sample can be taken off the block and the bush removed from the centre pin leaving only the 12mm dia. portion of the pin protruding above the table surface.

Turn the ply block groove side down locating one of the grooves onto the pin. Start the cutter and lower the head onto the workpiece until cutting takes place, then repeat the above process sliding the workpiece over the pin via the pre-machined groove until cut through.



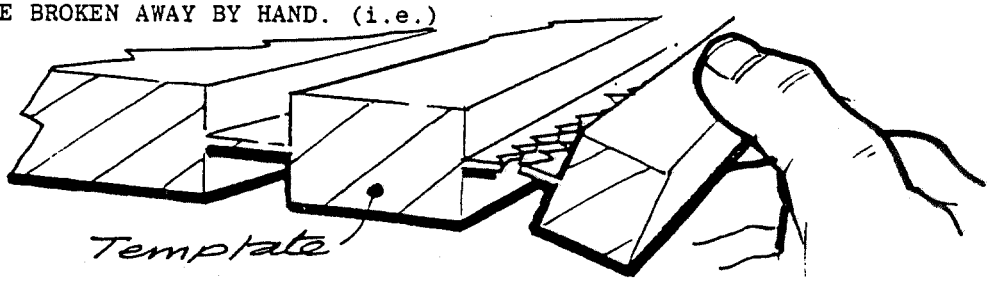
BE CAREFUL NOT TO MACHINE THROUGH ONTO PIN - AS SUCH LEAVE CLEARANCE BETWEEN PIN AND GROOVE AS SHOWN AT (X)

Repeat same procedure on second groove, feeding downwards gradually at each pass about 3mm until cut through.

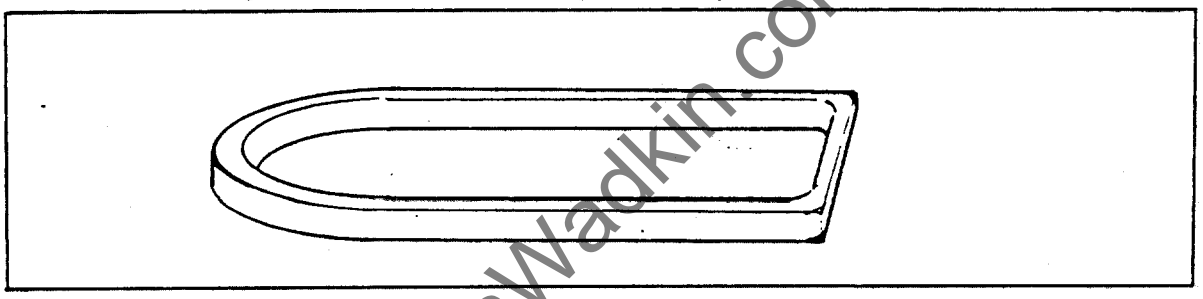
NOTE :

WHEN MACHINING ABOVE PROCEDURES DO NOT CLIMB CUT, AS TO DO SO CAN CAUSE CUTTER TO SNATCH AT WORKPIECE. FEED SMOOTHLY WITH HANDS SPACED AWAY FROM CUTTER.

IN MOST CASES IT WILL BE FOUND EASIER WHEN CUTTING GROOVES TO MACHINE DOWN TILL THE TWO ALMOST MEET BUT LEAVING A THIN VENEER BETWEEN, THUS ALLOWING THE WASTE TO BE BROKEN AWAY BY HAND. (i.e.)



After following the procedures to this stage the resulting piece will represent a single section of the complete template.

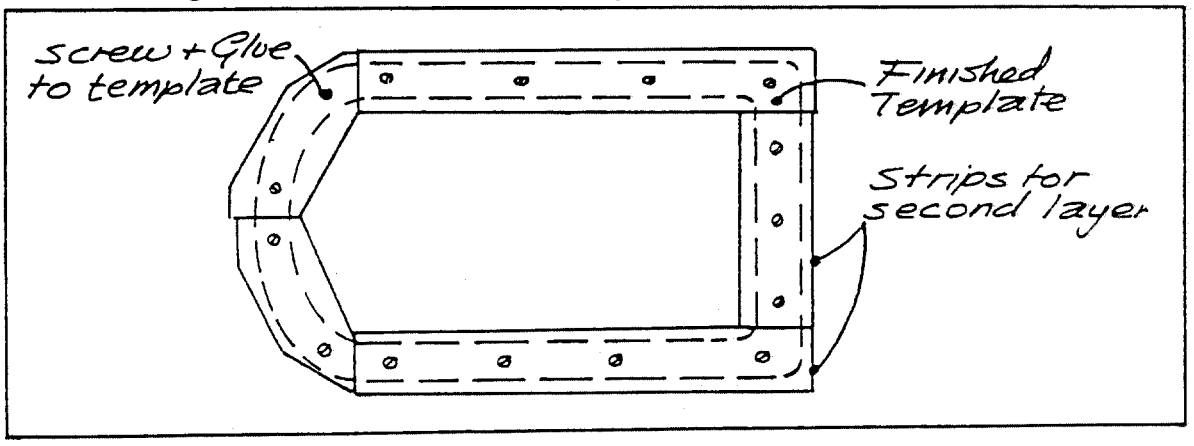


This will now require building up to give the required depth.

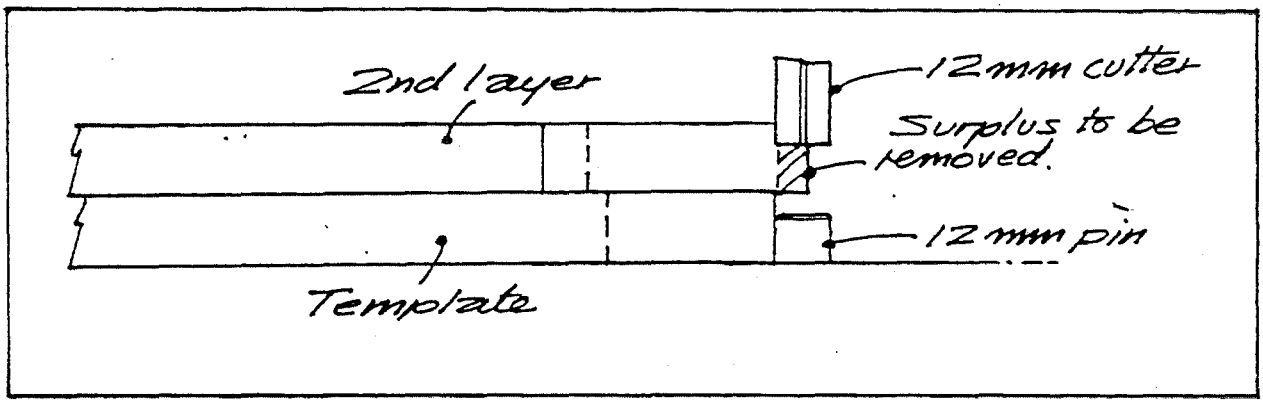
Having completed the first layer of the template the inner face should be sanded to remove any irregularities and to provide a smooth surface. The outer face is not critical and as such need only be cleaned up. Any large irregularities incurred in the initial stages should be filled and sanded smooth on both faces, for this a good brand of motor body cataloy filler is recommended.

Now we have to achieve the total height build up of the template section. We require an ideal template height of 70 - 75mm. Therefore, it is necessary to complete two or more layers similar to the one already produced.

The easiest and most economical method of doing this is to use scrap strip ply material from similar stock to that of the first layer. Such strips should be wider than the finished wall width by 5mm or so, and should be screwed and glued down onto the first layer as illustrated.



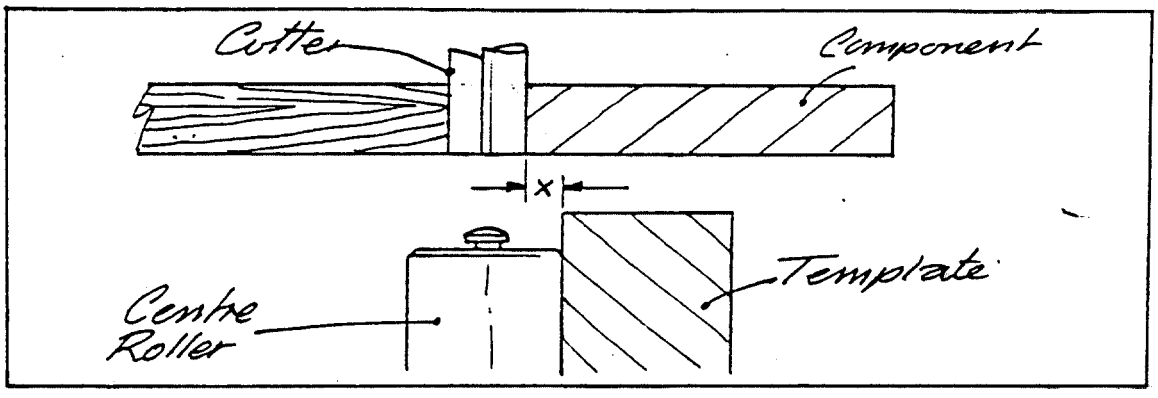
The surplus material should then be removed by machining the assembly against a 12mm pin and cutter.



This process should be repeated for the third payer.

PRODUCING TEMPLATES FOR INTERNAL WORK FROM SAMPLE COMPONENTS OR MODELS

The main difference from the principles already outlined for this procedure are that when working round the internal profile of a component, i.e. a frame, the cutter is working at the other side thus requiring a different offset, as such the calculations will now be different.



As such the value for X is arrived at from the formula :

B - A = C - D

Where :-

A = FINISHED CUTTER DIA.

B = FIXED CENTRE ROLLER (40mm)

C = TEMPLATE CUTTER DIA.

D = GUIDE PIN BUSH DIA.

To calculate the guide pin bush size it can be seen that the difference X between component and template inside face is the roller radius minus the cutter radius.

IN SOME INSTANCES IT MAY BE REQUIRED TO USE A LARGER DIA. TEMPLATE CUTTER THAN THE 12MM NORMALLY PREFERRED.

This anomaly occurs where in instances the finished cutter dia. is less than the fixed roller dia.

This can be seen if one inserts 12mm into the previous formula when sizes of finished cutter are less than 40mm, this would result in a guide pin diameter being indicated in value as a minus.

eg. FIXED CENTRE ROLLER DIA. - CUTTER DIA. = TEMPLATE CUTTER DIA. - GUIDE PIN DIA.

B	-	A	=	C	-	D
40	-	20	=	12	-	?
		20	=	12	-	?

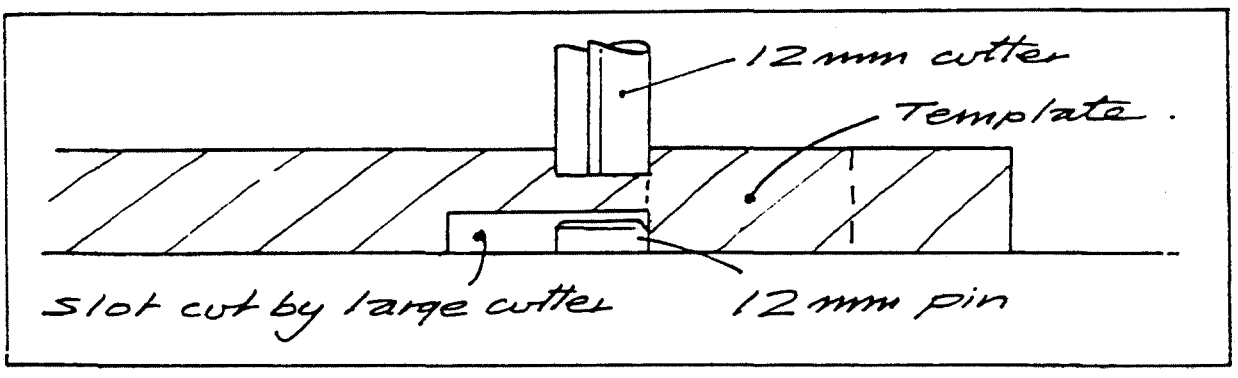
This is no number which can be taken away from 12 to equal 20 so 'C' must be increased.

eg.

B	-	A	=	C	-	D
40	-	20	=	30	-	D
		20	=	30	-	10

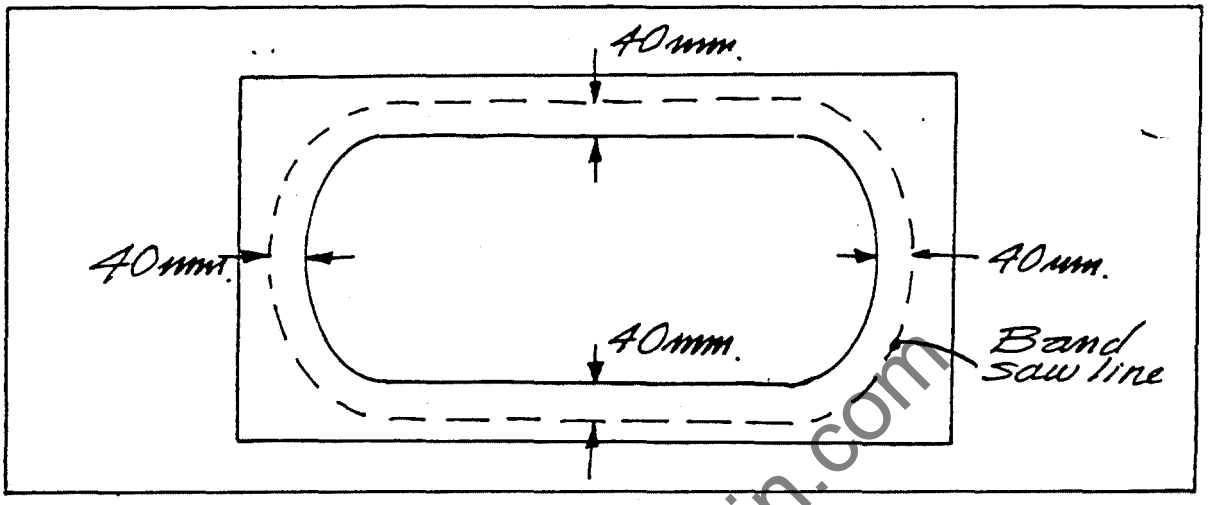
So guide pin will be 10mm and centre will be 30mm.

As such the inside face of the template can now be machined. However, if the calculations prescribe a larger dia. cutter to machine the template, this cutter need only be used to cut a 6 - 7 mm deep groove after which the larger cutter can be substituted for the usual 12mm dia. one, and a similar pin and cut through as previously described.



It should be noted that the outside face of the template cannot be machined by following the previous methods due to the offset. As such this can be overcome by marking an equi-distance line round the inside opening 40mm away and this shape bandsawn carefully away.

eg.



The resultant shape should then be sanded smooth, though this face is not critical a good standard should be maintained in order to preserve a smooth feed on the machine.

As such one master layer of our template has again been constructed, and as previously outlined this section should now be increased to its required 70 - 75mm section by layering glued and screwed strips onto it, finishing as outlined earlier using the 12mm pin and cutter.

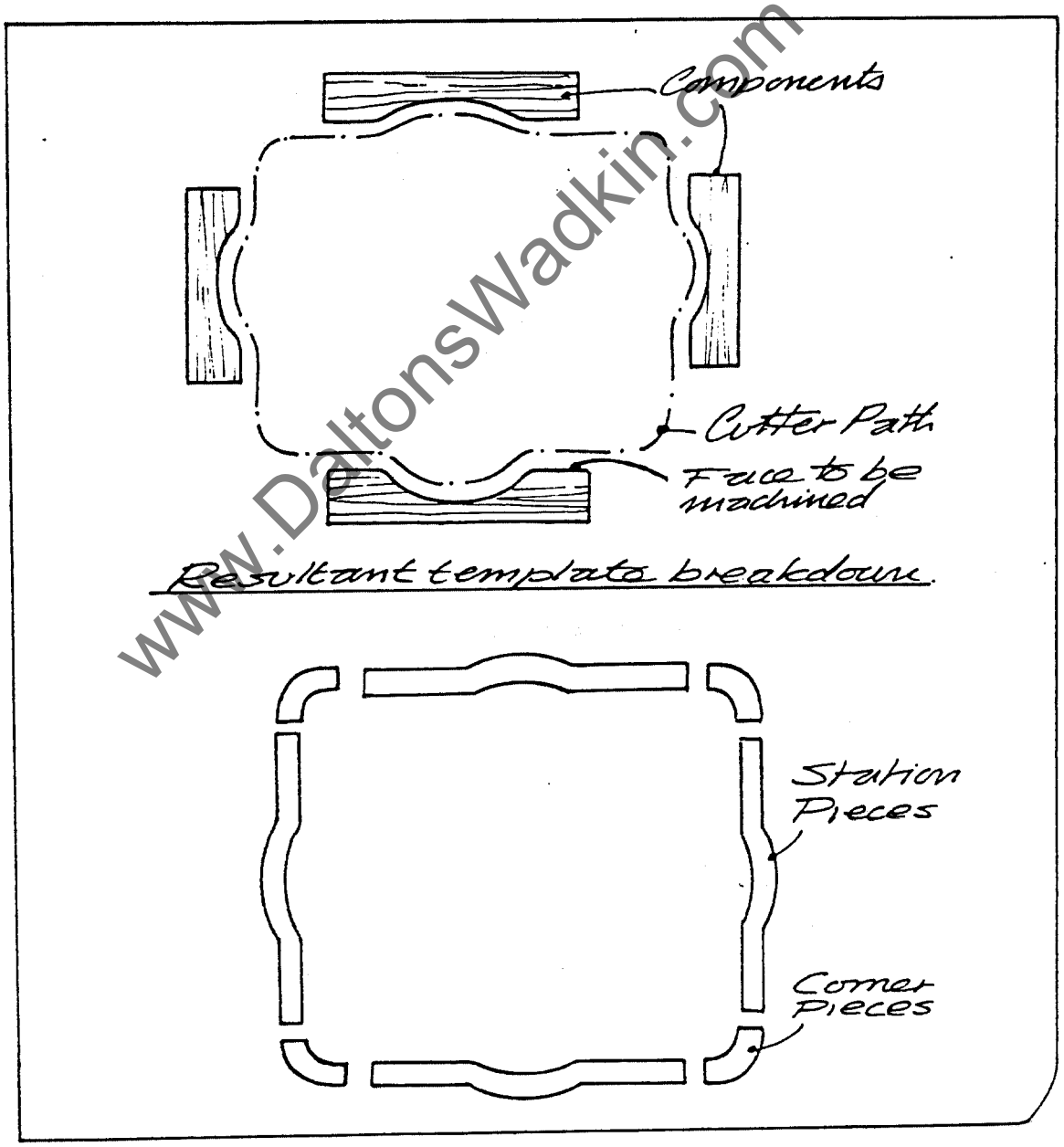
PRODUCTION OF MULTI-STATION JIGS

This particular kind of jig should be considered where it is required to produce a method of economically manufacturing large quantities of components, i.e. kitchen door rails. As such, depending on the size of component, such a jig can be designed to accept between 4 or 8 components on average.

By this process it can be seen that where one face of a component requires machining such a jig can provide a continual path feed past several components arranged in either a circular or square pattern.

Normally such jigs will be proportionately larger than the single component types, and though exactly the same processes can be applied, it will be found easier to break down the template into sections. As such the first step is to decide on the arrangement of the components and the number involved.

A four station jig can be broken down as follows.



If one master template is made for one station, all the other pieces for this arrangement can be made from this master ensuring that each station will be identical.

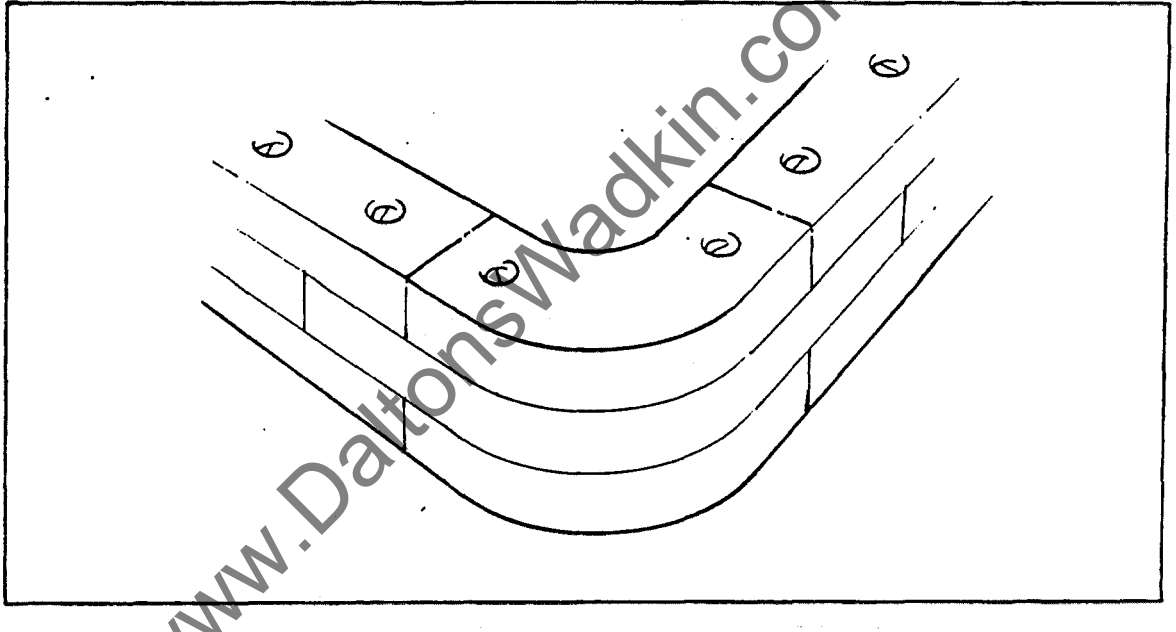
Similarly the corner pieces required to link each station into a continuous path can be made from one master. Using 25mm ply, such a four station jig would require 12 corner pieces and 12 station pieces.

The best method of providing the dimensions for the pieces is to draw the template to full size on either paper or sheet plywood using the previously given formulae.

A decision can then be made how to break the shape down and master pieces can be made from the drawing.

A point worthy of note when designing the construction of the template is that a stronger template can be made if the layers are dovetailed together rather than simply butting each section edge to edge.

i.e.

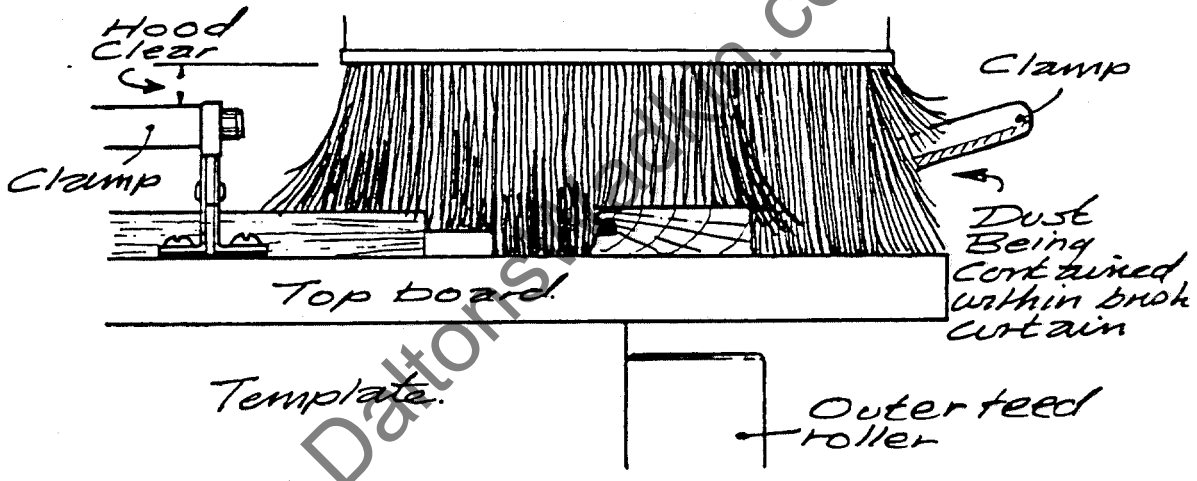


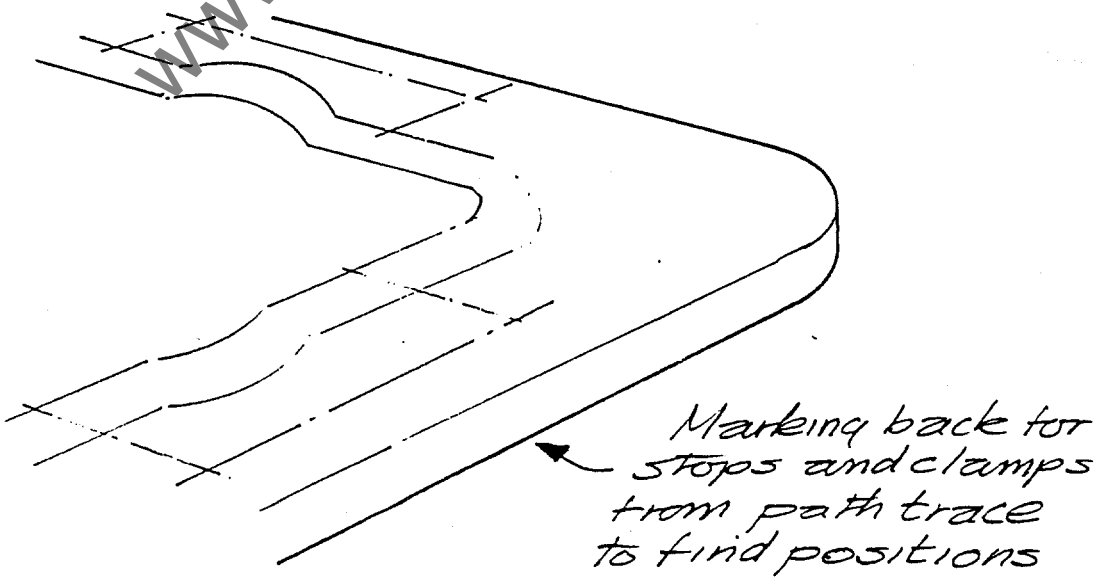
An alternative, though more exacting method of producing the template, is to mark out the entire template profile on sheet ply and then bandsaw and sand to the marked lines. Once a full single layer has been made in this fashion strips can then be fixed onto this layer, and as previously described the surplus material routed away using the pin method.

Having produced the template the next requirement is that of a top board. Consideration should be given to the physical size of this board, especially where a routex type dust hood is fitted to the machine, as it is an advantage to have the brush curtain of the extractor always on top of the board and not hanging over the edge. This ensures total enclosure of the suction effort thus giving less chance of dust being expelled in the operators area.

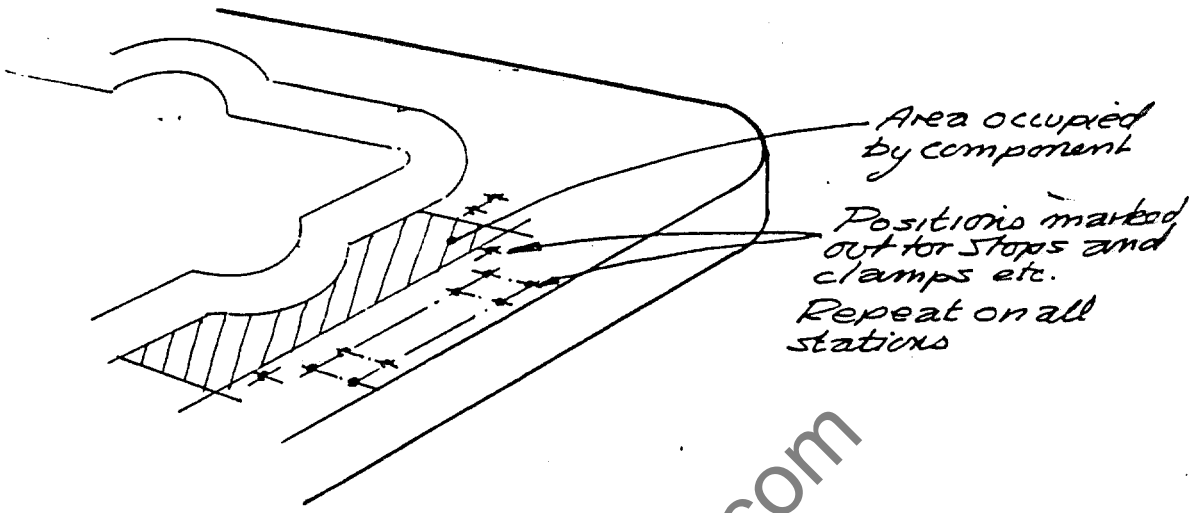
With a suitable top board secured to the template the assembly should be engaged between the feed rollers of the machine. A cutter which is the same diameter as the finished cutter should be installed into the cutter chuck. If a moulding cutter is to be used select a straight cutter which will suit the smallest profile dia. (See page 8)

Start the jig feed and head and lower the cutter onto the jig until a path is traced onto the top board approximately 0.5 - 1mm deep.



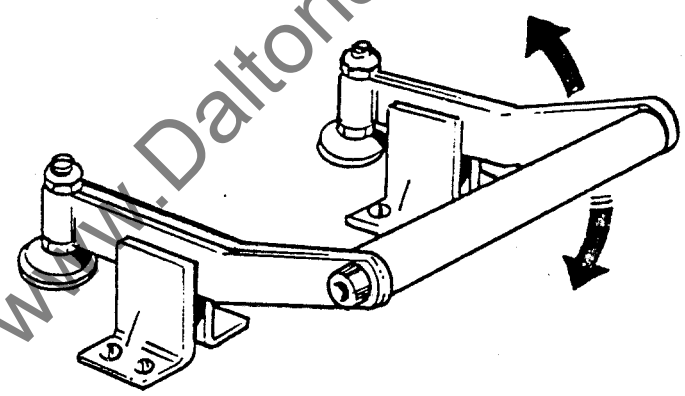


The resultant path shows where the machined face of the component will be, and as such the position of datum stops for each component can be marked back from this line with the aid of a sample component.

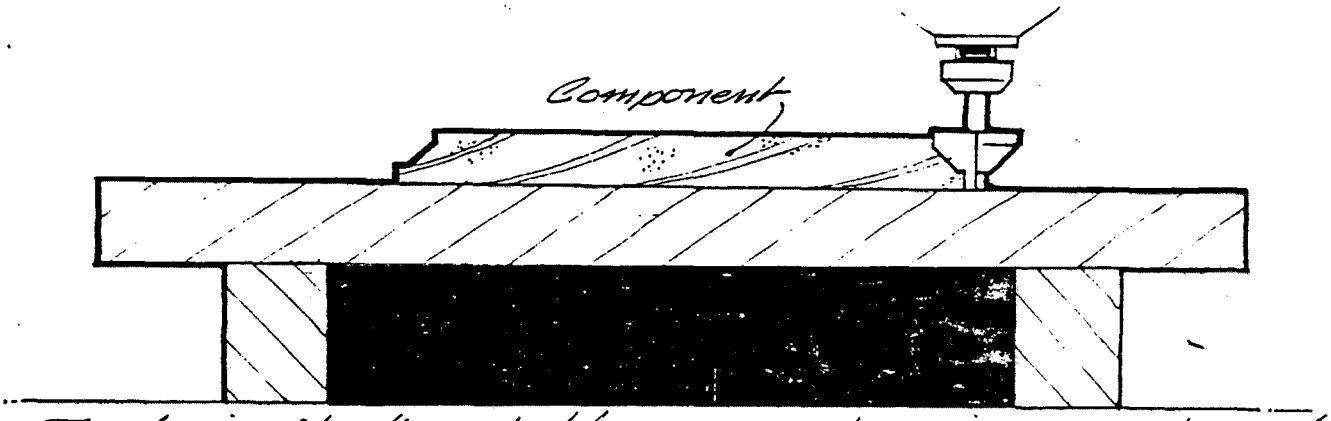


Work Piece Holding :-

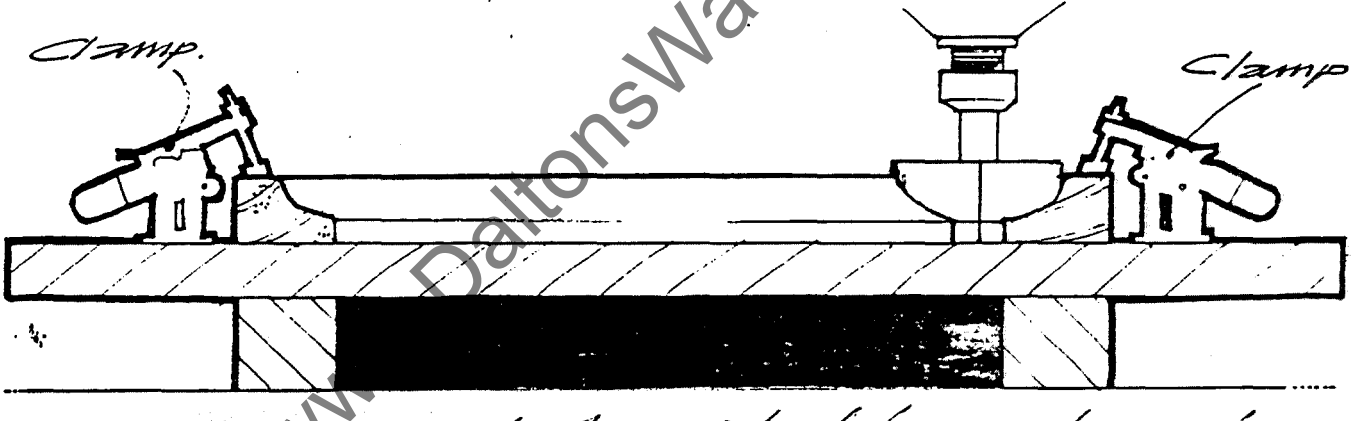
The normal method of clamping each piece on station is by mechanical (toggle) clamps. In most cases two clamps will be required to hold back component, and though supplied individually these clamps can be linked with a bar handle to facilitate the release of both clamps at once - thus saving time.



METHODS OF CLAMPING WORKPIECE



Jig design ideally suited for vacuum clamping as mechanical clamps would be on cutter path.



A component shape ideal for mechanical clamps.

For single component jigs two methods of work holding are available, i.e. VACUUM or MECHANICAL clamping.

It is the types of component which invariably dictates the type of holding which must be employed. The above drawings illustrate this point.

When placing mechanical clamps around a jig consideration should be given to loading / unloading of the component.

In certain instances the clamps may have to be raised above the top board surface with packing blocks. Here,. consideration should be given to ensure the clamps clear the routex hood and cutter chuck.

Adjustment is available on all toggle type clamps to enable the optimum clamping effort and height to be varied according to clearance available. This adjustment will provide more than adequate leeway in most cases to allow this style of clamp to be used.

Another point of note is that the clamping effort of these fasteners can be greatly enhanced by glueing pieces of abrasive paper onto the top of the top board under the component station. This method does not damage the workpiece but offers greater gripping powers to ensure complete firmness of the workpiece whilst cutting.

VACUUM CLAMPING :-

Vacuum clamping is a highly efficient and time saving method of work holding. The system applied to the UX router has been time tested and incorporates safety features outlined in the operators manual. The one main criteria which must be satisfed before contemplating this method is

HOW DENSE IS THE COMPONENT MATERIAL (i.e.) in that it is NOT HIGHLY POROUS.

Having said this, it must be understood that many materials are porous to some varying level.

However, this can be overcome by the vacuum system on the UX, as the vacuum effort can be varied to compensate by altering the vacuum pressure regulator (see manual).

In the previous sections we have covered the sequence of events in producing the actual jig template. The following procedures describe the installation of a vacuum system to a jig.

CONSTRUCTING A VACUUM FACILITY

In earlier sections of this manual it has been described how to cut a path or indicator line on the jig top board, thus showing the finished component profile. This should again be done using a straight cutter of the same diameter as the finishing cutter.

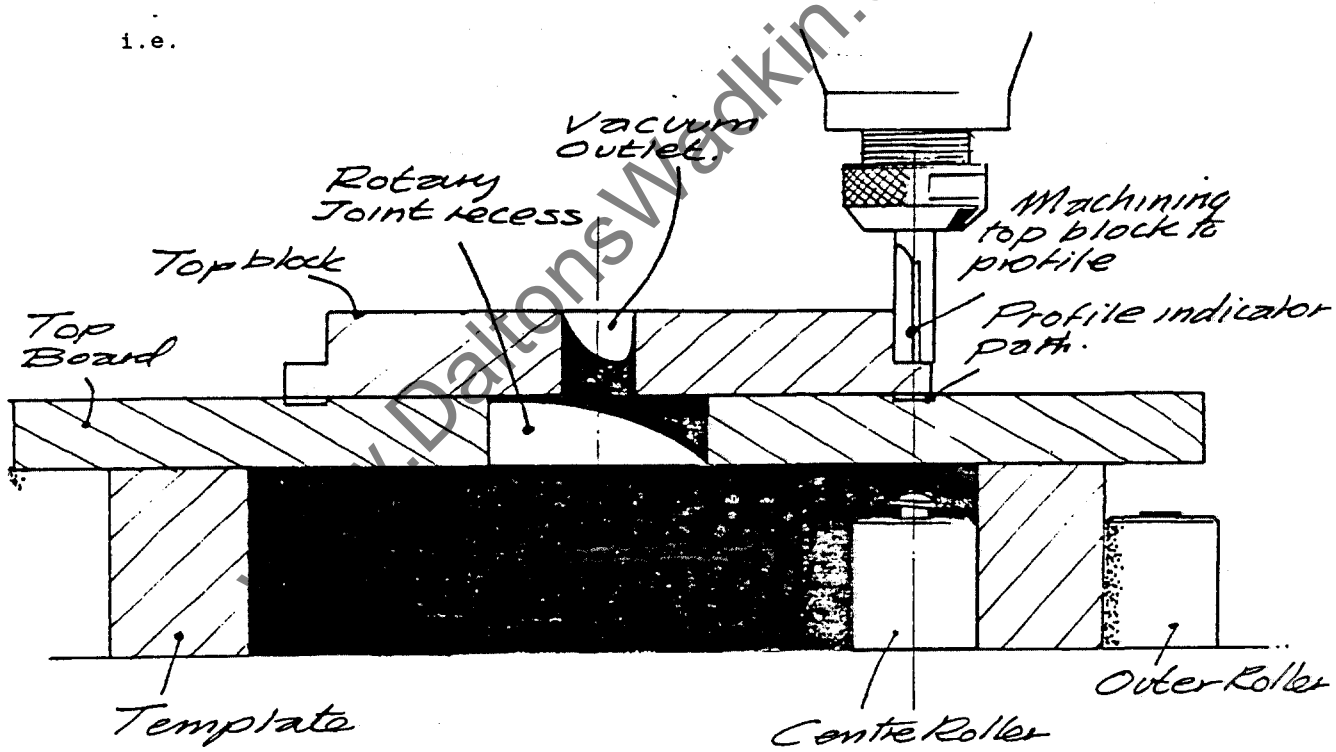
As mentioned earlier, this groove need only be about 0.5mm in depth as it is purely for location purposes.

A block of 25mm ply should be cut to size, which covers this path, and screwed down to the top board from the jig underside, ensuring that the wood screws do not break through the top of the block.

Using the aforementioned straight cutter, the whole jig should then be located between the feed rollers, and the top block machined down to the top board surface. The resultant shape of this top block will conform exactly to that of the finished component.

A hole of approximately 20mm dia. should then be bored through the jig at the central point of the component area. On the underside of the jig a clearance hole or cutout should be made into which the rotary joint can be fitted.

i.e.



Section through Jig Construction

An advisable step to take at this stage is to apply some sealing compound around the inside of the 20mm hole cut in the top block. As the vacuum effort will be directed through this hole, it is as well, at this stage, to ensure that no effort could be lost through the veneer of the ply. Any type of sealant can be used but preferably should be a hard setting type, such as PVA wood glue.

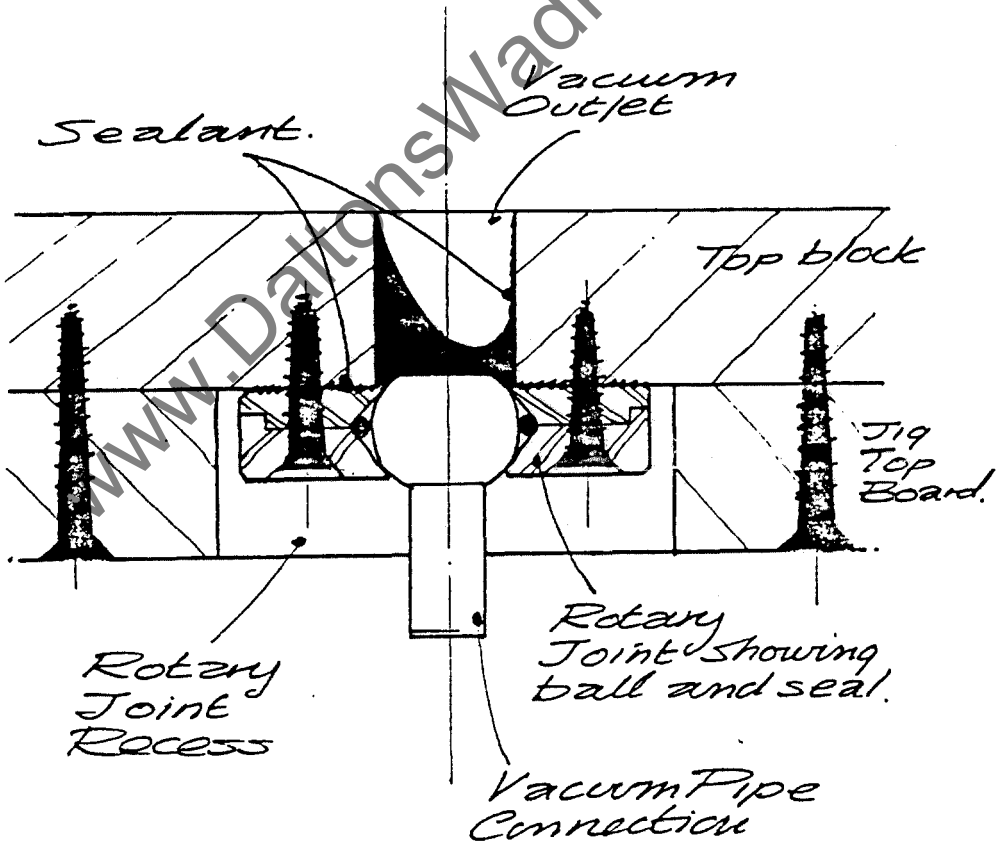
The rotary joint should now be fitted in the underside recess. Ensure the joint is central on the 20mm hole and apply a film of sealant between the jig and joint - Hermetite or rubber solution type adhesive are ideal.

The joint should be screwed to the underside of the jig, but ensure after fixing that the ball connector rotates freely.

The final operation is that of installing the vacuum seal. For this it is required to machine a groove around the top face profile of the jig top block, into which a special noepreme foam strip is inserted.

To produce this groove it will be necessary to revert to the hand pin method of machining.

As such a guide pin bush should be produced to create the slot 10mm inside the profile of the top piece. An 8mm dia. T.C.T. cutter should be used to cut the slot.

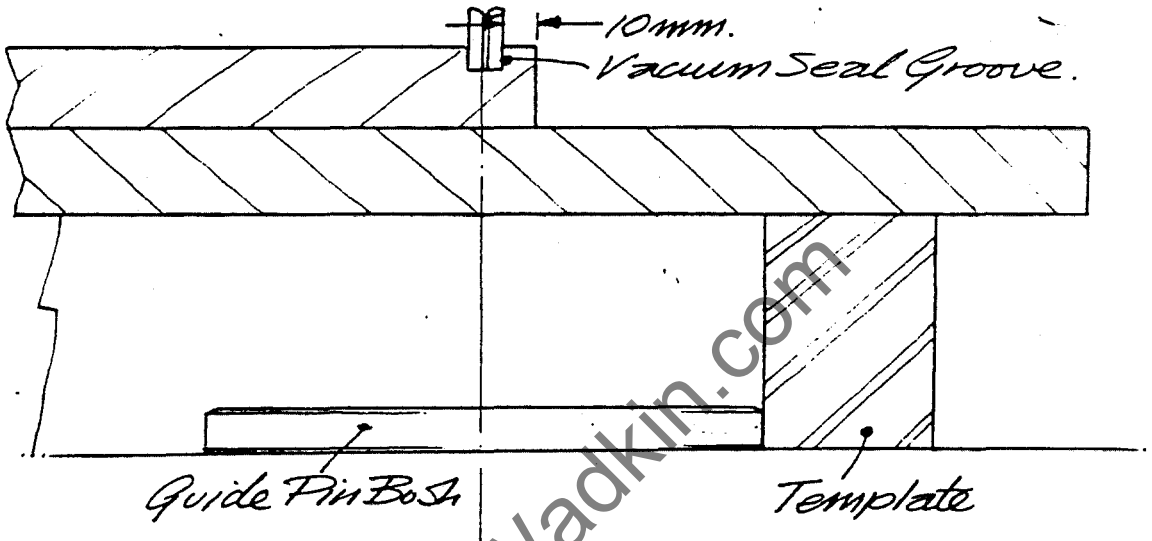


Section Through Rotary Joint Installation.

Select or produce a guide pin bush, as outlined previously, that will position the groove approximately 10mm from the edge of the top block.

Insert an 8mm cutter into the chuck and lower the head until the cutter is just above the top jig surface. Start the head and lower the head to take a light cut whilst feeding the jig round by hand carefully. Repeat this process until the slot is between 7 - 9mm deep.

When complete apply glue to inside of groove and insert rubber seal. Apply glue to end of seal strip and buff together when pressed into groove.

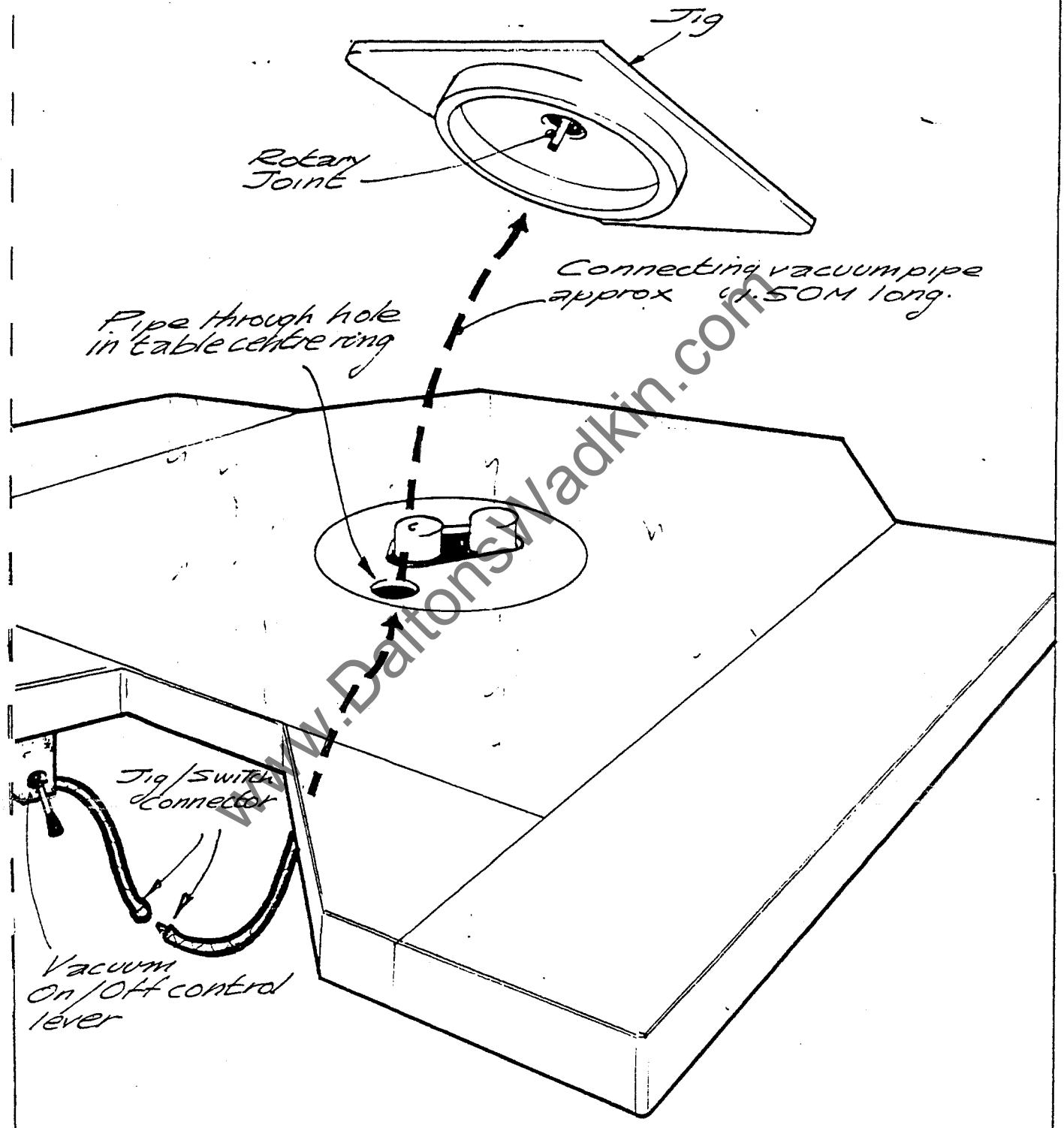


Connect vacuum pipe to jig and switch on vacuum pump. Test jig by applying a piece of non-porous material and check for leaks.

The jig is now ready for use.

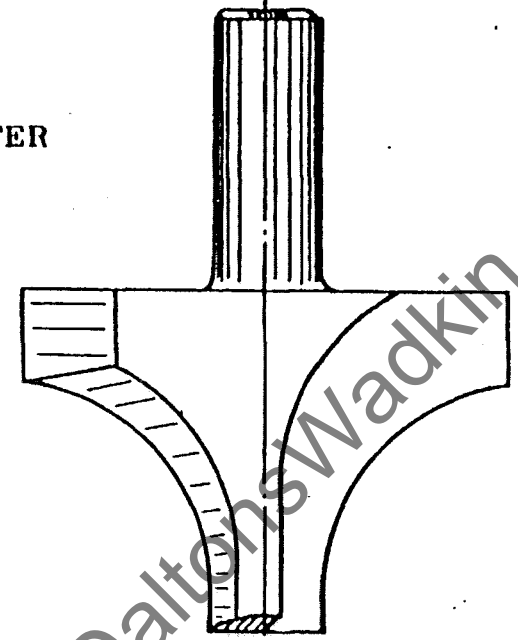
IN PRODUCTION TERMS, A WELL DESIGNED AND MADE JIG REPRESENTS A SOUND INVESTMENT, AS SUCH A COAT OF VARNISH ON ALL SURFACES EXCEPTING THE TEMPLATE WILL ENHANCE THE JIG AND PROTECT IT.

Jig installation details.



THE BASIC PRINCIPLES OF ROUTING TO PROFILED SHAPES.

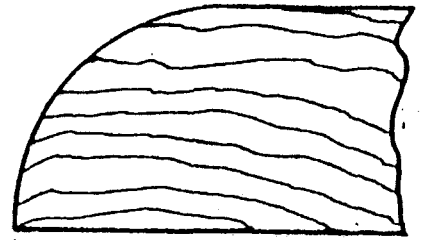
CUTTER



The smallest diameter of the router cutter and the diameter of the former pin should be the same.

FORMER PIN

The component produced will then be correct in size and profile.

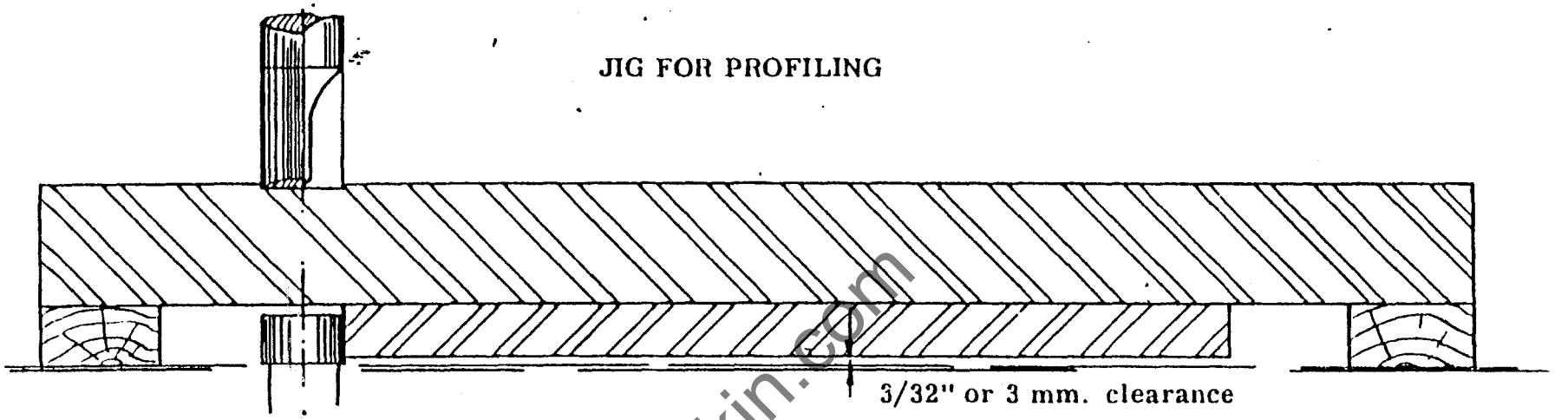


COMPONENT

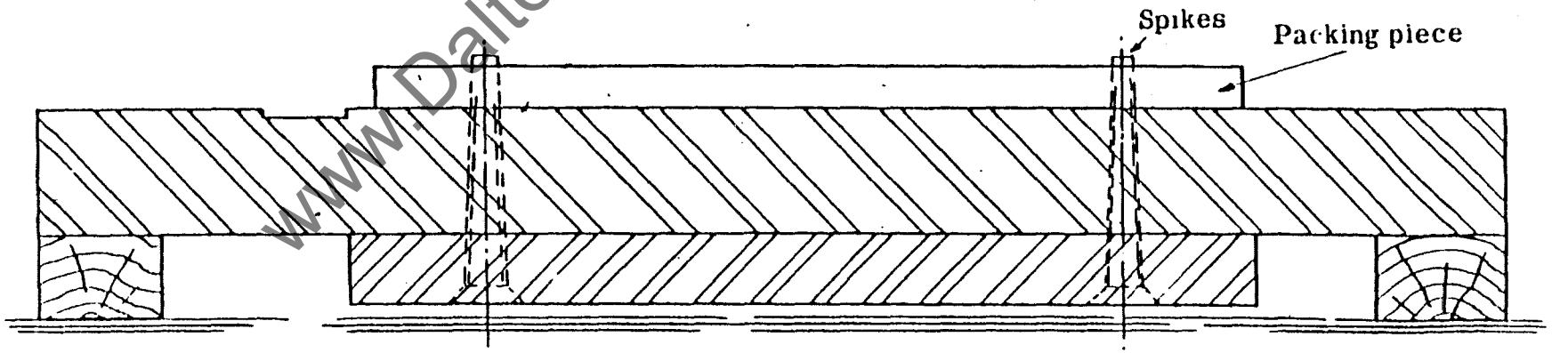
TEMPLATE

The template should be the same profile and size as the component or article to be produced.

JIG FOR PROFILING

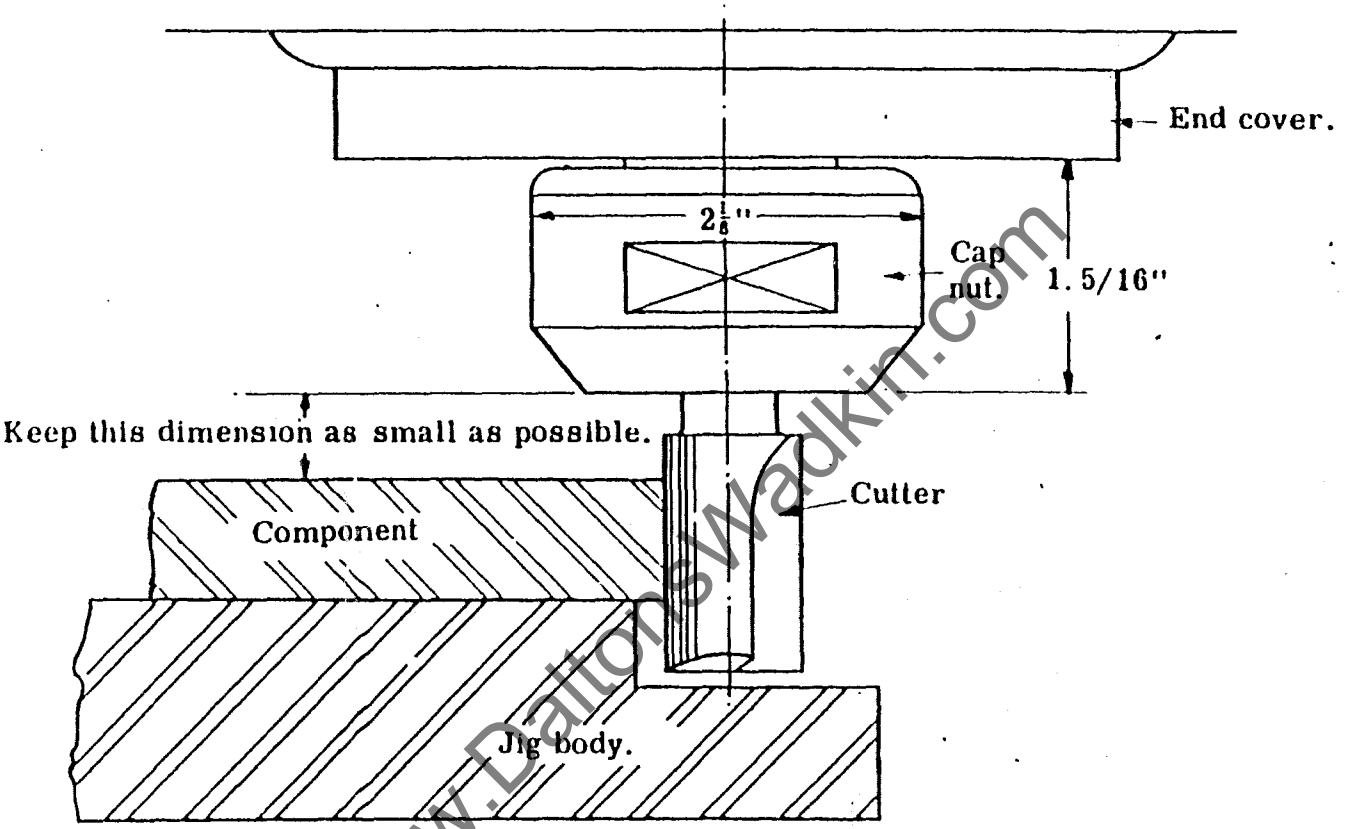


Fix hardwood rails to jig body and screw template in suitable position. It is advisable to have the jig 4" or 5" (100 mm. or 150 mm.) larger all round than the work piece. Fix rails and template, mark the surface of jig body by making a shallow cut with suitable size of cutter, tracing the shape of the template on the face of the jig. Cutter and former pin must be of same diameter.



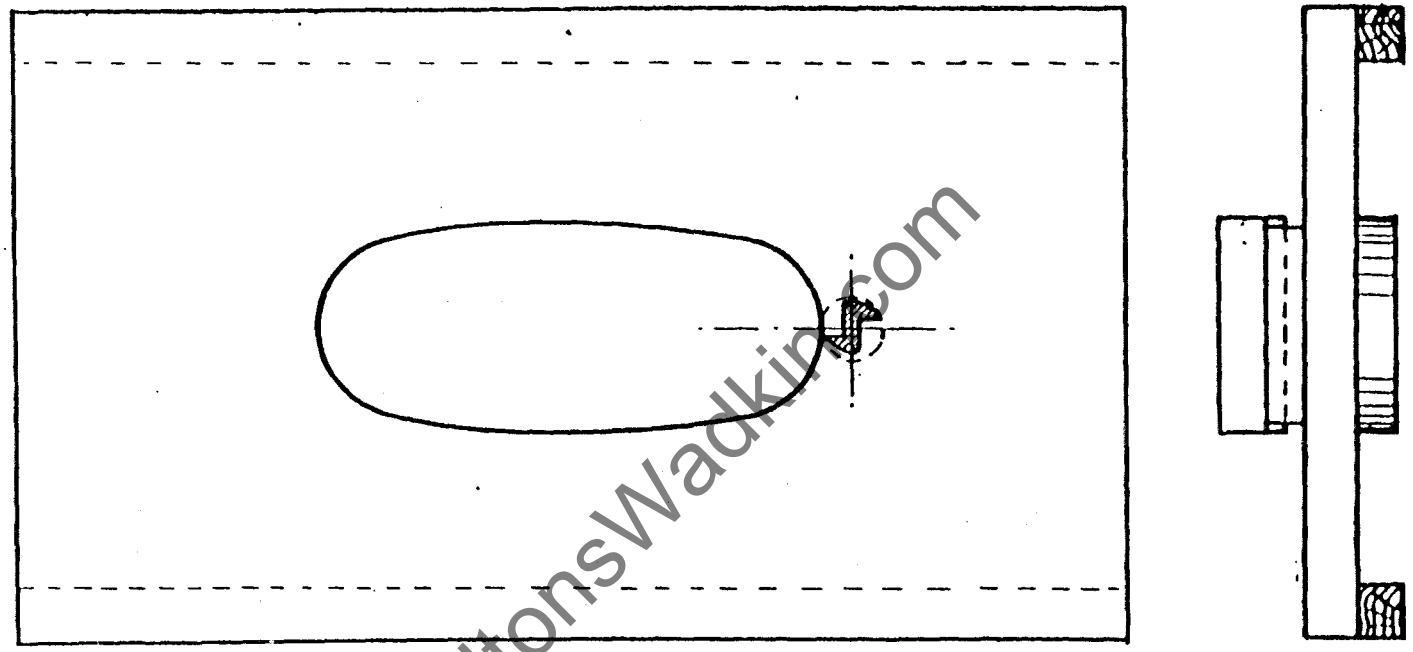
Having surface of jig correspondingly marked with the shape and position of template the packing piece can be fixed in position.

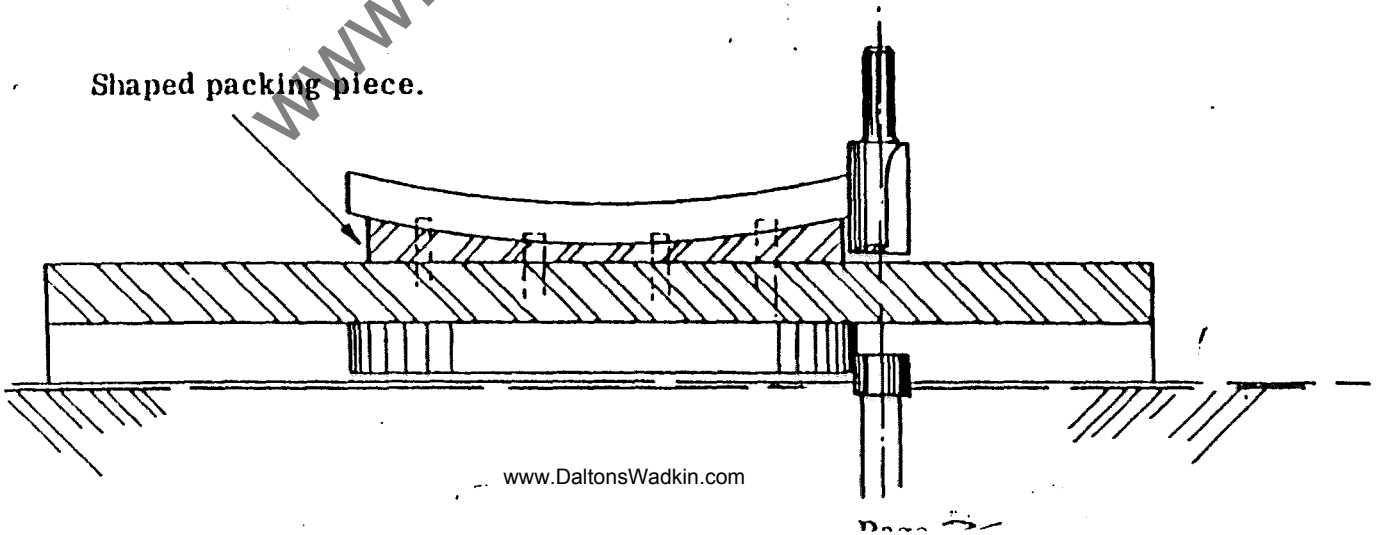
If holding spikes are required these can be fitted. Use wood screws of suitable length to project 3/32" (3 mm.) through packing piece. File screw ends to a chisel edge.

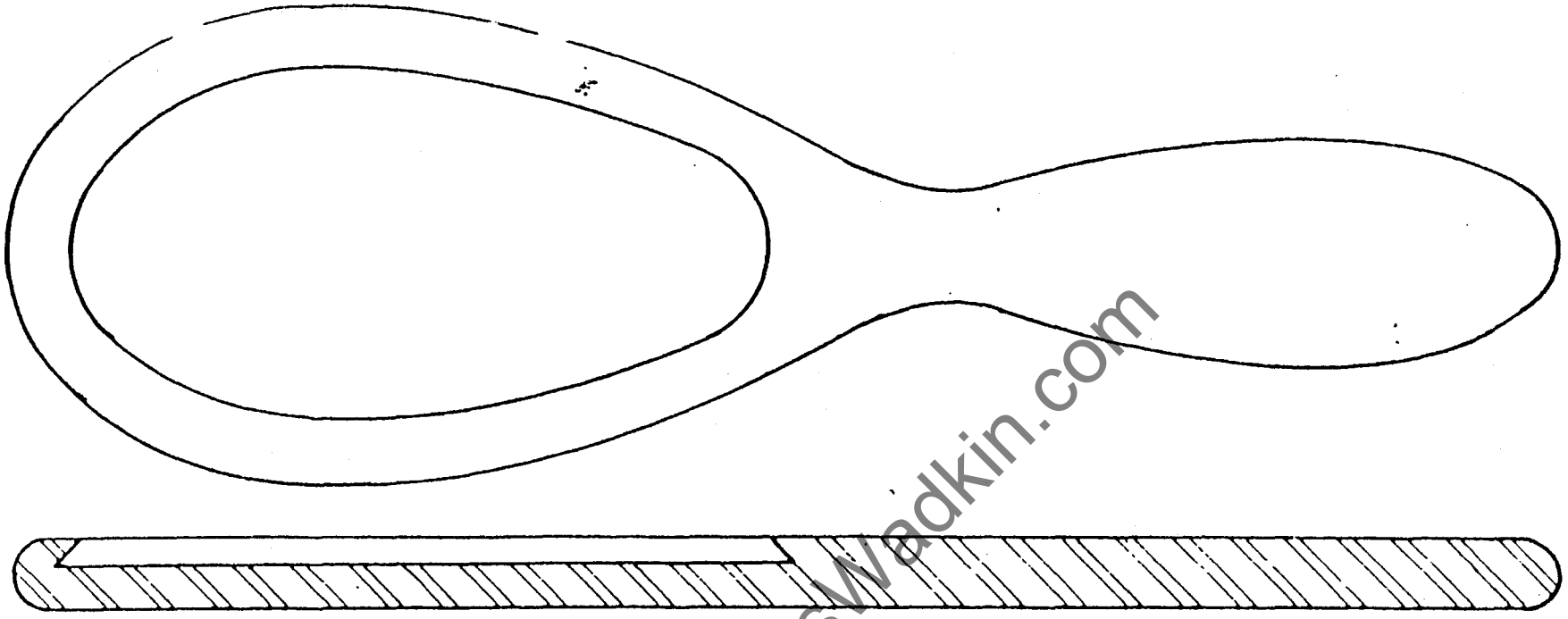


Always keep the top face of the component as near to the collet cap nut as possible.
Any top cramping device must be low enough to clear the end cover of router head.

Jig for routing to shape curved components such as brush backs, etc.



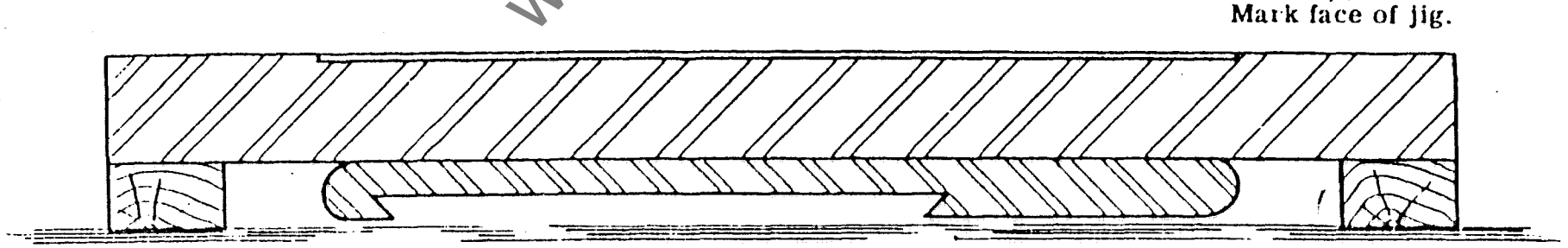




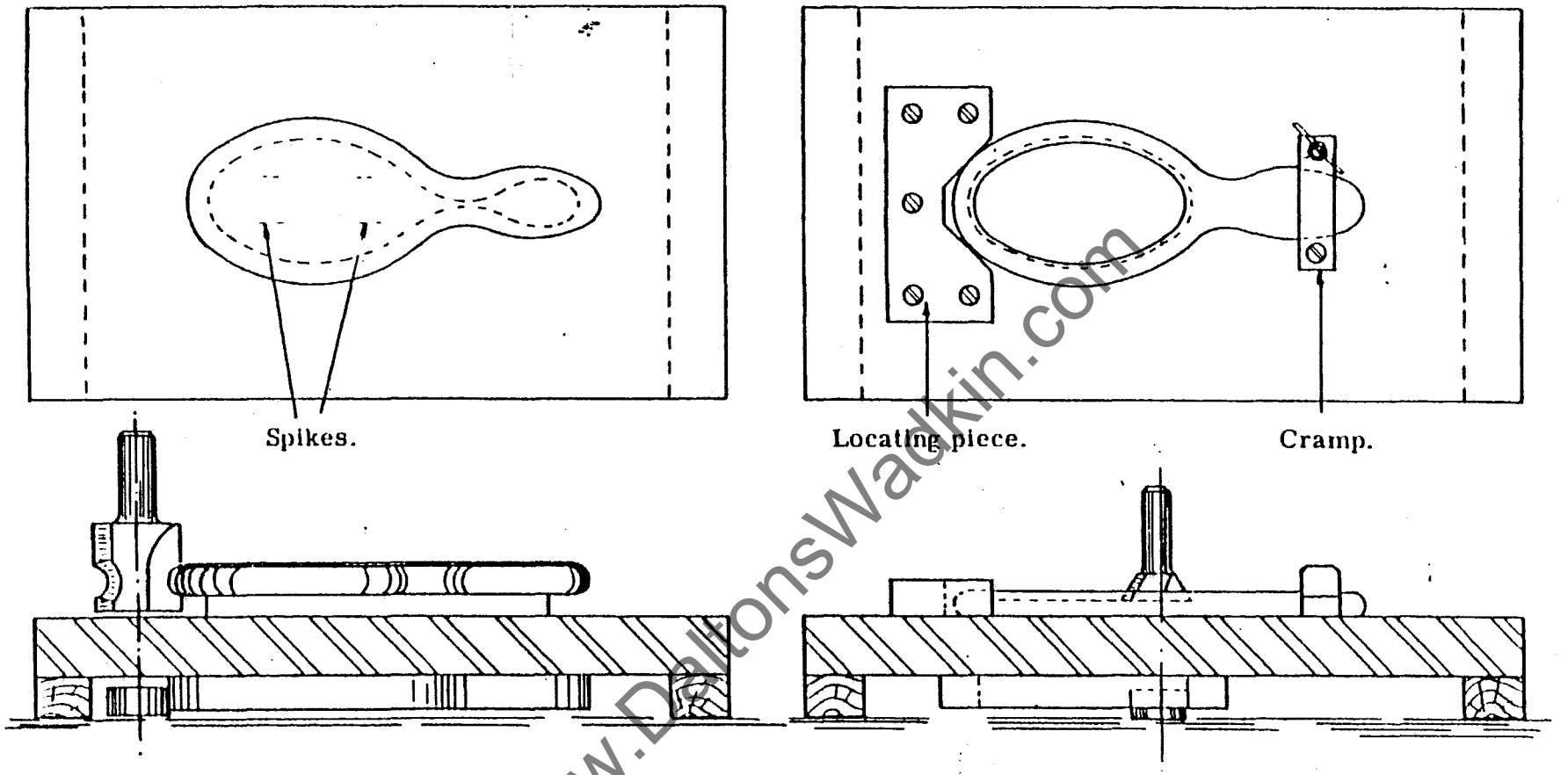
METHOD OF MAKING ROUTER JIGS FOR PRODUCING RECESSED BRUSH BACKS.

Prepare two jig bodies fitted with temporary hardwood rails and under each in turn pin (tack) the master sample brush back.

Mark the face of the jig with both outside profile of brush and shape of recess.

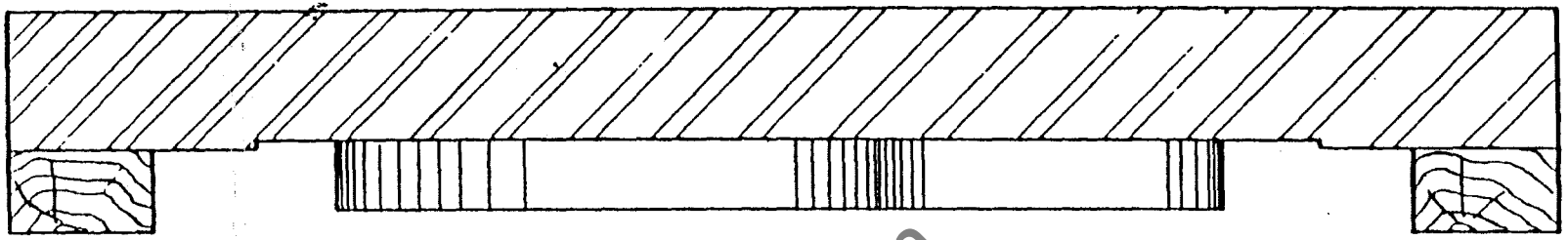


Template material can be mounted on face of jig and cut to shape during this stage of jig making.



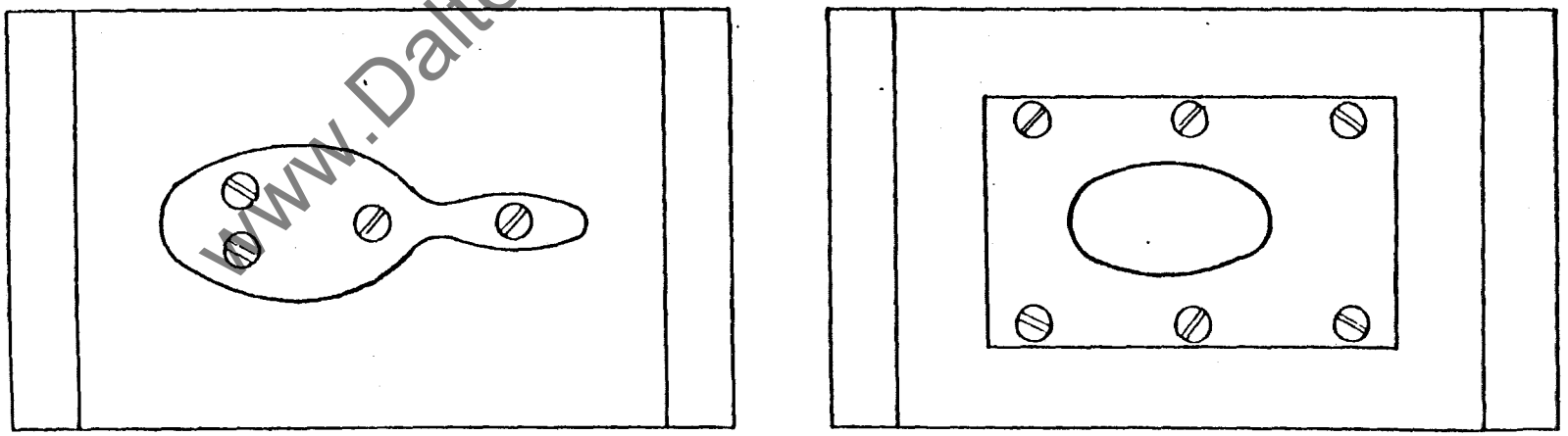
With templates firmly fixed the face of the jigs can be marked to show the position of templates. Fix screw for the holding spikes on the profiling jig as described on page 15 and locating piece and cramp on the recessing jig.

FITTING TEMPLATES TO JIG BODIES.



Remove temporary rails from jig body, turn jig over and fit hardwood rails on the opposite side, that is the marked face.

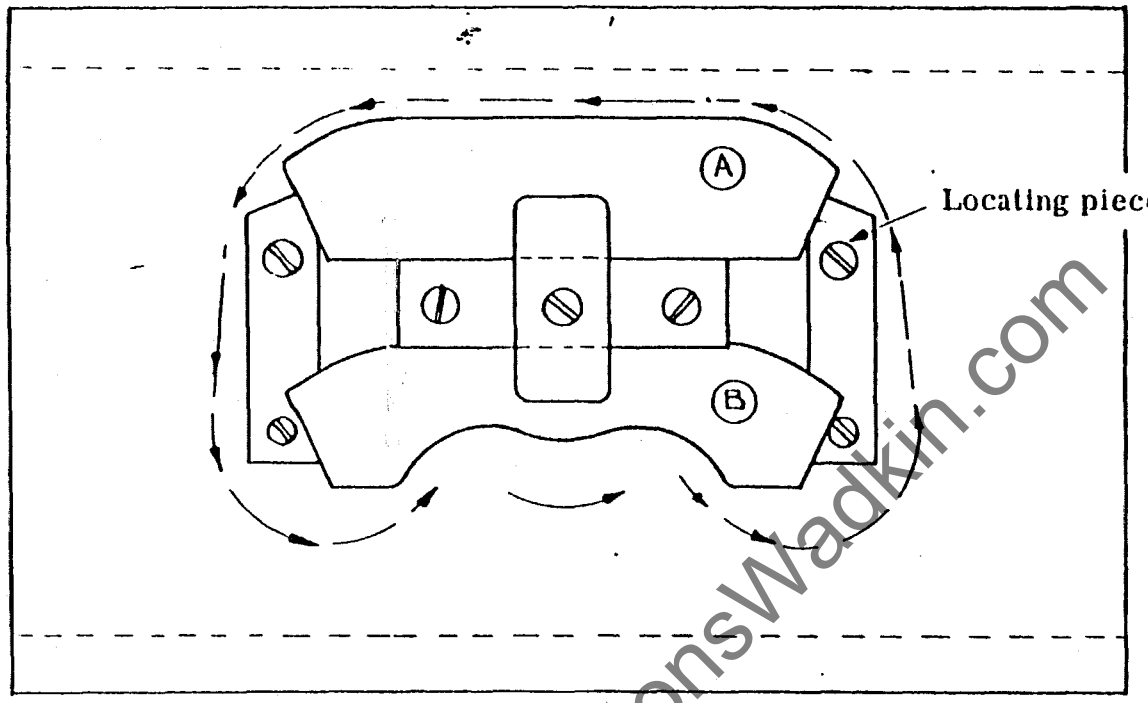
Fit template firmly, locating it from the previously made markings.

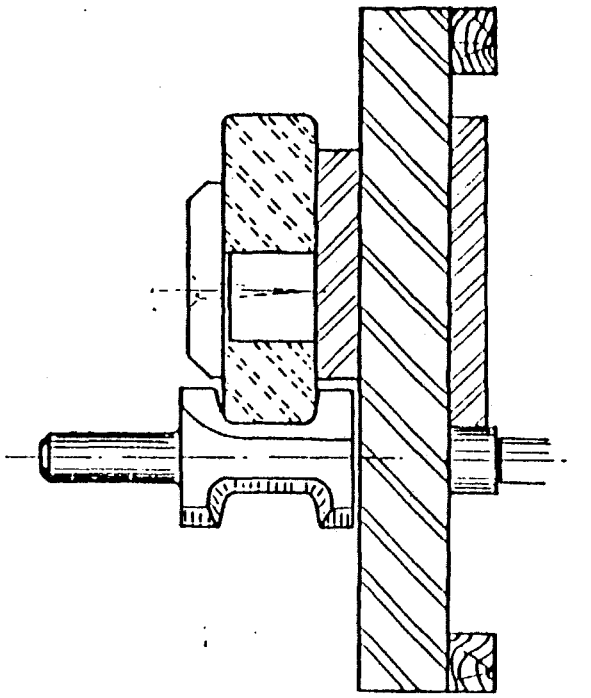


VIEW OF TEMPLATES FITTED TO JIG BODIES.

Jig for profiling and shaping 1st operation.

Jig for cutting out recess, 2nd operation.





Many articles to be shaped on the router require machining all round, such as bag handles, coat hangers, some types of brush handles, etc. For this class of work it is advantageous to make a jig carrying two components.

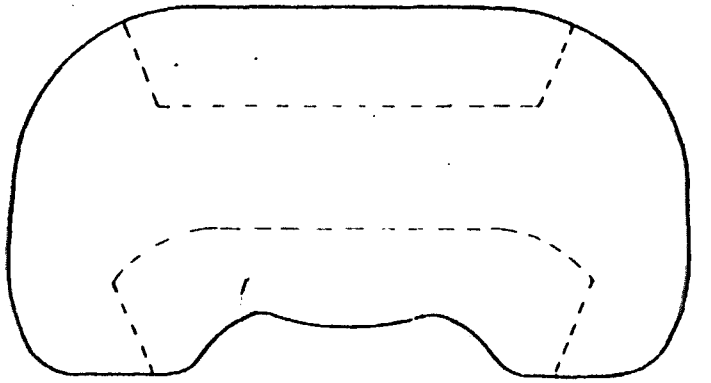
METHOD OF OPERATING JIG:-

1. Put prepared blank in position A and rout outer edge.

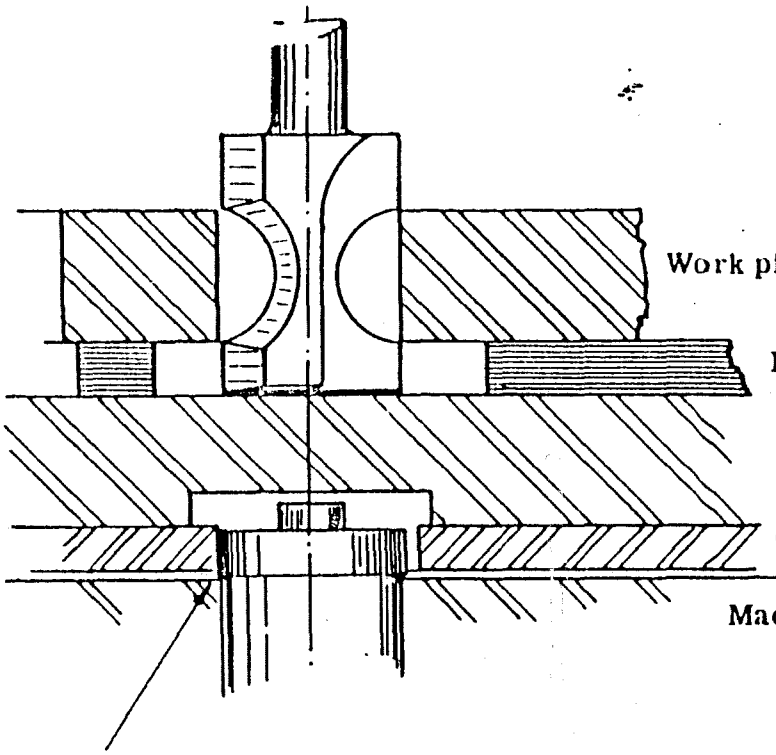
2 Move shaped blank into position B locating off previously cut edge

3 Place a new blank in position A. With the jig now fully loaded a finished handle will be produced at each complete circuit of jig

Actual shape of template.



ROUTING OUT HANDHOLES IN CASE END, SAW HANDLES, ETC.

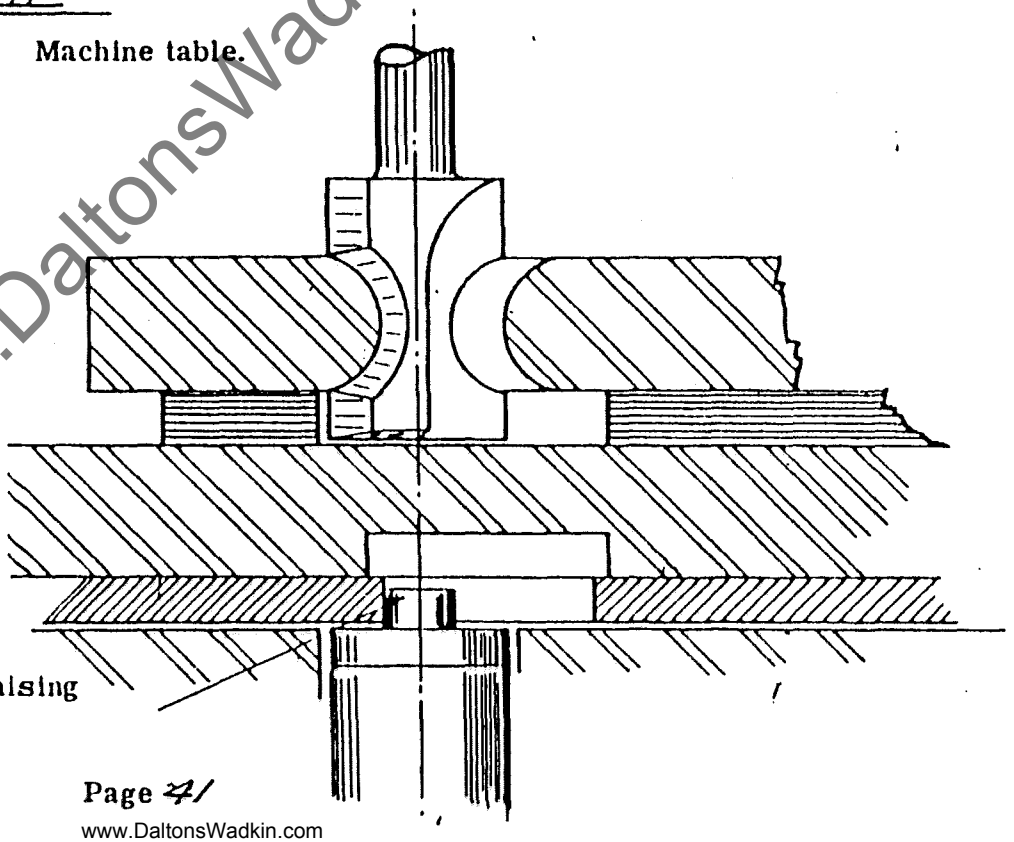


When sinking cutter through timber the large diameter of former pin engages template, thus cutter is guided through timber without gashing sides of handhole.

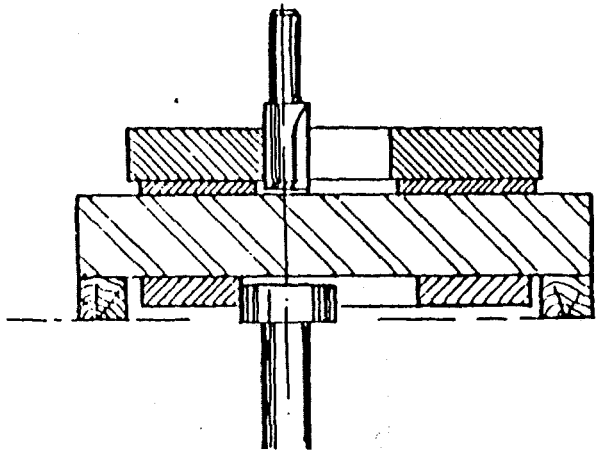
When cutter has been worked through timber and reached position required, lower the former pin so that the small diameter engages the template. One pass around the template will then complete the handhole.

To avoid gashing the sides of handhole, when raising the cutter, after finishing the cut, return the large diameter of the former pin into position in the template.

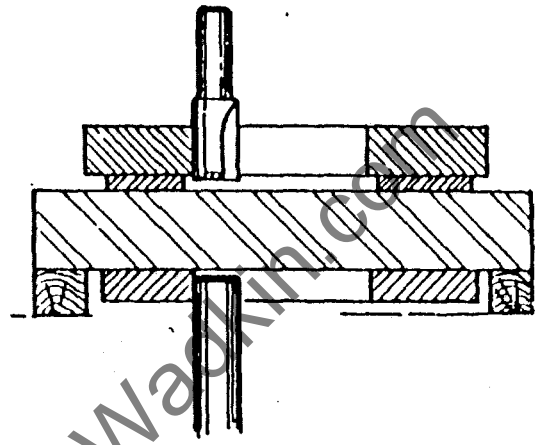
ALWAYS KEEP JIG MOVING WHILST WORKING CUTTER THROUGH TIMBER.



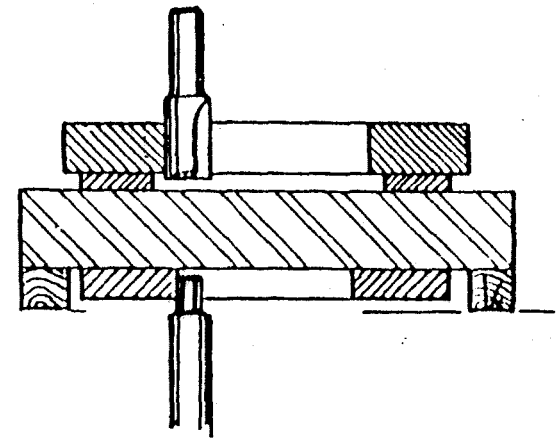
THE DIMENSIONS OF ANY WORK PIECE CAN BE ENLARGED OR DECREASED ON THE SAME JIG BY USING GUIDE PINS OF LARGER OR SMALLER DIAMETER THAN THE CUTTER.



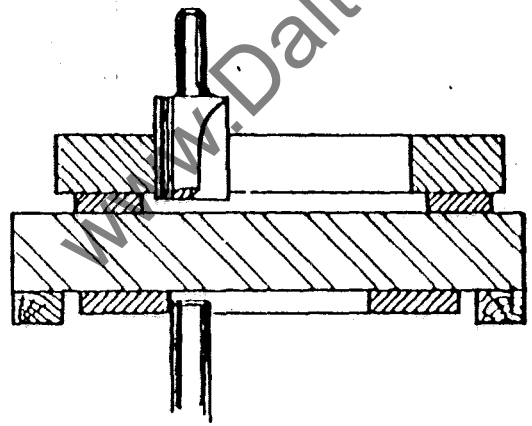
1. Pin larger than Cutter.

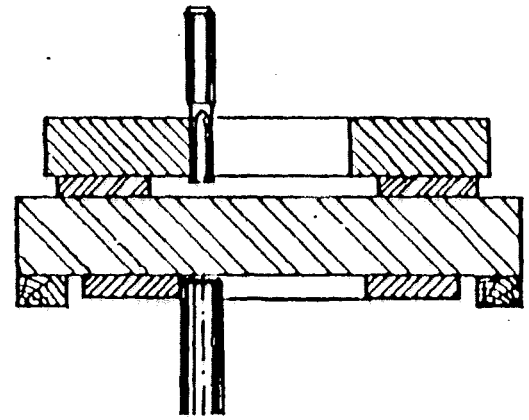


2. Pin and Cutter same size.

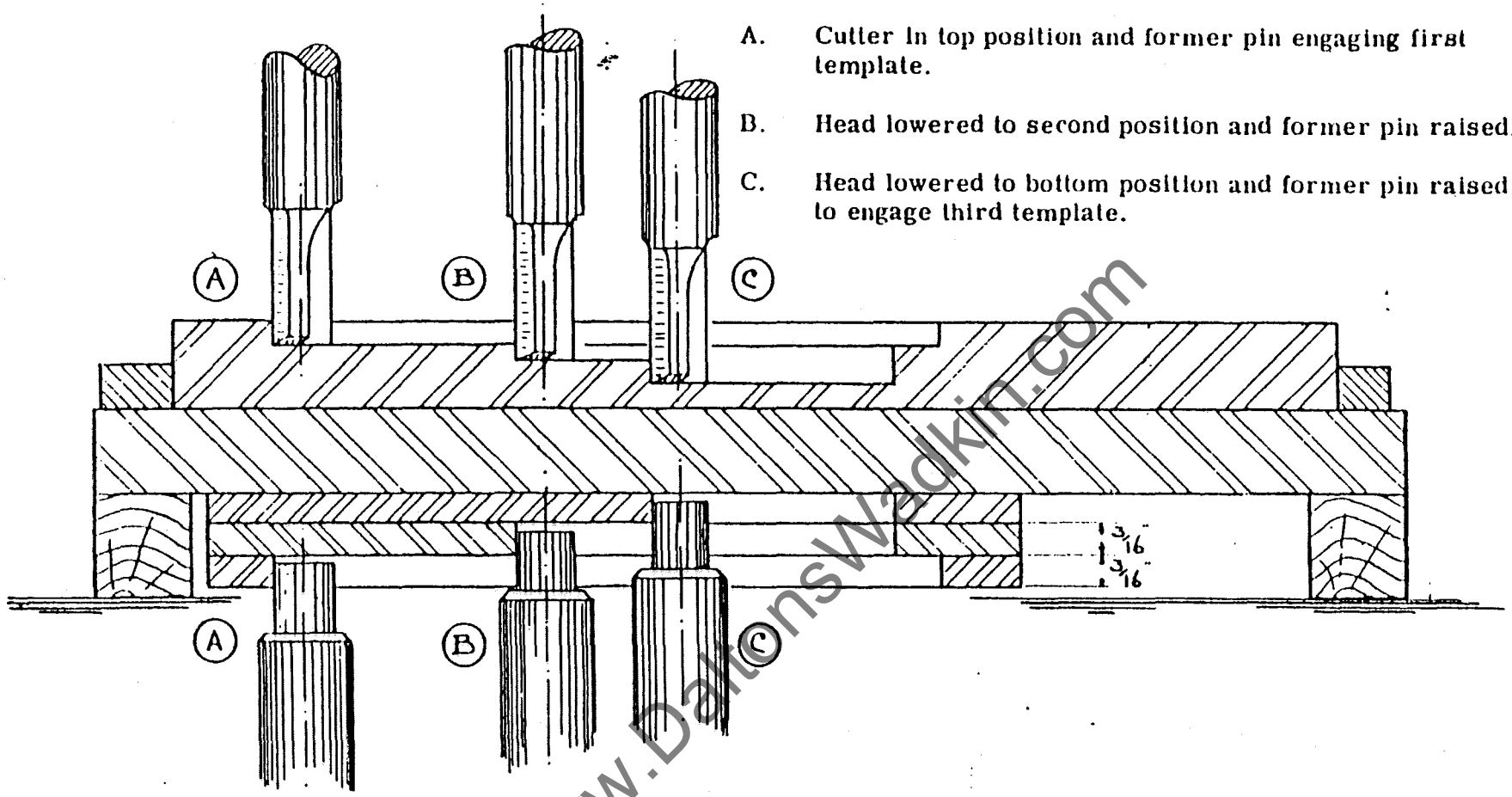


3. Pin smaller than Cutter.





THE SAME RESULT CAN BE OBTAINED BY USING CUTTERS OF VARYING DIAMETER

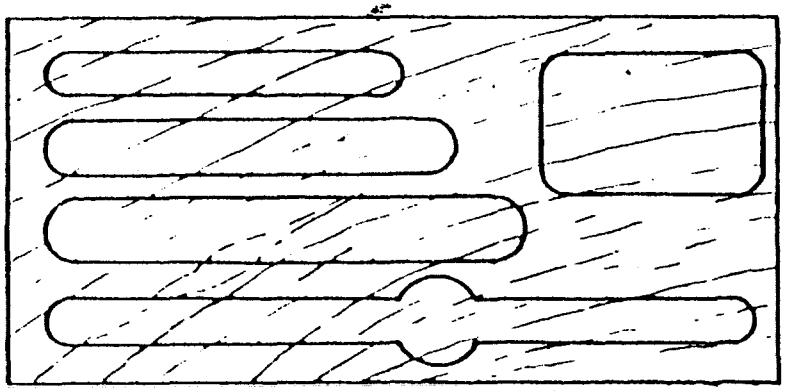


A. Cutter In top position and former pin engaging first template.

B. Head lowered to second position and former pin raised.

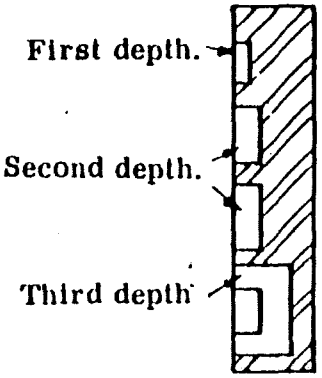
C. Head lowered to bottom position and former pin raised to engage third template.

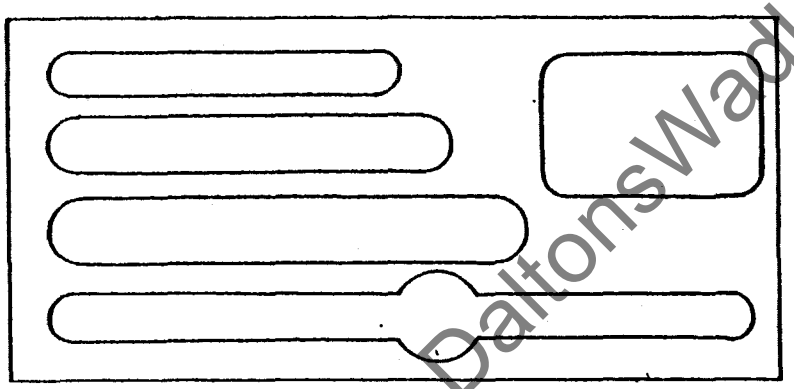
Recesses of various depths such as those In Cutlery trays, Tap and Die cases, types of Brush backs, etc., can be worked by making a jig with multiple templates. Each template corresponding to the recesses of one depth. Mount the templates in one pack on the jig body and raising the former pin by the hand lever on the front of the machine table - each template can be engaged In succession. The various depths of cut are pre-set by the variable stops on the router head.



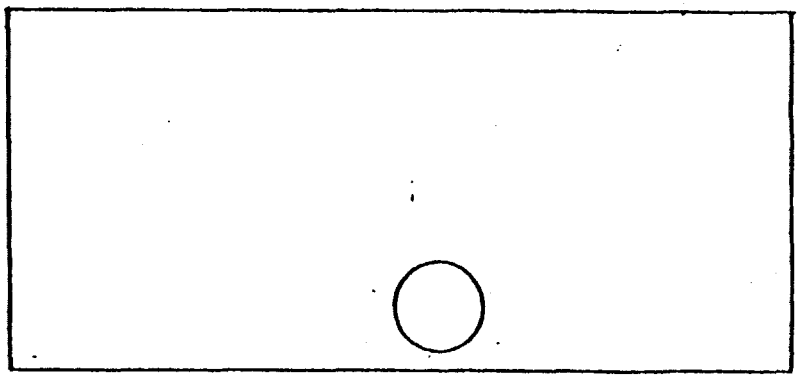
Finished article.

Section across tray.

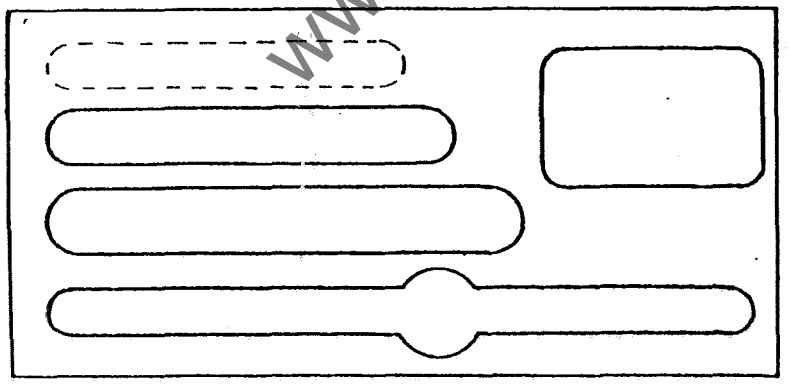




First template "A"

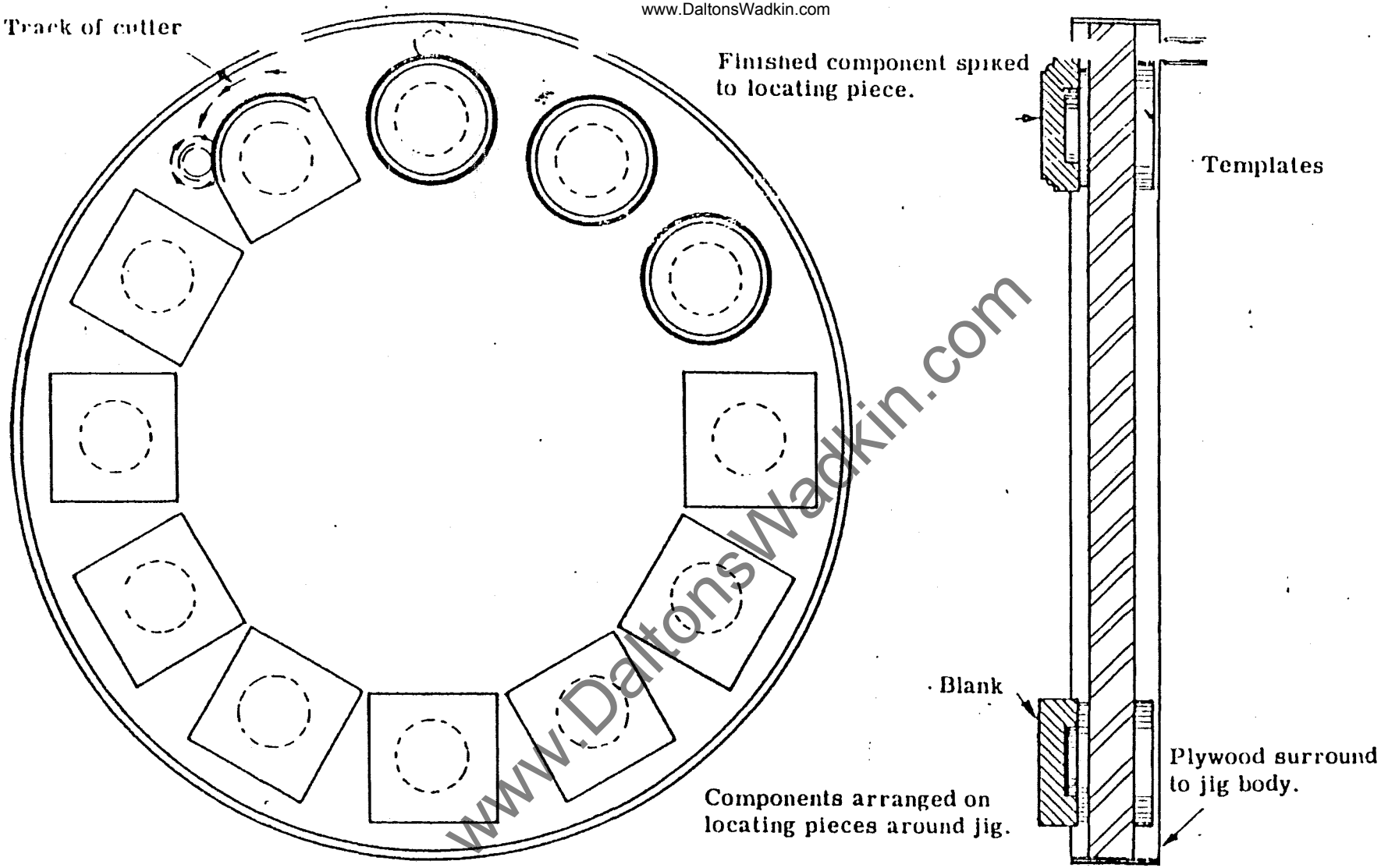


Third template 'C'



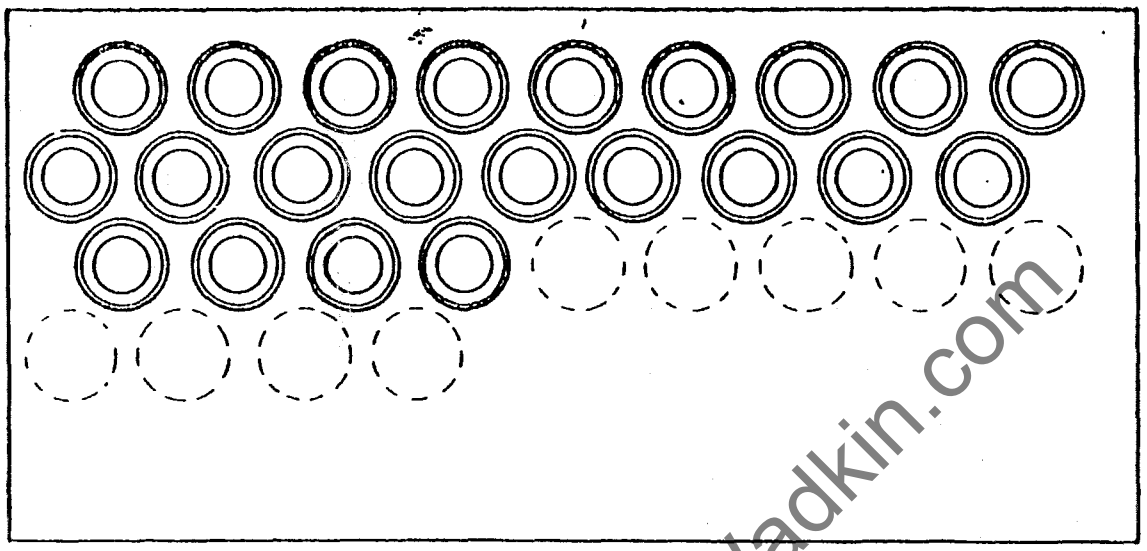
Second template "B"

Details of templates for working recesses of various depths.

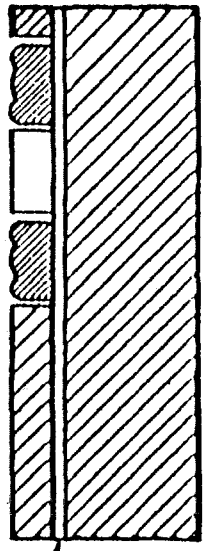


When large quantities of any small articles such as electric light ceiling rosettes, etc., are to be made, it is often advantageous to build a circular jig carrying a number of components. By using this type of jig the operator's position in relation to the machine is constant and excessive movements of the hands avoided.

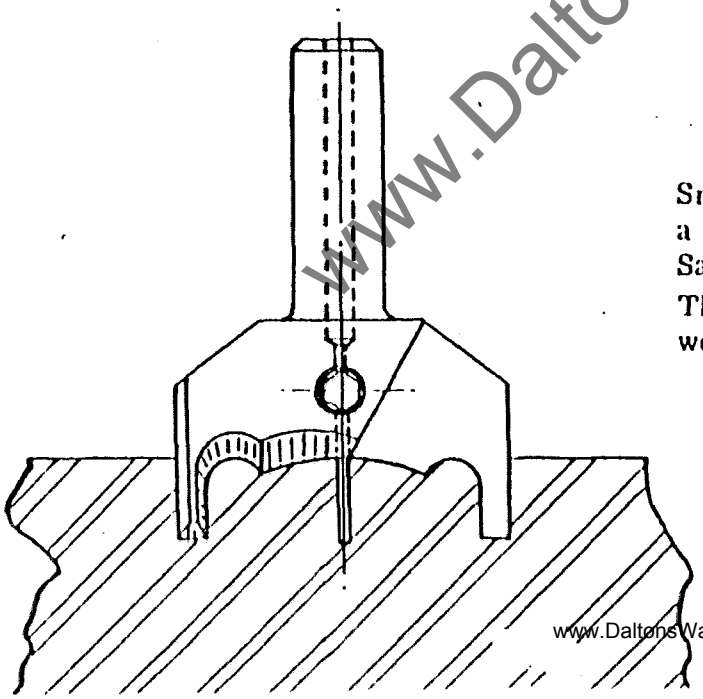
To maintain constant production, duplicate jigs can be used, one being reloaded whilst operator routs with second jig. This eliminates idle machine time.



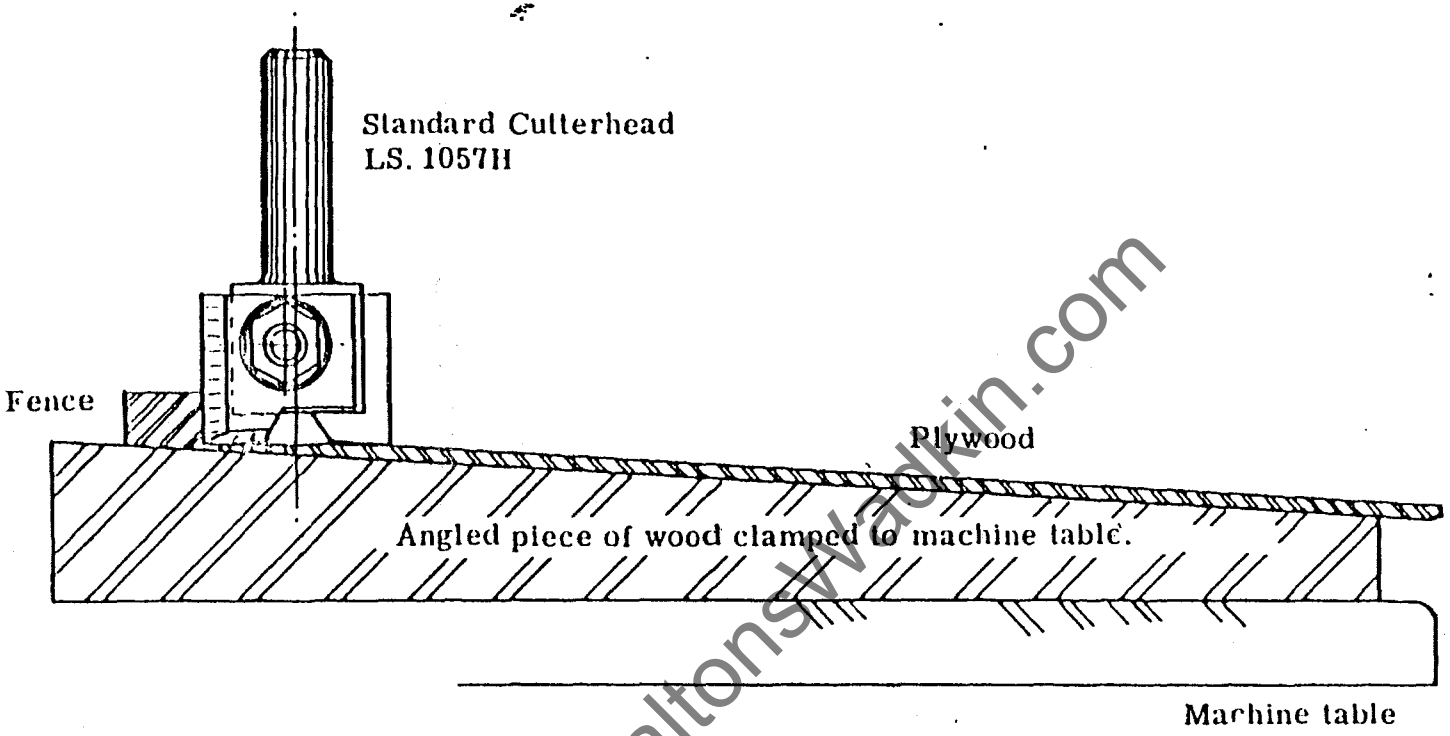
Routed face of wood.



Saw-cut.

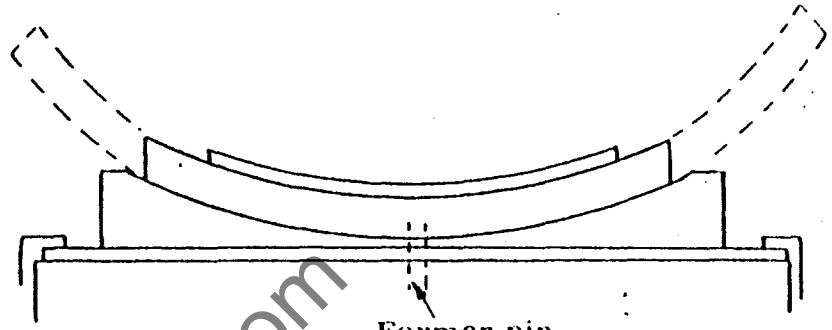


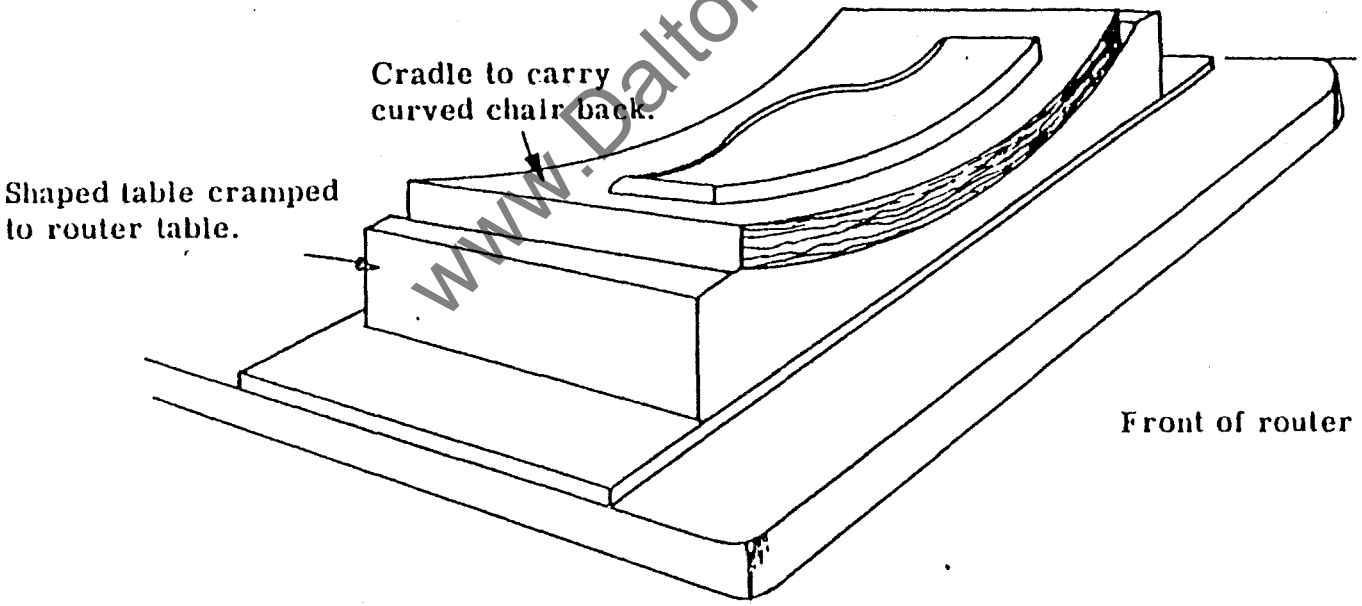
Small circular objects and wheels for toys can be made by sinking a special shaped cutter into the surface of any suitable wood.
Saw off the routed face then the wheels will fall loose.
The routing operation can then be repeated on the stock piece of wood if of suitable thickness.

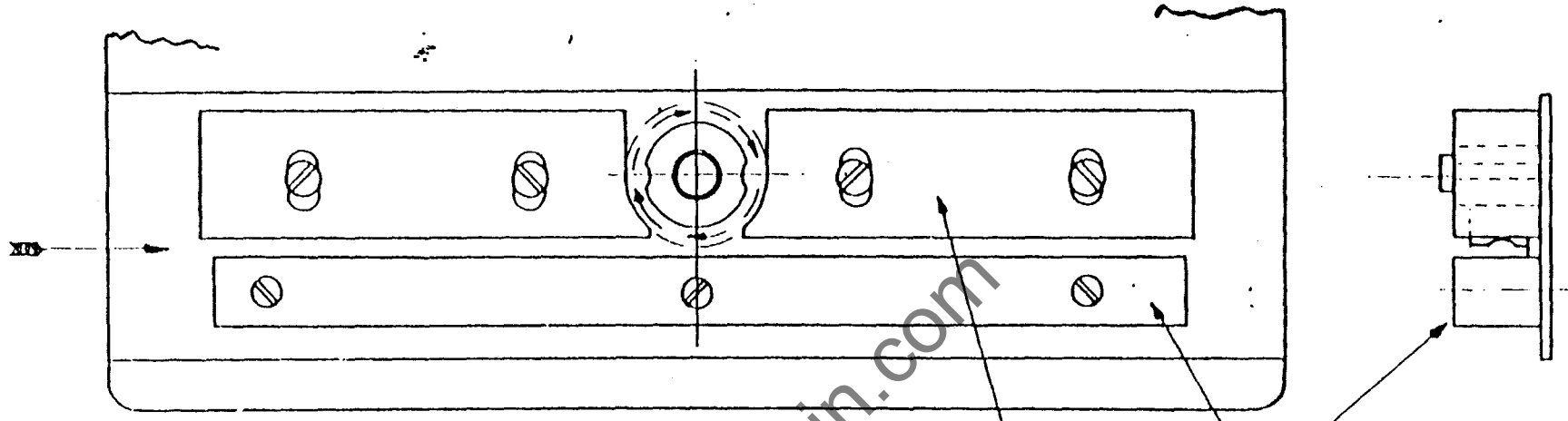


METHOD OF SCARFING PLYWOOD, ETC., ON A WADKIN ROUTER.

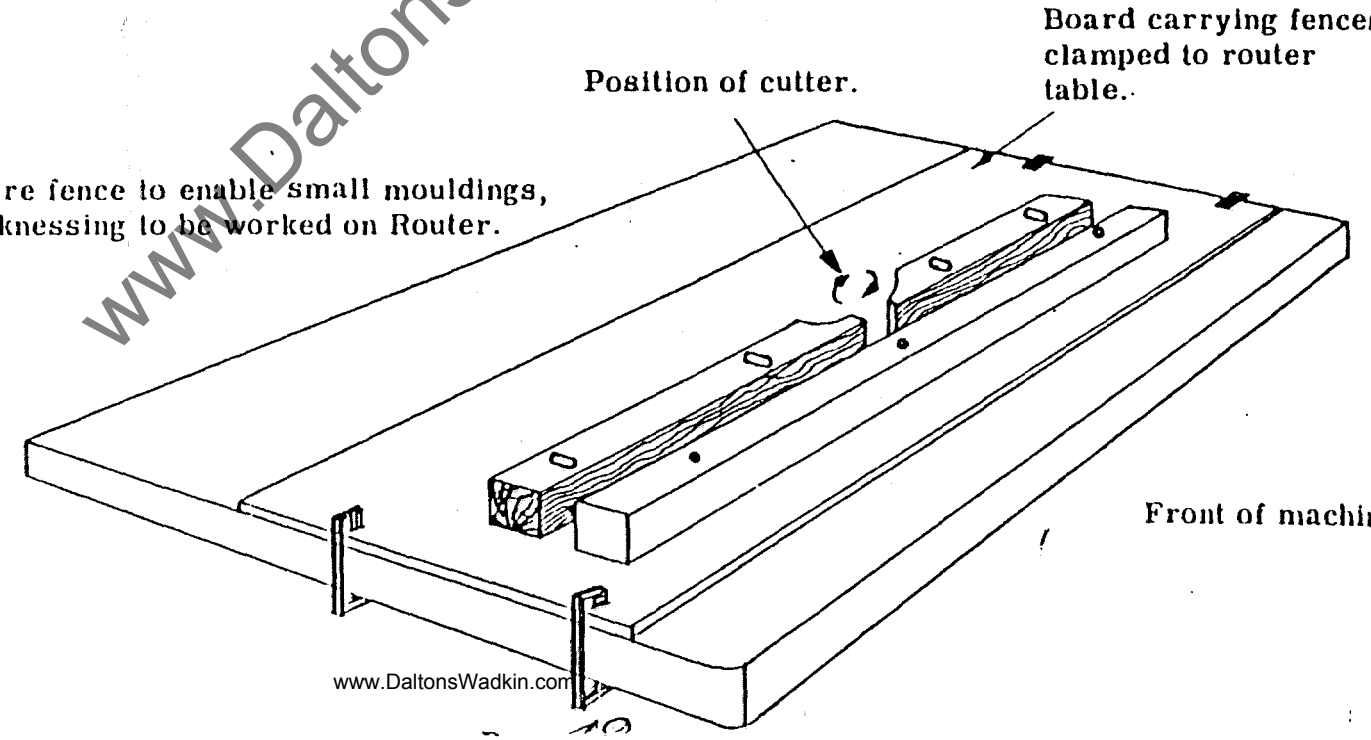
Type of jig required for shaping and moulding curved chair backs, etc.

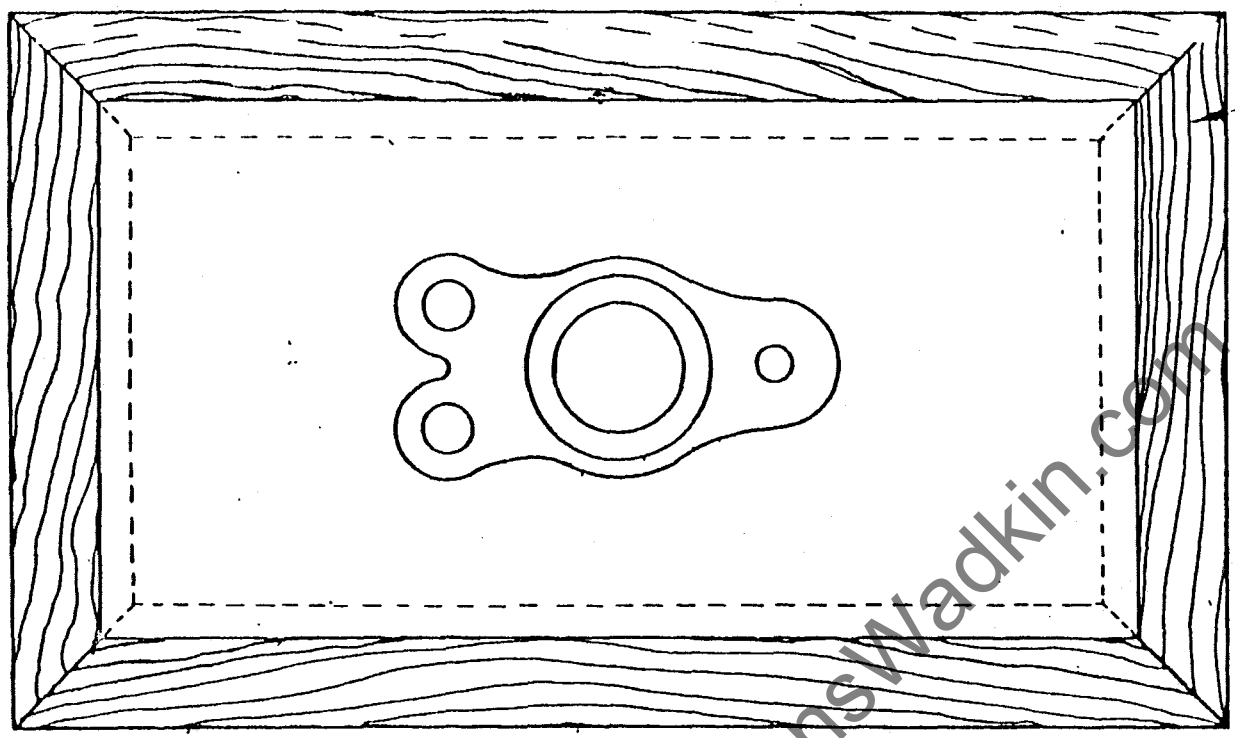




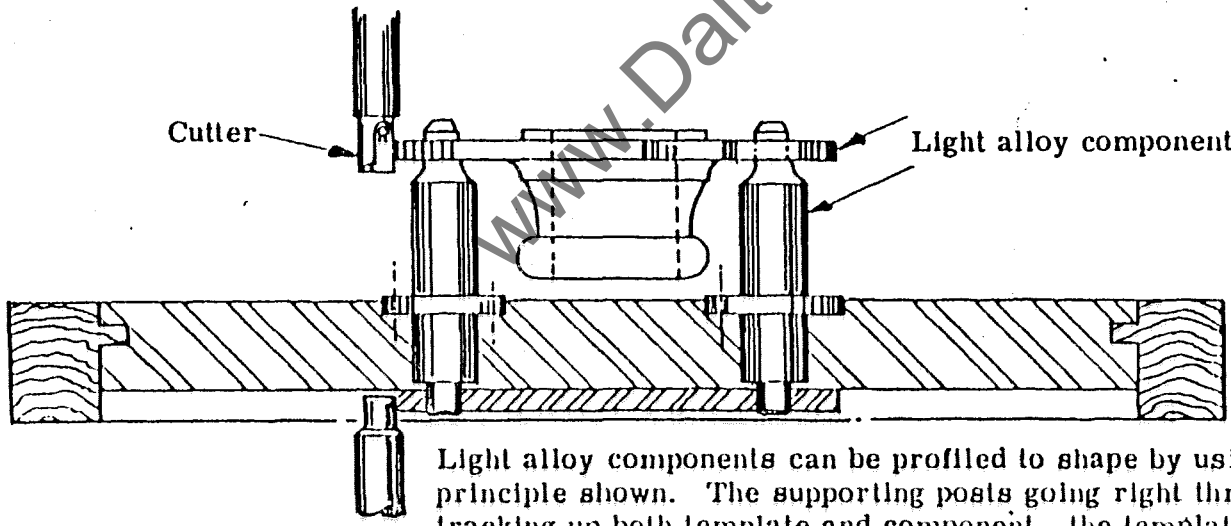


Simple type of pressure fence to enable small mouldings, beads, etc., and thicknessing to be worked on Router.





Hardwood frame around composition or aluminium jig body.



Light alloy components can be profiled to shape by using a jig made on principle shown. The supporting posts going right through jig body, tracking up both template and component, the template having exactly the same profile and tooling holes as component.

ECCENTRIC CHUCKS

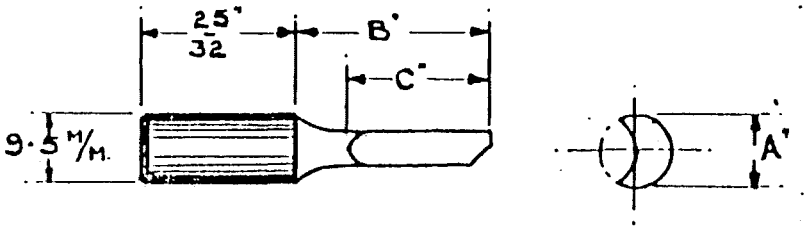
For slotting, small mortices, grooving, etc., where constant cutting diameter is important, the use of an eccentric chuck is advised.

The cutters are only sharpened inside the flute. Providing the cutting edge is always set in position, between the 30° and 50° marks as shown in diagram, the effective cutting diameter will never decrease.

It is important that the right combinations of cutter and chuck as set out on the chart are maintained. If not, cutter burning and poor work will result. Eccentric chucks must be balanced carefully.

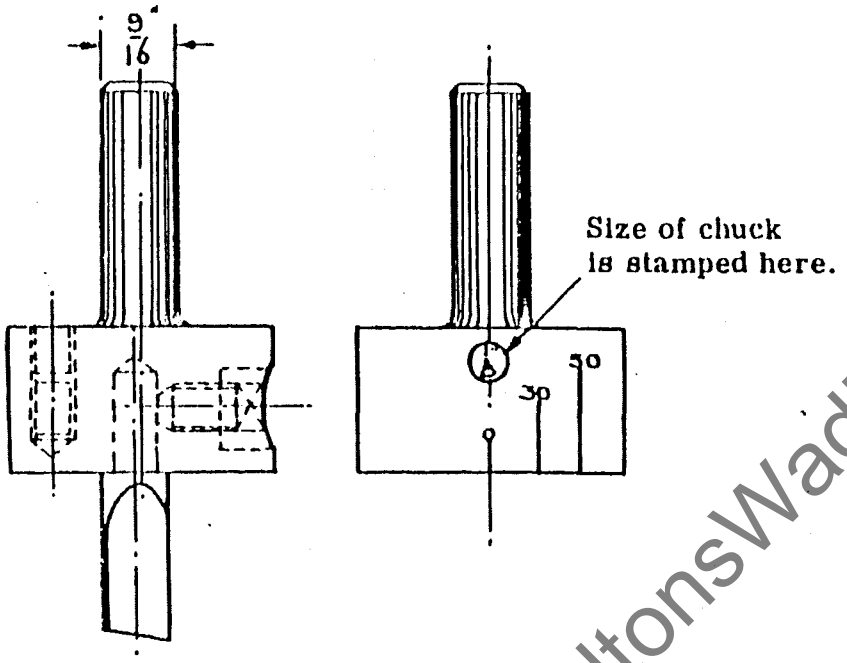
SIZE OF CHUCK	DIAMETER OF CUTTER				EFFECTIVE CUTTING DIAMETERS			
1/32	1/8		5/32	3/16	5/32	3/16	7/32	
3/64	1/8	5/32	3/16	7/32	11/64	13/64	15/64	17/64
1/16	3/16	7/32	1/4	5/16	1/4	9/32	5/16	3/8
3/32	1/4		5/16	3/8	11/32		13/32	15/32
1/8	5/16	3/8	13/32	7/16	7/16	1/2	17/32	9/16
5/32	3/8	13/32	7/16	15/16	17/32	9/16	19/32	5/8

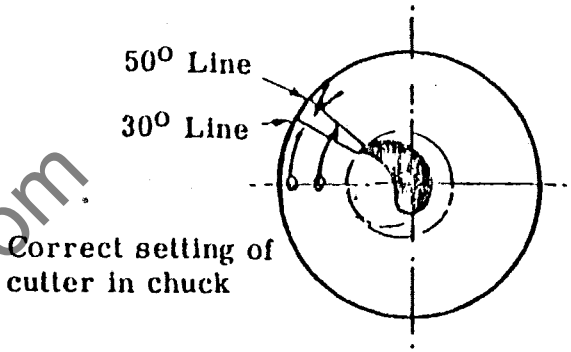
DIMENSIONS OF CUTTERS FOR ECCENTRIC CHUCKS.

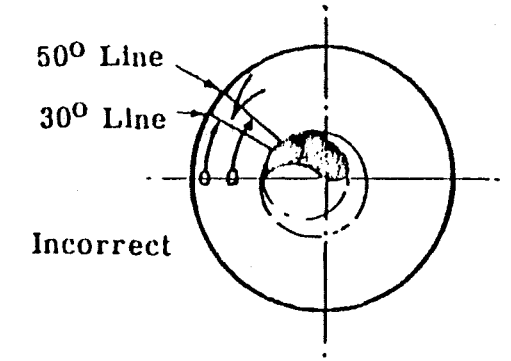


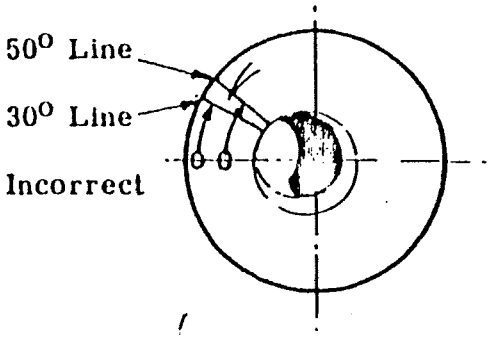
A	1/8"	5/32"	3/16"	7/32"	1/4"	5/16"	3/8"	13/32"	7/16"	15/32"	1/2"
B	31/32"	31/32"	31/32"	31/32"	1. 3/16"	1 3/8"	1 3/4"	1 3/4"	1 3/4"	1 3/4"	1 3/4"
C	9/16"	9/16"	5/8"	5/8"	3/4"	7/8"	1 1/8"	1 1/8"	1. 3/16"	1. 3/16"	1 1/4"

Eccentric chuck.









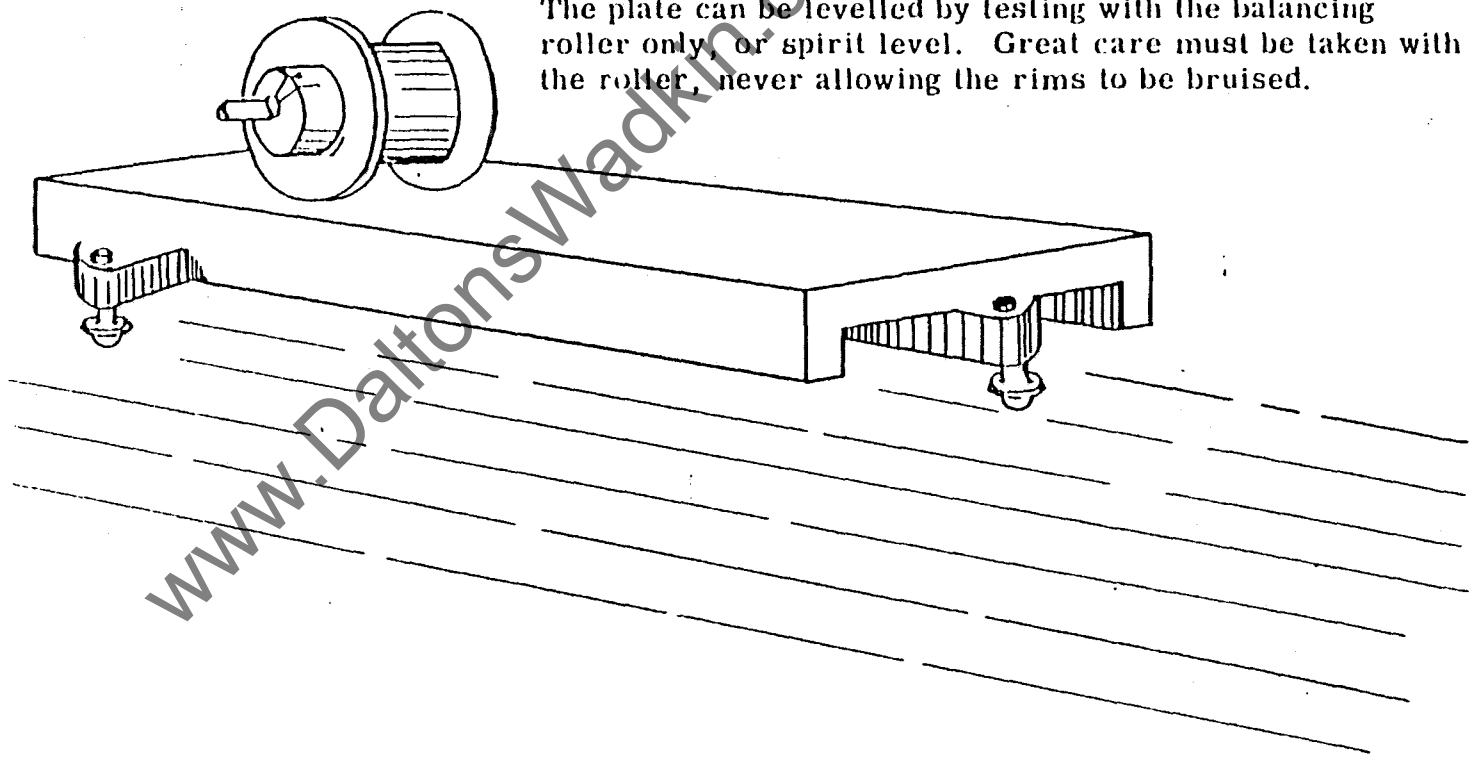
To find the cutting diameter of any respective chuck and cutter, add the chuck size to the diameter of the cutter. The cutting edge of the cutter must be either on or between the lines marked 30°-50° to ensure cutter clearance and the best cutting angles.

With cutter so set a chuck marked 1/16" and a cutter $\frac{1}{4}$" diameter will cut 5/16" diameter.

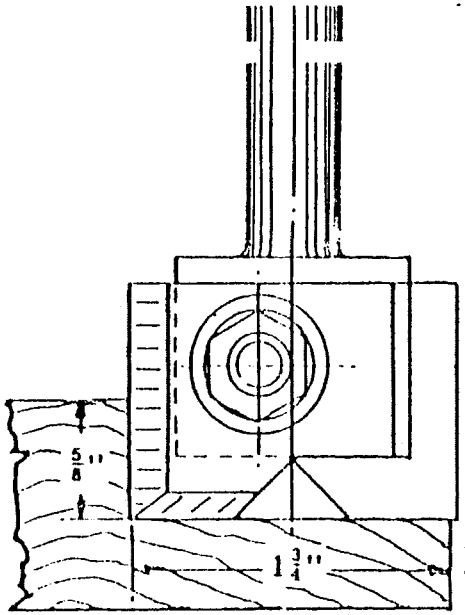
It is important that an eccentric chuck should be balanced every time the cutter is changed. The cutter being set in its correct cutting position before the balance operation is carried out.

Balancing plate is levelled by means of three adjustable screws. Then the chuck is inserted in the balancing roller and the correct balance is obtained by inserting or withdrawing balancing screws. When the chuck is perfectly in balance the roller will come to rest in any position.

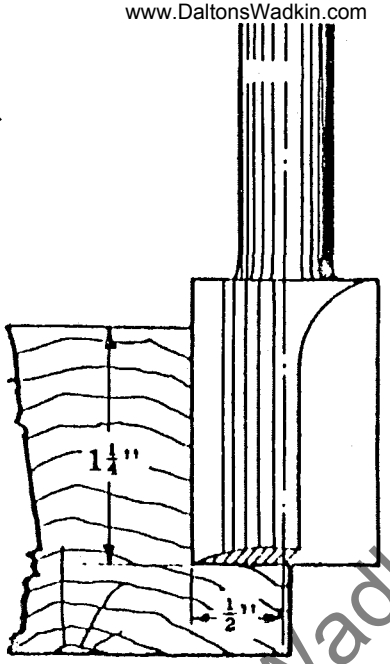
The plate can be levelled by testing with the balancing roller only, or spirit level. Great care must be taken with the roller, never allowing the rims to be bruised.



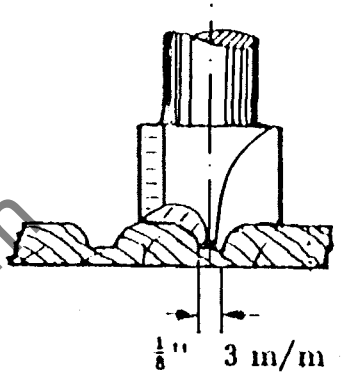
EXAMPLES OF EXTREME CUTS POSSIBLE ON WADKIN ROUTER

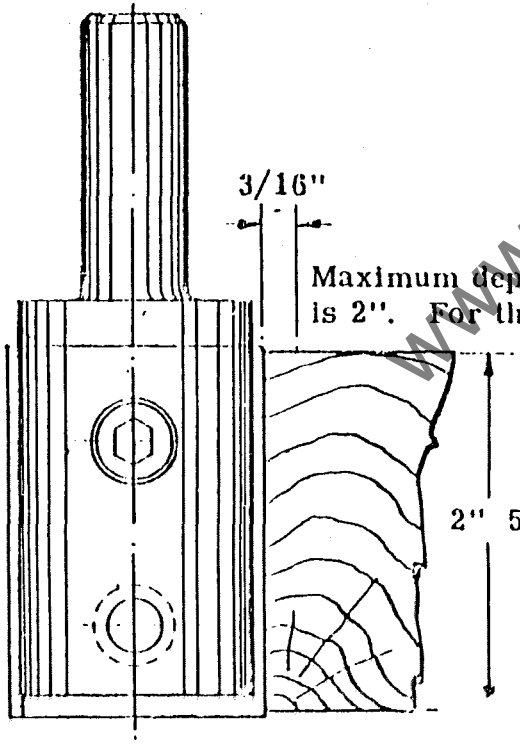


5/8" deep x 1 3/4"

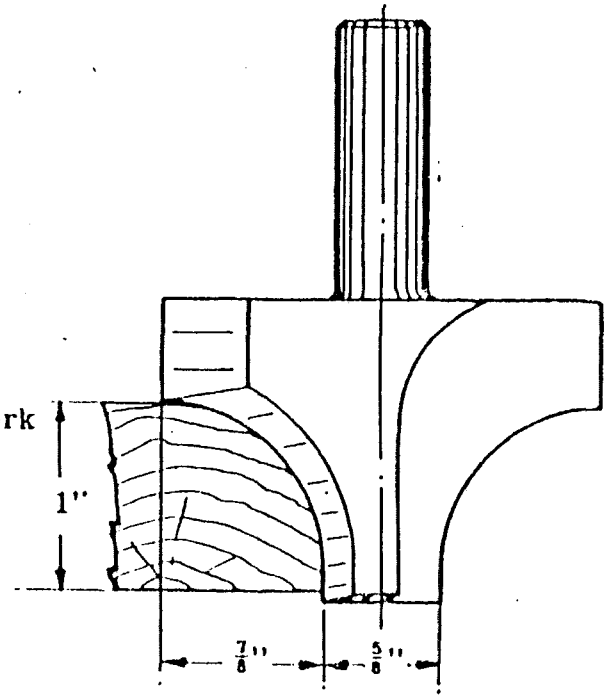


Rebating across or with the grain.



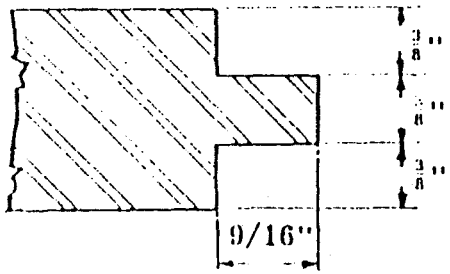


Maximum depth of cut when edging shaped work is 2". For this class of routing 3/16" is the maximum amount of wood to remove continuously.

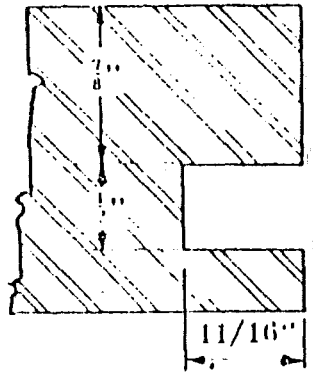


Maximum dimension of moulding on Router.

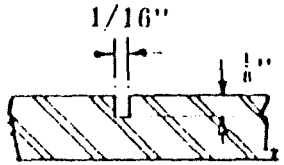
EXAMPLES OF EXTREME CUTS POSSIBLE ON WADKIN ROUTERS.



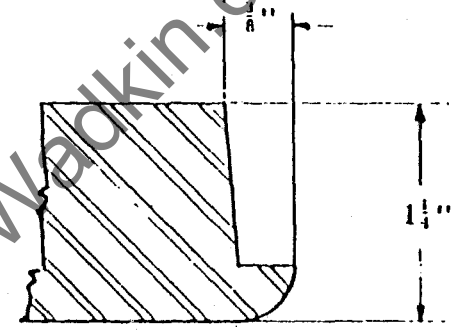
Maximum sizes double rebate

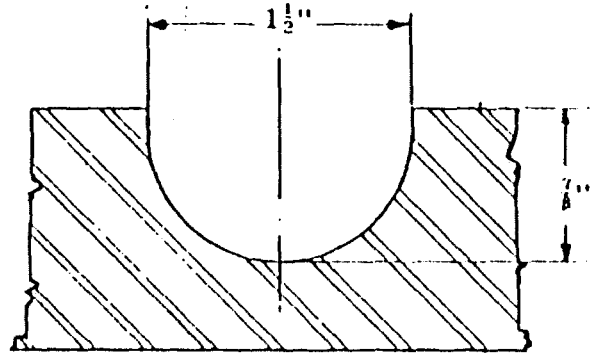


Maximum size of groove

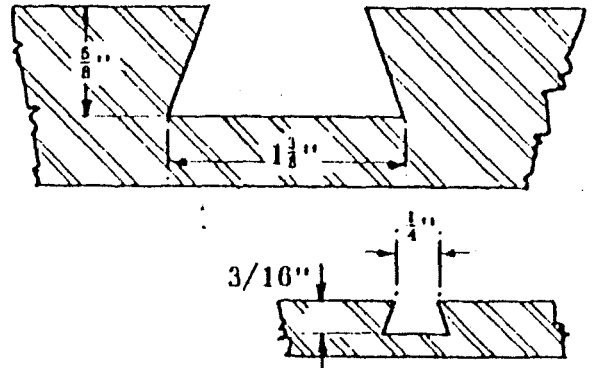


Smallest groove possible

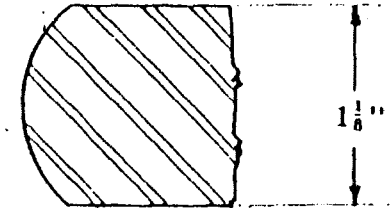


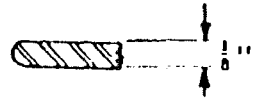


Maximum size of flute



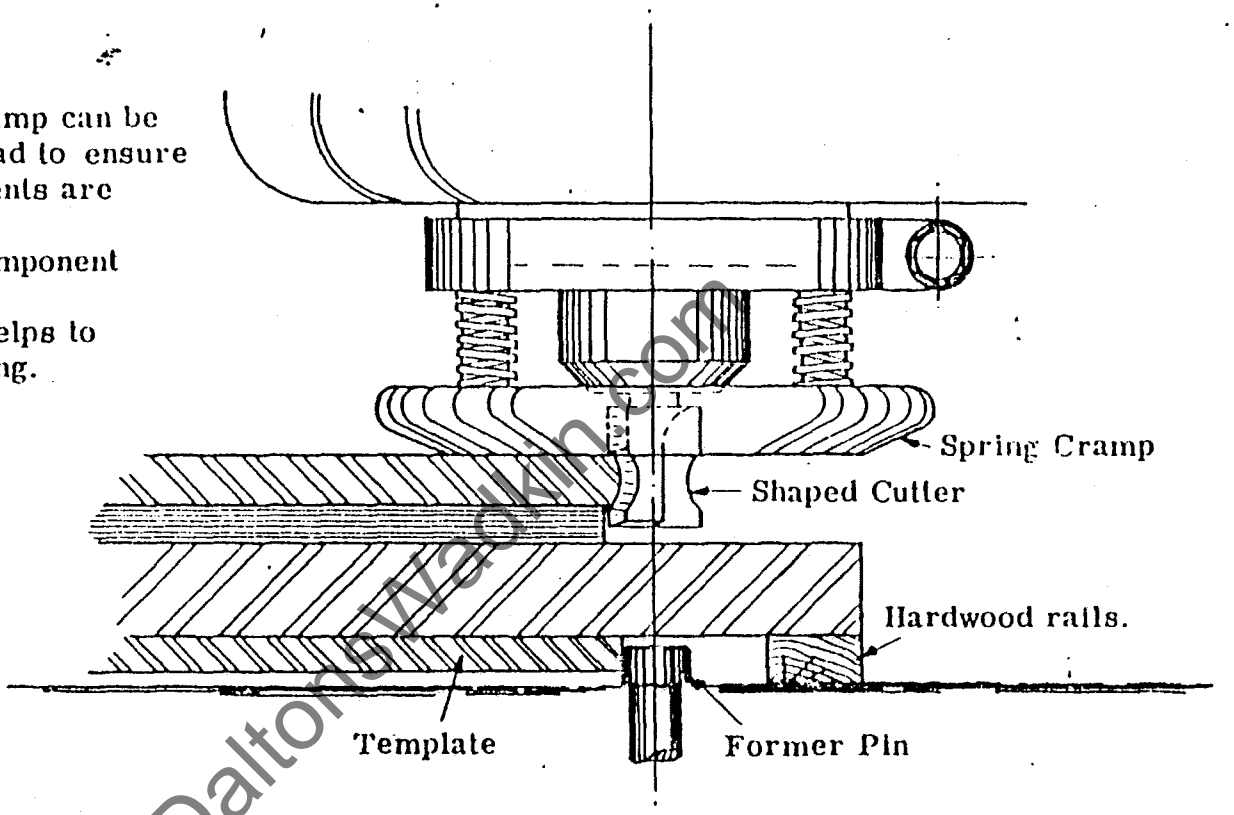
Maximum and minimum sizes of dovetail grooves





Maximum and minimum sizes of nosing (rounding) cutters Type 23.

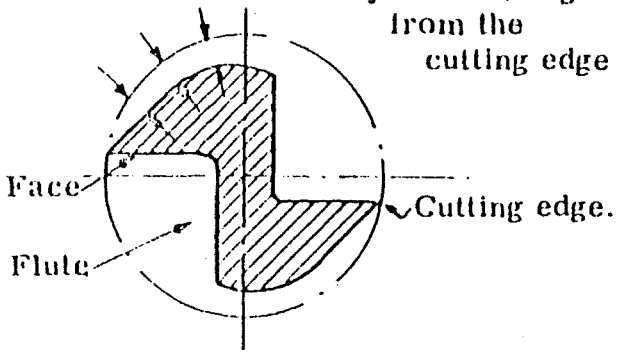
A Spring Pressure Cramp can be fitted to the Router Head to ensure that hardwood components are pressed onto the jig.
Also preventing the component lifting off the spikes.
The spring pressure helps to provide accurate routing.



Applicable when routing thin plywood, veneers, plastics, and hardwood components which are held to the jig by spikes.

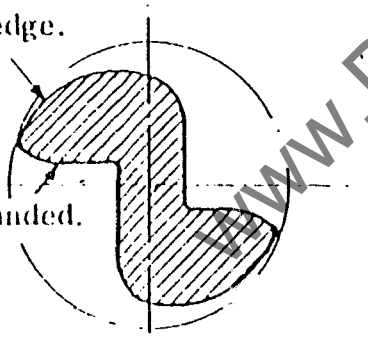
Double Edged Cutters - Panel Type 4.

Relief or clearance always increasing from the cutting edge

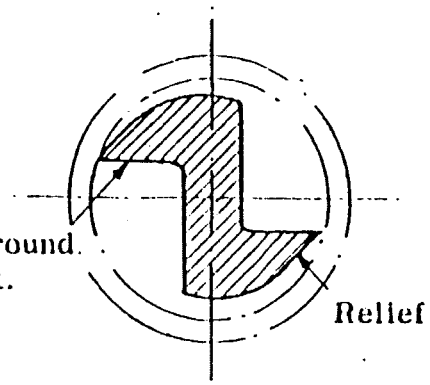


Cutter as sent out by Wadkin Ltd.

Hump behind cutting edge.

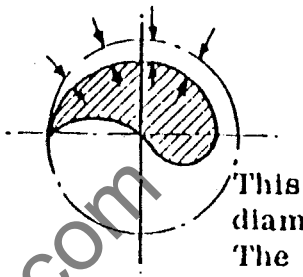


Cutter incorrectly ground and honed.

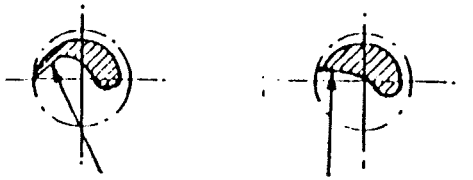


Cutter reground correctly.

Single Edge Cutters-Spoon Type 1.

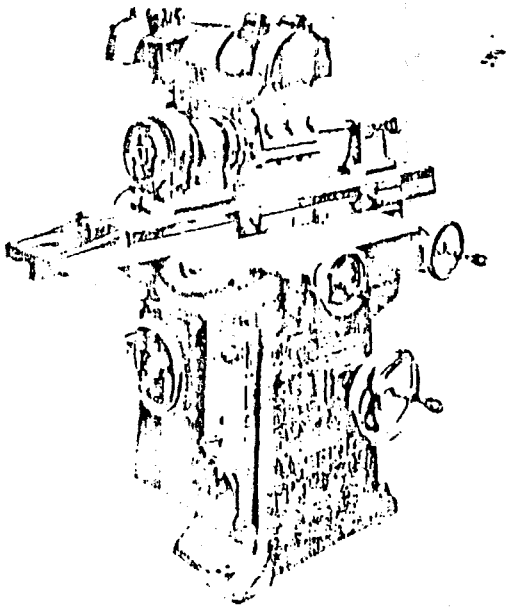


This type of cutter is used where cutter diameters of $\frac{3}{8}$" or less are necessary. The relief or clearance of this type of cutter must never be ground free-hand. Always grind and hone spoon cutters in the flute, maintaining the original form as near as possible.



Incorrect grinding will result in cutter breakage and bad work.

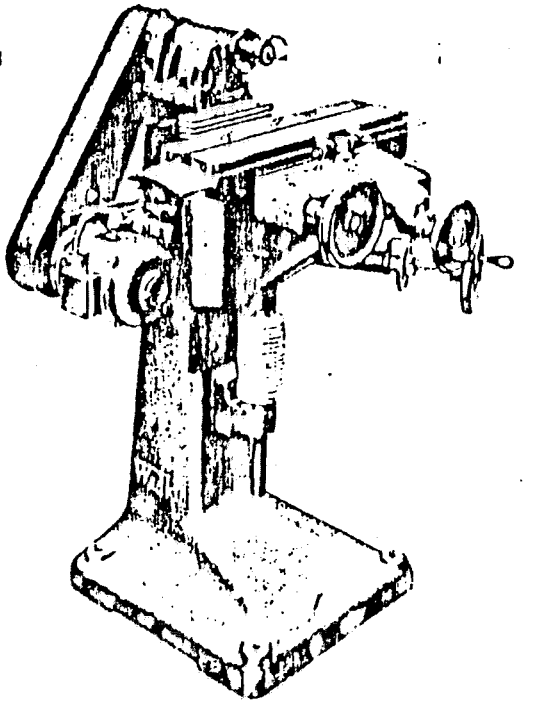
CUTTER GRINDING

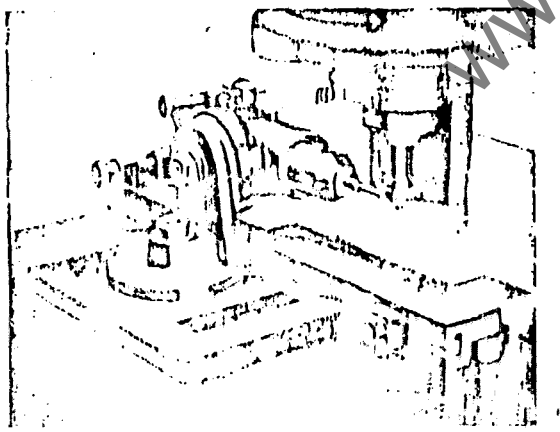


To obtain consistently good work from high speed routing it is essential that the cutters are kept sharpened and ground correctly. This can only be assured when suitable equipment is available. The ideal grinder for this purpose is the Universal Type N. H. shown left. Not only will this machine deal with all router cutters, but it is indispensable for maintaining every type of cutter equipment used in a woodworking plant, excluding long planer knives.

NOTE - Where a suitable grinder is already installed we can supply the set of fixtures for router cutters as used on this machine.

Where the amount of cutter grinding does not justify a Universal Grinder we recommend the N. U. type machine shown right. This machine has been specially designed for router cutters. It is self-contained and provided with a precision grinding spindle. Table has movement in three directions and is designed to take fixtures for handling all types of router cutters.





Whilst we strongly recommend the use of a separate grinder, where the number of cutters to be maintained does not justify either of the above machines, we can supply the fixture shown left for use on the Router itself. In this case it is essential to use the Router with speed 18,000 r.p.m., this lower speed being necessary for the grinding wheels.

INSTRUCTIONS FOR GRINDING WADKIN ROUTER CUTTERS

A sharp and properly ground cutter is the key to good routing. It is important, therefore, that the operator should understand exactly what he is doing when sharpening cutters.

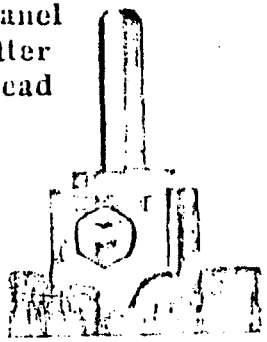
Detailed instructions in the grinding of all types of router cutters are given on the following pages, and if read carefully and the instructions carried out will ensure trouble free running and high production.

WOODWORKING CUTTERS.

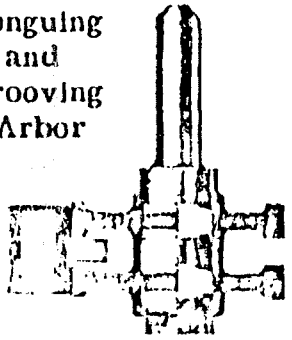
CHOICE OF THE CORRECT CUTTER.

In order to get the best results from routing it is essential to use the proper cutter for each operation. Straight cutters from 1/16" diameter to 1½" diameter are available in varying lengths. A wide range of shaped cutters can be supplied, also built-up cutters for tonguing and grooving, moulding, etc., circular cutterblocks and moulding blocks. Illustrations show some of the principal types in the range.

TYPE 52
Panel
Cutter
Head



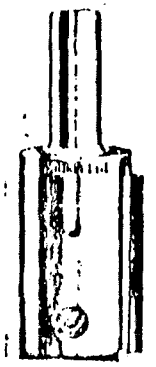
TYPE 53.
Tonguing
and
Grooving
Arbor



TYPE 1
Spoon Bit

TYPE 4
Double edge
Panel Bit

TYPE 21
Solid Profile
Cutter

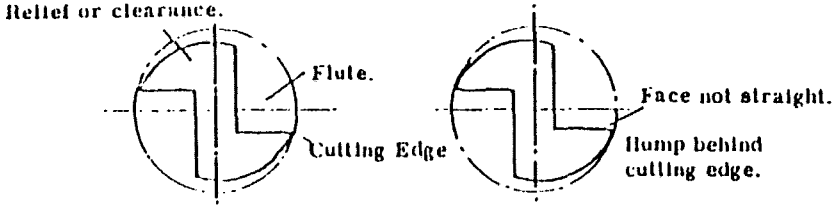


TYPE 55
Circular Block

When in doubt, always consult Wadkin Ltd. for advice and recommendations. More information on cutter types can be obtained under the following References :-
Cutters for Wood, Plastics, Synthetic Bonded Ply. Book No. 713
Router operation, Design of Jigs and Fixtures, etc. Book No. 716

THE AIM OF CUTTER SHARPENING.

The primary object of cutter sharpening is to restore the cutting edge at the correct cutting angle and ensure correct clearance behind the cutting edge.



Correctly honed and ground cutter.

Incorrectly honed cutter.

Worn cutter correctly ground and honed.

Dotted line indicates necessary grinding to restore cutting edges.

THE IMPORTANCE OF MACHINE GRINDING.

The key to high quality routing is a cutter with clean sharp edges and smooth continuous relief. In order to maintain the correct cutting angle and clearance, machine grinding is essential. Experience has shown that free-hand grinding does not give the clean smooth edge essential for good cutting, and the result is nothing like the life of a machine ground cutter. Another important point is that it is almost impossible to grind equal amounts from both edges free-hand. Mechanical grinding ensures that both edges of a cutter are identical, also the minimum amount of metal is removed at each regrind, thus making sure of longer life from a cutter than when most carefully free-hand ground.

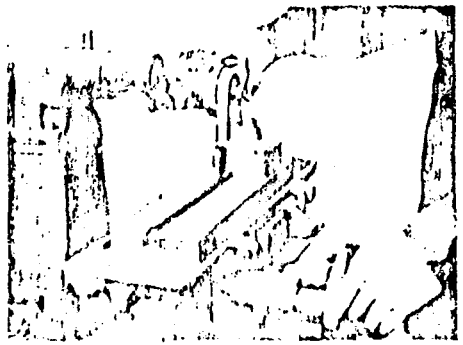
GRINDING MACHINE, TYPE N. U.

This is the Grinding Machine generally supplied for grinding router cutters (see Illustration on Page 42). It has a spindle speed of 4,750 r. p. m. and is provided with rise and fall, and also traverse movement to the table. With the aid of the three attachments shown overleaf, most types of cutters for both metal and wood routing can be dealt with. The class of work being done will dictate the attachments needed, but for wood cutters the S. F. A. attachment is essential, and the P. R. F. is very useful for regrinding the relief on straight panel cutters. For sheet dural, alclad and brass the D. G A. and P. R. F. attachments are essential.

Where an existing Tool Room Grinder of suitable type and having a speed of not less than 5000 r. p. m. is available, the grinding attachments only are needed.

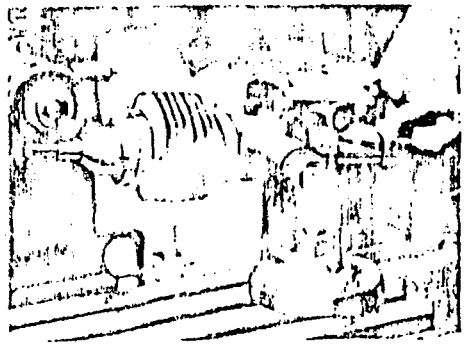
In such cases the user will need to make a spindle extension arbor to suit his machine.

GRINDING ATTACHMENTS



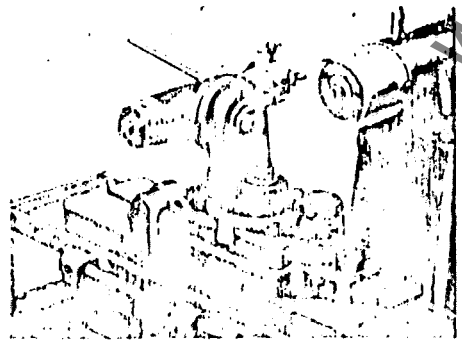
ATTACHMENT S. F. A.

to be used for grinding straight fluted cutters of all types, also ending up panel cutters and Spoon Bits.
This attachment will generally be used for profiling cutters and spoon bits. It is also suitable for tungsten carbide cutters.



ATTACHMENT D. G. A.

to be used for grinding the flutes (spiral or straight) of all alclad or dural cutters used on SHEET WORK.

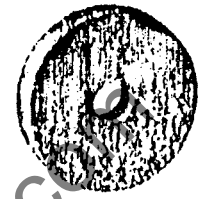


ATTACHMENT P. R. F.

to be used for regrinding the eccentric relief on panel cutters; suitable for dural, alclad and brass cutters, after loss of clearance due to continuous honing.

Grinding wheels supplied with GRINDING ATTACHMENTS.

FOR ATTACHMENT S. F. A. ONLY

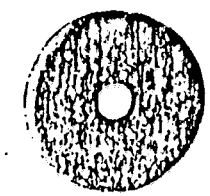


139
2" diameter
3/8" FLAT face
3/8" Bore

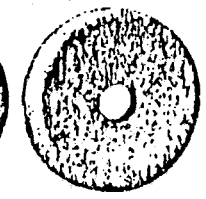
140
2¼" diameter
1" CUP
3/8" Bore

141
2¼" diameter
1" DISH
3/8" Bore

FOR ATTACHMENT D. G. A. and S. F. A.



137



138

137 — 2" diameter, 3/16" ROUND edge, 3/8" Bore

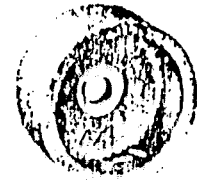
138 — 2" diameter, 1/4" ROUND edge, 3/8" Bore

FOR ATTACHMENT S. F. A.

86R Rougher 87R Finisher

These wheels are used for grinding chipped edges of Tungsten Carbide Cutters. Both are 2¼" diameter, 1" dish, 3/8" bore.

FOR ATTACHMENT P. R. F.



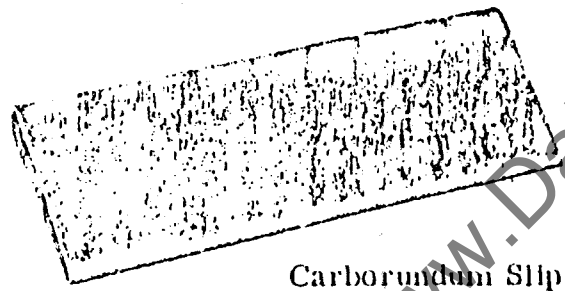
146
2¼" diameter
1" CUP
3/8" Bore

LAPS FOR TUNGSTEN CARBIDE TIPPED ROUTER CUTTERS.

Diamond lap wheel for use on Attachment S. F. A. and used for lap finishing Tungsten Carbide Tipped Cutters after regrinding with wheels 86R and 87R.

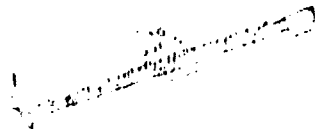
145

Diamond Impregnated for Hand Lap honing Tungsten Carbide Tipped Cutters. Also a similar hone of solid material in fine and medium grain can be supplied.



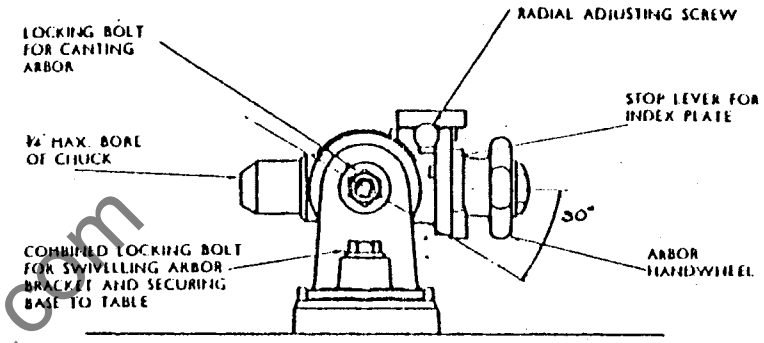
Carborundum Slip Stones
for High Speed Steel Router Cutters
No. 183. $4\frac{1}{2}$" x $1\frac{3}{4}$" x $\frac{1}{2}$" - 3/16"
No. 177. $4\frac{1}{2}$" x $1\frac{3}{4}$" x $\frac{1}{4}$" - 1/16"

WHEEL DRESSER DIAMOND.PART NO. P. R. F. 37.



used for dressing all types of grinding wheels, excepting the Diamond Lap Wheel, No. 145.

REGRINDING STRAIGHT FLUTED CUTTERS OF ALL TYPES, ON ATTACHMENT S. F. A.

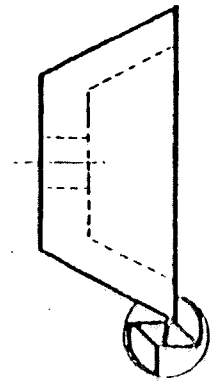


TYPES OF CUTTERS MOST COMMONLY GROUND ON THIS ATTACHMENT :-

SPOON BITS. Use grinding wheels Nos. 137 and 138.

After grinding the flute, it will be necessary to stone a flat on the cutting edge of this type of cutter to obtain more clearance. The outside diameter should not be ground.

PANEL ROUTER CUTTERS OR SOLID SHAPED CUTTERS



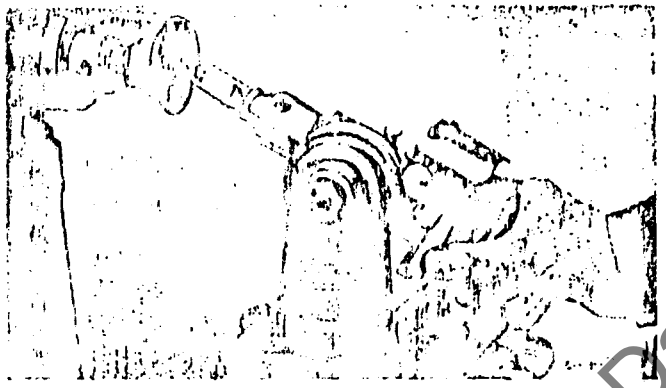
Use grinding wheels Nos. 140 and 141. After setting up as described opposite both flutes should be ground at the one setting.

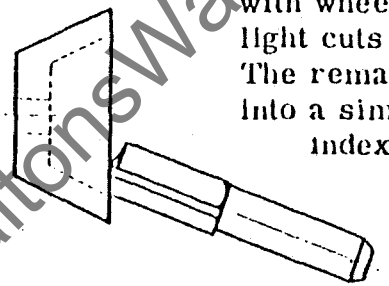
After several regrinds of the flutes it becomes necessary on this type of cutter to give more clearance on the back of the cutting edge. (See pages 48 and 49.)

TO SET UP FOR GRINDING FLUTES.

First bring the cutter flute into correct relation with wheel. Adjust the stop on machine table to suit length of flute to be ground. Use table movement to grind the flute taking light cuts. To put on any cut use the radial adjusting screw, thus maintaining a correct cutting angle. Both flutes should be ground after each adjustment to ensure that each is ground identically.

TO SET UP FOR GRINDING THE END OF THE CUTTER.





First turn attachment round at right angles to grinding wheel and lock up. Bring cutter into correct relation with wheel and adjust stop. Take light cuts by using table movement. The remaining face can be brought into a similar position by using index plate.

Use grinding wheels 140 and 141.

PERIPHERAL RELIEVING OR REGRINDING CLEARANCE OF PANEL CUTTERS ON ATTACHMENT S. F. A.

The best results on relief grinding are obtained by using the attachment P. R. F., as described on pages 49 to 53.
This method is illustrated for operators who have the S. F. A. Attachment only, but it should be stressed that the results obtained will not be as good as with the P. R. F.

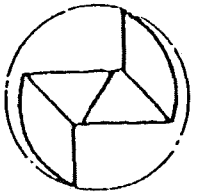


Fig. 1
Shows a new panel cutter with plenty of clearance.

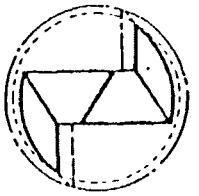
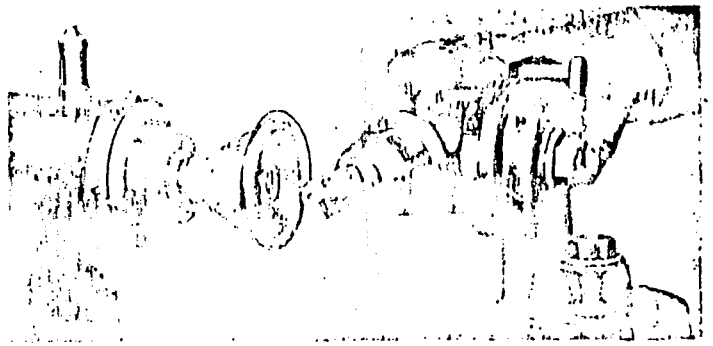


Fig. 2
Shows the same cutter after several regrinds with no clearance.



Cutter is moved across the wheel by table movement as for grinding the flutes. Take light cuts.

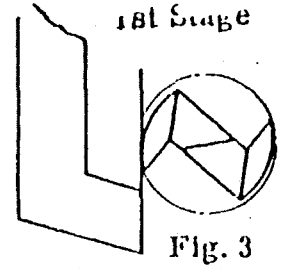


Fig. 3
Use wheel No. 140 or 141

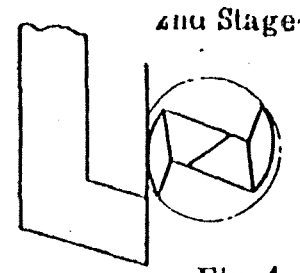
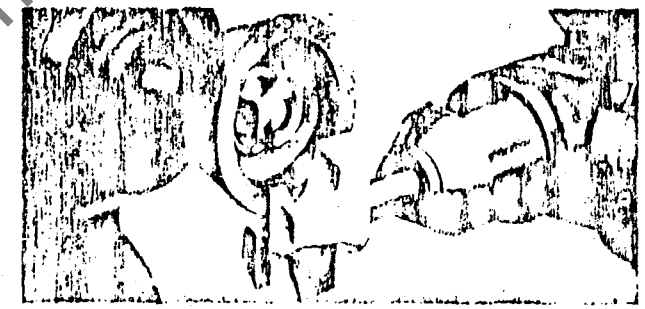


Fig. 4
Using same wheel.

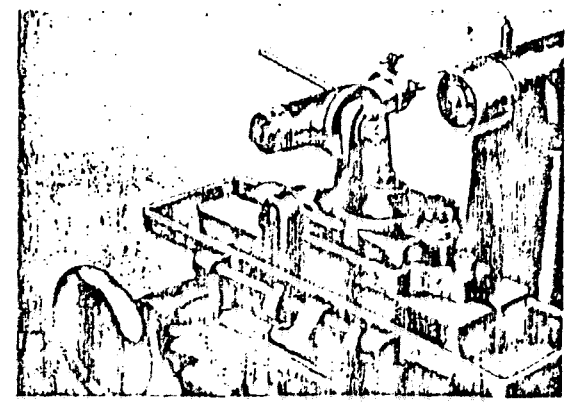
GRINDING OF SHAPED CUTTERS TYPE NOS. 9, 11, 12, 32.

Shaped cutters must only be ground in the flute and must never be ground on the straight relief, unless the shape or profile of the cutter is being altered. This operation is done on the S. F. A. Attachment, using wheel No. 141. The method is illustrated right and described on page 46.

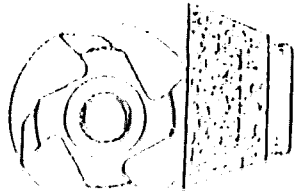


PERIPHERAL RELIEVING OF PANEL CUTTERS ON ATTACHMENT P. R. F., ALSO SUITABLE FOR RELIEVING OF TWO-EDGED CUTTERS FOR SHEET DURAL, ALCLAD AND BRASS.

This Attachment, mounted on our N. U. Grinder has been designed to obviate the poor results obtained when operating Routing Machines due to the outside relief of cutters being improperly honed, and in some cases, hand ground. It consists of a base plate, on which is pivoted a platen carrying a swivelling bracket, on which in turn is carried the spindle head which can also swivel. Both the swivelling units are graduated and the control knob for pivoting has also a graduated dial. The work spindle is on the eccentric principle, provision being made to vary the eccentricity (or radius of relief).



GRINDING OF GROOVING CUTTERS TYPES 41 - 53.



These cutters must never be ground in the flutes because of the loss of width which would quickly result, due to side relief of cut[illegible] edges. Resharpen these cutters by g[illegible]ding on the outside face,

Grinding of cutters for Flat Knife Chuck No. 50, Expanding Cutterhead No. 51, Panel Cutterhead No. 52, Circular Block No. 55.

For resharpening these cutters it is recommended that the knives be removed from [illegible] block and ground freehand on a

For holding the cutters, bushes $\frac{3}{8}$" and $\frac{1}{2}$" bore are provided; these have two lines engraved at 180°, each line in turn being brought into alignment with a zero line on the spindle nose, thus enabling both edges of the cutter to be ground at one setting. An approximate position to place the cutter radially is also indicated by another line on the nose of each bush, one of the cutter edges being placed opposite this; this position can only be approximate as some cutters require more drastic relief (or clearance) than others.

This variation of clearance must not be confused with varying eccentricity or (radius of relief).

The bushes are gripped in a split body and can be changed quickly.

A holder with diamond for trueing the wheel is also provided and fits the spindle nose the same as the cutter bushes. Arrangements are made to hold the work spindle radially when using the diamond. Part No. of this diamond is P. R. F. 37.

It is absolutely essential to true the grinding wheel with a diamond. A special fine grain wheel No. 146 is supplied with this attachment.

TO SET UP FOR GRINDING.

First set both swivelling bracket and spindle head with graduations at zero; then, with the vertical movement of the machine table, bring the attachment spindle to the same height approximately as the grinding wheel spindle (if anything the centre of the attachment spindle should be a little higher than the centre of grinding wheel spindle). Now insert cutter with one edge opposite the line on the NOSE of the cutter bush and tighten firmly with the set screw; then set cutter bush with one graduation in line with zero line on spindle nose and tighten with tee headed screw shown in right hand in Fig. 2. Fig. 3 shows cutter setting line on nose of bush and also one of the bush setting lines correctly set on the zero line of spindle nose; this photograph also shows the actual grinding operation.

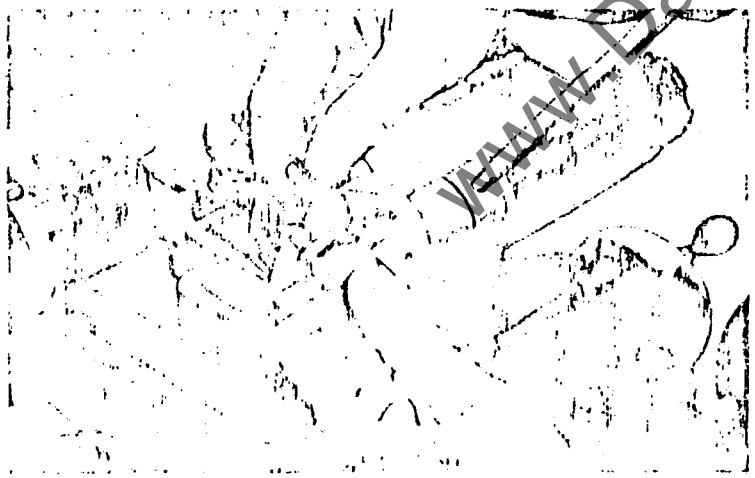


Fig. 2

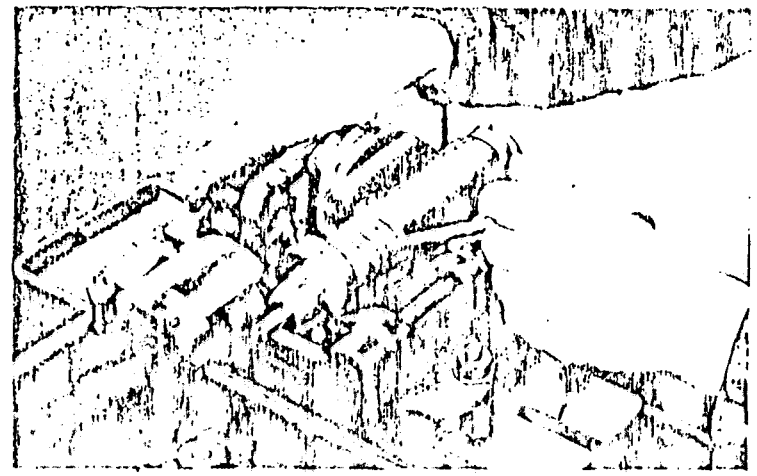


Fig. 3

It will not be necessary as a general rule to move the spindle head away from zero, but the swivelling bracket (which has its base on the platen) will require moving a little off zero for the spiral fluted cutters, otherwise, due to the spiral angle, the grinding operation will produce a taper cutter.

For right hand spiral cutters move the bracket zero line a little to the left and vice versa for left hand spiral cutter. Fig. 4 shows the zero line on bracket moved out of line as required for a right hand spiral cutter.

TO GRIND A CUTTER.

Unscrew control knob shown in right hand on Fig. 4 to give about $\frac{1}{8}$" opening between the platen and base plate. Bring the table up until the surface of the cutter to be ground is 1/16" away from the grinding wheel; then move table stop indicated by left hand up to stop bracket and tighten up.

Start machine, and by the control lever rotate one edge of the cutter to and fro, bringing the cutter into contact with the grinding wheel by turning the control knob clockwise.

Take care not to take the control lever too far over or the opposite cutting edge will come into contact with the wheel and be damaged.

Now bring the table and fixture away from the wheel and note the number of the graduation on the control knob dial which is opposite the zero line on the platen.

Unscrew control knob half to three quarters of a turn, unscrew tee headed screw shown in right hand on Fig. 2 and turn cutter holder round until the arrow on opposite side is in line with zero mark on spindle nose; left hand indicates this being done (do not release cutter), then tighten up tee headed screw, move table up to stop and proceed as before until dial on control knob comes to the same number as before. For metal routing cutters proceed to remove a further .010", to cut back one edge, by using in feed of machine table. See Page 57.

Fig. 4

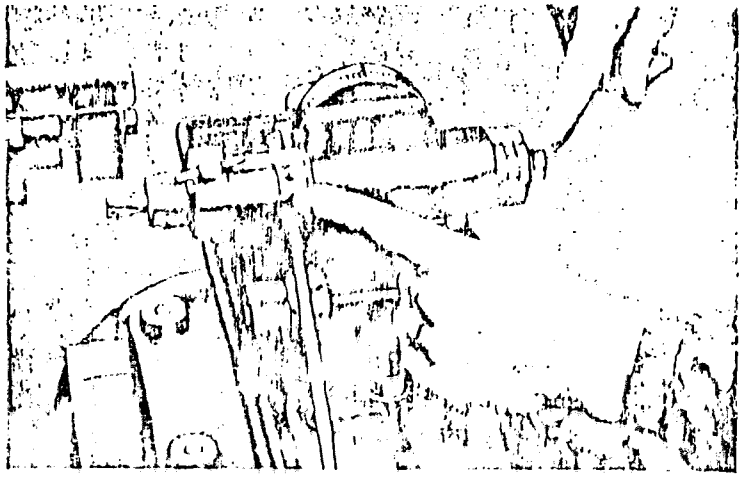


Fig. 5

For cutters of greater length than the face of the wheel, repeat the operation with the table cross traverse adjusted to cover the remaining length of the cutter edge. When finishing, pass the cutter over the grinding wheel once or twice, moving the cross traverse slide sufficiently to cover the whole length of the cutting edge being relieved. On short cutters move the cross traverse a little each way to improve the surface finish.

Fig. 5 shows how the eccentricity (or radius of relief) is varied.
The spindle nose has an initial amount of eccentricity which can be varied as follows :-

Ease hexagon nut indicated by right hand, but do not slacken it right off; slacken off the small screw indicated by left hand, say a quarter of a turn, and tighten the one on the opposite side; this increases the eccentricity. To decrease the eccentricity slacken the screw on the opposite side and tighten the one indicated by left hand; then re-tighten the nut indicated by right hand. On no account try to adjust without easing the hexagon nut and be sure to re-tighten.

The amount of eccentricity required and the exact position to set the cutter are dependent on conditions and must be left to the operator who will find these adjustments quite easy after a little experience.

Fig. 6 shows the split chuck and the simplicity of changing cutter bushes or inserting the diamond holder. All that is necessary is to release the tee headed screw and draw the bush out; insert another, pushing it right up to the shoulder; bring the graduated line opposite zero line on the spindle nose and re-tighten the tee headed screw.

See that bushes and the base of the split chuck are perfectly clean and free from grit.

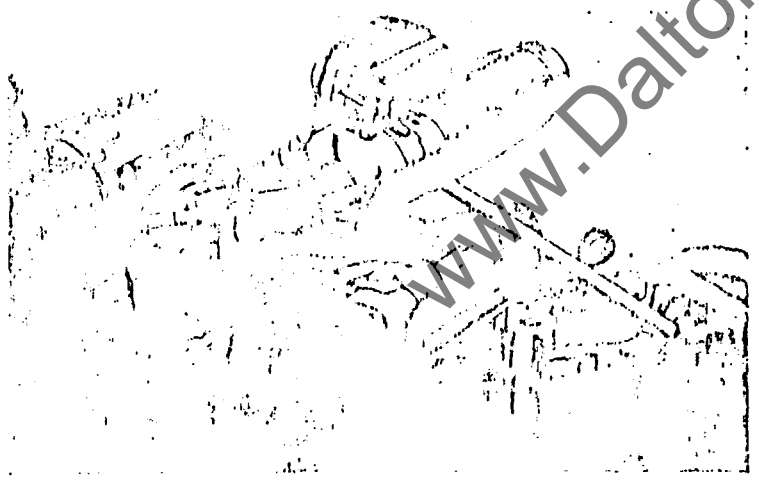


Fig. 6

TO DRESS THE WHEEL.

Fix clip onto operating handle as shown by right hand in Fig. 7, then insert the diamond holder in the spindle nose with the diamond inclined to point a little below centre (this is important) and follow the same procedure as for grinding cutters (see Page 51), using the cross slide of machine to pass the diamond across the periphery of the wheel and the control knob to regulate the cut as shown in Fig. 8.

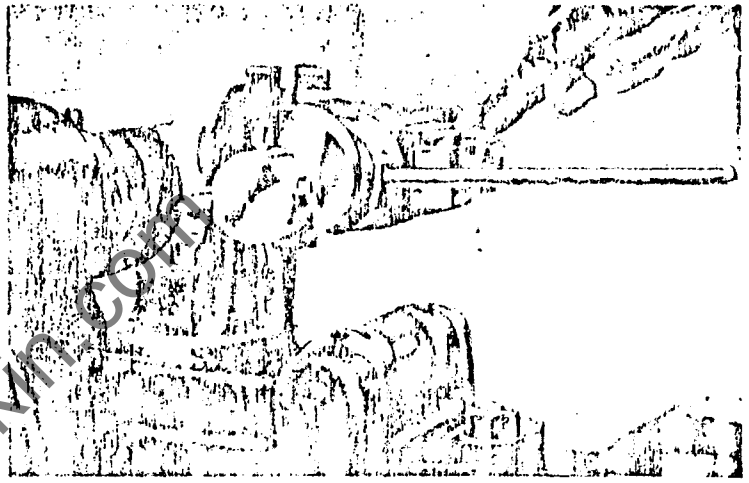


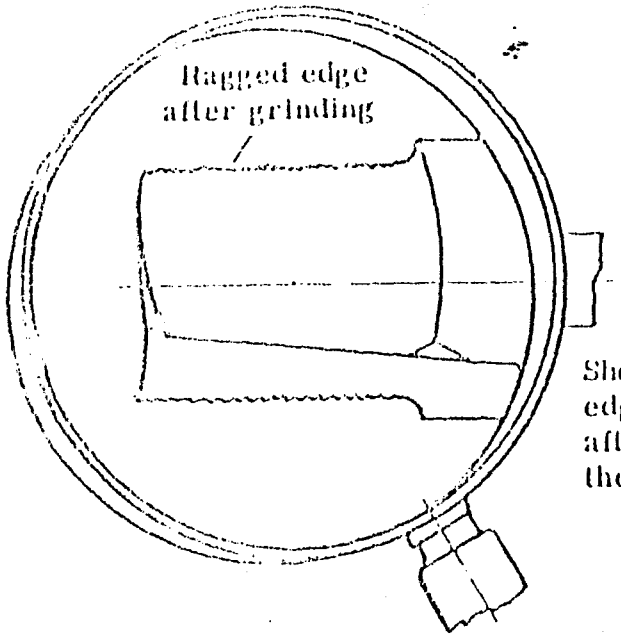
Fig. 7

Fig. 8

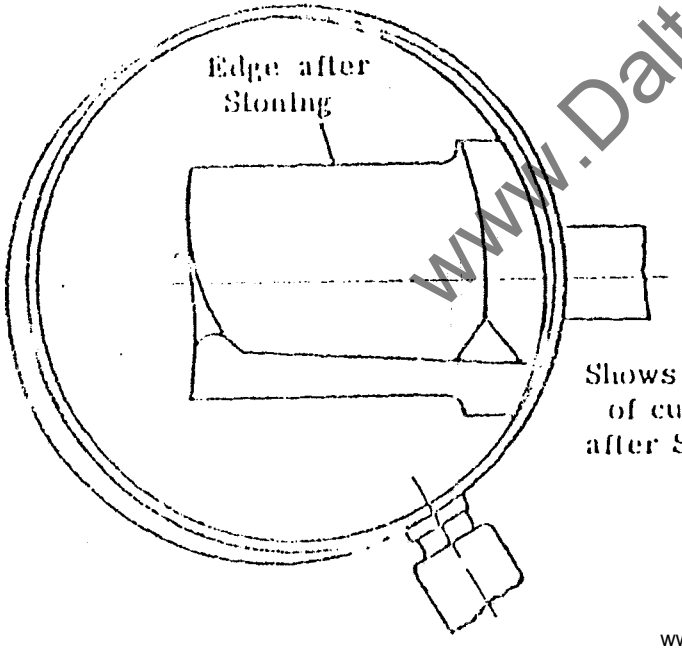
See that the table stop is tight, only take LIGHT cuts and pass the diamond over the wheel slowly and with a continuous regular motion. When mounting the wheel on machine spindle place it with the recessed side towards the machine as shown in Fig. 2.

Frequent dressing of the grinding wheel is not necessary. Considerable quantities of cutters should be ground between dressings and after the initial truing of a new wheel subsequent dressings should be of the lightest character.

STONING OF CUTTERS

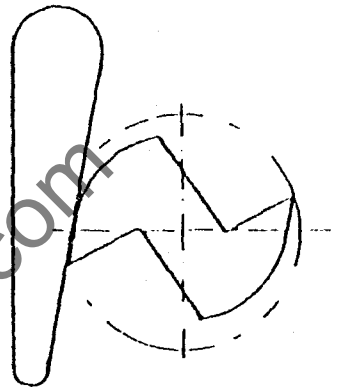


Shows ragged edge of cutter after grinding the flutes.

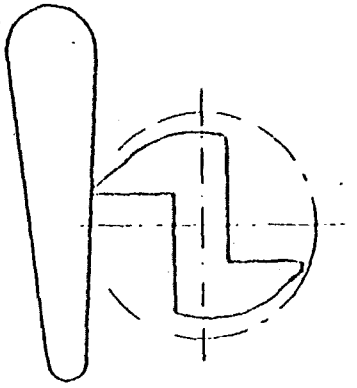


Shows edge of cutter after Stoning.

THE RIGHT AND WRONG WAY OF STONING



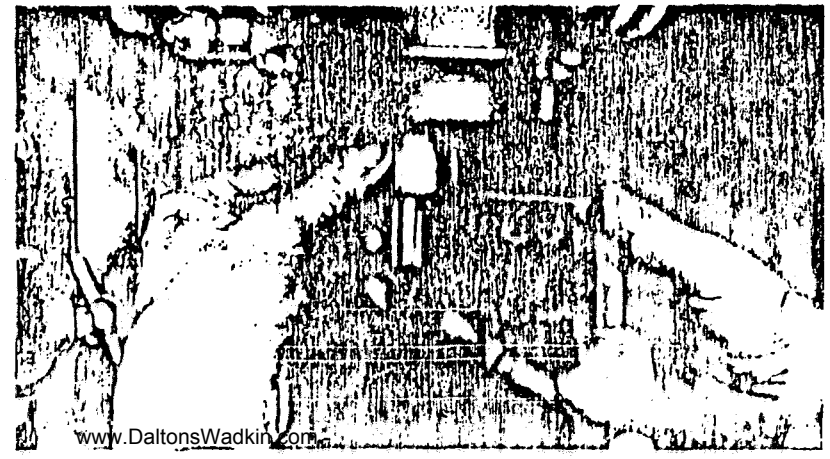
THE RIGHT WAY - Cutting edge is on the outside periphery of cutter track, with back of cutter clearing the job.



THE WRONG WAY - Back of cutter forms outside periphery of cutter, with the result that rubbing of the back on the job occurs.

STONING OF CUTTERS

After grinding, the cutter must be stoned up before using to remove the ragged edge. This is done by using a No. 183 or 177 Carborundum slip stone dipped in paraffin and applied to the edge of the cutter as shown below. (Stones are illustrated on Page 47). Correct stoning can only be achieved by practice, but most operators have no difficulty with this operation after a few weeks experience. A reliable guide as to whether the cutter has been properly stoned will be that the job will almost feed itself, instead of requiring force in feeding past the cutter. In addition to stoning after grinding, the cutter will need restoning between regrinds. The length of time the cutter will retain its edge will depend on the material, and may vary between half an hour and two hours or more. Here again, the effort required to feed the work is the best indication of the condition of the cutter and whether stoning is required. Stoning for half a minute should be sufficient and the cutter should stand between four and eight restonings between regrinds, depending on the skill of the operator.



TYPICAL QUESTIONS AND ANSWERS ON WOOD ROUTER CUTTER SHARPENING

Is a cutter as despatched by the makers ready for use?

No. It requires honing or stoning before being used. The cutters are sent out as they leave the Grinding Machine. They are not stoned up at our Works as the edge may be damaged in transit.

Is the use of a slip stone necessary on router cutters?

Yes. All cutters should be honed before using on the Router. The sharper the cutter the better the finish and the faster the feed.

What sort of slip stone should be used, and what methods should be employed?

See recommendations as regards stones on Page 47, and the method of stoning, Pages 54-55.

How often should the cutter be honed?

This depends on the timber being cut. Stringy timber may require a stone on the cutter every 20 minutes, while on clean straight grain wood the cutter may run for an hour.

When does a cutter need sharpening?

When the work is difficult to push past the cutter, or when the finish is not clean and smooth, the two characteristics generally go together. When the cutter is sharp, the work will almost feed itself.

What determines whether a panel cutter should be ground in the flute or on the relief?

The general practice is to grind in the flute, as shown on Page 48, and continue to do so until the relief or clearance, shown on Page 44, becomes insufficient. Then regrind the relief as shown on Pages 49 to 52.

Is there any means of truing the emery wheels on the Cutter Grinder?

Yes. The diamond mounted in a steel holder, $\frac{1}{2}$" diameter, is shown on Page 47. The method for truing wheel No. 146 is shown on Page 53. When truing the face of the wheel No. 141, mount the diamond in place of the cutter on the attachment S. F. A. shown centre of Page 48, and proceed as described on Page 53.

Is machine grinding of cutters essential?

Yes. To get good work, and economy of cutter life. See Page 45.

ROUTER CUTTERS FOR NON-FERROUS METALS.

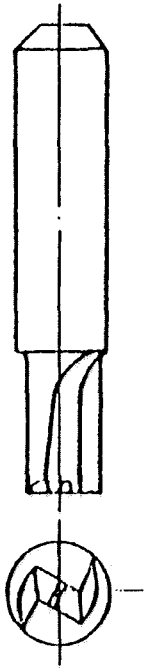
CUTTERS FOR NON-FERROUS SHEETS.

Wadkin cutters are made in two ranges, one having a profile suitable for cutting Dural and Brass, and the other suitable for cutting Aluminium and Alclad. In general, these cutters are quite suitable for use as sent out, without modification of the profile, but some operators claim to obtain improved performance by slightly modifying the profile of the cutter to suit the particular specification of metal which they are cutting.

These modifications may be regarded as refinements and should not be attempted until the operator has become quite proficient in the use of the machine.

The types of cutters available are shown on a list which is issued and revised from time to time, and can be obtained on enquiry from us. All Wadkin cutters are numbered and it is advisable to quote the reference number when ordering or referring to specific types and sizes of cutters.

For cutting out from sheet the best size to use is a $\frac{3}{8}$" diameter double-edged cutter, having a $\frac{1}{2}$" diameter shank. It is possible to use a $\frac{1}{4}$" cutter where $\frac{1}{8}$" internal radii are essential or $\frac{1}{2}$" diameter, if required.



Typical cutter for profiling.

CUTTERS FOR PROFILING CASTINGS STAMPINGS AND NON-FERROUS METAL FACED PLYWOOD, ETC.

For this class of work we recommend an entirely different range of cutters from those used for sheet cutting. In general, these cutters are Z section with straight flutes, but it is advisable to consult us before ordering cutters, to ensure that the most suitable type is used for the particular metal to be cut and for the amount of metal to be removed.

SIZES OF CUTTER SHANKS.

All cutter shanks on the cutters we supply are held to a limit of +.0005 and -.0005", i. e. a tolerance of one thousandth of an inch, but whatever the diameter it is most important that the shank is parallel. A cutter shank over .0005" taper will not give satisfactory results.

SMALL CUTTERS FOR SPECIAL WORK SUCH AS GROOVING.

When using small cutters, such as $\frac{1}{8}$" or 3/16" diameter, we recommend ordinary wood cutting spoon bits, and these are quite satisfactory. Always shorten the cutting blade as much as possible to avoid breakage. This is best done by the user himself as the cutters can then be shortened to suit his own type of work.

HOW TO TELL WHEN A METAL WORKING CUTTER NEEDS RE-GRINDING.

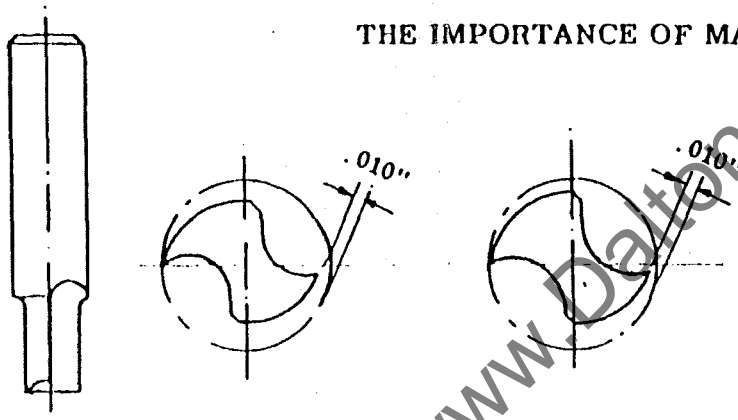
The first thing a routing machine operator should know is how to tell when the cutter is sharp and working correctly. The answer is that when the cutter is right, the chips will leave the cutter bright and curly, and the feed will be so easy that the job almost feeds itself. When these conditions exist the cutter will have a long life between grinds.

If the cutter is incorrectly ground, the chips will come off in straight shreds, and an excessive amount of force will be needed to push the job past the cutter. Good work is out of the question under such conditions, and there is always the danger of pushing the end off the cutter.

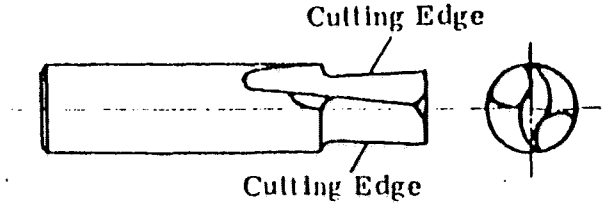
If the cutter is not working correctly, stop the machine immediately and find out why.

To ensure the maximum life of the cutter, and at the same time obtain free cutting, it is essential that the cutter is kept efficiently lubricated. Always use a lubricant consisting of a mixture of paraffin and lard oil. The simplest method of application is by brushing the lubricant on to each blank before clamping. The lubricant need only be applied on the sheets in the track of the cutter.

THE IMPORTANCE OF MACHINE GRINDING.



Wadkin metal working router cutters (except special purpose cutters) are supplied with two spiral cutting edges, as shown in the sketch below.



All metal cutting router cutters have one edge ground back .010. This is done in the formed relief grinding so that the normal re-grinding in the flutes of the cutter will not be affected.

In order to preserve the cutting diameter resharpening is done by regrinding the two spiral flutes equally. Experience has shown that free hand grinding does not give the clean smooth throat essential for chip clearance and good cutting and, in consequence, gives nothing like the life between grinds that a machine-ground cutter gives.

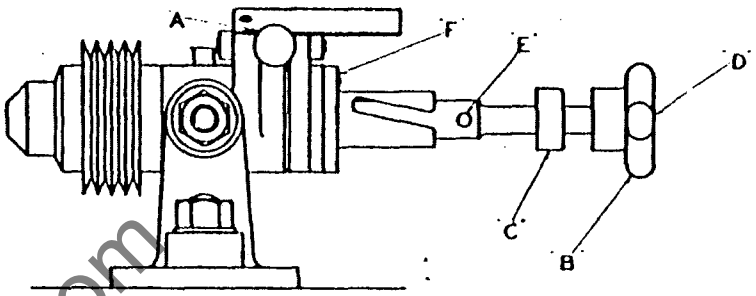
Another important point is that it is almost impossible to grind equal amounts from both edges free hand.

By resharpening by mechanical means, not only is accurate grinding ensured, with both edges of the cutter ground identically, but the minimum amount is removed from the cutter at each regrind, ensuring a longer life than is possible by the most careful free hand grinding.

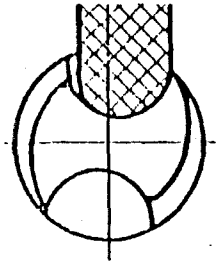
For details of the recommended grinding machine and attachments, see pages 42, 45 and 46.

REGRINDING STRAIGHT OR SPIRAL FLUTED CUTTERS FOR NON-FERROUS METAL SHEETWORK ON

ATTACHMENT D. G. A.



TO SET UP FOR GRINDING STRAIGHT FLUTES.



Use grinding wheels Nos. 137 or 138.

The cutter is placed in the spindle nose and the attachment adjusted to bring the flute into correct relation with the wheel, i e., parallel with the table slots. The table and cross slide should then be locked, and the rise and fall of the table and the radial adjustment screw "A" only, should be used during the subsequent grinding operation.

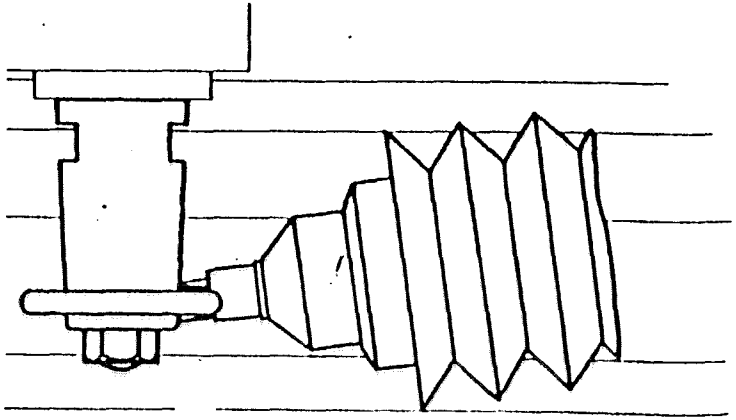
The cross slide of the table must not be used to put on cut after once setting up, as this will alter the contour of the flute, thus varying the cutting angle.

TO SET UP FOR GRINDING SPIRAL FLUTES ON METAL CUTTERS.

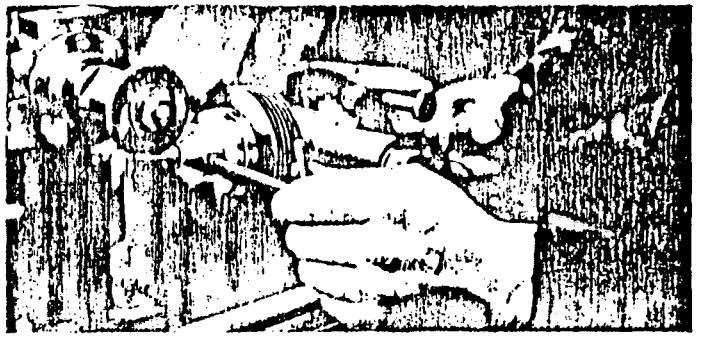
The set up and method of grinding in this case is identical with that for the straight fluted cutters except that it is necessary to set over the head as shown below to bring the flute into the correct parallel relation with the table slots.

It will also be necessary to change the slotted sleeve. To do this first remove the handwheel B and collar C by loosening grub screws with the special key provided. Slacken off grub screw D in the end of the spindle and withdraw guide pin E. Unscrew the three countersunk screws F from the sleeve. The sleeve is now free to be withdrawn from the spindle.

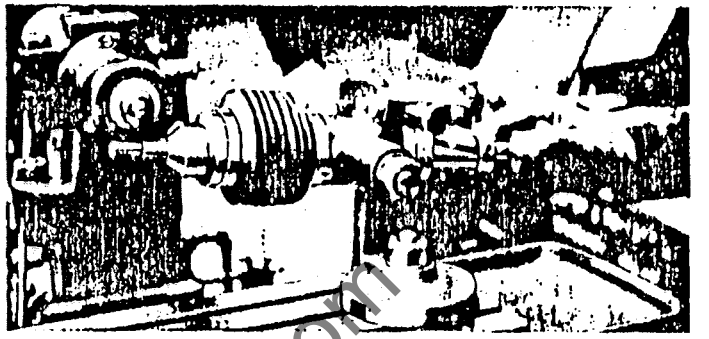
PLAN VIEW SHOWING HEAD SET OVER FOR GRINDING SPIRAL FLUTES.



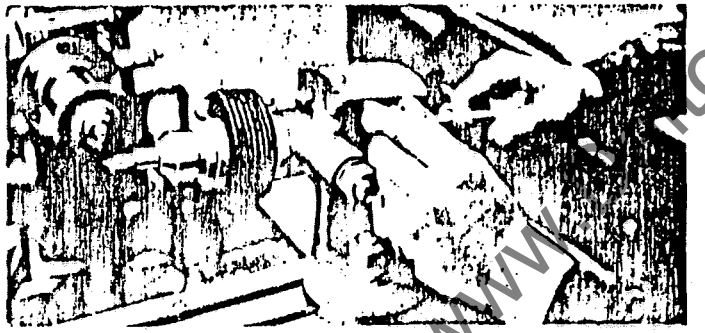
METHOD OF GRINDING FLUTES ON THE ATTACHMENT D. G.A



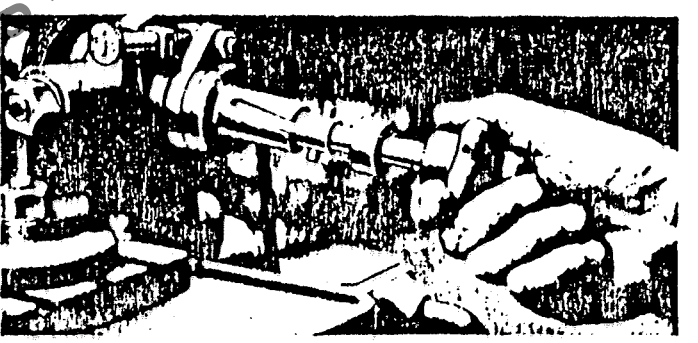
1 Bring the cutter into the correct relation with the grinding wheel by adjusting the table slides. Lock table slides and lock cutter as shown above.



2 The grinding is done by sliding the cutter past the wheel, taking care to set the stop collar near the operating handle. This motion is controlled by a grooved sleeve. Raise the table until the wheel makes contact, and draw spindle right back after making each stroke. Turn through 180^{o}, then grind the other flute.



3 The cutting edge of the cutter is adjusted relative to the grinding wheel by turning the small screw as shown above. Both flutes should be ground at the one setting. If after examination both edges have not been cleaned up, put on more radial cut and repeat the grinding operation. Both flutes should be ground after each adjustment to ensure that both flutes are ground identically.



4. After grinding one flute of the cutter, the spindle is drawn back to bring the diagonal pin clear of the bush, as shown below. It is then rotated half a turn to bring the opposite flute into position, when the pin can be re-inserted in the bush.

TYPICAL QUESTIONS AND ANSWERS ON METAL CUTTER SHARPENING.

Is a cutter received from the Stores ready for use?

No. It requires honing or stoning before use. The cutters are sent out as they leave the Grinding Machine. They are not stoned up at our Works, as the cutting edges would be damaged in transit.

Is it permissible to use an oil stone on the outside of the cutters when dull?

This is the essence of routing and the key to high performance. As soon as the cutter begins to drag, stop the machine and hone up the cutter on the outer edges until they are sharp. This can easily be done in half a minute and the method is illustrated on pages 54 and 55.

How often should a metal working cutter be stoned?

About every hour. On hard material it may be every half hour. On some soft materials every two hours, but on aluminium and alclad sheets it pays to keep the cutter sharp to prevent packing on the cutter.

How many times should a cutter be stoned between regrinds?

A cutter should stand four to eight stonings depending on the skill of the operator.

What stone should be used and should it be used dry?

A No. 183 Carborundum Slip Stone. Dip the stone in oil and paraffin to give the best results.

Should the cutters be used dry on metal?

No. Always use a lubricant consisting of paraffin and lard oil, mixed and applied to the sheets by brush before commencing to cut. The paraffin is only a thinner to help to spread the lard oil, and only enough for the purpose should be used. Excessive paraffin causes a blue smoke when cutting.

What causes metal chips to pack on the cutter?

Generally, blunt cutters. The wrong shape of cutter, especially on aluminium and alclad sheets will cause it, also a lack of lubricant.

What causes chips to pack in the guide bush?

Blunt cutters. They make shreds of swarf which work up into the bush and weld to the shank. If the cutter is correct the large curly chips cannot possibly get into the small clearance between cutter and guide bush.

What causes shudder when cutting?

The cutter has not been stoned. The rough saw edge left by the grinding wheel causes it. To cure it, stone the cutter.

Can the loss of diameter due to cutter wear be compensated for?

Yes. All Fixed Head Routing Machines are now sent out with a range of graded pins :-
.005", .010", .015", .020" on all sizes. On the Radial Machine, undersized guide bushes can be supplied.

What is the feed speed on the Router?

Feed as fast as the cutter will take it. If the cutter is sharp the job will almost feed itself and will only require guiding. If the job needs pushing the cutter is not sharp. On metal, a good speed on straight work is 4 inches per second. On intricate shapes, it is impossible to feed at this speed, and the limitation is the speed at which the operator can manipulate the job, generally, 1 to 2 inches per second.

Can sheet steel be routed?

No, only non-ferrous metals such as Alclad, Dural, Aluminium, Brass, Copper, Lead. Not Bronzes, Zincs or Tin.

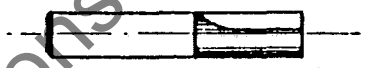
TUNGSTEN CARBIDE TIPPED ROUTER CUTTERS.

As a general rule, tungsten carbide cutters should only be used when high speed steel cutters will not stand up to the hardness of the material being routed. They are not suitable for ordinary timbers and will not cut half as cleanly as high speed steel on wood.

Tungsten carbide cutters are necessary on the following materials :-

Resin bonded plywoods, wood pulped board and wall board, plastics such as Holloplast and Catalin. Linen and paper based materials, such as Tufnol and Elephantide. Aluminium alloys, die cast or wrought, containing silicon or manganese (there are certain high silicon alloys which are too hard even for tungsten carbide on the router). All sand cast aluminium castings.

Type 60, Two Edged Panel Cutter, for cutting outside profiles only. Not suitable for sinking or cutting inside profiles.

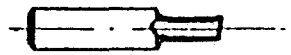


Dia.	$\frac{3}{8}$"	$\frac{1}{2}$"	$\frac{1}{2}$"
Length on cut	$\frac{3}{4}$"	$\frac{3}{4}$"	$1\frac{1}{4}$"

Type 61, Two edged Panel Cutter, for sinking and cutting on side.

Dia.	$\frac{3}{8}$"	$\frac{1}{2}$"	$\frac{5}{8}$"	$\frac{3}{4}$"
Length on cut	$\frac{3}{4}$"	1"	$1\frac{1}{4}$"	$1\frac{1}{4}$"

Type 62, Single Edge Spoon Bit, suitable for sinking and cutting on side.



Diameter	$\frac{3}{8}$"
Length on cut	$\frac{3}{8}$"

Other sizes and profile cutters of all types are available to special order.

SHARPENING TUNGSTEN CARBIDE ROUTER CUTTERS.

Tungsten carbide cutters cannot be sharpened with ordinary grinding wheels or honed with Carborundum honing stones. The grinding can be done on the N. U. Grinder and S. F. A. Attachment described on pages 45-46, using grinding wheels 86R and 87R described on page 46. Use the wheels dry; 86R for roughing, taking very light cuts, and expect to take a long time removing a small amount of carbide. Finish grind dry, using wheel 87R. In order to get a good cutting edge it is necessary to machine lap with wheel No. 145. This wheel is made from soft material and its cutting edge is impregnated with diamond dust It is expensive to use and should be used for final finishing. It can, of course, be used for grinding in place of the 86R and 87R wheels, but the wear and cost of the laps would be prohibitive. Never attempt to true the diamond lap. When using the machine lap smear the face of the wheel with oil and then take the lightest possible cuts to get a polished face and a clean edge. Finish the cutting edge with a hand lap, which is also impregnated with diamond dust and is illustrated on page 47.

The best method of using the hand lap is to immerse the lap and tool under water and hone in this position. This is recommended so that the diamond dust freed from the lap floats to the surface of the water and does not become abrasive between the cutter and the lap, causing excessive wear on the lap. If this is not possible, use as much water as possible to swill off the diamond dust.

The general instructions on stoning cutters on pages 54-55 apply to tungsten carbide cutters except that the diamond lap is used instead of the Carborundum stone.

Tungsten carbide cutters sent out from our Works require honing with the hand lap.

CONCERNING CUTTER COLLETS.

Never over-tighten a collet. The short spanner or screw key provided is designed to give the maximum grip, when used by the average operator. The use of a pipe wrench strains the collet and actually reduces the grip on the cutter.

Never allow cutters to project from the collet more than is absolutely necessary. It is a golden rule that the nearer the cutter to the collet, the better the cut and the longer the life of the cutter.