Warning : (The left-hand angular holder must not touch against the tension ring of the lathe chuck - see Diagram 28.)

Push the guide rod from the tailstock side through the right-hand angular holder to the height of the support - place the complete cutting arm on the guide rod - push the guide rod through the left-hand angular holder - place the guide arm on the left-hand end of the guide rod and tension firmly with the clamping screw. Slide the spring on to the right-hand end of the guide rod and secure in place with the clamping ring.
As the cutting arm and guide arm move towards the left during thread cutting, the spindle on the cutting arm must be located at the right-hand end of the support in the starting position. Move the support accordingly.
The spindle on the cutting arm serves to adjust for the various workpiece diameters. By rotating the spindle to the right (slacken clamp beforehand and tighten again afterwards) the cutting arm is lifted, so that larger workpieces can be processed.
When adjusting the spindle the thread cutter must be set in the external tool holder so that its tip locates at the centre of the workpiece.

Please note further :

The follower must engage in the leader without any play whatsoever, as otherwise irregularities will occur in cutting the thread. Check the correct engagement of the follower by pressing it firmly into the leader with the clamp of the cutting arm slackened, whereby the spindle must lie snugly on the support and only then should the cutting arm be reclamped.
The operating speeds for thread cutting should be taken from the tabulation of speeds.

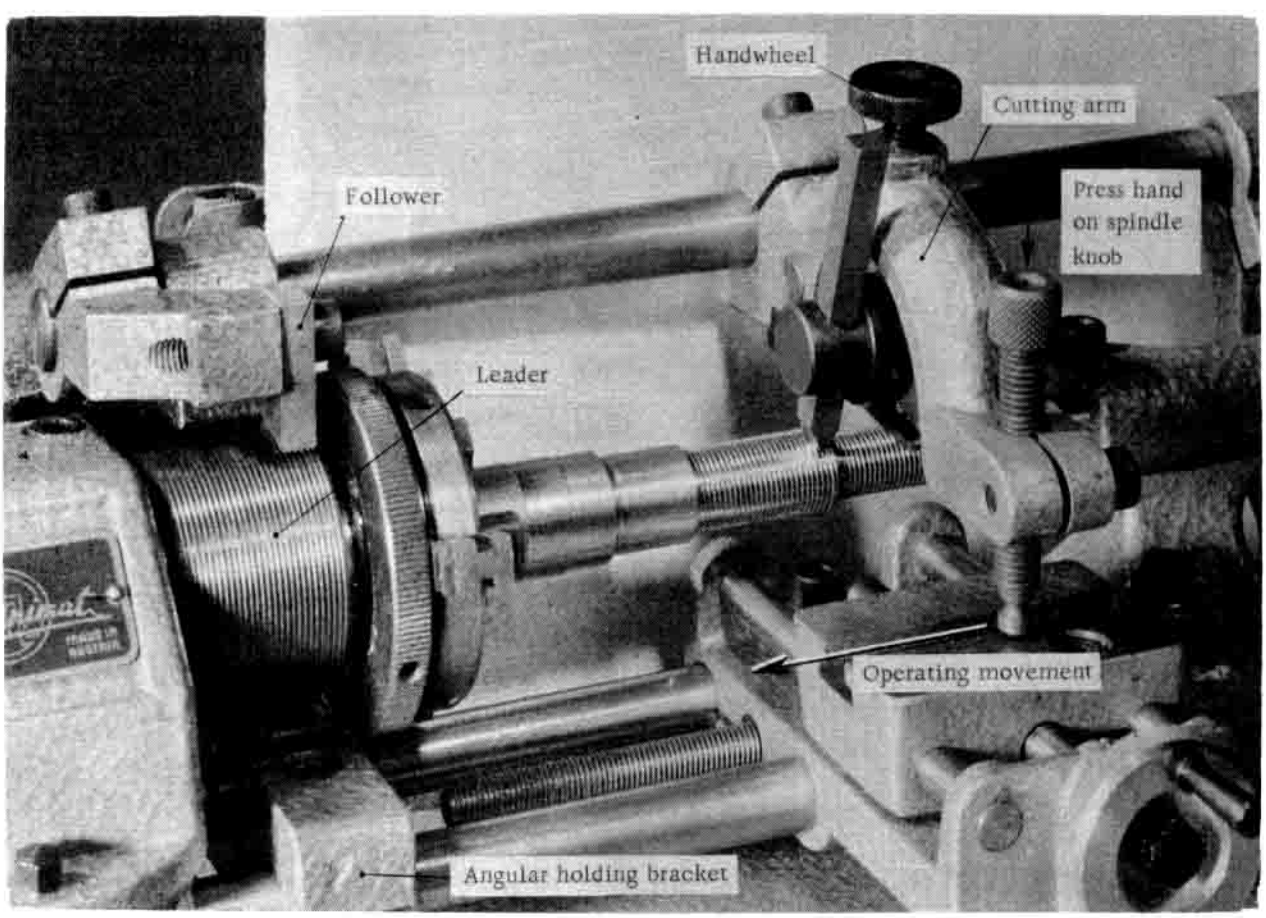


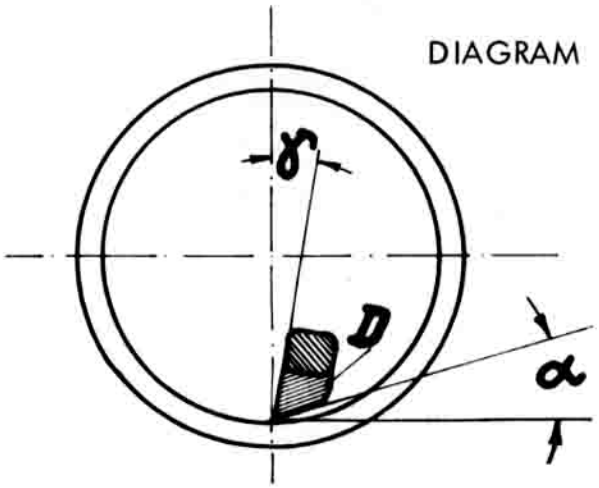

DIAGRAM 29

The actual work will now be explained in brief phrases:
Clamp thread cutting tool in external tool holder - flap the cutting device back - start the machine - swing in the cutting device, until spindle lies snugly on support (follower now engages in leader and carries cutting arm to the left) - press with the hand on the knob of the spindle, so that it does not lift from the support, but glides over it - after completing the thread groove lift up the cutting device - spring pulls cutting device to the right again. After cutting through by means of handwheel, set to cutting depth of approx. 0.004" - repeat process until maximum thread depth has been attained.
Check the finished thread with thread gauge or try screwing into thread of nut.
To cut external threads between the two lathe centres (without clamping in the lathe chuck) the procedure is as follows :
The jaws of the lathe chuck are removed - a centre is inserted in the hole of the headstock the lathe dog secured to the workpiece is taken up by one of the jaw guide grooves.

Cutting of internal threads :

Clamp workpiece (pipe, ring, etc.) in Universal-Lathe-Chuck - in place of thread cutter clamp internal tool holder with internal thread cutting tool (point downwards) in cutting arm. By moving the internal tool holder in the external tool holder set height of internal tool in relation to internal diameter of workpiece roughly - tension tool as short as possible (move cutting arm as near as possible to the headstock and clamp firmly to guide rod). Fit on internal cutting tool (see Diagram 30), set feed of cut with handwheel on guide arm. The work then proceed exactly as when cutting external threads, but care must be exercised when lifting the cutting device after completing the cut that the internal cutting tool does not hit on the opposite internal wall and damage the thread.

DIAGRAM 30




$\gamma$ = cutting angle
$\alpha$ = clearance angle
$D$ = cutting tool

## The automatic feed attachment. Order No. 1290:

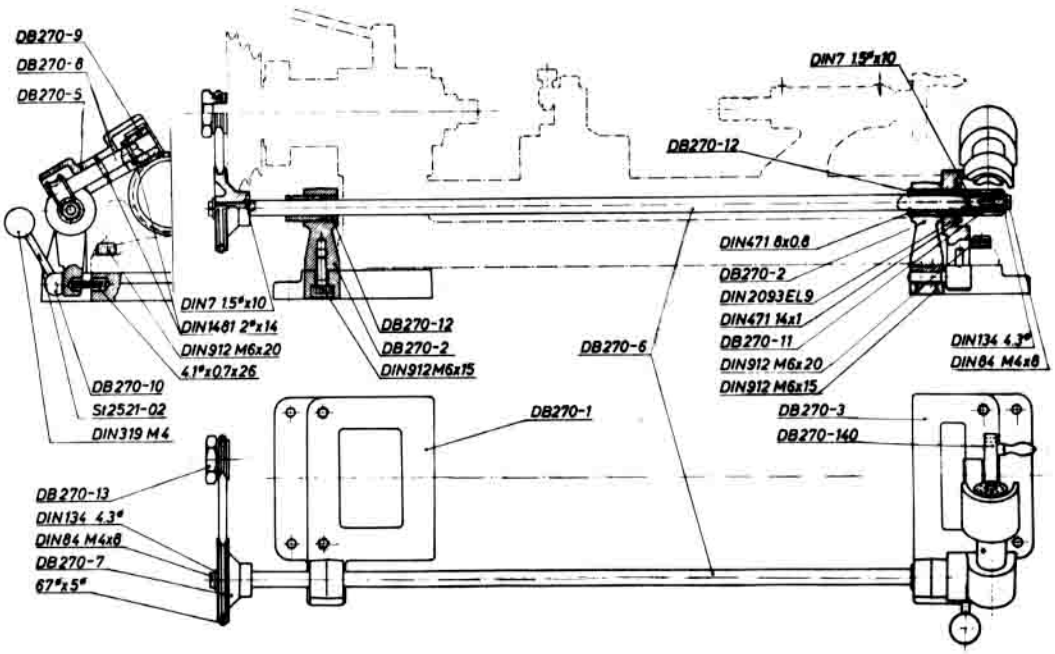



DIAGRAM 31

The UNIMAT - Feed attachment is an auxiliary device that may be mounted subsequently on to any machine. Once mounted it can remain permanently on the machine and need not be removed for any kind of work or conversion.
It is mounted as a complete unit and is supplied ready for mounting. The belt nut DB270-13 and the toothed handwheel DB270-140, as well as 4 internal hexagon headed screws are included as separate parts.

### Assembling the belt nut :

The sleeve is removed from the spindle head after extracting the pinion and slackening the two clamping screws. The clamping screw of the motor bracket is then loosened and the latter together with the motor drawn from the sleeve. To unscrew the nut from the large pulley shaft the pulley is held face side in a vice between cardboard or wood packing. The standard nut can then be unscrewed with an SW 19 spanner and the new belt nut screwed on with an SW22 spanner. The sleeve is then refitted to the headstock in the reserve sequence.

### Assembling the toothed handwheel :

The standard handwheel on the longitudinal spindle is firmly held by hand by its knurled rim and the hexagon nut (Cap nut) unscrewed with an SW 9 spanner. The standard handwheel is then unscrewed and the toothed handwheel mounted in the reverse sequence. Care should be taken to ensure that the handwheel is screwed home until there is no play axially on the longitudinal spindle, still permitting it, however, to rotate freely.

### Assembling of the feed mechanism:

The two base plates are moved aside until the fixing holes in the bed of the supermounted UNIMAT coincide with the screw holes in the two base plates. With the 4 internal hexagon headed screws supplied the two base plates are screwed in this position to the UNIMAT and tightened up until the feed shaft lies in front of the machine below the support and rotates freely in its position. Should the feed shaft jam, the two bearing blocks must be loosened

and reset. (Fixing screws are located on the underside of the base plates.) The sleeve is displaced axially in the headstock to the extent that the two recesses for the rubber ring are in alignment in the belt pulley nut and in the feed belt pulley, whereupon the rubber ring is laid on.
To switch on the feed the lever is swung to the top, whereupon the gearing on the handwheel engages under spring pressure and the longitudinal spindle and the support are set in motion. If on switch-on the gearing locates tooth on tooth, these mesh automatically. To switch off the feed the lever is pressed backwards and downwards. To switch back the support to the original starting position the feed is switched off and turned backwards by the geared handwheel. If the feed device is not being used, the driving belt should be removed, When the feed gear is used the bearing points should be lubricated with sewing machine oil.

The Double Reduction Motor Bracket. Order No. 1280:

With the double reduction gear the minimum speed (365 r.p.m.) can be reduced even further to a minimum speed of 155 r.p.m.

Assembly of the Double Reduction Gearing :

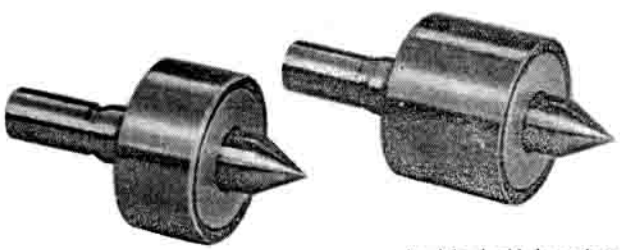
Remove the motor pulley after slackening the M4 cylindrical screws, undo the two motor fixing screws and remove motor. Withdraw spindle sleeve after slackening the clamp screws and removing the pinion. (Unscrew the set screw on the upper side of the headstock right out.) Take off standard gear and reassemble new gearing in reverse sequence. Mount motor pulley, so that the largest step faces motor.

DIAGRAM 32

Live Centres:

We distinguish between 2 types : Single ball-bearing. Order No. 1220
Double ball-bearing. Order No. 1220a
The use of the conjointly running centre is partculary advantageous, where workpieces are being machined at high speed. Whilst fixed centres tend to spread by rubbing when running fast, despite good lubrication, this is avoided in the case of the conjointly running centre by the incorporated ball-bearings. The co-running centre can be pressed firmly on to the workpiece, without laving to run it in, as with a fixed centre. The co-running centre tip can easily be ejected and changed by inserting a drift in the centric bore of the device. Also from time to time thick oil or grease should be pumped into the same drill hole.

Live centre



single double ball-bearing

DIAGRAM 33

The Polishing Spindle. Order No. 1030:

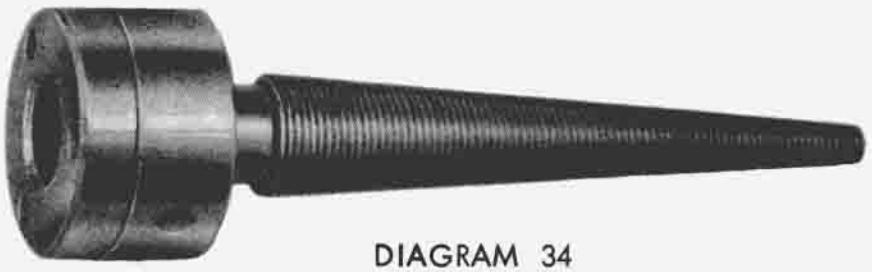


DIAGRAM 34

The polishing spindle is a conical threaded arbor, designed to take felt plates, fabric covered plates, round brushes and all other rotating plates for polishing and grinding (plates with soft cores). The advantage of a polishing spindle lies therein that all the aforesaid plates of hole diameters from 1/4" to 5/8" can be accommodated.

Flanging on:

The associated flange is screwed on to the spindle nose of the UNIMAT and machined in the same way as the lathe chuck. The actual polishing spindle can then be screwed firmly to the flange with the 3 cylindrical screws supplied.

Fitting on the plates:

The individual plates or round brushes are fitted on to the running spindle. By the increasing diameter of the thread the plates or brushes screw themselves on firmly and align themselves facially by their own centrifugal force. It is, however, recommended that no plates with hard centres be used, as this will damage the conical thread and may render it unserviceable.

Removal of plate:

The spindle pulley of the UNIMAT is firmly held with the left hand and the plate or brush loosened on the threaded cone by a small left-hand turn with the right hand, whereupon it can easily be removed. To remove the polishing spindle from the UNIMAT the tension pin is inserted into one of the three radial holes and by simultaneous countergripping of the pulley unscrewed from the UNIMAT spindle. In the case of all operations with the polishing spindle it is desirable to swing the headstock through an angle of 90°. This permits free manipulation of the workpiece. The operating speeds may be read off the speed tabulations.

The Truing Diamond. Order No. 1160:

The truing diamond is used for the truing up of grinding wheels and to obtain the smoothest top surfaces.

DIAGRAM 35

Truing up a grinding wheel:

The truing diamond is clamped in the tool holder and fine shavings ground off the grinding wheel at approx 2000 r.p.m., until the grinding wheel again runs concentrically and face-true. Perfectly smooth top surfaces are attained by linear and face turning with the truing diamond. It is clamped in the same way as a turning cutter and operated at a speed of twice that for steel turning. Adjust for shaving only with the workpiece in motion and very fine shavings with small feed (shaving depth 0.004").
A further use of the truing diamond is in the turning of plastics such as Bakelite, hard rubber and fibre-glass substances, where clean surfaces can only be achieved with difficulty with the usual turning tools.

The Collet Attachment. Order No. 1020 :

The purpose of this is to clamp round material with smooth, cylindrical surfaces of from 1/16" to 5/16" diameter, by using the collet chucks of the same diameter supplied by us. But also for the precise clamping of shank tools such as milling cutters, grinding pins, drills, countersinks and hones (or reamers). It permits strong and short clamping without damage to the workpiece surface, and in addition true, concentric running.
The special advantage of the double-cone collet chuck as against other collet chucks lies therein that workpiece of any desired length up to 1/4" in diameter can be fed through the spindle centre hole.

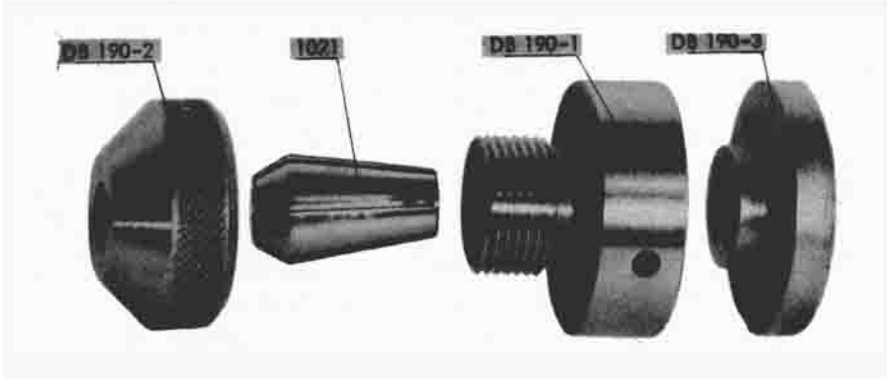



DIAGRAM 36

The collet chuck device consists of the collet chuck holder, the tension nut, the flange for fixing the complete device to the machine, also 3 sunk screws M4, 2 tension pins for tightening the appliance and the slotted double-cone collet chuck of optional clamping diameter (The type E 16). Flanging on of the collet chuck device is carried out in exactly the same manner as in the case of the three-jaw Universal-Lathe-Chuck. It must, however, be done very carefully, as otherwise the high degree of accuracy which favours the use of the collet chuck in place of other appliances would be impaired.

The Clockmaker's Sleeve. Order No. 1022:

This ancillary device permits the most precise lathe turning operations on the UNIMAT and is suitable for the direct reception of clockmaker's collet chucks of type B8.

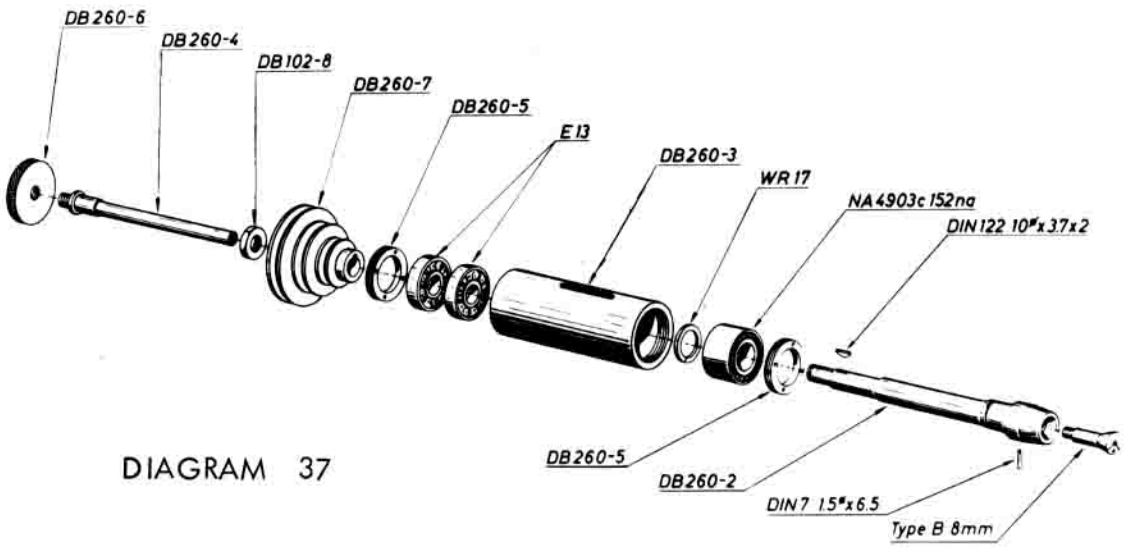


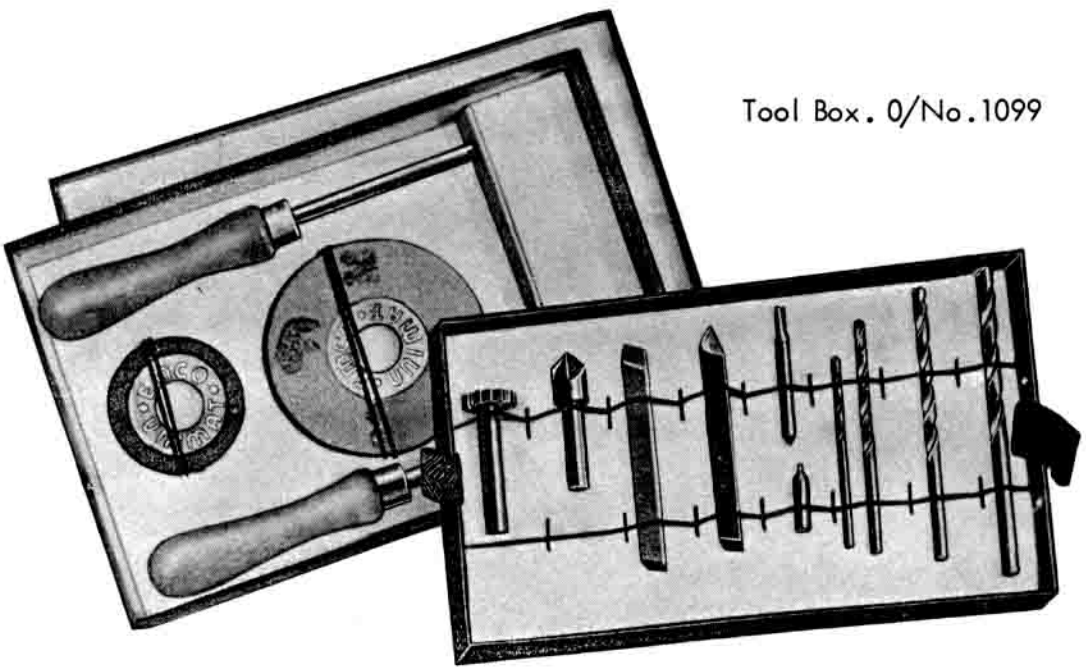

DIAGRAM 37

Installation of Sleeve:

Slacken the two clamping screws and remove the pinion on the headstock. Unscrew the set screw on the upper side of the headstock so far that the spindle sleeve can be withdrawn. The motor holding plate is drawn off by slackening the clamping screw. Then a collet chuck sleeve is installed again in the reverse sequence.

Warning: When screwing in the set screw care must be taken to ensure that the cylindrical or shoulder rim of the pin rest inside the special recess for it in the sleeve (linear groove). Tighten up the set screw and then slacken again half a turn.

Tool Box. Order No. 1099:



Tool Box. O/No. 1099

DIAGRAM 38

## CONVERSION OF THE UNIMAT INTO A WOODWORKING LATHE

### Conversion Kit. Order No. 1395 (Turning Lathe) :

This conversion kit consists of a pair of long guide columns, a swivable handtool rest and a drive centre.

### The conversion is carried out in the following way :

First of all the headstock and tailstock are dismantled. Then the nut and handwheel on the linear spindle are slackened. After removing the 4 internal hexagon screws on the underside of the bed the guide columns with the supportlinear spindle may be pushed against the headstock and then lifted off. The bearing surface of the guide columns on the lathe bed are now cleaned of shavings. In the reverse sequence the long guide columns are screwed on to the machine bed, whereby on to the front column the swivable handtool rest must be slid on. According to the length of the particular workpiece the tailstock must be mounted to the left or right of the machine bed. With this machine workpieces of a diameter of 2 3/4" and up to a length of 13.2" can be processed.

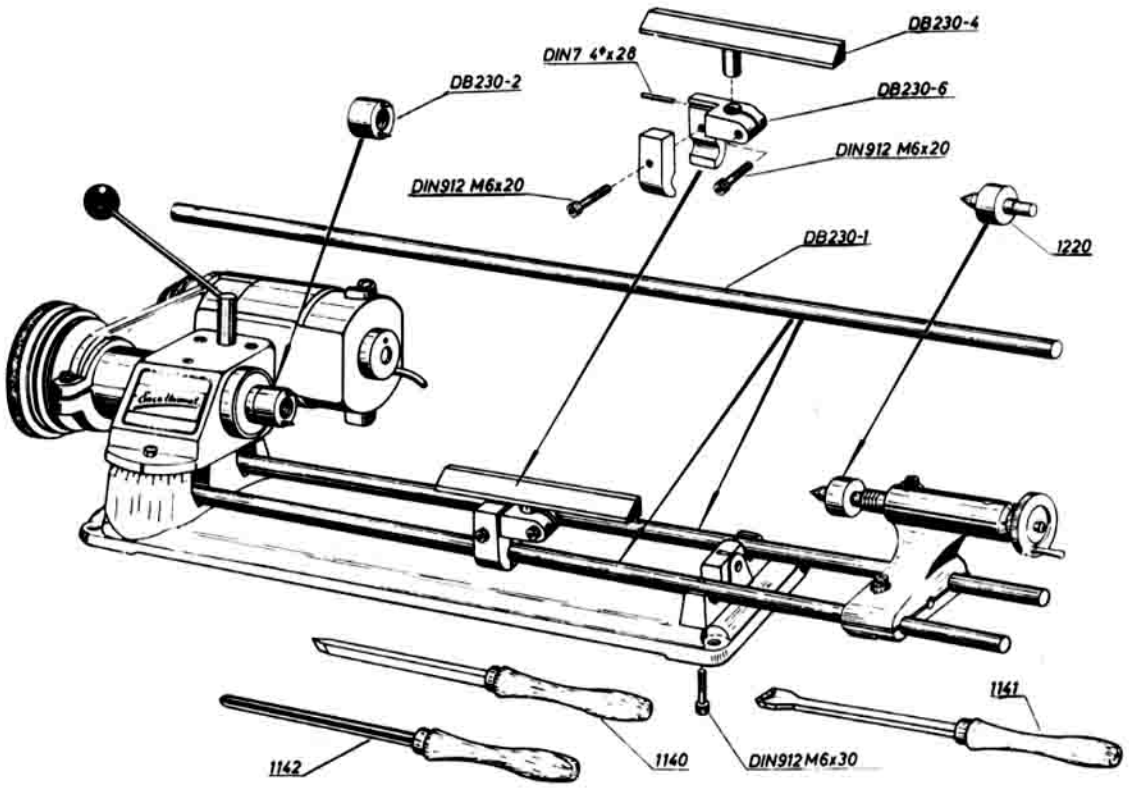



DIAGRAM 39

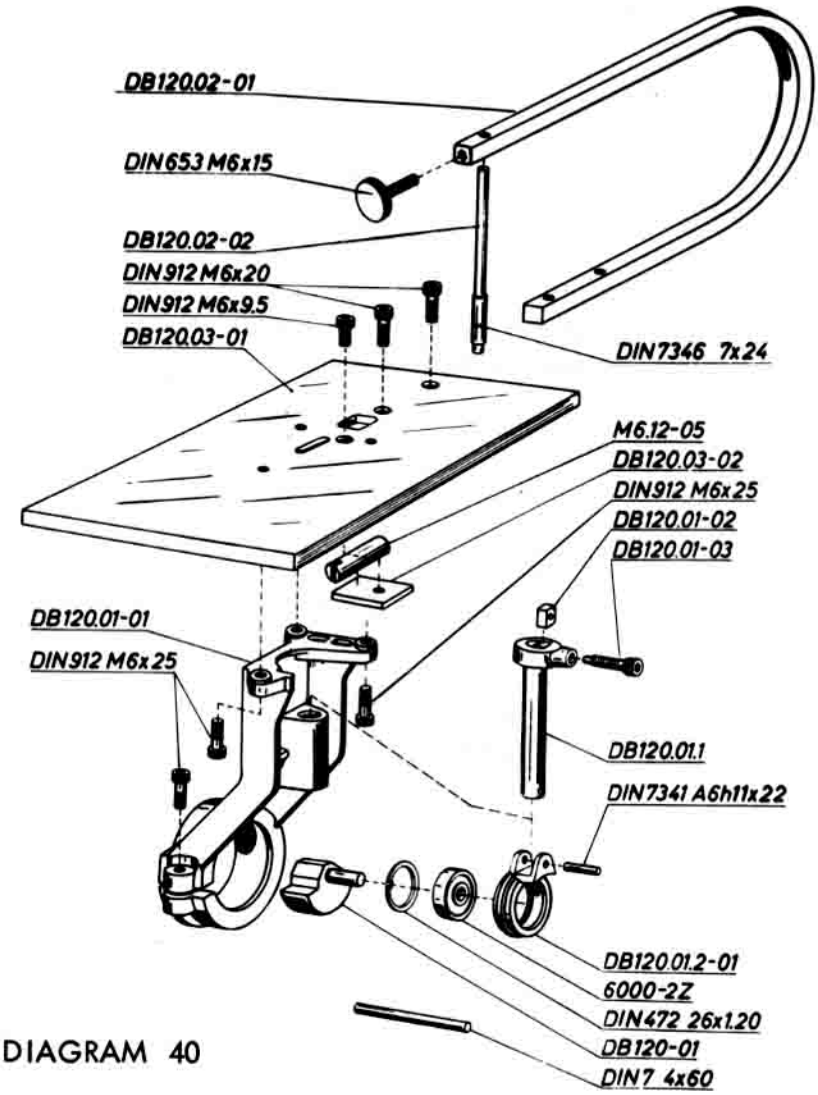



DIAGRAM 40

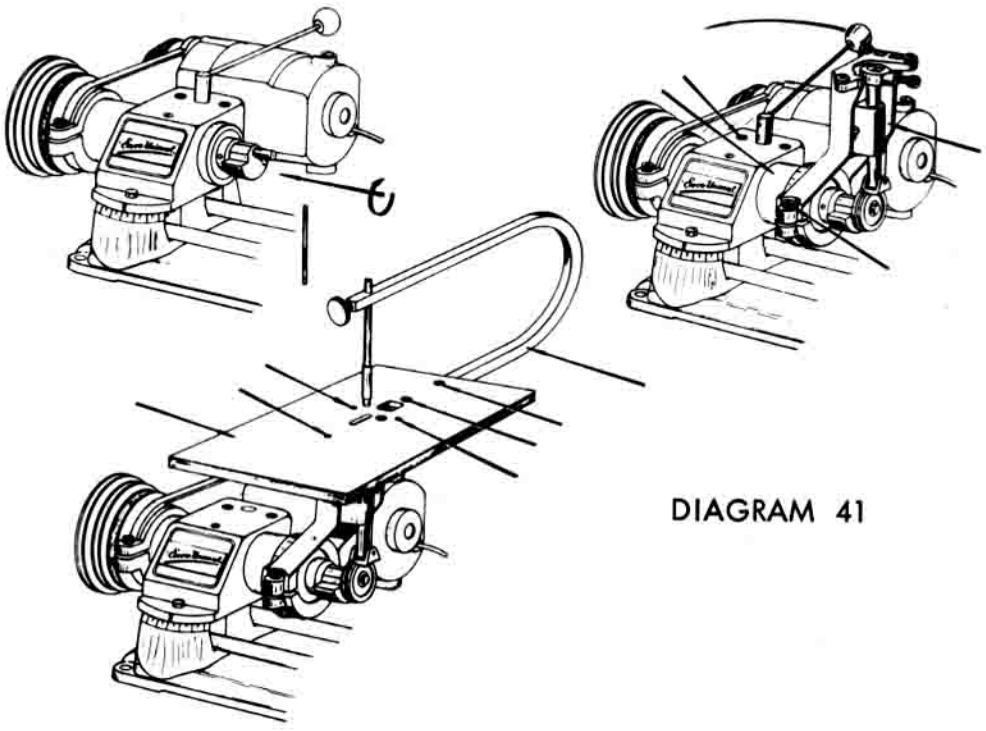


DIAGRAM 41

Fret and Sabre Saw. Order No. 1080:

A further ancillary attachment to the UNIMAT is the fret or sabre saw. With it all fret saw work in wood, metal and plastic can be carried out. Particular care should be taken that the fret saw blades supplied by us with it are not mixed up for the various materials. As despatch has to be effected in the dismantled state for the sake of convenience and ease of packing, the fret saw should be assembled in accordance with the following brief instructions. (See Diagram 40).

We supply the following parts:

1. Saw holder DB 120.01 with loosely fitted drive eccentric.
2. Saw bow DB 120.02 with saw blade holder, knurled screw and 2 screwed in socket head screws.
3. Saw table DB 120.03.
4. 3 socket head screws.
5. 1 cylindrical pin.
6. Assorted fret saw blades.

a) Screw out the two loosely screwed in socket head screws on the upper side of the saw bow, locate the saw bow underneath the table and fix it securely with the two socket head screws.

b) Locate the saw holder beneath the table and screw it on from underneath with the 3 socket head screws supplied. Care should be exercised that the saw blade holder (adjustably mounted on the saw bow), the brass guide (adjustably mounted on the underside of the table) and the clamping device (on the drawing column) are exactly in alignment.
Necessary corrections can be made by virtue of the play in the socket head screws, which secure the saw bow and saw holder to the table.

c) Tensioning of saw blade.
Thread the saw blade into the saw holder and clamp it securely in the drawing column (in clamping head), note direction of teeth ! With the saw holder adjust for thickness of wood to be cut. (Thread saw blade in from top !)

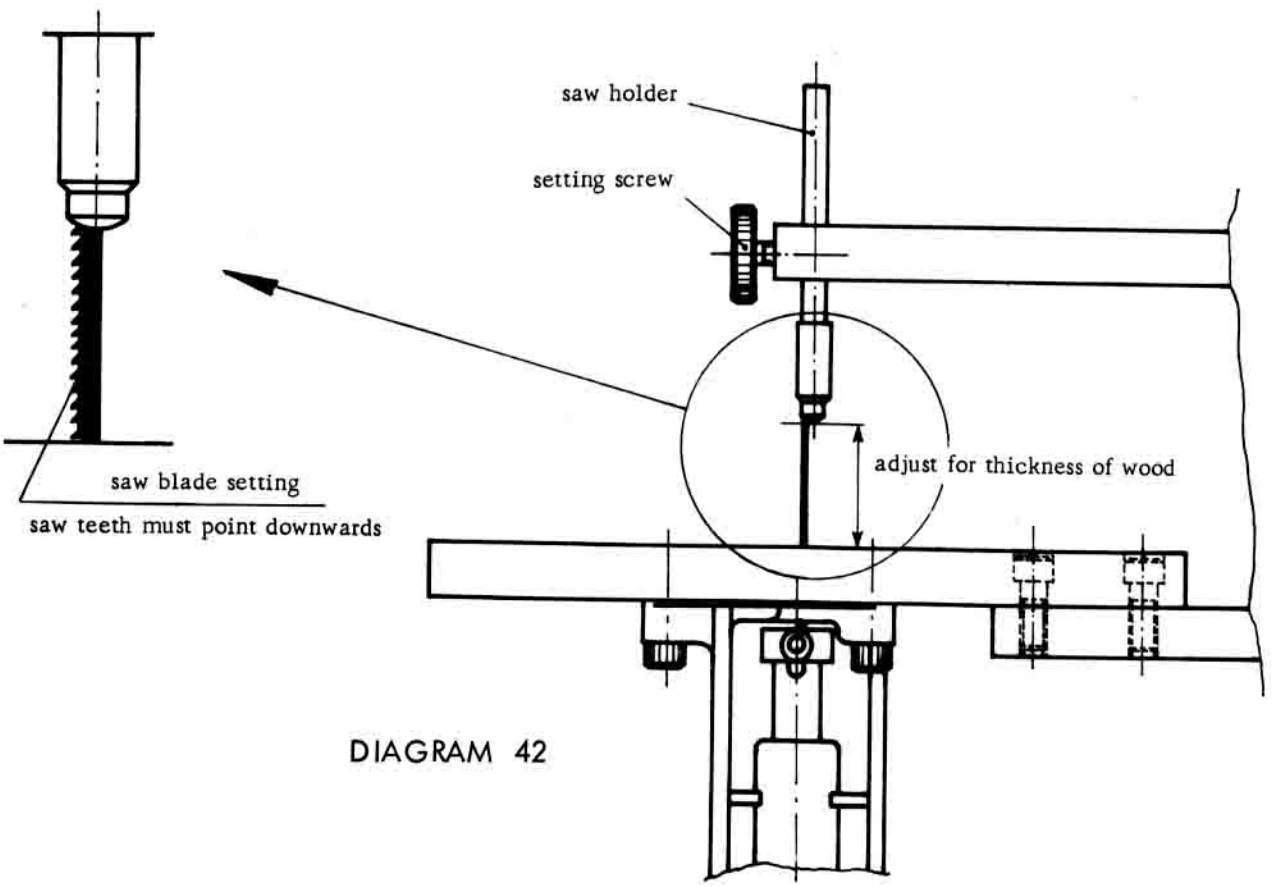



DIAGRAM 42

The assembling of the saw attachment on the UNIMAT should be carried out with the help of Diagram 41.
First of all scew the drive eccentric on to the spindle nose. For securing this firmly use the cylindrical pin supplied by us. The spindle sleeve is then slid up to the shoulder from the front, in the direction of the tailstock and the sleeve again firmly clamped. Next push up the fret saw and at the same time insert the eccentric stud (bolt) into the connecting rod.

The sabre saw:

The erection of the sabre saw is the same as the fret saw, except only for the saw bow, as the sabre saw blade is clamped in only at one end. The advantage of a sabre saw is that one can cut out the widest variety of shapes from any desired sheet size. Any desired sabre saw blades may be used.

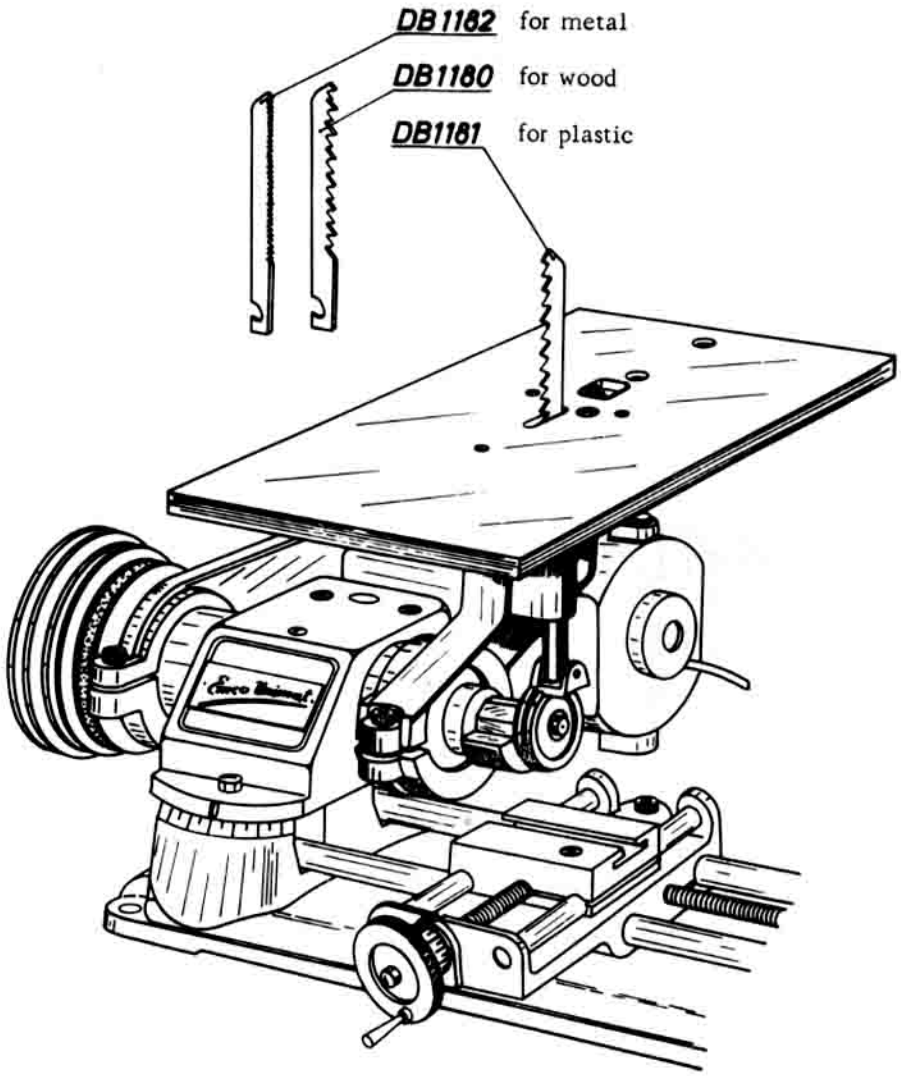



DIAGRAM 43

## Circular Saw attachment. Order No. 1240 :

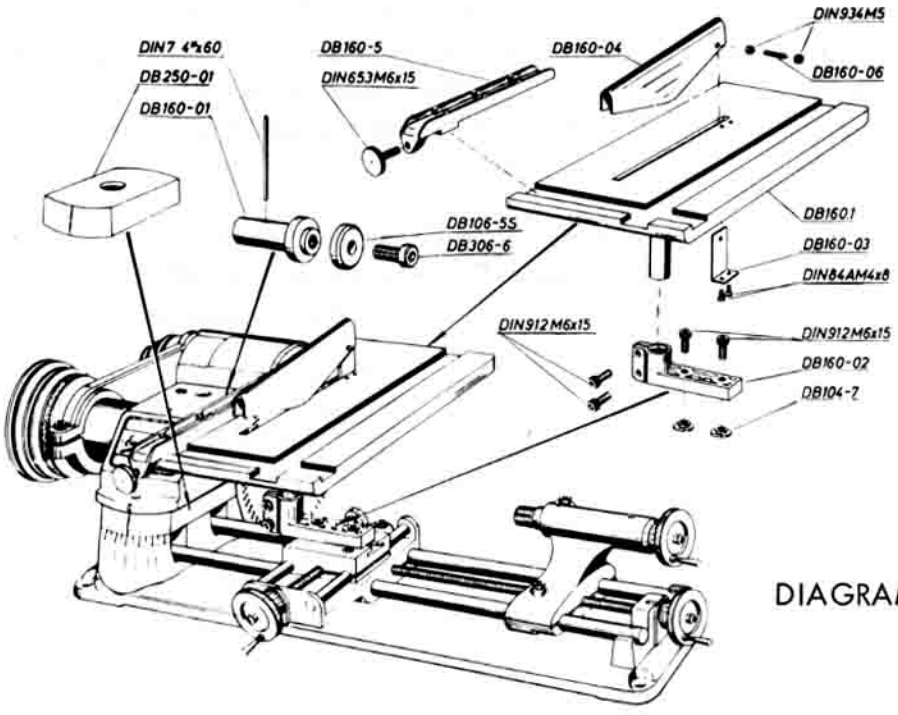



DIAGRAM 44

The circular saw attachment offers multiple application possibilities in all cutting and finishing work. According to the type of saw blade used, metal, wood or plastic can be worked. For circular sawing supplementary to the circular saw attachment the intermediate piece Order No.1240 has to be used.

## Fitting of the Saw Blade :

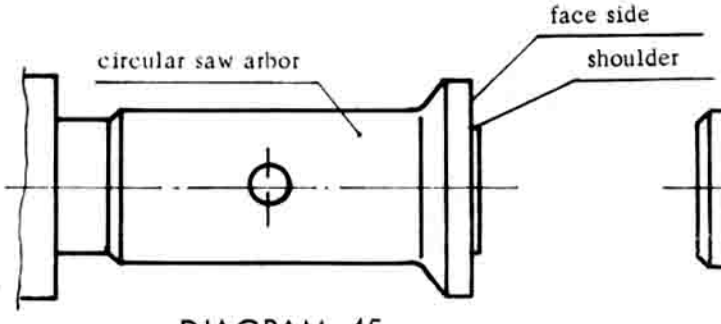



DIAGRAM 45

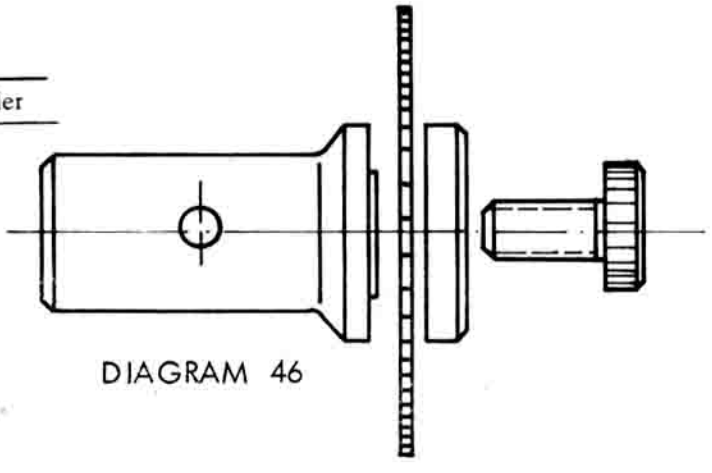


DIAGRAM 46

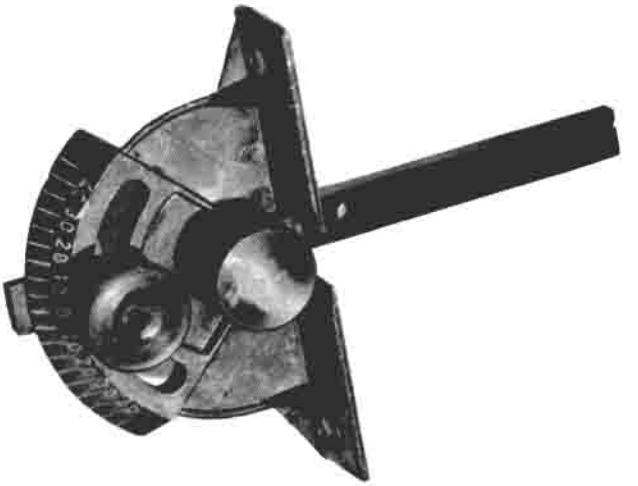
Carefully clean thread and contact surface of the lathe spindle, then securely fix circular saw arbor with the aid of the tensioning pin supplied. To ensure good concentric running, the circular saw blade must be fitted to its arbor. Set the headstock at normal for cylindrical turning. Speed 800 r.p.m. The circular saw blade must slide on easily, but without any play. Turn down fine shavings from the approx. 0.02" wide shoulder of the circular saw arbor (using point tool), until the saw blade with its 0.63" centre hole can be pushed on. Next turn off about 0.008" from the face of the circular saw arbor. Care must be taken that the transfer from the face surface to the outside turned shoulder is sharp edged. The circular saw blade must be fitted so that the teeth point in the direction of rotation.

Assembling the table:

Loosen the table on its holder, slide holder with T-nuts into groove of upper part of support and tighten up. Insert table with studs and clamp tightly so that saw blade comes to rest freely. Then fix both supports with the clamping screws. Take care that the riving knife is set exactly in alignment with the circular saw blade. Fit on the parallel stop and clamp securely to the desired width. When cutting, the workpiece which is moved forward by hand, is simultaneously pressed on to the table and against the stop. With 60 mm-blade nose of bracket DB 160-2 should look downwards, and with 90 mm-blade upwards.
Cutting is done at such a speed that the motor revolutions do not drop unduly. Exact, straight cuts can be achieved with the circular saw. By using the intermediate piece and the 3.543" (90 mm) blade a maximum cutting depth of 0.985" will be obtained.
For producing right-angled transverse cuts (square ended cuts) on short workpieces one employs the

Mitre gauge. Order No. 1241:

DIAGRAM 47



To achieve a right-angled cut on a workpiece, the mitre gauge should be used. In this work procedure the workpiece is fastened to the mitre gauge. See Diagrams 48/49. The mitre gauge can be swivelled on both sides through 45 degrees and is provided with a degree scale.

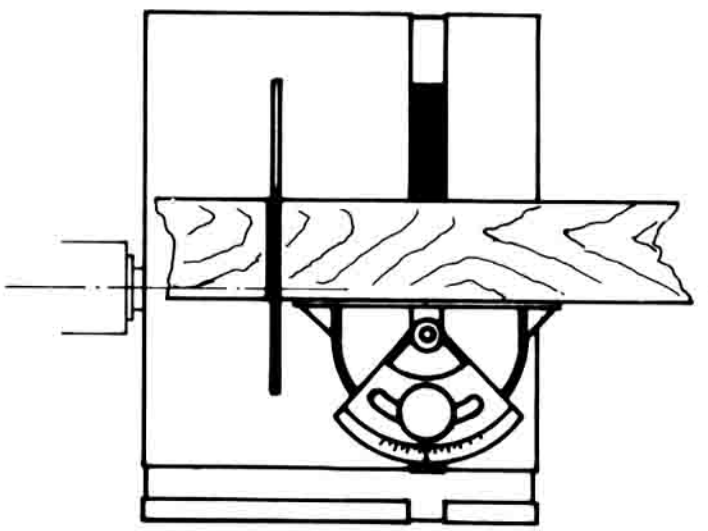


DIAGRAM 48

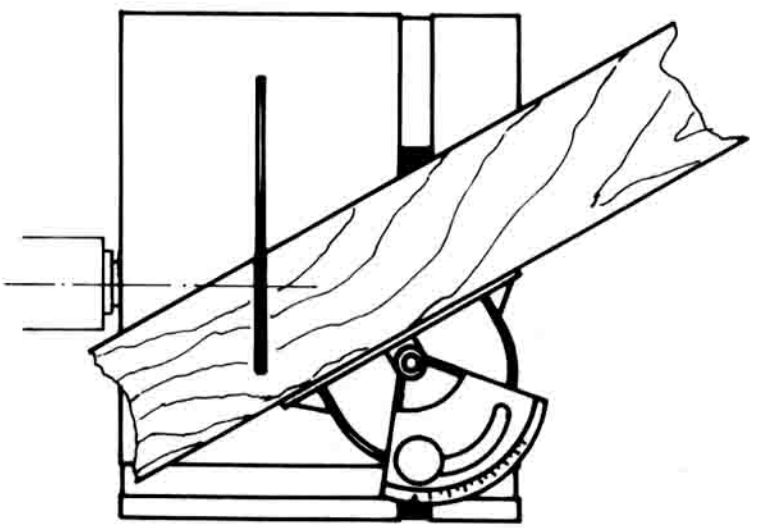
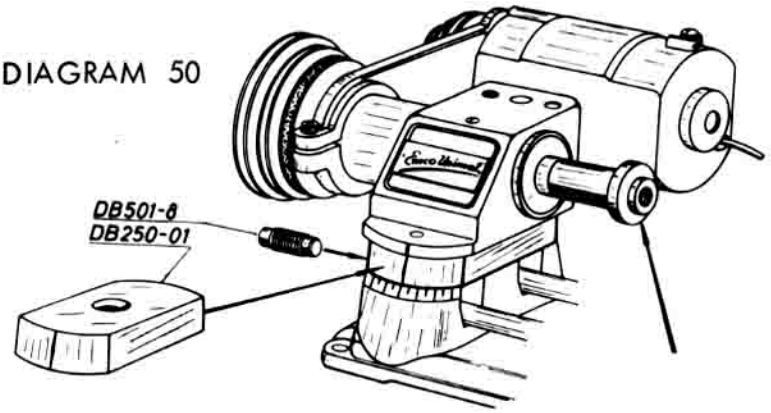


DIAGRAM 49

The best cutting outputs are achieved with the 3.543" diameter circular saw blade supplied by us at a speed of 1600 r.p.m. For this circular saw blade it is necessary to lift the head stock. An intermediate piece must be incorporated between headstock and bed.

Intermediate piece. Order No. 1311:

DIAGRAM 50




Handtool Rest, simple. Order No. 1201:
(Woodworking, turning)

After removing the tool holder the handtool rest is fitted in place of it in such a manner that the resting surface for the lathe cutter is parallel with the lathe axis and located as near to the workpiece as possible.
Those homeworkers and modelmakers, who carry out frequent lathe work are recommended to use the swivable handtool rest, Order No. 1201 a.

DIAGRAM 51

Sanding Plate. Order No. 1330:

Assembly is similar to that of the circular saw, only instead of the circular saw arbor the sanding plate with sandpaper glued thereon is screwed on to the lathe spindle. The circular saw table is set at its lowest position and together with the support pushed on to the sanding plate. For angle grinding the mitre gauge can be used with reverse installed guide gib on the circular saw table. Self-adhesive grinding sheets can also be employed.

DIAGRAM 52

Rubber Plate. Order No. 1165:

Used in the same way as the sanding plate for sanding work on shaped parts. With a lambswool covering the rubber plate is suitable for the most diverse polishing jobs. The rubber plate can be used with advantage on the hand spindle of the flexible shaft.

DIAGRAM 53

Care of UNIMAT:

The tools (drills, lathe cutters and millers) should be lubricated. When machining metals use for the lubricant ordinary machine oil (iron and steel), for wood-soap, for aluminium and brass - mineral oil or turpentine. When working on castings no lubricant is used.

When the work is finished first of all remove all shavings and then oil all the plain iron parts by means of a brush or rag, using a good machine oil. Moving parts such as a tailstock and headstock sleeve should be turned out for this purpose.
Take pains to see that the machine looks like new again after working. It will give you a greater amount of pleasure, apart from which a well cared for machine will last longer and retain its original precision. After about 1,000 working hours the two ball-bearing races in the headstock should be regreased. To do this the belt pulley on the headstock spindle is loosened, the pulley unscrewed, then withdrawing the whole lathe spindle.
After cleaning the bearings with petrol regrease them with ball-bearing grease and reassemble spindle sleeve.

## CHECKING A WORKPIECE FOR DIMENSIONAL ACCURACY

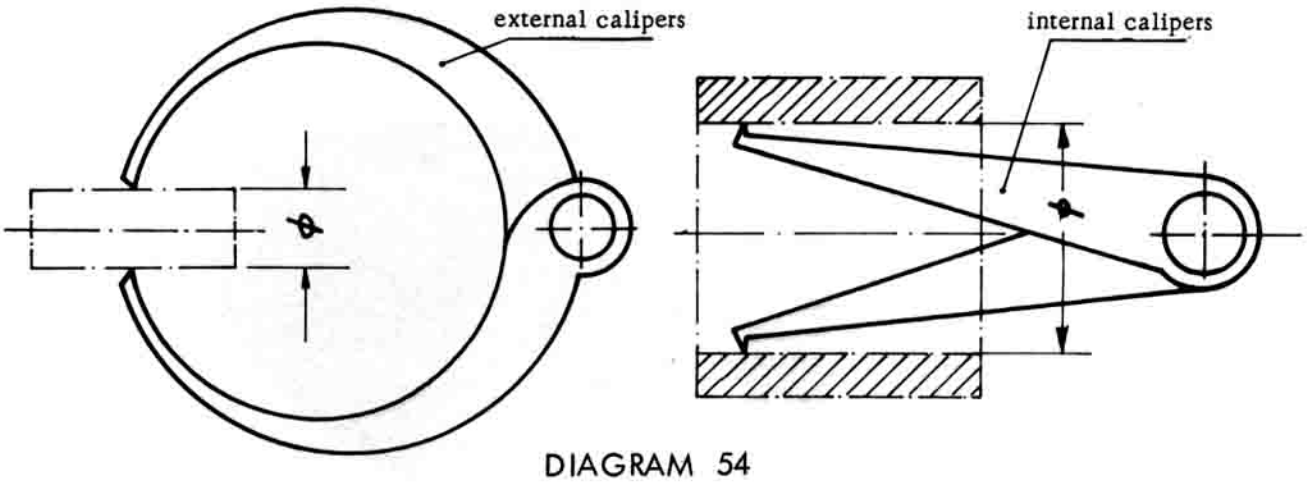



DIAGRAM 54

One of the most common methods of testing a workpiece for accuracy of dimensions is to use the sliding calipers.

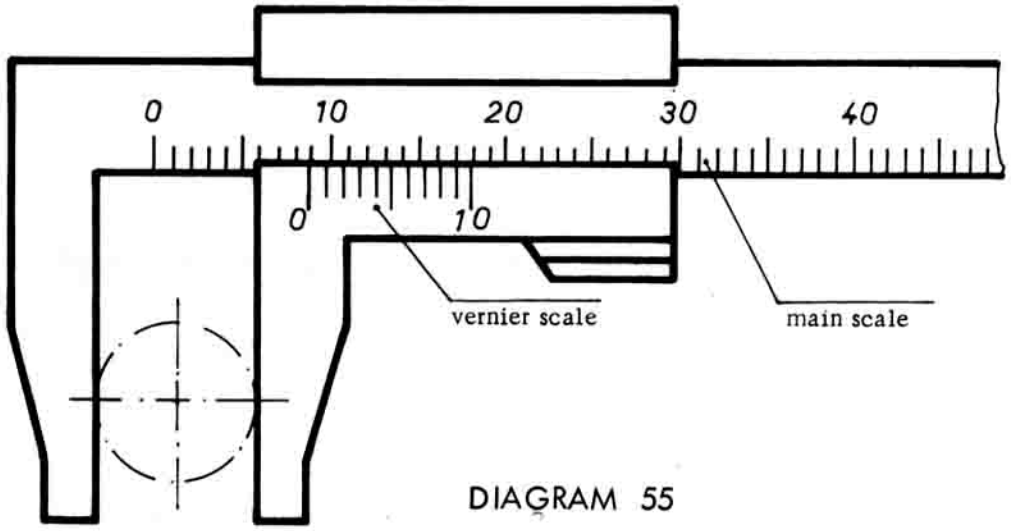



DIAGRAM 55

We will give you an example, based on the above drawing.
The full millimetres may be read off the main scale. The vernier scale division mark which coincides with a main scale division mark gives the answer to one-tenth of a millimeter.
For example the O mark of the vernier scale in the above sketch shows between 8 and 9 on the main scale. This signifies 8 whole millimeters. The 9th division mark on the vernier scale tallies with a division mark on the main scale, and this signifies 9/10th mm. The diameter of the workpiece is thus 8.9 mm.

# WORKING SPEEDS

Motor speed (Rated Output) 4000 r.p.m.

| Material | up to 3/8" | 3/8 - 3/4" | 3/4" - 1 1/8" | 1 1/8" up |
|---|---|---|---|---|
| TURNING | | | | |
| Steel | 1100(10)* | 850(7) | 685(2) | 365(1) |
| Fancy metals | 2000(11) | 1600(8) | 1100(10) | 685(2) |
| Wood, Plastic | generally 1600(8) | | | |
| THREAD CUTTING | | | | |
| All types of materials | generally 300(13) | | | |
| FRET or SABRE SAWING | | | | |
| Steel | generally 365(1) | | | |
| Fancy metal | generally 685(2) | | | |
| Wood, Plastic | generally 850(3) | | | |
| CIRCULAR SAWING | | | | |
| Steel | generally 365(1) | | | |
| Fancy metal | generally 685 (2) | | | |
| Wood, Plastic | generally 1600(8) | | | |

* the figures in brackets relate to the corresponding numbered belt settings (Page 38 )

| MILLING | Speed | Belt Setting |
|---|---|---|
| Shank milling up to 5/32" dia. | 1100 | 10 |
| up to 3/8" dia. | 850 | 9 |
| up to 3/4" dia. | 685 | 2 |
| Metal circular saw blades from 1 1/2" dia. | 365 | 1 |
| DRILLING OF STEEL | | |
| for fancy metal approx. double | | |
| up to 1/8" dia. drill | 1600 | 8 |
| 1/8 - 5/32" dia. drill | 1100 | 10 |
| 5/32-3/16" dia. drill | 850 | 9 |
| 3/16-1/4" dia. drill | 365 | 1 |
| GRINDING | | |
| Grinding wheel 2.362" dia. for tool grinding | | |
| Coarse grinding | 2000 | 11 |
| Fine grinding | 2600 | 7 |
| Cup grinding wheel | 2600 | 7 |
| Grinding pins 3/8" dia. | 3750 | 5 |
| Smaller grinding pin | 6000 | 6 |
| GRINDING WITH EMERY | | |
| Steel and fancy metal | 850 | 9 |

## BELT SETTING AND SPEEDS

These speeds apply when the load is in proportion to the rated output of the motor. Because of the main (series) characteristics of the motor the speeds increase with the machine running at no load and derease with heavier loading. The speeds given in the tabulation are mean (average) values.

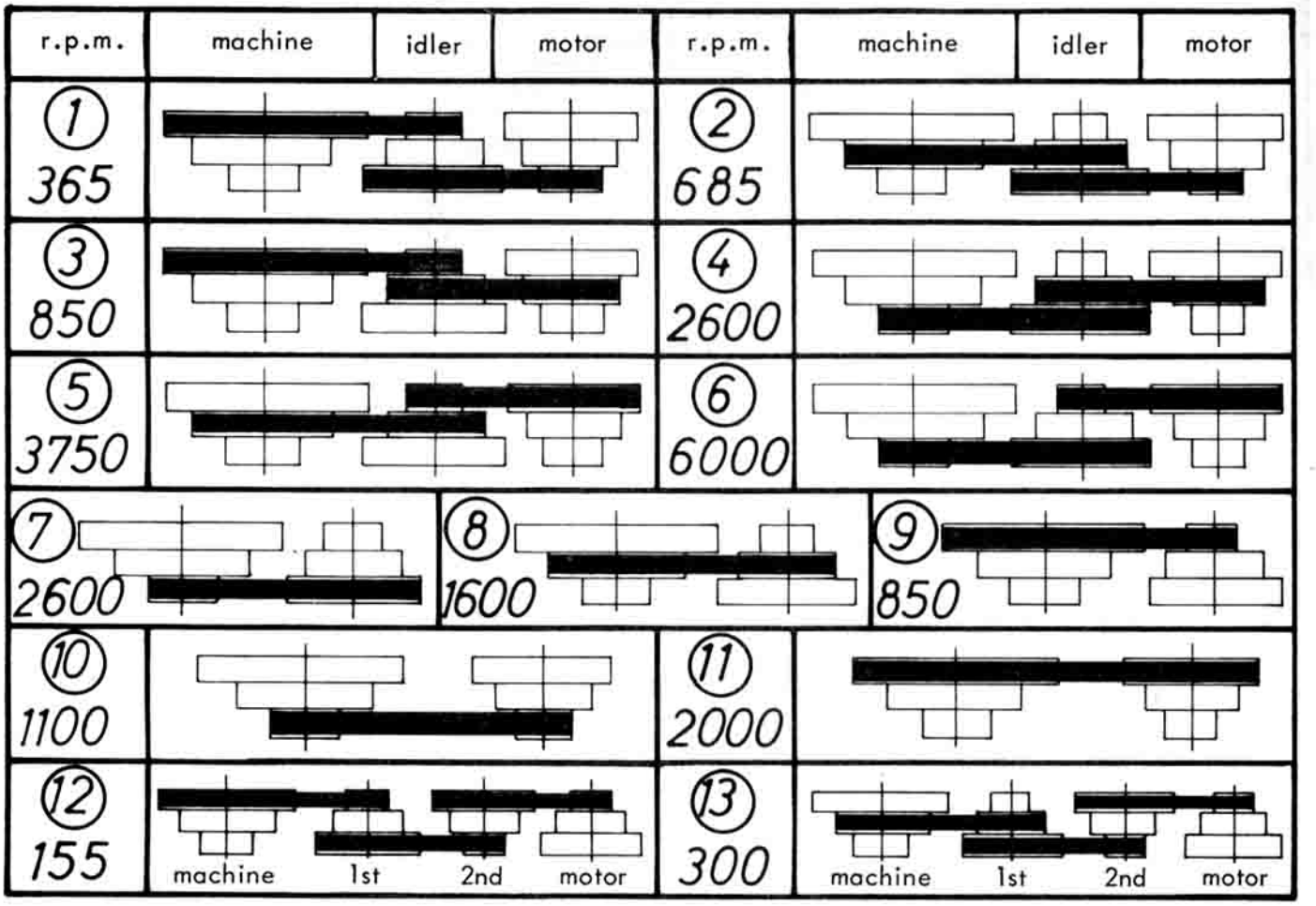



DIAGRAM 56

On the basis of an example we will show you how to calculate a working speed.

We require two values :
1.) Material (Aluminium, brass, steel, cast metal, etc.)
2.) Thickness of material (diameter) or thickness of workpiece

For our example we will use a brass rod of 19/32" diameter.

Under "TURNING OF FANCY METAL" and "MATERIAL THICKNESS OF 15mm"(0.591") a speed (number of revolutions) of 1600 r.p.m. is given in the tabulation. With the second figure, in this case an 8, we look up in the speed tabulation the necessary belt setting and with the help of the Diagram we thus set the speed on the machine.

## THE MOULDING SPINDLE

Order No.1060 This accessory permits the machining of timber picture frame and other types of moulding.

### MOUNTING THE MOULDING SPINDLE

1) Remove headstock from bed.
2) Fix vertical column with clamping head with clamping head screw facing towards the bed.
3) Mount headstock complete with motor (spindle nose facing upwards).
4) Screw cutter to spindle nose.
5) Mount moulding table on vertical column; note that:
   a) the table is flush with the column end face,
   b) that the cutter is central with the hole.
6) The moulding depth is adjusted by movement of the headstock quill and the moulding width by adjusting the fence.

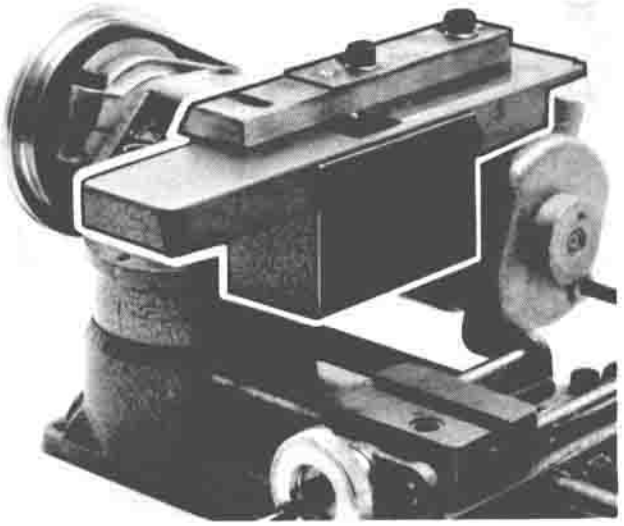
The depth of cut and the feed depend on the timber being machined.

## TECHNICAL DATA

Table size 7 7/8" x 3 1/8", cutter diameter 1.10", recommended speed 2600 R.P.M. Belt position 11.

## THE PLANING ATTACHMENT

Order No.1050 This accessory permits the planing of timber up to 1" wide.



### MOUNTING THE PLANING ATTACHMENT

1) Fit headstock to bed with packing block interposed.
2) Swing motor with mounting arm downwards and tighten.
3) Remove guard plate (2 socket head screws M 6 x 20).
4) Place cutter on spindle nose and screw into position by rotating the spindle pulley.
5) Replace guard plate.

**IMPORTANT !**

Never operate without the guard plate !

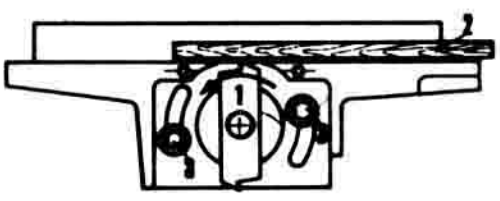
### TECHNICAL DATA

Table size 7 7/8" x 2", blade width 1.1/16", depth of cut 0.020", blade envelope 2.1/16" diameter, recommend speed 2600 R.P.M., belt position 11.

## ADJUSTING THE DEPTH OF CUT

When the cutter has to be sharpened after extensive use, it is necessary to adjust the planer body to the new cutter envelope (the cutter can be re-ground to an envelope of 1.31/32" dia.)

The adjustment is carried out as follows:



1) Fit cutter to spindle as described above (Item 1)
2) Loosen body retaining screws (2 off M 6 x 10) (Item 3)
3) Place a planed piece of timber on the table (Item 2).
4) Turn complete body in a clockwise direction, until the blade contacts the timber.
5) Lock body in this position (screws item 3).
6) Re-fit guard plate.

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