

INSTRUCTION MANUAL

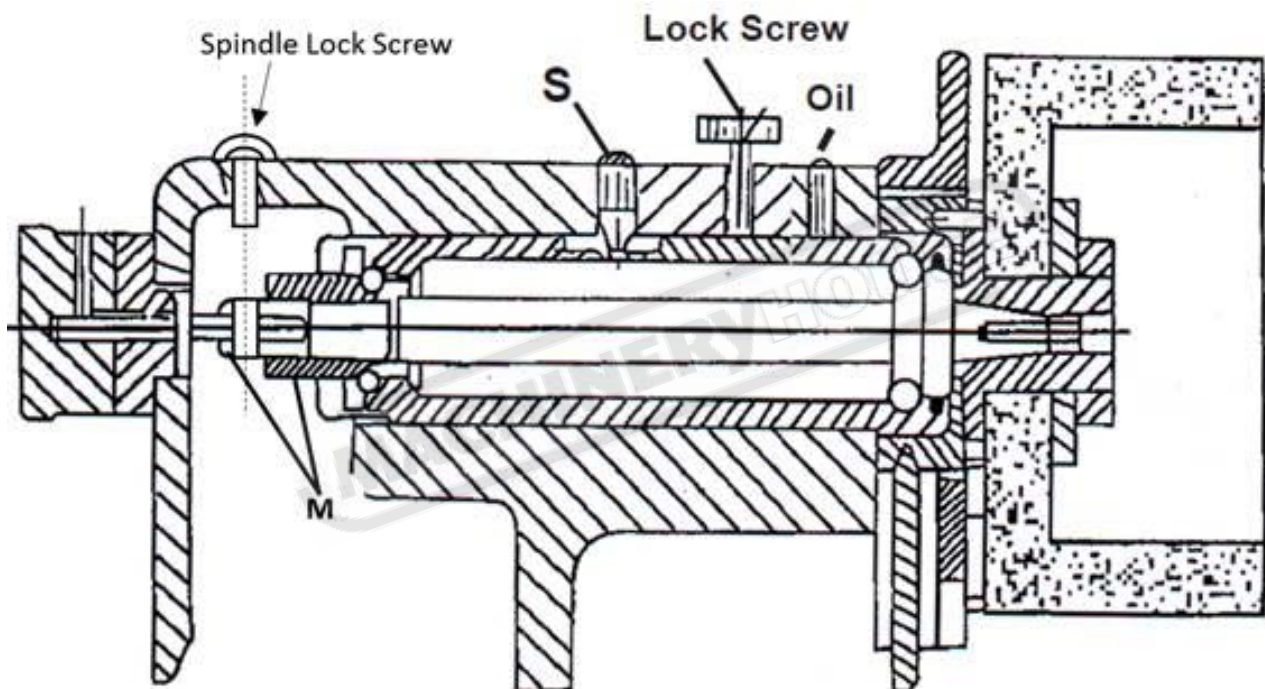
TM-U3
Universal D BIT Grinder (240V)
1/4HP



G1975

GRINDING SPINDLE

The spindle bearing has been factory-adjusted to exclude play while allowing for free-running of the spindle. In the event some play develops in the course of time, such play should be taken up by tightening the two nuts M. for this purpose, pull spindle from its seat after having loosened screw S and removed the parts as indicated. When tightening the nuts allow for a freerunning spindle. Excessive tightening will result in bearing failure. After reinserting the spindle assembly carefully tighten screw S in the bore, to hold the spindle assembly in position:



Wheel Replacement

To remove Grinding wheel you need to lock the spindle.

Firstly remove cup head cap screw (spindle lock screw)

Then line up hole in the spindle with the bolt hole,
may need to move spindle forward or back to correctly align

Use a pin to lock the spindle and the special tool to undo the wheel nut

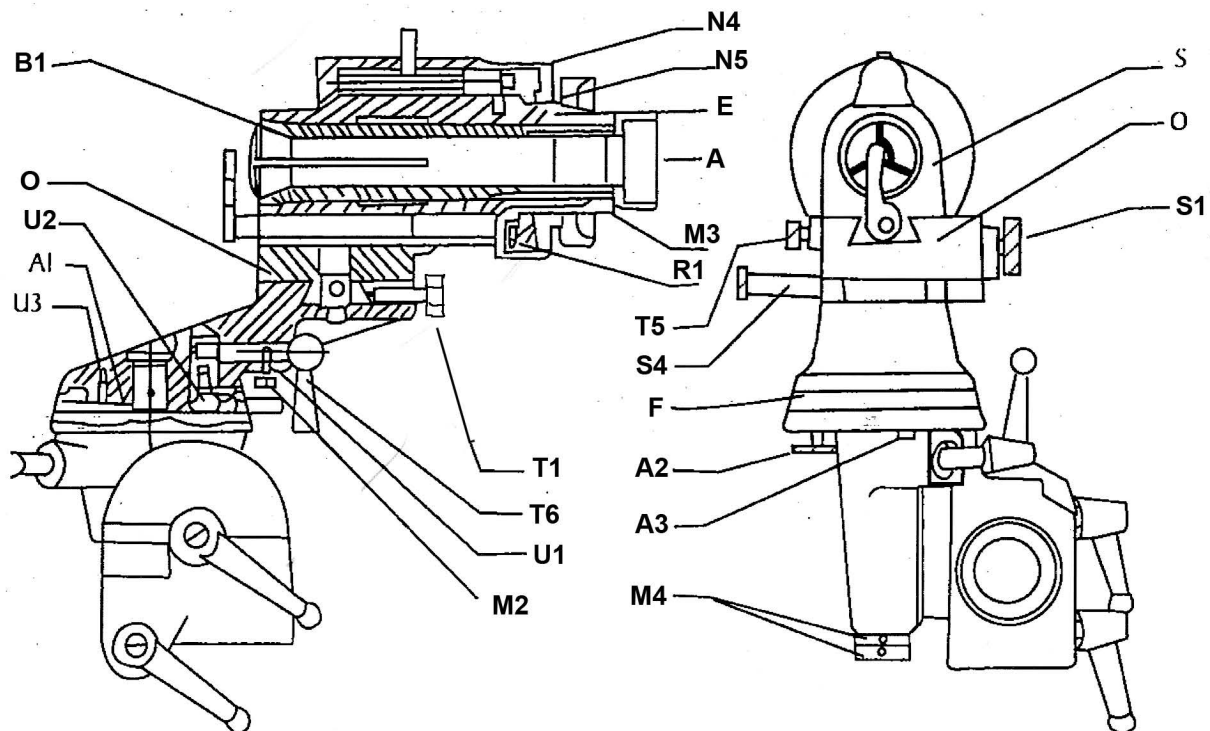
Fit new wheel, tighten nut, remove pin and replace screw

Nomenclature of Controls

The details below are used in most of the procedures listed in this manual, unless otherwise stated.

D	Wheel dressing attachment
A	Spring collet clamping quill
T1	Cross slide clamping lever
S2	Vertical swivel mount setting scale
T2	Vertical swivel mount clamping lever
T3	Horizontal swivel mount clamping lever
T4	Tubular guide clamping lever
F	Horizontal swivel mount index drum
T7	Clamping lever for adjustment along tubular guide
H	Index head bracket fine adjustment screw
G	Adjustable stop screw
T5	Index head slide clamping lever
C	Cutter lip aligning gauge
C1	Cross slide vernier scale for off-center radii
P	Spring collet index pin
S	Index head slide
S5	Index head slide fine adjustment set screw
S1	Index head slide fine adjustment screw
Q	Cross slide
T6	Index drum F clamping lever
B1	Collet sleeve
U2	Screw
A1	Stop plate for 90 degree
U3	Screw for A1
N4	Index drum
N5	Ring nut
E	Index ring bearing sleeve
M3	Nut for index sleeve
R7	Slotted disc
A3	Adjusting eccentric pin
M4	Nut

INDEX HEAD



Servicing The Index Head Bracket

General

After a major period of use it will be necessary to dismantel the index head bracket and to clean and lubricate the collet sleeve bearing, the index head slide, and the swivel arm.

Collet Sleeve Bearing

To remove the collet sleeve proceed as follows: Remove ring nut N5, index drum N4, and index ring, in that order. Remove two M3 nuts out of the index bearing sleeve E. There is a annular grease chamber in the longitudinal slide which will now be made accessible. This should then be cleaned with petrol and refilled with grease.

Slide

Release clamping screw T5 and remove the longitudinal adjusting screw. Remove the index head slide S. Clean all working surfaces, smear lightly with oil, cross slide O can not be removed. Release clamping screw T1 and turn screw S4 to move the cross slide to its extreme positions. Clean the bearing surfaces, smear lightly with oil.

Swivel Arm

To remove the swivel arm and the index head as a unit remove the two nuts M4. Clean the bearing surfaces and smear them with oil.

Adjusting the Clamping Mechanism of Index Drum F.

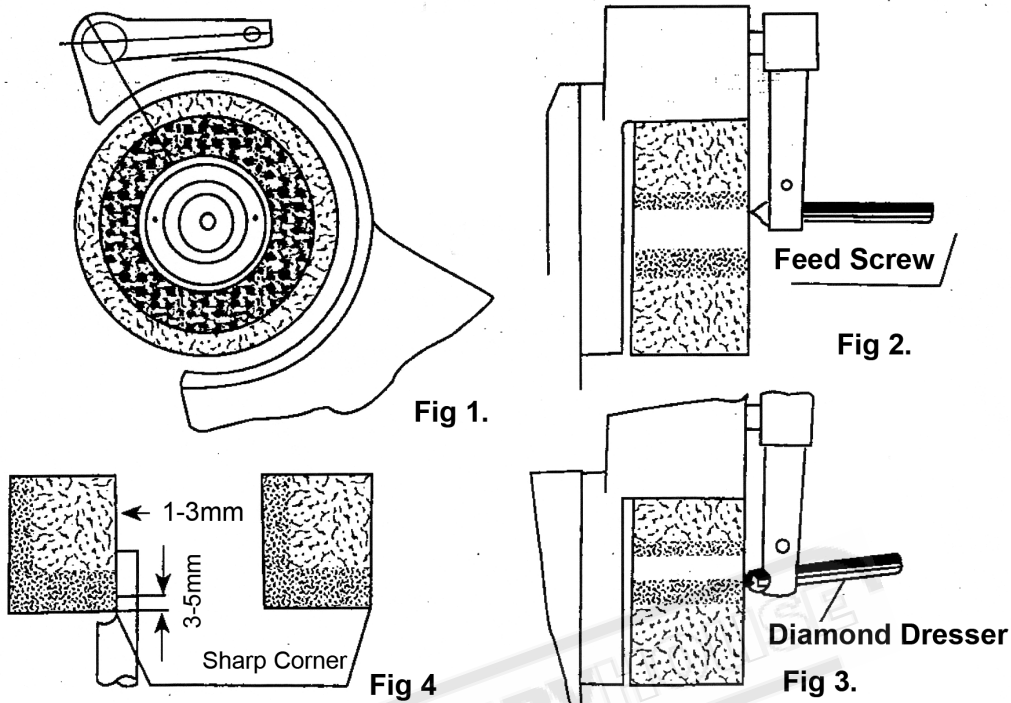
After constant use the clamping lever T6 may no longer function correctly to lock the swivel index drum F. To correct this screw U2 will need to be adjusted. To do this remove the swivel arm as described above. Remove screw U3 and stop plate A1. Back off nut M2 and screw U1 and pull out the clamping lever T6. Lift off the index drum F to access the adjusting nut and screw U2. Rotate the screw 180° relative to the nut to reduce the length. Then reassemble.

Adjusting the stop pin for the 90° Swivel Motion

Constant striking of the stop plate A1 against stop pin A2 and A3, could cause the angle to no longer be exactly 90°. Correct the adjustment by turning the two eccentric stop pin A2 and A3 until the angle is correct. Turning the stop pin A2 will change the cylindrical setting of the collet sleeve bearing, while turning stop pin A3 will adjust the 90° swivel motion.

MACHINERYHOUSE

DRESSING THE GRINDING WHEEL



NOTE ! Diamond wheels should not be dressed.

If using abrasive wheels, wheel truing and dressing should be performed at regular intervals. For abrasive wheels, dressing is done by means of a diamond set into a tip of a rod. The diamond dresser is attached to a arm. The in feed is done by the main spindle feed knob. The diamond tool assembly is supported by the wheel guard. (see Fig. 1 and 2) Wheel truing and dressing is particularly necessary when the wheel has become hardened or when sharp corner has been worn off. Wheels in this condition result in poor surface finish and overheating of the cutting tools.

Dressing:

1. Loosen clamping grub screw that holds the diamond dresser. Move the diamond dresser away from the wheel so it clears the wheel. Swing the dressing attachment in front of the wheel
2. Set diamond, dresser 1 mm away from the wheel. Lock the clamping grub screw
3. Turn Feed screw until the dressing diamond contacts the wheel. The maximum cut should be around 0.2mm.

Cutter Profiles-Tool Angle-Cutting Speeds

Cutter Profiles

As rule, single-lip milling cutters are given one of the seven basic profiles illustrated below,

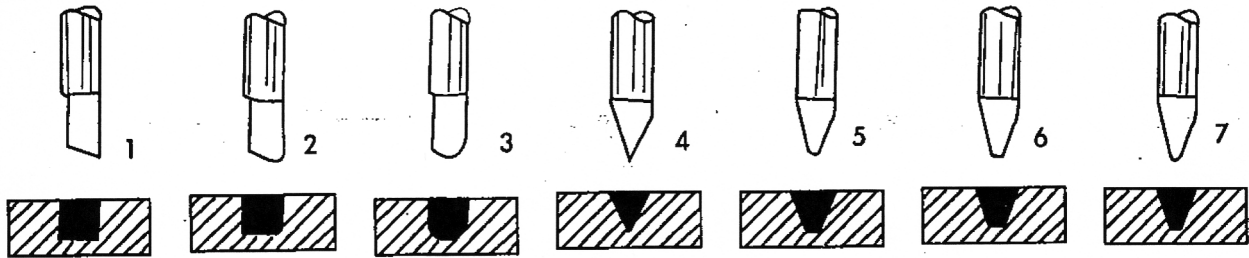
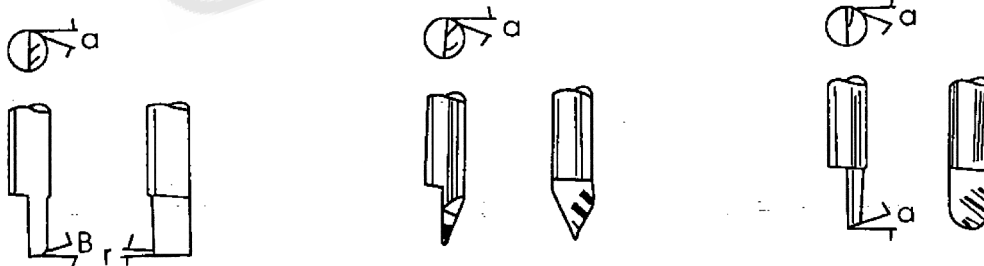


Fig 1.

- | | |
|------------------------------|-------------------------------------|
| 1. cylindrical, w/end relief | 2. cylindrical, w/off-center radius |
| 3. cylindrical, rounded off | 4. pointed |
| 5. tapered, w/end relief | 6. tapered, w/off-center radius |
| 7. tapered, w/rounded point | |

Above are illustrated the seven basic cutter profiles and cross sectional views of the profiles they will produce,



Cutter with end relief. Cutter with pointed end. Rounded-off cutter

Tool Angles

As is the case with all metal cutting tools, single-lip milling cutters require the proper amount of cutting edge relief or back rake angle for maximum stock removal and high surface finish. As regards single-lip cutters, three different tools angles will have to be taken care of these angles being used in all kinds of cutters.

Angle B applies to end relieved cutters only. Cutters having an angle of less than 20° should be relief ground at between 25° and 30°

Cutter Speeds

As regards single-lip milling cutters, it is recommended to use cutting speeds three times higher than those used with standard type milling cutters. The data tabulated below should be used only as a guide, as such factors as, drive conditions and available spindle speeds will also have to be taken into consideration. In end cutting edges the cutting speed will decrease towards the cutter center line. This effect is particularly noticeable in rounded-off cutters, As a consequence, care should be taken that stock is preferably removed by the outer portion of the cutting edge. When cutting soft aluminium, use kerosene as a coolant. When cutting celluloid, the cutter must always be in feed motion, in order to avoid the material catching fire.

Tool angles and recommended cutting speeds for single-lip cutters

Material to be cut	α	B	T	Recommended cutting Speeds for single lip cutters of High Speed Steel m/min
Grey cast iron	25°	15°	5°	60
Cast steel				
Malleable cast iron				
Machinery steel,				
57,000 to 85,000 psi (40 to 60 kg/mm)				70
85000 to 115,000 psi (60 to 80 kg/mm)				60
over 115,000 psi (80 kg/mm)				40
Tool steel				
soft grade				60
hard grade				50
Brass, 58/41				
soft grade				200
hard grade				250
Brass, 63/37	30°	15°	5°	
soft grade				120
hard grade				150
Bronze				
soft grade				260
hard grade				200
Aluminium	35°			
soft grade				200
hard grade				250
Wood	25°	15°	5°	
	35°			250
Plastic : Trolon				200
Pert inaz, Fiber	45°	25°	20°	200

Circular . Grinding of -Cutters

Grinding the Back Angle of End Cutting Edges(Round)

Cutter profiles having either on-center or-off-center radii are derived from cylindrical single lip cutters having a straight end cutting edge by rounding off the corner as shown in Fig.1(No. 2 and 3 profiles).

In rounded cutters of this type the back rake angle of the side cutting edge is the same as that of the end cutting edge.

For this reason it is necessary, :during grinding the end rake angle, that the work fixture is set at the side rake angle by means of setting scale S2. If the end cutting edge is ground immediately after grinding the side cutting edge, it will not be necessary to re-set the work fixture and to re-align the cutting lip by means of gauge C.

Setup Operations

1. Engage index pin P into short slot and bring the white dot into window O.
2. a, **No. 2 profile** : Release clamping lever T1; rotate knurled knob S4 to set cross slide by means of vernier scale C1 for desired radius (to the right) tighten clamping lever T1, (see Fig. 2) as the radiused corner is required to be tangent to the cutter diameter, the amount of off-set

$$\text{"a" is : } a = \frac{D}{2} - r.$$

Example: Given $r = 0.06''$ (1.51mm); $D = 0.30''$ (8mm)

$$a = 0.15'' (4\text{mm}) - 0.06'' (1.5\text{mm}) = 0.09'' (2.5\text{mm})$$

- b. **No. 3 profile** : The vernier scale C1 of the cross slide must be set zero (see Fig. 3).
3. Rotate fine adjustment screw H to bring the side cutting edge of the cutter into light contact with the face of the grinding wheel. Caution: do not injure the land of the side cutting edge. Now screw H must no longer be rotated.

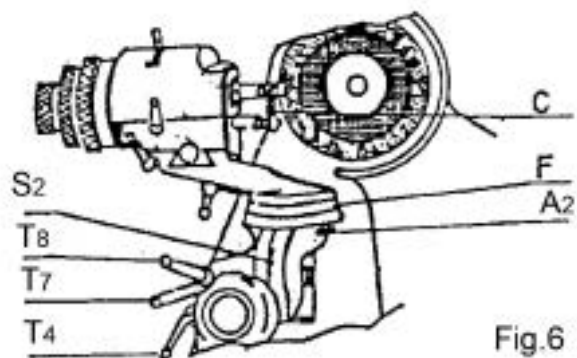
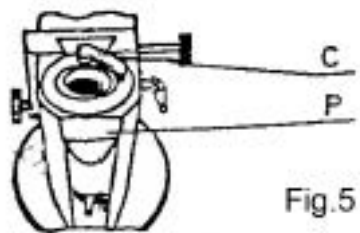
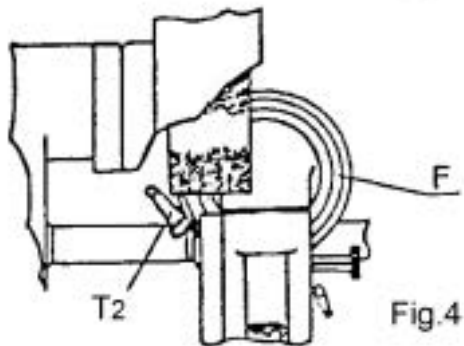
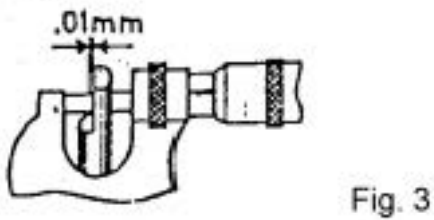
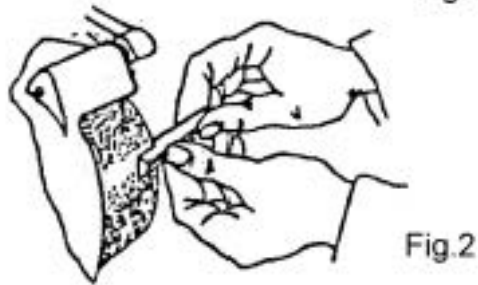
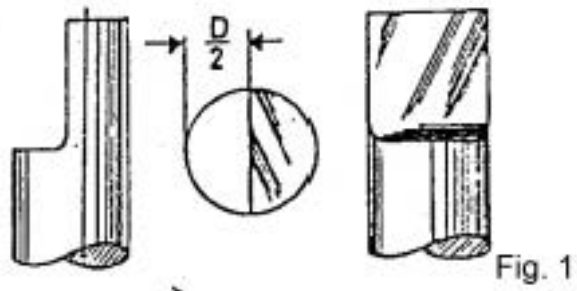
Grinding the Back Rake Angle

4. Swivel the index head through 90° (see Fig. 4). 'Depth of cut adjustment now is by index head slide Si. Rne adjustment is by mfcrometer screw S6 of the index head slide with adjustment screw S5 thghtened. The end of the cutter is rounded by slowly swivelling the index head back to its original position while the collet bearing is continuously rotated back and forth between the stops, the rotation being through 180° (see Fig. 5 and 6). Prior to grinding, be sure to with draw the index head a slight amount by rotating screw S in order to prevent overheating of the cutter by excessive stock removal.

After each pass of the grinding wheel the cutter is then fead toward the wheel by means of screw S.

In order to obtain a satisfactory cutting edge it is advisable, as a final operation to swivel the index head through 90° with the cutter lip pointing vertically upward.

In case where cutters given a No. 3 profile are intended the machiring of hard steel which requires a small of back rake angle, it is good practice to flatten the curvature of the cutter by a manual grinding operation as shown in Fig. 7.



Centering the Cutter Lip by Grinding

Cylindrical single-lip milling cutters are supplied by the manufacturer with the lip preformed by rough milling (see Fig. 1). As a result, the cutter lip will first have to be accurately centered by grinding. Rough grinding of the lip is performed manually by holding the cutter against the circumference of the grinding wheel (see Mg. 2). This operation is followed by finish grinding in the machine. The off-center tolerance is $\pm .0004$ " (0.01mm), which should be checked with a micrometer caliper (see Fig. 3 on the last page). To grind the cutter lip correctly, proceed as follows:

Setup Operations

1. Set swivel arm and index drum F at zero, tighten clamping lever T3: set vertical setting scale S2 at zero, tighten clamping lever T2 (see Fig. 4).
2. Have index pin P engage the short-slot (see Fig 5).
3. Set cutter with aligning gauge C clamp cutter in position, return aligning gauge C (see Fig. 6).
4. Withdraw index pin P, rotate spring collet bearing 180° , allow index pin P to engage the short-slot.
5. Shift index head bracket along tubular guide to bring cutter lip into light contact with end face of grinding wheel. Be sure, prior to tightening clamping lever T7, to align vertical swivel mount index mark with tubular guide.
Tighten clamping lever T7, release clamping lever T4.

Centering the Cutter Lip

6. Fine adjustment screw H serves to set the index head accurately relative to the wheel and to provide the desired depth of cut. The travel of the cutter past the wheel can be limited by means of adjustable stop screw G.- Thus it is possible, during grinding to advance the cutter as far as it will go. To bring the cutter lip within the prescribed off-center tolerance, reciprocate the index head bracket while advancing the cutter by rotation fine adjustment screw H.

In order to prevent the cutter from being overheated, it is recommended to leave only a narrow cutting zone on the grinding wheel (see page 5 "Dressing the Grinding Wheel"). The length of the, cutter lip should equal one and one half times the diameter of the cutter.

It is not advisable to increase the length of the cutter lip beyond a certain limit! In the case of deep engraving work where stepped cutters are used the shank of the cutter will be increased instead of the lip,

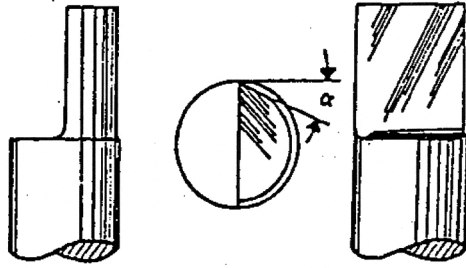


Fig.1

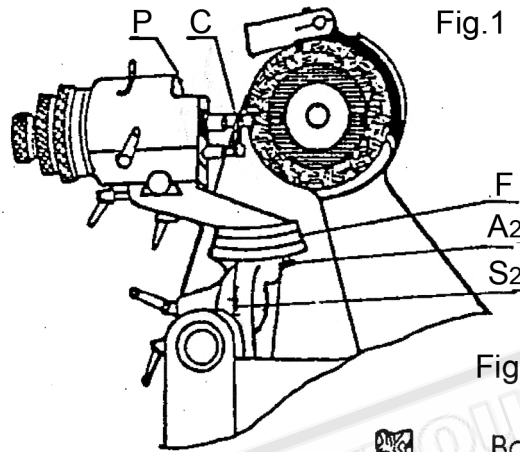


Fig.2

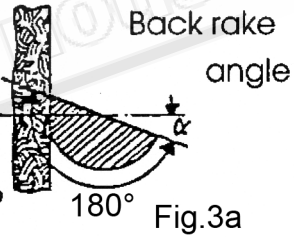


Fig.3a

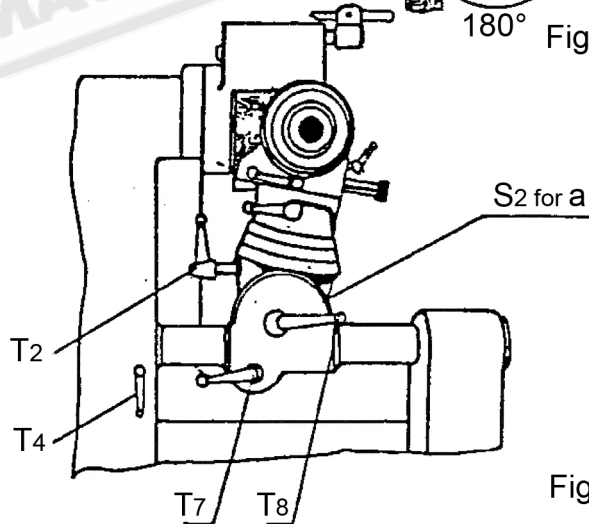


Fig.3

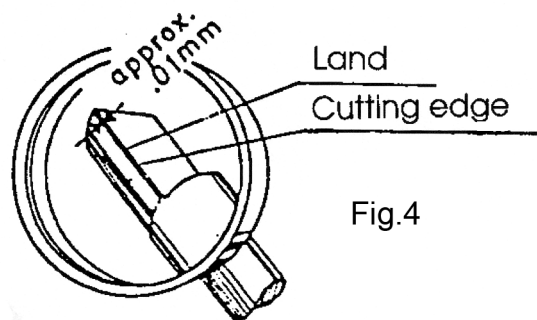


Fig.4

Circular Grinding of Cutters

Grinding the Back Angle of Side Cutting Edges

After centering the lip it will be necessary to grind the back rake angles to the sides of the cutting edge and the end cutting edge. The back rake angles of both cutting edges should be selected to suit the material to be cut.

Setup Operations

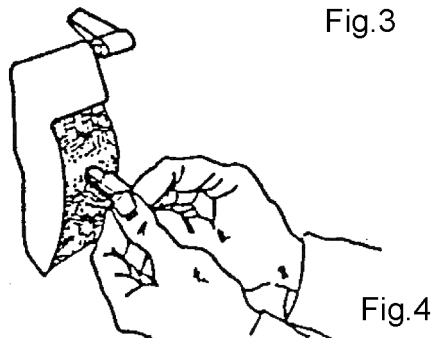
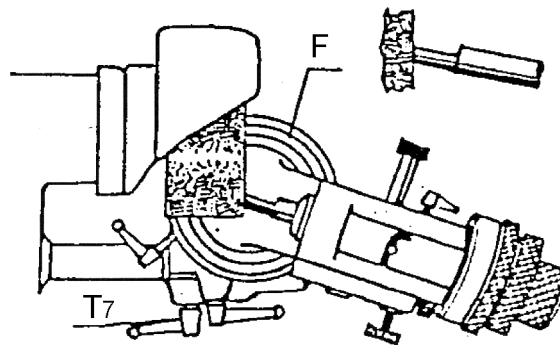
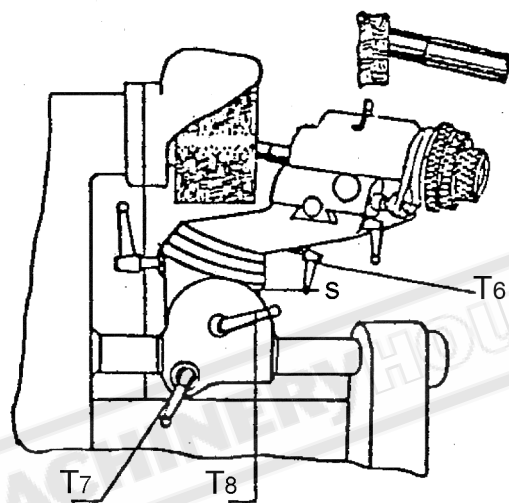
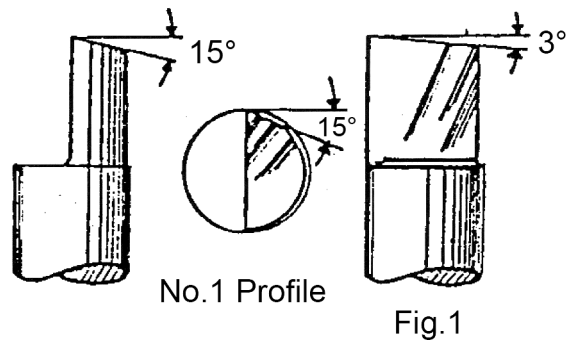
1. Rotate swivel arm to set index F at zero; tighten clamping lever T3.
2. Engage index pin P into the long slot.
3. Align cutter by means of gauge C; grip cutter in position return gauge C (see Fig.4).
4. Release clamping lever T2; set swivel arm at desired back rake angle using setting scale S2; tighten clamping lever T2 (see Fig, 3).
5. Tighten clamping lever T4; release clamping lever T7; shift work fixture on tubular guide to bring cutter into light contact with grinding wheel, tighten clamping lever T7; release clamping lever T4.

Circular Grinding

6. Draw index pin P out of the slot; grind desired diameter by rotating spring collet bearing through 360°. During this operation slowly rotate adjustable stop screw G, while continuously rotating the spring collet bearing, to advance the work fixture past the grinding wheel; this will produce uniform stock removal. Fine adjustment during circular grinding is by screw H. Stop screw G is used to establish the length of the cylindrical portion which should always be slightly longer than the cutting lip.
7. Engage Index pin P into short slot to enable the collet bearing to be rotated 160° between the index plate stops.

Grinding the Back Rake Angle

8. When grinding the back rake angle, use the fine adjustment screw H over the entire range of rotation of the collet bearing (see Fig. 3a). Grinding of the back rake angle is positive controlled. The angle is required over the entire length of the cutting lip. The vertical swivel bearing, which permits the work holding fixture to be swung back, enables relief angles up to 40° to be produced, Relief angles over 40° can be obtained by additionally rotating the collet bearing in the index head. (Only for cylindrical or tapered cutter with straight end cutting edges or for pointed cutters.) Upon completion of grinding operations a very narrow land must remain at the cutting edge (see Fig. 4).
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Circular Grinding of . Cutters Grinding the Back Angle of End Cutting Edges(Straight)

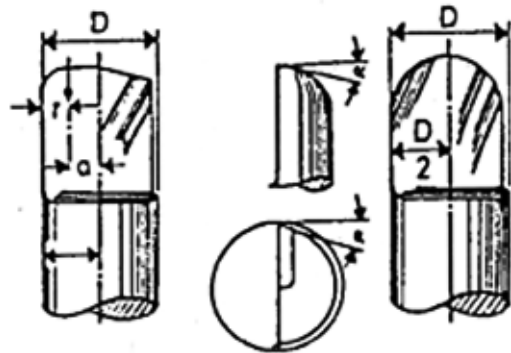
The end cutting edge illustrated in Fig.1 may be ground In an operation immediately following the grinding of the side cutting edge; or it may be ground independently. In the latter case the cutter will have to be aligned by means of gauge C and clamped in position. Whenever a single-lip cutter is to be ground, the aligning gauge will have to be used, as one leg of the cutting angle should be selected to suit the material to be cut.

Setup Operations

1. Engage Index pin P into the long slot,
2. Release clamping levers T2, and using setting scale S2, set swivel arm at approx. 3°
Tighten clamping lever T2. Release clamping levers T3 and T6 and hold the Index drum F against stop and, beginning at 90° position.
3. Set the swivel arm at the desired angle; for example set the arm at 75° for back angle of 15° (see Fig. 2 and Fig. 3). Tighten clamping lever T3 and T6.
4. Tighten clamping lever T4 and release lever T7. Shift the work fixture on the tubular guide to bring cutter into light contact with grinding wheel. Tighten clamping lever T7; and release lever T4.

Grinding the Back Rake Angle

5. Fine adjustment screw H serves to set the index head laterally relative to the wheel and to set the work for the desired depth of cut.
It is also possible to produce the desired back rake by holding the cutter against the circumference of the grinding wheel as is shown In Fig.4, _



No.2 Profile No.3 Profile Fig.1

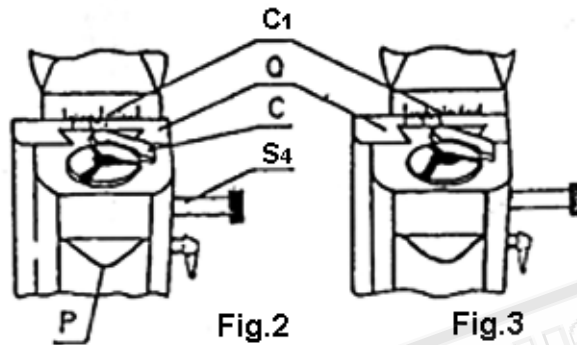


Fig.2

Fig.3

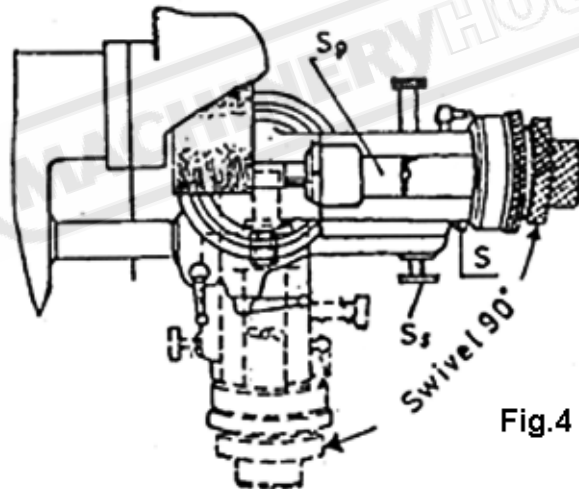


Fig.4

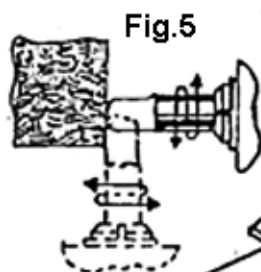


Fig.5

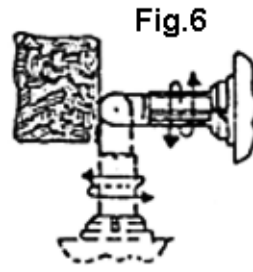


Fig.6



Fig.7

Circular Grinding of -Cutters Grinding the Back Angle of End Cutting Edges

Cutter profiles having either on-center or-off-center radii are derived from cylindrical single lip cutters having a straight end cutting edge by rounding off the corner as shown in Fig.1(No. 2 and 3 profiles). In rounded cutters of this type the back rake angle of the side cutting edge is the same as that of the end cutting edge.

For this reason it is necessary, during grinding the end rake angle, that the work fixture is set at the side rake angle by means of setting scale S2. If the end cutting edge is ground immediately after grinding the side cutting edge, it will not be necessary to re-set the work fixture and to re-align the cutting lip by means of gauge C.

Setup Operations

1. Engage index pin P into short-slot; and bring the white dot into window O.
2. a. **No. 2 Profile** : Release clamping lever Ti and rotate knurled knob S4 to set cross slide by means of vernier scale C1 for desired radius (to the right). Tighten the clamping lever Ti, (see Fig. 2) as the radiused corner is required to be tangent to the cutter diameter, the amount of off-set

$$\text{"a" is } a = \frac{D}{2} - r.$$

Example : Given $r = 0.06''$ (1.5mm); $D = 0.30''$ (8mm)
 $a = 0.15''$ (4mm) - $0.06''$ (1.5mm) = $0.09''$ (2.5mm)

- b. **No. 3 Profile** : The vernier scale C1 of the cross slide must be set zero (see Fig. 3).
3. Rotate fine adjustment screw H to bring the side cutting edge of the cutter into light contact with the face of the grinding wheel. Caution ! Do not injure the land of the side cutting edge. Now screw H must no longer be rotated.

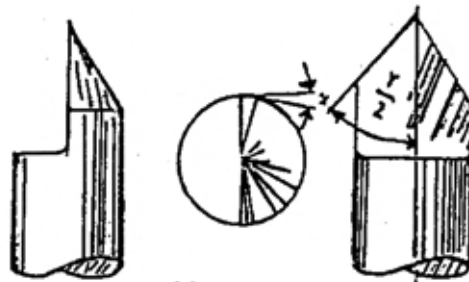
Grinding the Back Rake Angle

4. Swivel the index head through 90° (see Fig, 4). Depth of cut adjustment now is by index head slide S1. The adjustment is by micrometer screw S6 of the index head slide with adjustment screw S5 tightened. The end of the cutter is rounded by slowly swivelling the index head back to its original position while the collet bearing is continuously rotated back and forth between the stops, the rotation being through 180° (see Fig. 5 and 6).

Prior to grinding, be sure to withdraw the index head a slight amount by rotating screw S in order to prevent overheating of the cutter by excessive stock removal. After each pass of the grinding wheel the cutter is then feed toward the wheel by means of screw S.

In order to obtain a satisfactory cutting edge it is advisable, as a final operation, to swivel the Index head through 90° with the cutter lip pointing vertically upward.

In cases where cutters given a No. 3 profile are intended for the machining of hard steel which requires a small back rake angle, it is good practice to flatten the curvature of the cutter by a manual grinding operation as shown in Fig. 7.



No.4 Profile

Fig. 1

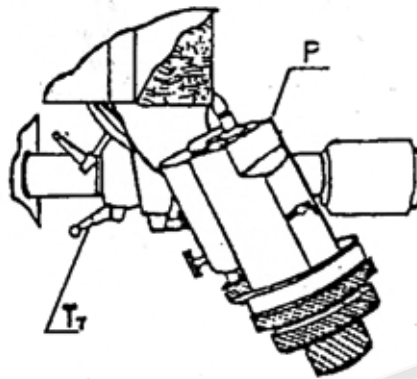


Fig. 2

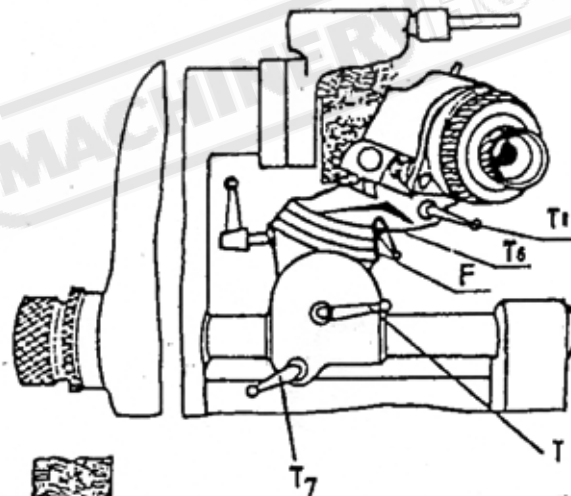


Fig.3



Fig.4:

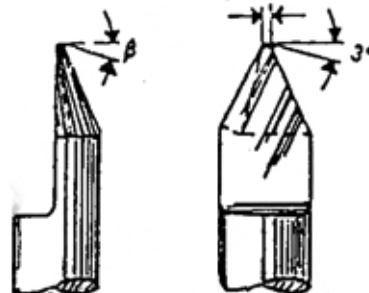
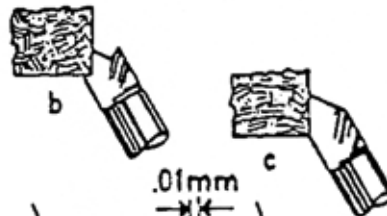


Fig. 5

Grinding Pointed Cutters

Where pointed cutters are concerned, both the included angle of the point and the back rake angle are produced in one operation (see Fig. 1). The back rake angle should be selected to suit the material to be cut. (see page 5)

Setup Operations

1. Engage index pin P into long slot;
2. Align cutter lip by means of gauge 'C'. Grip the cutter in position and return gauge C
3. Engage index pin P into short slot to enable collet bearing to be rotated 180° between stops.
4. Release clamping levers T3 and T6 and hold index drum F against stop and, beginning at zero position, set the swivel arm at one half of the desired point angle (see Fig. 2).

Example : Given a point angle of 60° Set swivel arm by index drum F at 30° . Retighten clamping levers T3 and T 6.

5. Release clamping lever T2. Set the work fixture for the desired back rake angle by means of setting scale S2, see Fig. 3. Tighten clamping lever T2.
6. Tighten the clamping lever T4. Release lever T7; and shift the work fixture on the tubular guide to bring the cutter into light contact with grinding wheel. Tighten clamping lever T7; release lever T4.

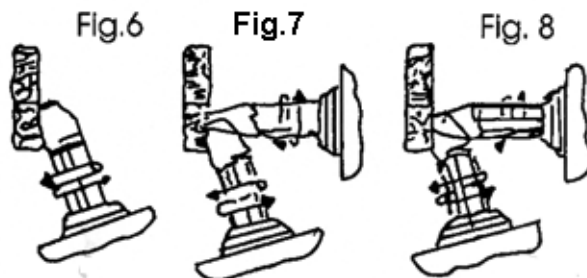
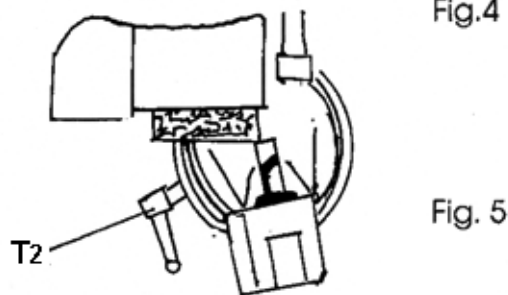
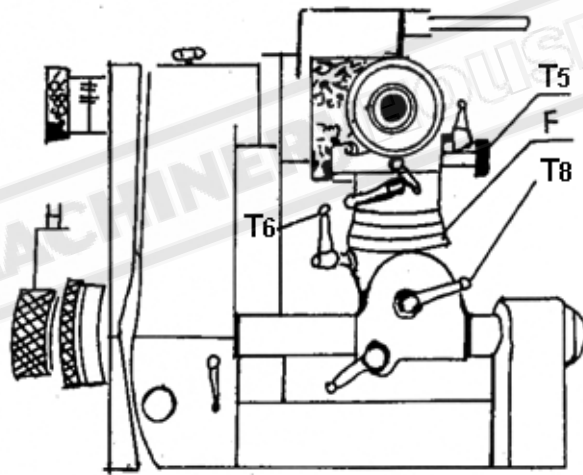
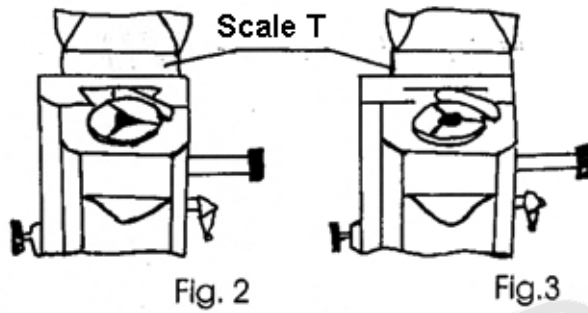
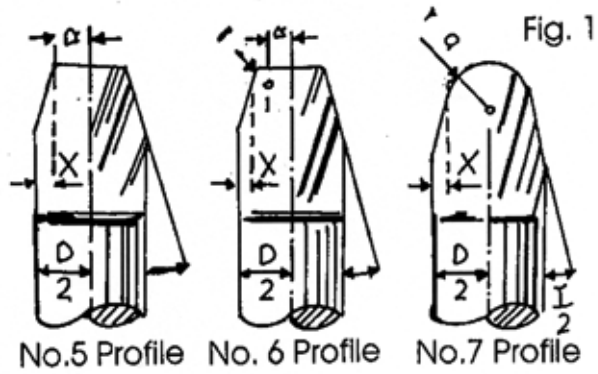
Grinding the Back Rake Angle

7. During grinding slowly return stop screw G to advance the work fixture past the wheel. At the same time continuously rotate the collet bearing back and forth between the stops, the rotation being through 180°. This ensures uniform stock removal (see Fig. 4a,b,c), Uniform stock removal will protect the cutter from overheating. Whet the cutter point by means of an oil stone. It is advisable to whet the point as far as engraving conditions permit. This operation will give the point a small end cutting edge which will participate in removing stock (see Pg. 5).

However; where arline engraving work is concerned (depth of cut not to exceed 0.0004" (.01imm)) the shape of the point should not be changed. Only the cutting edge proper should be carefully whetted.

In addition it is recommended to whet also the cutting lip by means of an oil stone in order to remove burrs. However, care should be exercised not to remove noticeable amounts of stock from the cutting lip, as this would destroy the centering of the lip, moreover this would render a greater or lesser part of it useless.

When grinding the cutting lip for the first time, care should be taken to grind with a positive tolerance.



Grinding Tapered Cutters Circular Grinding of size and End Cutting Edges

Tapered cutters can be ground to size in the machine without the use of any measuring instrument, except for the scales provided on the machine. For circular grinding operations of profiled cutters follow this procedure :

Setup Operations

1. Engage pin C into long-slot.
2. Align the cutter lip by means of gauge C. Grip the cutter and return the C gauge
3. Draw index pin P out of the slot hole to enable collet bearing to be rotated through 360° . Release clamping levers T2, T3, T6. Set scale S2 and F at zero. Tighten clamping levers T4, T2, T3, T6 see Fig.4
4. Release clamping lever T7; bring cutter diameter into light contact with grinding wheel; tighten clamping lever T7, taking care to keep Index mark of vertical swivel mount aligned with tubular guide; release clamping lever T4, see Fig. 4. .
5. a. No. 6 profile (Fig.1 and 2) : Release clamping lever T1; rotate knurled knob S4 to shift cross slide to the right by one-half of dia, of the taper('a' in Fig. 9. For this purpose use cross slide vernier scale T. Tighten clamping lever T1
- b. No. 6 profile (Fig. a and 2) :Release clamping lever T1; rotate knurled knob S4 to shift cross slide to the right by the desired amount "a" (use cross slide vernier scale T). Tighten clamping lever T1.
- c. No. 7 profile (Fig.1and 3) :Set cross slide vernier scale at zero.
6. a. No. 5 and 7 profiles: Rotate fine adjustment screw H to. bring cutter diameter into light contact with grinding wheel: again rotate screw H to shift cutter to the left by amount $x = D/2 - a$. To facilitate this setting operation, set scale drum of screw H at zero without disturbing the setting of the screw (see Fig, 4).
- b. No. 6 profile : Rotate screw H to bring cutter diameter into light contact with grinding wheel; again rotate screw H to shift cutter to left by the amount $x = D/2 - (a + r)$. To facilitate this setting operation set scale drum of screw H at zero without disturbing the setting of the screw (see Fig. 4). Release clamping lever T3 and rotate the swivel arm through 90° . Release clamping lever T5 and rotate index head slide micrometer screw S to advance end face of the cutter towards grinding wheel. Wheel tapered cutters are to be resharpened, the length of the cutting edge at the end of the cutter should be made greater than the small diameter of the tapered portion.
8. Release clamping lever T6; hold index drum F against its stop and counting from the zero position, set swivel arm at the desired taper angle; tighten clamping lever T3 and T6, see Fig. 6.
9. a. No. 5 profile : Slowly return stop screw G and continuously rotate the collet bearing through 360° to advance the cutter past the grinding wheel. Prior to the circular grinding operation rotate the adjustment screw H to shift the cutter to the right; then advance the cutter towards the wheel by small increment until the desired size has been obtained (see Fig. 6).
- b. No. 6 and 7 profiles : Release clamping lever T3; first slowly return stop screw G, then slowly swing the swivel arm while continuously rotating the collet bearing through 360° to move the cutter past the wheel and thus to circular grinding operation rotate fine adjustment screw H to shift the cutter to the right; then advance the cutter towards the wheel by small increments until the desired size has been obtained (see Fig. 7 A 8).

Twist Drill Grinding Attachment

The twist drill grinding attachment has been designed for grinding twist drills of 3 to 18 mm (1/8" to 9/16") diameter. The lip angle is always 116° , while the back rake angle is adjustable as required. To mount the attachment K1 (see Fig. 2), insert a 12 mm (1/2") spring collet, into the index head. Insert the drill grinding attachment into the collet making sure that the the retaining pin K2 locates into the front of the index head. Adjustable stop K5 has a flat surface on one side for holding twist drills of 3 to 18mm (1/8" to 11/16") diameter. The drill is held by hand against stop K5 and the V-guide K4 attachment swiveled during grinding (Fig.1). After backing off the clamping screw K7, the stop K6 can be moved forward for small drills (3 to 6mm or 1/8" to 1/4") by means of clamping screw K6, since that such drills are difficult to hold by hand while grinding. .

Setup Operations

Release clamps K3 and K4. Hold Index drum T4 against stop by means of the knob and set swivel arm at 13°. Retighten clamps K3 and K4.

2. Release clamp K2 and set swivel arm at zero on setting scale T2 (resulting in a normally suitable rake angle). If larger or smaller rake angles are required, adjust swivel arm accordingly.

Ret-ingten clamp K2.

Release clamp K6 and screw D6. Move index head slide T until its front face roughly coincides with the front face of cross slide Q. Retighten clamp K6 and screw D6.

3. Only if new grinding wheel should be used :

4. Release clamp K5, move cross slide Q fully to the right using knurled screw S5. Retighten clamp K5. Release clamp K3(on attachment) and adjust swivel-mounted V-guide K4 until the scale shows the diameter of the twist drill to be ground. Retighten clamp K3.

Release clamp K1, tighten clamp K2. Move index head bracket on the tubular guide until gauge plate K8 is position 6. approx..04"(laterally fo the face of the grining wheel. Align vertical swivel mount index mark with reference line of tubular guide, then retighten'clamp K1and release clamp K7

Place test drill on V-guide "K4". Back off clamping screw "K7" and advance stop "K5" until the cutting face of the drill rests against gauge plate "K8", projecting approx. 0.02"(.5mm) Tighten clamping screw "K7". When using the adjustable stop in reverse position (for small twist drills of 3 to 6mm (1/8" to 1/4" dia.), tighten clamping screw "K6".

INSTRUCTION FOR GRINDING A END MILL

Change the original workhead into End mill attachment workhead. (as drawing I)

Insert the suitable size U2 collet into the tapered hole of the end mill attachment workhead.. Insert the end mill into the U2 collet and fasten it, so that the end mill will not turn. (as drawing II)

-Set the center of the Wheel-head at the height of the work head: spindle center and locate the end mill about 5mm from grinding wheel. (as drawing III)

Swivel the end mill attachment workhead by the degree of relief angle.
Use the grinding guide pin to grind the rake of end mill following the screw of end mill by the direction from front to back. (as drawing IV)

To grind the secondary relief angle when the primary relief angle grinding is finished, take the grinding guide pin into the screw groove of secondary rake then grind same as first rake.

Swivel the end mill grinding attachment horizontally by 90 degree then according to the degree of end cutting edge angle of end mill for grinding the rake of the top angle of end mill. (as drawing IIV)

Twist Drill Grinding Attachment

The twist drill grinding attachment has been designed for grinding twist drills of 3 to 16mm (1/8" to 5/8") diameter. The tip angle is always 116°, while the back rake angle is adjustable as required.

To mount the attachment (see Fig. 2), attach a 12 mm spring collet to locating pin land insert the collet into the index head slide of the index head bracket, introducing retaining pin 2 into the bore of the offside setting gauge. Adjustable stop 5 has a flat surface on one side for holding twist drills of 3 to 16mm (1/8" to 5/8") diameter. The drill is held by hand against stop 5 and the swivel-mounted V-guide 4 during grinding (Fig. 1). After backing off clamping screw 7, stop 5 with ring 9 can be pulled off (depress catch 10) and mount in a reverse position. This permits the clamping of small drills (3 to 6mm or 1/8" to 1/4" dia.) by means of clamping screw 6, since experience has shown that such drills are difficult to hold by hand grinding.

Setup Operations

1. Release clamps K3 and K4. Hold index drum T4 against stop by means of the knob and set swivel arm at 13°. Retighten clamps K3 and K4.
2. Release clamp K2 and set swivel arm at zero on the setting scale T2 (resulting in a normally suitable rake angle). If larger or smaller rake angles are required, adjust swivel arm accordingly. Retighten clamp K2. Release clamp K6 and screw D6. Move index head slide T until its front face roughly coincides with the front face of cross slide Q.
3. Retighten clamp K6 and screw D6

If new grinding wheel is used :

4. Release clamp K5, move cross slide Q fully to the right using knurled screw S5. Retighten clamp K5. Release clamp 3 (on attachment) and adjust swivel-mounted V-guide 4 until the scale shows the diameter of the twist drill to be ground. Retighten clamp 3.
5. Release clamp K1, and tighten clamp K. Move Index head bracket on the tubular guide until gauge plate 8 is position approx .04" laterally to the face of the grinding wheel
6. Align vertical swivel mount index mark with the reference line of the tubular guide, then retighten clamp K1 and release clamp K3.
7. Place test drill on V-guide K4. Back off clamping screw K7 and advance stop K5 until the cutting face of the drill rests against gauge plate K8, projecting approx. 0.02" (.5mm). Tighten clamping screw K7, When using the adjustable stop in the reverse position (for small twist drills of 3 to 6mm 1/8" to 1/4" dia.), tighten clamping screw K6.

Setup Operations

8. Swivel the twist drill grinding attachment upwards. Use fine adjustment screw F to advance the drill until it contacts the grinding wheel. Grind the first cutting edge by swivelling the attachment downwards (Fig. 3). Repeat feed and grinding operation if required.
 9. Place twist drill into V-guide 4 in 180° inverted position and grind second cutting edge leaving the attachment and the adjustable stop in the previously used position (i.e. not advancing fine adjustment screw F.)
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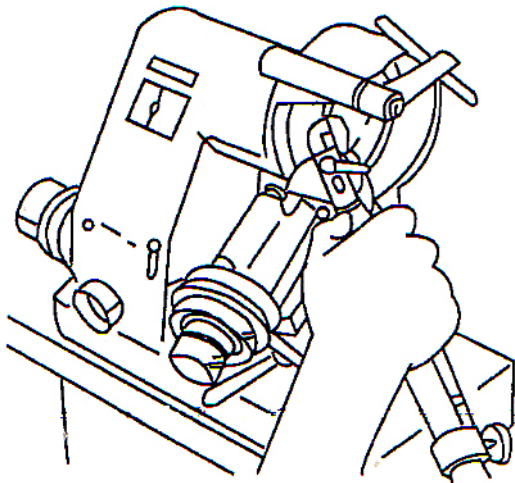


Fig.1

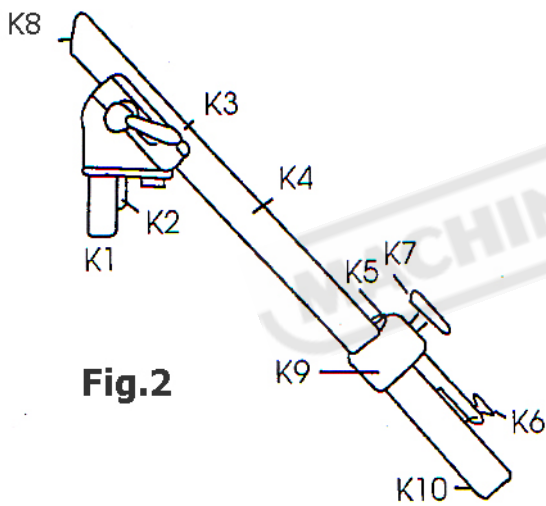
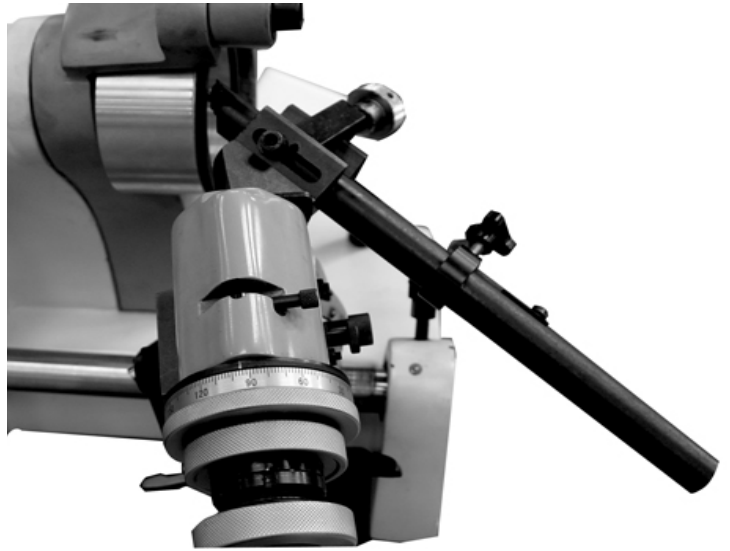
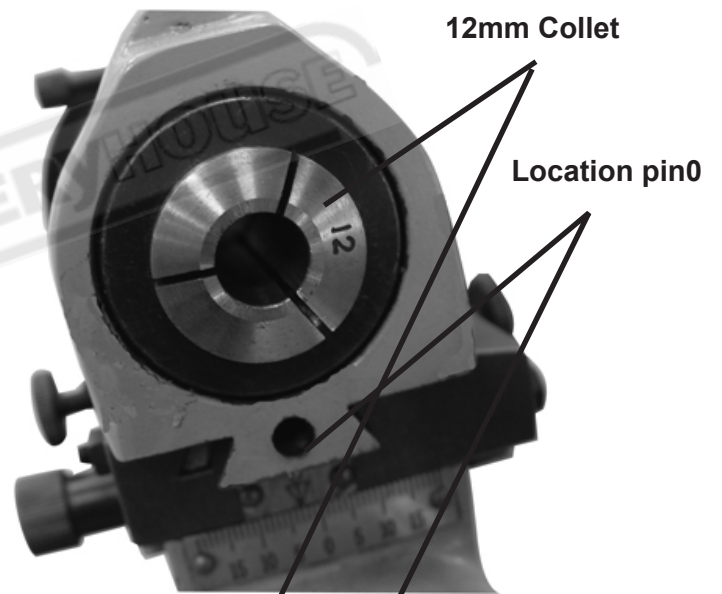


Fig.2



12mm Collet

Location pin0

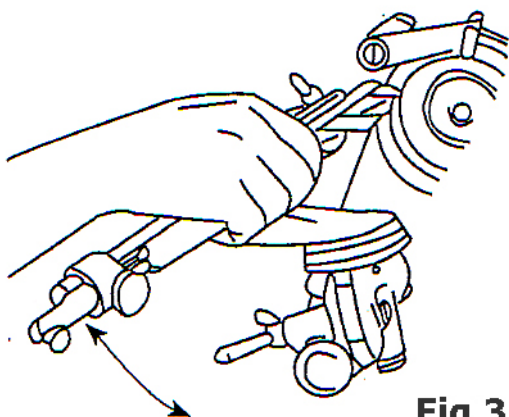
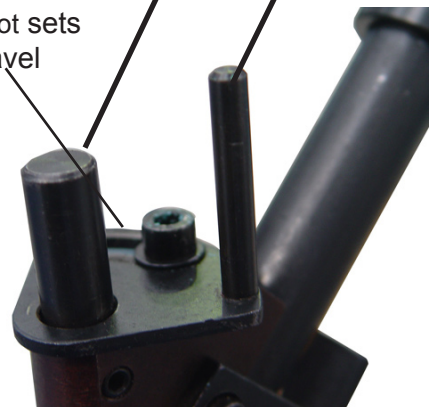


Fig.3

This slot sets the travel



LATHE TOOL GRINDING ATTACHMENT

Change the original workhead with the Lathe tool attachment (as displayed below)

Insert the Lathe tool bit into the Lathe tool attachment workhead and fasten it, so that the Lathe tool bit will not move

Set the center of Lathe grinding attachment at the height of the grinding wheel at the spindle center.

Recommended Angles and Relief

Each manufacturer has their own recommended relief angle for machining different material. Consult the manufacturer for the desired angles and relief

Side Cutting Edge Angle

Set the lathe tool grinding attachment horizontally by the degree required for the side cutting edge angle for grinding the side cutting edge angle (A). Tilt the lathe tool grinding attachment vertically by the recommended side rake angle (B) to grind the side rake angle (as drawing below)

End Cutting Edge Angle

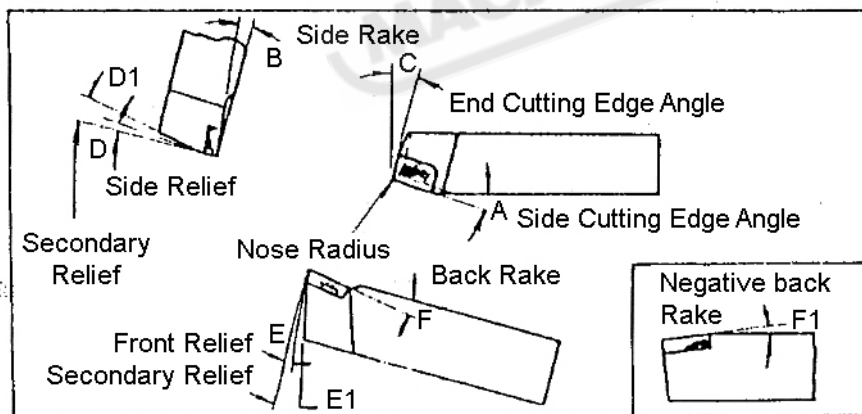
Set the lathe tool grinding attachment horizontally by the degree of the angle for the end cutting angle grinding required for grinding the end cutting edge angle (C). Tilt the lathe tool grinding attachment vertically by the recommended end rake angle (C) to grind the end rake angle (as drawing below)

Secondary Relief Angles

Repeat the processes above to grind the secondary relief rake angle.

Back Rake Angle

Adjust the lathe tool grinding attachment to a vertical position and set the positive or negative back rake angle (F)



MILLING CUTTER ATTACHMENT

Remove the original work head from the dove tail slide by loosening knurled screws T5 and S1. Slide the milling cutter attachment into the dovetail and secure with screws T5 and S1.

Milling cutters must be sharpened occasionally to keep them in good operating condition. When grinding milling cutters, care must be exercised to maintain the proper angles and clearances of the cutter. Improper grinding can result in poor cutting edges, lack of concentricity, and loss of form in the case of formed tooth cutters. Milling cutters cannot be sharpened by offhand grinding. A tool and cutter grinding machine must be used.

Sharpening The Ends of End Mills and Slot Drills

Select the suitable collet to hold the shank of the End Mill or Slot Drill. Put collet into the sleeve, and then rotate the sleeve to lock it firmly as Figure 1.



Fig.1

Loosen the positioning screw of the tooth rest, and then adjust the tooth rest to the position where the cutter will not touch the pointer when the sleeve is pulled all the way back as in Fig.2.

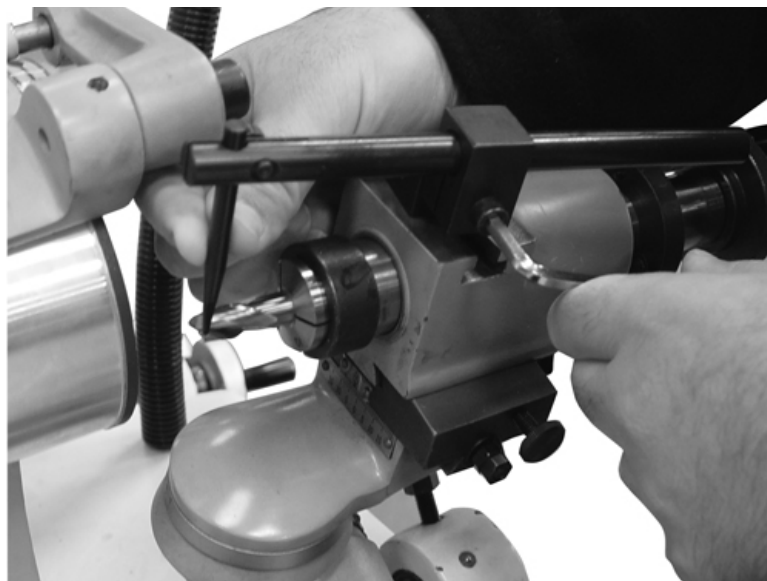


Fig.2

Locate the tooth rest into the outer edge of the cutter blade, and position it as close as possible to the end of the cutters cutting edge to be ground making sure that there is clearance and the finger will not touch the grinding wheel.

Move the tooth rest until the tooth rest's point and the cutter's centre are on the same line horizontally (Fig.1)

Release handle T and tilt the endmill grinding attachment down to the angle required for the cutter relief.



Fig.1

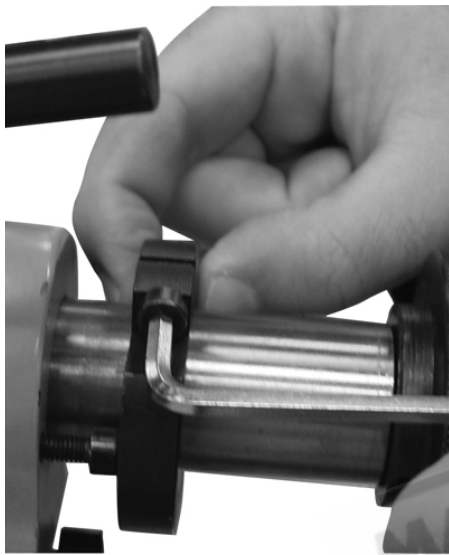


Fig.2

Adjust the collar on the endmill grinding attachment so that when the cutter is pushed forward to a stop the tooth rest's tip is about 0.5mm from the end of the cutter. (Fig.2)

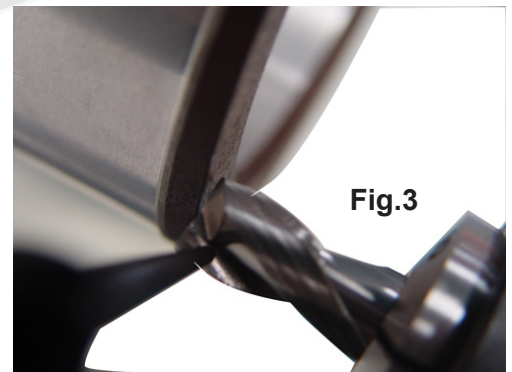


Fig.3

Adjust the end mill grinding attachment and the wheel so that when the fixture spindle is pushed up against the stop and the collar the cutter is nearly touching the wheel. (Fig.3)

Adjust the wheel in so that it just touches the cutter by using the adjustment knob at the end of the grinding wheel spindle. (Fig.4)

Move the cutter across the face of the wheel using the adjustment screw (Fig.5)

Withdraw the spindle holding the cutter so that the cutter clears the tooth rest and rotate 180 degrees. Move the spindle back and locate the cutter on the tooth rest and take the same cut

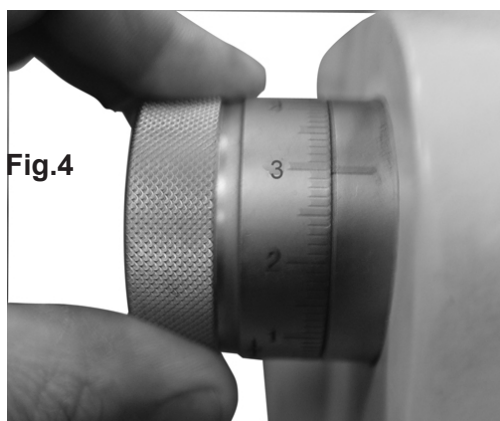


Fig.4

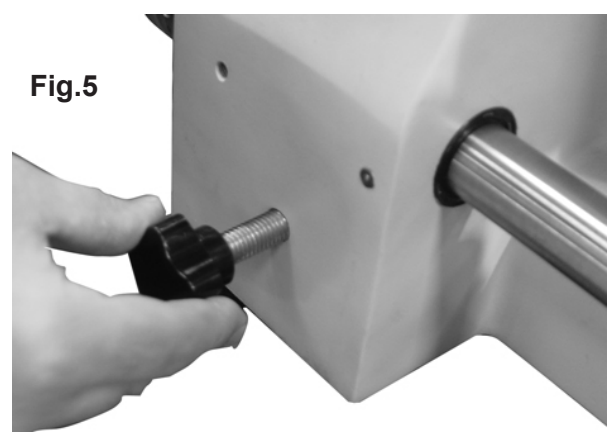


Fig.5

Sharpening The Sides of End Mills and Slot Drills

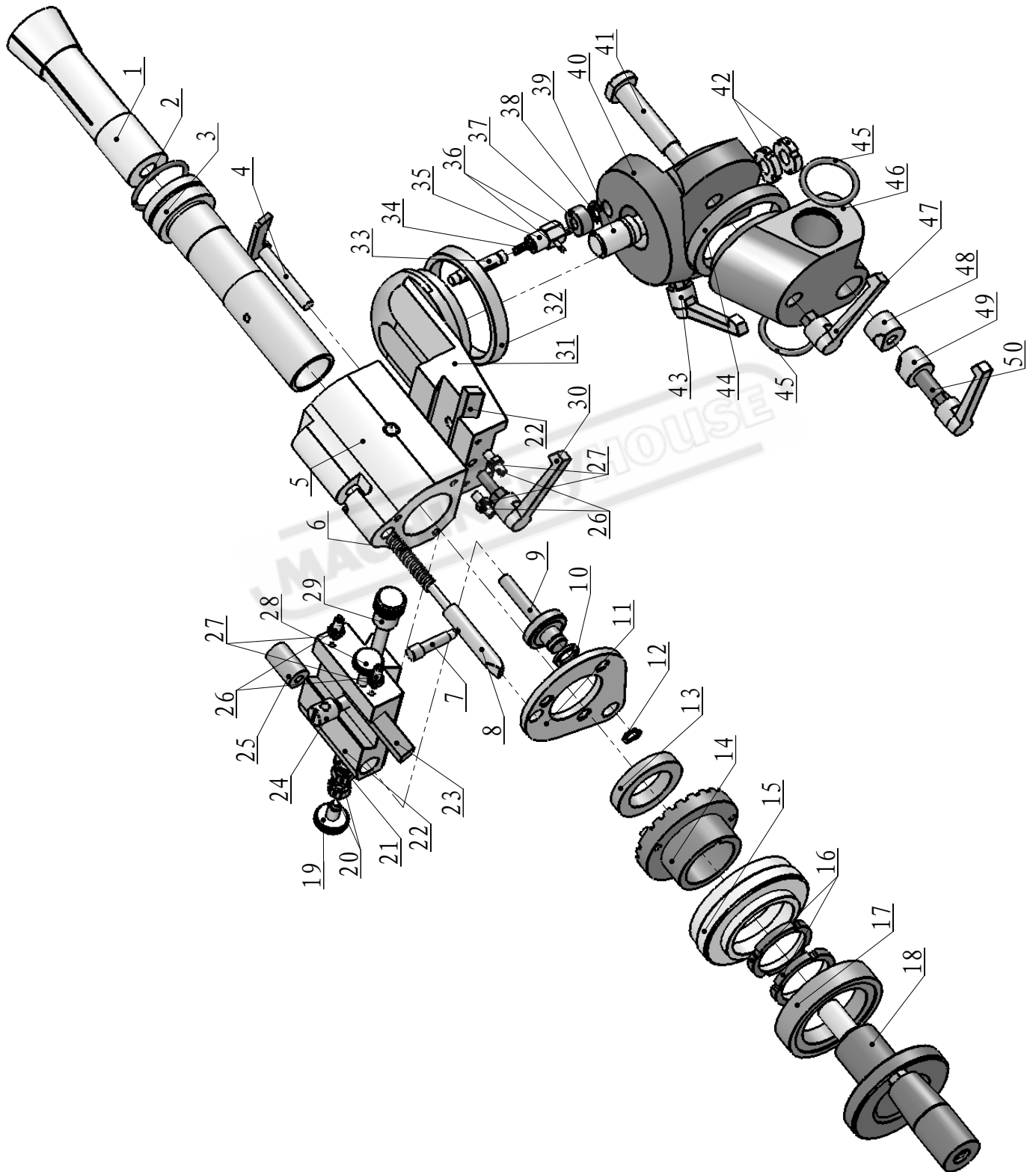
Set the tooth rest into the outer edge of the cutter blade, and position it as close as possible to the edge to be ground making sure that there is clearance and the finger will not touch the grinding wheel. Move the tooth rest until the tooth rest's upmost point and the cutter's center are on the same line horizontally

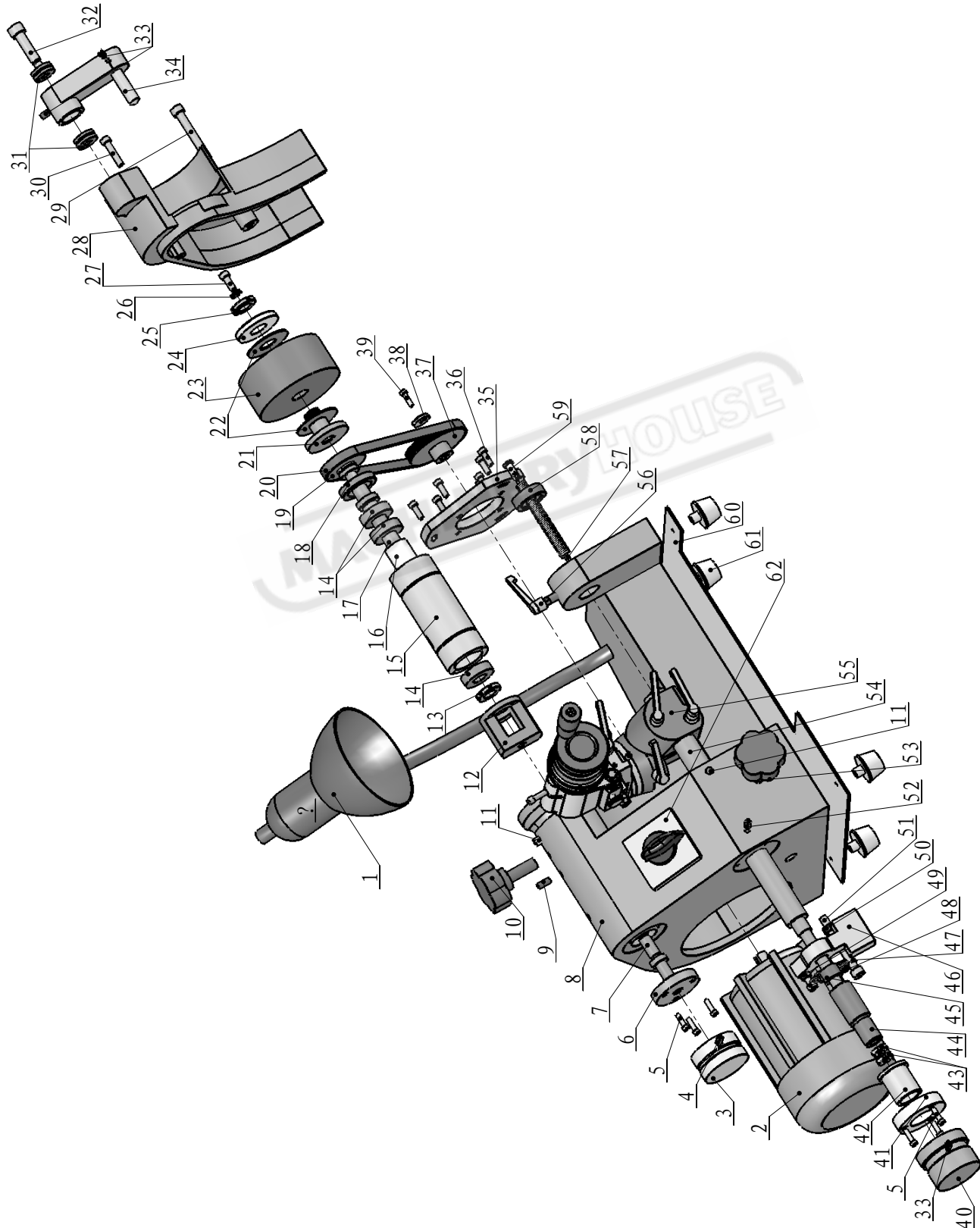
Pull the sleeve slightly backwards, so that the cutter clears the wheel. Move the sleeve forward and let it rotate naturally against the tooth rest as you move it forward and back being sure to never let the cutter part from the tooth rest. Don't force the cutter to rotate.

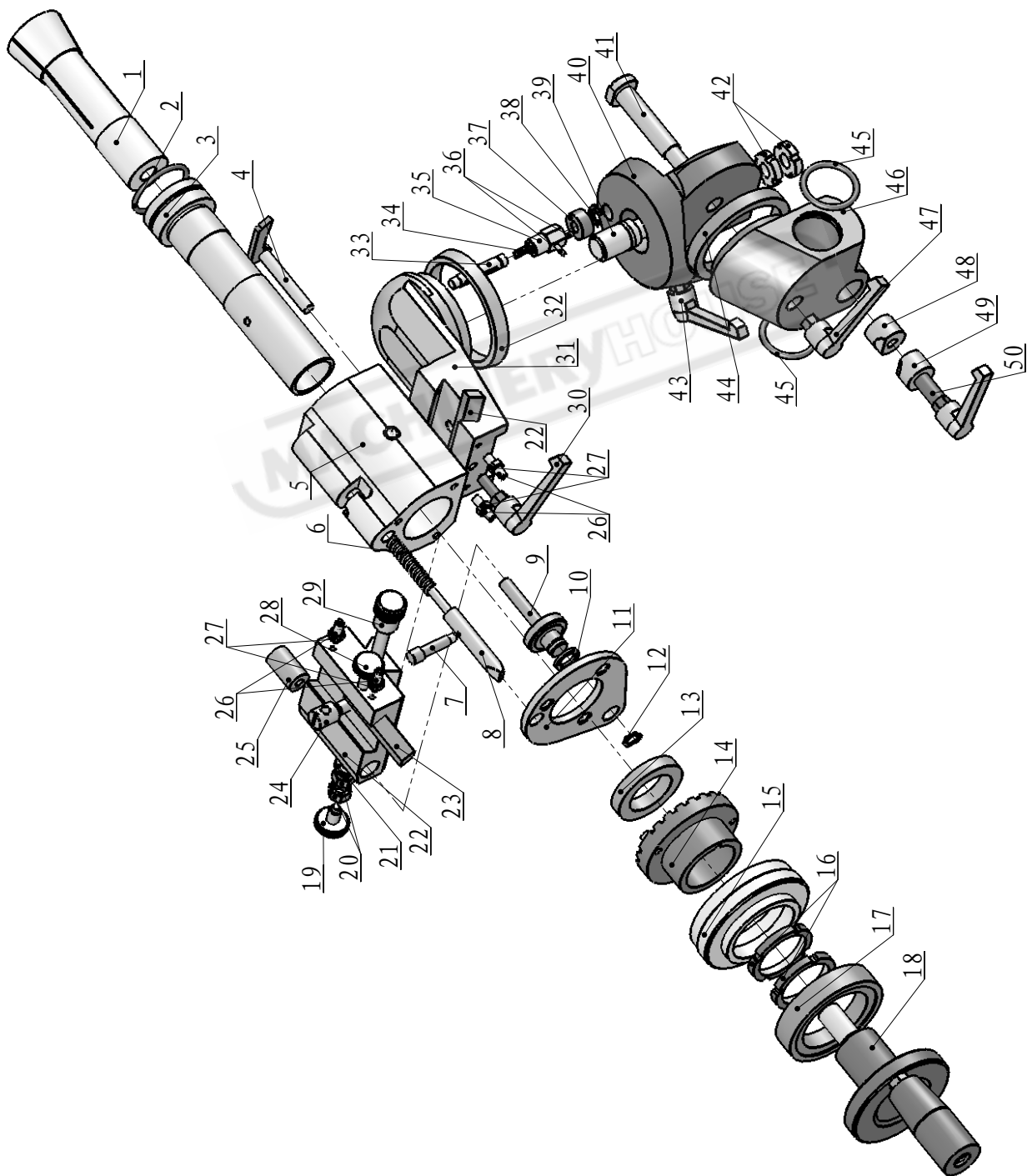


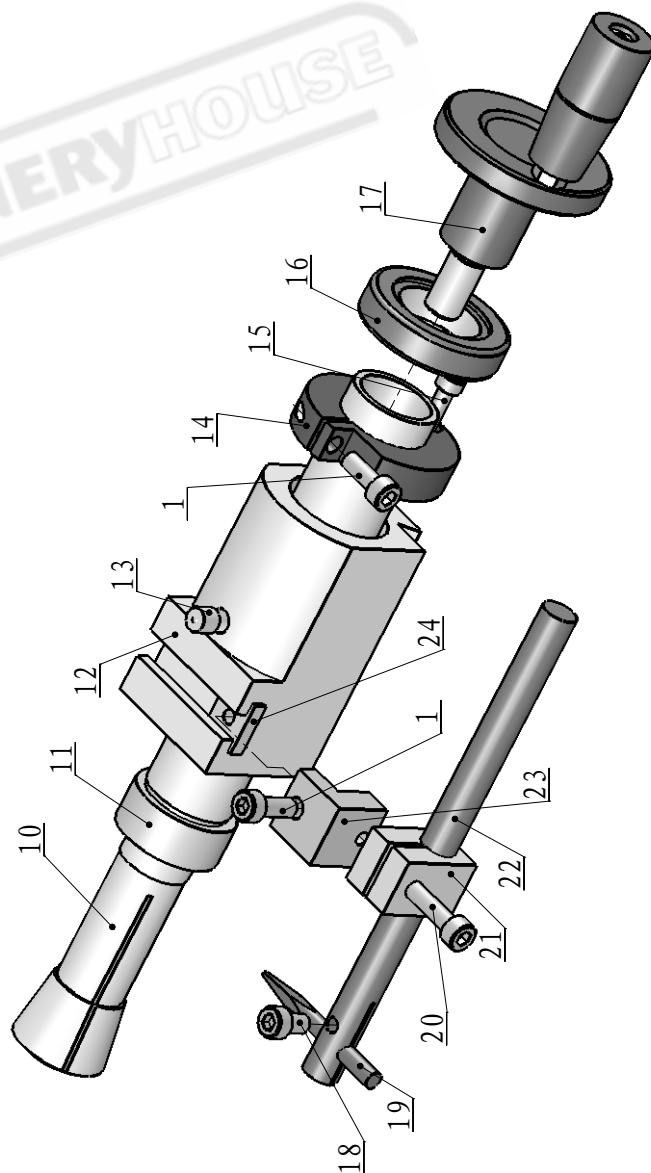
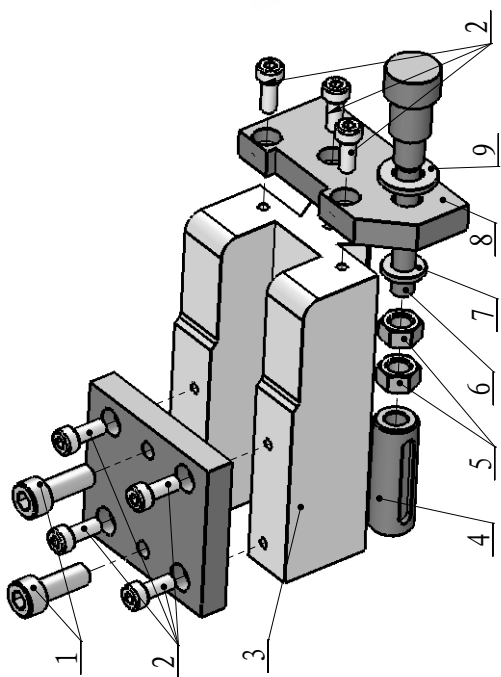
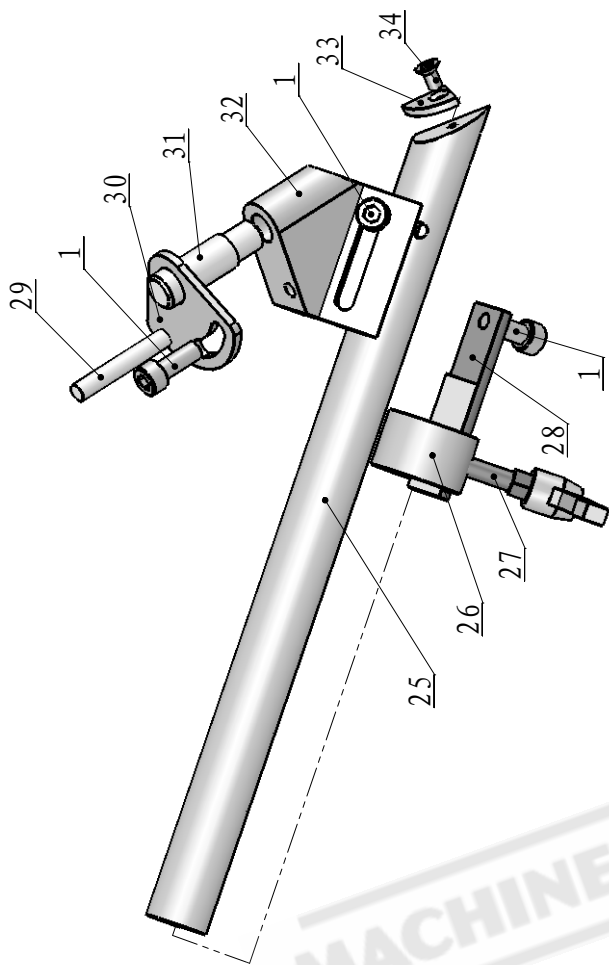
When the flute is ground pull the cutter back away from the grinding wheel and off the tooth rest, and then rotate the sleeve to the next blade. Push the cutter forward to the start point and making sure that the flute is located on the tooth rest and repeat the grinding process as before. After all the blades are ground, turn off the motor when finished.

SPARE PARTS









WARNING

General Machinery Safety Instructions

Machinery House
requires you to read this entire Manual before using this machine.

- 1. Read the entire Manual before starting machinery.** Machinery may cause serious injury if not correctly used.
- 2. Always use correct hearing protection when operating machinery.** Machinery noise may cause permanent hearing damage.
- 3. Machinery must never be used when tired, or under the influence of drugs or alcohol.** When running machinery you must be alert at all times.
- 4. Wear correct Clothing.** At all times remove all loose clothing, necklaces, rings, jewelry, etc. Long hair must be contained in a hair net. Non-slip protective footwear must be worn.
- 5. Always wear correct respirators around fumes or dust when operating machinery.** Machinery fumes & dust can cause serious respiratory illness. Dust extractors must be used where applicable.
- 6. Always wear correct safety glasses.** When machining you must use the correct eye protection to prevent injuring your eyes.
- 7. Keep work clean and make sure you have good lighting.** Cluttered and dark shadows may cause accidents.
- 8. Personnel must be properly trained or well supervised when operating machinery.** Make sure you have clear and safe understanding of the machine you are operating.
- 9. Keep children and visitors away.** Make sure children and visitors are at a safe distance for you work area.
- 10. Keep your workshop childproof.** Use padlocks, Turn off master power switches and remove start switch keys.
- 11. Never leave machine unattended.** Turn power off and wait till machine has come to a complete stop before leaving the machine unattended.
- 12. Make a safe working environment.** Do not use machine in a damp, wet area, or where flammable or noxious fumes may exist.
- 13. Disconnect main power before service machine.** Make sure power switch is in the off position before re-connecting.
- 14. Use correct amperage extension cords.** Undersized extension cords overheat and lose power. Replace extension cords if they become damaged.
- 15. Keep machine well maintained.** Keep blades sharp and clean for best and safest performance. Follow instructions when lubricating and changing accessories.
- 16. Keep machine well guarded.** Make sure guards on machine are in place and are all working correctly.
- 17. Do not overreach.** Keep proper footing and balance at all times.
- 18. Secure workpiece.** Use clamps or a vice to hold the workpiece where practical. Keeping the workpiece secure will free up your hand to operate the machine and will protect hand from injury.
- 19. Check machine over before operating.** Check machine for damaged parts, loose bolts, Keys and wrenches left on machine and any other conditions that may effect the machines operation. Repair and replace damaged parts.
- 20. Use recommended accessories.** Refer to instruction manual or ask correct service officer when using accessories. The use of improper accessories may cause the risk of injury.
- 21. Do not force machinery.** Work at the speed and capacity at which the machine or accessory was designed.
- 22. Use correct lifting practice.** Always use the correct lifting methods when using machinery. Incorrect lifting methods can cause serious injury.
- 23. Lock mobile bases.** Make sure any mobile bases are locked before using machine.
- 24. Allergic reactions.** Certain metal shavings and cutting fluids may cause an allergic reaction in people and animals, especially when cutting as the fumes can be inhaled. Make sure you know what type of metal and cutting fluid you will be exposed to and how to avoid contamination.
- 25. Call for help.** If at any time you experience difficulties, stop the machine and call you nearest branch service department for help.

WARNING

Tool & Cutter Grinder Safety Instructions

Machinery House
requires you to read this entire Manual before using this machine.

- 1. Maintenance.** Make sure the Tool & Cutter Grinder is turned off and disconnect from the main power supply and make sure all moving parts have come to a complete stop before any inspection, adjustment or maintenance is carried out.
- 2. Tool & Cutter Grinder Wheel Condition.** A Tool & Cutter Grinder must be maintained for a proper working condition. Never operate a Tool & Cutter Grinder with damaged or badly worn wheels. Replace if required. Scheduled routine maintenance should be performed on a scheduled basis.
- 3. Secure your Tool & Cutter Grinder.** Make sure your Tool & Cutter Grinder is levelled and fixed to the floor if required.
- 4. Hand Hazard.** Never place your hands or fingers between grinding wheel and parts of the machine.
- 5. Leaving a Tool & Cutter Grinder Unattended.**
Always turn the Tool & Cutter Grinder off and make sure all moving parts have come to a complete stop before leaving the Tool & Cutter Grinder. Do not leave the Tool & Cutter Grinder running unattended for any reason.
- 6. Avoiding Entanglement.** The Tool & Cutter Grinder guards must be used at all times. Remove loose clothing, belts, or jewelry items. Never wear gloves while machine is in operation. Tie up long hair and use the correct hair nets to avoid any entanglement with the Tool & Cutter Grinders moving parts.
- 7. Understand the machines controls.** Make sure you understand the use and operation of all controls.
- 8. Power outage.** In the event of a power failure during use of the machine, turn off all switches to avoid possible sudden start up once power is restored.
- 9. Work area hazards.** Keep the area around the Tool & Cutter Grinder clean from oil, tools, chips. Pay attention to other persons in the area and know what is going on around the area to ensure unintended accidents.
- 10. Starting the Tool & Cutter Grinder.** If a wheel is damaged it may fly apart shortly after start up. To avoid any injury, always stand out of the grinding wheel path when turning it on, allow it to gain full speed and wait for 1 minute before standing in front of the Tool & Cutter Grinder.
- 11. Workpiece Handling.** Always make sure the workpiece is supported & fixed tight. Never load or unload the workpiece while grinder is still running.
- 12. Hearing protection and hazards.** Always wear hearing protection as noise generated from the Tool & Cutter Grinder and workpiece vibration can cause permanent hearing loss over time.
- 13. Eye protection.** Always wear safety glasses when using this machine. Small particles become airborne at high speed and can cause serious eye injury. Use Grinding guards on machine at all times.
- 14. Coolants.** Always read and understand the user information listed on the coolant. Some coolants can be hazardous to your health if not stored correctly.
- 15. Ensure Grinder is adjusted before operating.** Set the job up correctly and make sure it is adjusted before starting. Always remove chuck keys from chucks.
- 16. Starting position/speed.** Never turn the Tool & Cutter Grinder on when the workpiece is resting on the grinding wheel. Allow wheel to reach full speed before grinding.
- 17. Guards.** Do not operate a Tool & Cutter Grinder without the correct guards in place.
- 18. Stopping the grinding wheel.** Do not stop or slow the wheel with your hand or workpiece. Allow the machine to stop on its own.
- 19. Dust hazard.** Grinding causes hazardous dust, which may cause long term respiratory problems if inhaled. Always wear an approved respirator when grinding.
- 20. Call for help.** If at any time you experience difficulties, stop the machine and call your nearest branch service department for help.

PLANT SAFETY PROGRAM

NEW MACHINERY HAZARD IDENTIFICATION, ASSESSMENT & CONTROL

Tool & Cutter Grinder

Developed in Co-operation Between A.W.I.S.A and Australia Chamber of Manufactures
This program is based upon the Safe Work Australia, Code of Practice - Managing Risks of Plant in the Workplace (WHSA 2011 No10)

Item No.	Hazard Identification	Hazard Assessment	Risk Control Strategies <small>(Recommended for Purchase / Buyer / User)</small>
A	ENTANGLEMENT	HIGH	Eliminate, avoid loose clothing / Long hair etc.
B	CRUSHING	LOW	Secure & support work material when grinding.
C	CUTTING, STABBING, PUNCTURING	MEDIUM	Isolate power to machine prior to any checks or maintenance being carried out. Do not adjust or clean machine until the machine has fully stopped.
D	SHEARING	MEDIUM	Make sure all guards are secured shut when machine is on. Isolate power to machine prior to any checks or maintenance.
E	FRICITION	MEDIUM	Keep hands and body away from grinding wheel.
F	STRIKING	MEDIUM	Ensure grinding wheels are tightly secured on spindle. Wear safety glasses. Stand clear of moving parts on machine. Check grinding wheels for damage before use. Remove all loose objects around moving parts. Ensure jobs are locked tight on table when grinding.
H	ELECTRICAL	MEDIUM	All electrical enclosures should only be opened with a tool that is not to be kept with the machine. Machine should be installed & checked by a Licensed Electrician.
M	HIGH TEMPERATURE	LOW	Wear appropriate protective clothing to prevent hot sparks.
O	OTHER HAZARDS, NOISE.	LOW	Wear hearing protection as required.
Plant Safety Program to be read in conjunction with manufactures instructions			



www.machineryhouse.com.au



www.machineryhouse.co.nz

Authorised and signed by:
Safety officer:



Manager:



Revised Date: 12th March 2012