DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S MANUAL

GRINDING MACHINE, TOOL AND CUTTER

UNIVERSAL TYPE, BENCH MOUNTING,

1/2-HORSEPOWER 110-VOLT,

60-CYCLE, SINGLE-PHASE

(FOLEY MANUFACTURING COMPANY MODEL 374)

(3415-523-7374)

HEADQUARTERS, DEPARTMENT OF THE ARMY

DECEMBER 1968

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *23 December 1968*

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NG: State AG (1).

USAR: None.

For explanation of abbreviations used, see AR 320-50.

Change No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C. *4 April 1973*

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(3415-523-7374)

This Change is current as of 23 February 1973.

TM 9-3415-230-10, 23 December 1968, is changed as follows:

Page 22. Delete the last paragraph RECOMMENDATIONS FOR PUBLICATION IMPROVEMENT and add the following two paragraphs.

Reporting of Equipment Publication Improvements

The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to: Commander, US Army Weapons Command, ATTN: AMSWE-MAS, Rock Island, IL 61201.

Parts Included With End Item

Parts included with the end item and considered a component part of item configuration are listed in the following table. All items are manufactured by the Foley Manufacturing Company (Manufacturer's Code 22831).

Part	*Part Number*
COLLET: 1/8 in.	370084
COLLET: 3/16 in.	370085
COLLET: 1/4 in.	370081
COLLET. 5/16 in.	370087
COLLET: 3/8 in.	370082
COLLET: 7/16 in.	370091
COLLET: 1/2 in.	370083
COLLET: 9/16 in.	370092
COLLET: 5/8 in.	370093
COLLET: 11/16 in.	370094
COLLET: 3/4 in.	370095
DIAMOND WHEEL: For carbide cutter, 2 in. diam.	370169
DIAMOND WHEEL: For carbide cutter, 3 in. diam.	370686
DRESSER, EMERY WHEEL: Diamond type	370420
DRESSING STICK: For diamond wheels	370426
DRESSING STICK: For emery wheels	370786
FLARING CUP WHEEL: 2 in. diam	370168
FLARING CUP WHEEL: 3 in. diam	370585
GRINDING WHEEL: 2 in. diam, 1/8 in thk.	370164
GRINDING WHEEL: 2 in. diam, 1/4 in. thk	370165
GRINDING WHEEL: 2 in. diam, 3/8 in. thk.	370166
GRINDING WHEEL: 2 in. diam, 1/2 in. thk	370167
GRINDING WHEEL: 3 in. diam, 1/8 in. thk.	370581
GRINDING WHEEL: 3 in. diam, 3/16 in. thk.	370584
GRINDING WHEEL: 3 in. diam, 1/4 in. thk.	370582
GRINDING WHEEL: 3 in. diam, 3/8 in. thk.	370583
MANDREL: 1/4 X 3 3/4 in.	370225
MANDREL: 5/16 X 4 in.	370226
MANDREL: 3/8 X 4-1/4 in.	370227
MANDREL: 7/16 X 4 1/2 in.	370228
MANDREL: 1/2 X 5 in.	370229
MANDREL: 9/16 X 5 1/4 in.	370223
MANDREL: 5/8 X 5 1/2 in.	370224
MANDREL: 11/16 X 5 3/4 in.	370230
MANDREL: 3/4 X 6 in.	370231
MANDREL: 13/16 X 6 1/4 in.	370232
MANDREL: 7/8 X 6 1/2 in.	370233
MANDREL: 15/16 X 6 3/4 in.	370234
MANDREL: 1 X 7 in.	370235
MANDREL: 1 1/16 X 7 1/4 in.	370236
MANDREL: 1 1/8 X 7 1/2.in.	370237
MANDREL: 1 3/16 X 7 3/4 in.	370238
MANDREL: 1 1/4 X 8 in.	370239
STEEL ADAPTOR BUSHING: Reduced from 1/2 to 1/4 in.	370096
STEEL ADAPTOR BUSHING: Reduced from 1/2 to 5/16 in.	370097
STEEL ADAPTOR BUSHING: Reduced from 1/2 to 3/8 in.	370098

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For explanation of abbreviations used, see AR 310-50.

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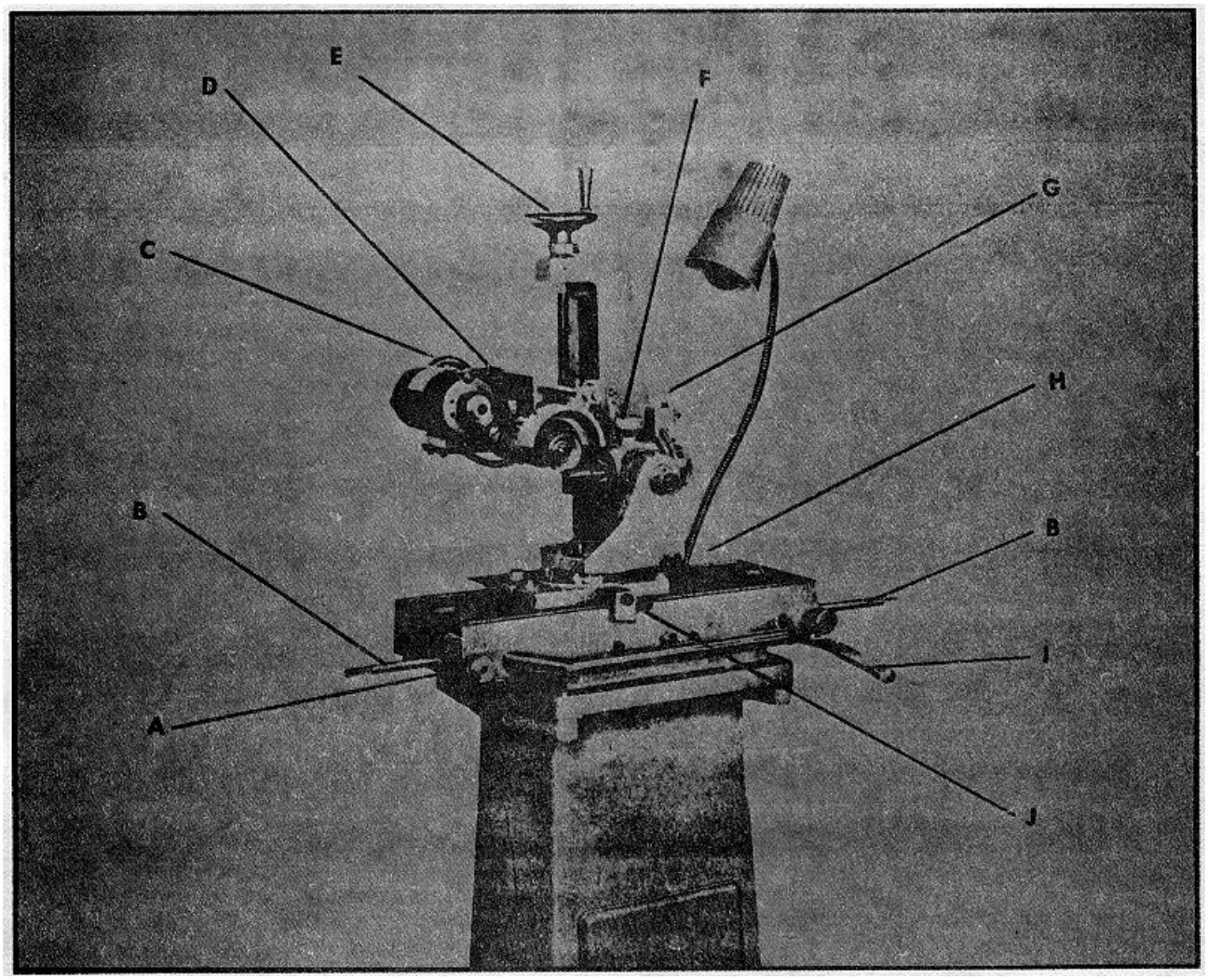
INDEX FOR ROUTER BIT

General View Showing Design Features and Points of Adjustment



A STOP ROD LOCK
B STOP ROD
C CROSS FEED HANDLE
D WHEEL GUARD
E VERTICAL FEED HANDLE
F COLLET TUBE LOCKING KNOB
G INDEX PIN
H MOTOR SWITCH
I TABLE FEED HANDLE
J TABLE LOCK

374 ROUTER BIT GRINDER INSTRUCTIONS

The 374 Router Bit Grinder was designed primarily to grind router bits both straight and spiral. It can also grind a large variety of small wood and steel cutters as well as carbide tipped saw blades to 12" diameter using the saw grinding attachment. Capacity of the machine is as follows:

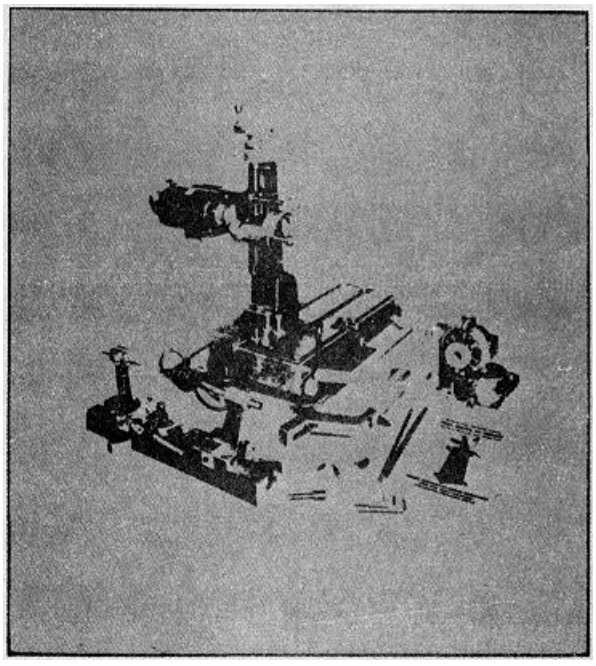
Grinding wheel travel - 7 1/2" vertical
Grinding wheel travel - 5 1/2" horizontal

Table Travel - 6"
Carbide saws with attachment to 12" dia.

Distance between centers - 14"
Swing on centers (dia.) - 4 1/2 dia.
Swing in work-head (dia.) - 4 1/2 dia.

CHECKING SHIPMENT OF MACHINE FOR DAMAGE AND COMPLETENESS

Examine Shipment: Carefully inspect the machine for intransit damage. Look particularly for cracked castings, bent or broken parts. Any loss of or damaged parts should be reported to the freight agent immediately.



SETTING UP THE GRINDER

After unpacking your grinder, remove sub-table and centers from machine. Also remove stop finger base castings. The removal of these components will facilitate setting up the grinder. Next, place grinder on floor stand or suitable bench of solid construction. The bench should be 38" high to bring the grinder to a convenient working height. Loosen table lock screw, dia. No. 30, expl. view No. 1. Bolt grinder to floor stand or bench. Use four cap screws, dia. No. 5 of Floor Stand exploded view No. 8 to fasten grinder to the floor stand. The feed handle, dia. No. 4 exploded view No. 1 should now be fastened to grinder table using the two (2) cap screws diagram No. 29. Assemble the moveable feed handle next. First fasten cam plate dia. No. 15 to moveable handle dia. No. 5 by use of shoulder screw dia. No. 16. Be sure that cam plate is assembled so that the counter bored holes in each end of the cam plate are down. Now place moveable handle onto post dia. No. 18. The cam plate is now screw fastened to grinder table using two flat head screws dia. No. 27 with spacers, dia. No. 17 between cam plate and grinder table. Place a small amount of cup grease or heavy engine oil on shoulder bolt dia. No. 16 and cam plate. Traverse grinder table and check for free movement. Next place a small amount of light engine oil on table guide rod dim. No. 14 and on cam follower wiper felts, dia. No. 7. Run table back and forth several times and then wipe off excess oil.

LEVEL MACHINE

After bolting the grinder to floor stand, take a machine level and place it lengthwise on the grinder table. Adjust floor legs as necessary to bring machine table level. Next level across table and adjust floor legs as needed to bring machine table level.

MACHINE LINE UP

1. Before grinding router bits on your grinder the following adjustment should be made:

Mount work head assembly to grinder table by first placing work-head onto table and then snugging up on cap screw, dia. No. 34 of exploded view No. 3 to pull work-head base plate against key slot. Next, lock work-head base plate to table using two (2) hex cap screws dia. No. 35 and bar nuts dia. No. 18. Place a piece of

straight shafting about eight inches long into collet of work-head. The shaft should be true and at least 1/2" in diameter. lock shaft in place by tightening collet draw knob dia. No. 8. A dial indicator should be mounted as shown in *illustration No. 1* and with the indicator anvil rubbing against the shaft in the collet head, traverse table back and forth. Adjust until table can be traversed back and forth at least four inches and a dial indicator reading of not more than (.004) four thousandth of an inch difference is achieved. Lock hex nut dia. No. 40 of exploded view No. 3 and set pointer. This alignment will ensure that the aligning shaft is horizontal.

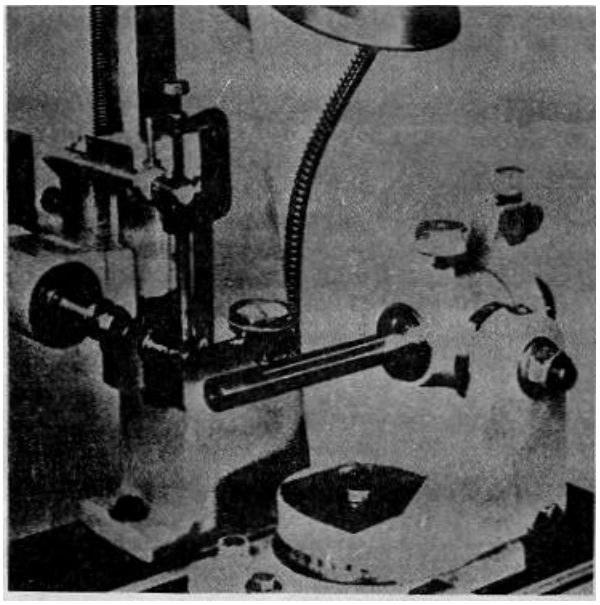


ILLUSTRATION NO. 1
LINING UP THE WORK-HEAD

2. The next step is to reposition dial indicator as shown in *illustration No. 2* so that work-head may be aligned with the grinder table. Using the same 8" piece of shafting, traverse table back and forth until dial indicator reading of not more than (.002) two thousandth of an inch difference is read. Rotate work-head angle bracket as needed to accomplish indicator reading. Now set stop screw dia. No. 38 and lock jam nut dia. No. 39 of exploded view No. 3. You should now be able to loosen angle bracket lock screw, rotate angle bracket slightly, reposition angle bracket against stop pin, dia. No. 44, lock angle bracket and traverse table back and forth and have dial indicator read within .002 inches. Re-adjust stop screw dia. No. 38 if you do not get a .002 inch reading. Repeat check in paragraph 1 to ensure that shaft is horizontal. Adjust if necessary.

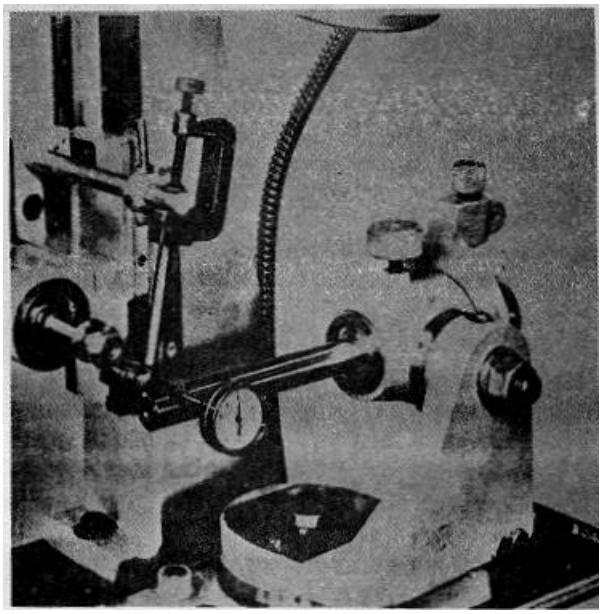


ILLUSTRATION NO. 2
LINING UP THE WORK-HEAD

3. Repeat steps in paragraph 2. Adjust stop screw No. 38 if necessary.

4. After you have the work-head aligned, move stop pin, dia. No. 44 to hole at left side of work-head base plate. See *illustration No. 3*. Now align work-head by adjusting stop screw dia. No. 38 of exploded view No. 3 until a dial indicator reading of .002 is achieved. Lock jam nut dia. No. 39. Now rotate work-head angle

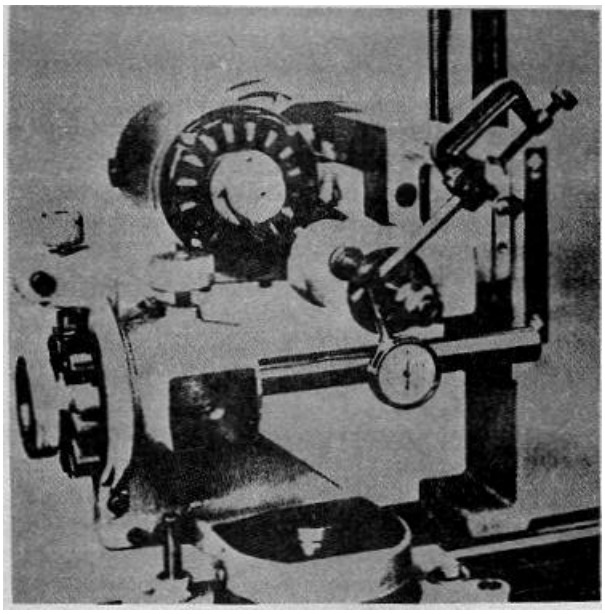


ILLUSTRATION NO. 3
LINING UP THE WORK-HEAD

bracket slightly and reposition against stop pin. Check position on indicator. Traverse table back and forth. Dial indicator should not vary more than .002.

The grinding wheel spindle and column should next be adjusted to permit grinding wheel relief. Loosen hex cap screws dia. No. 36 of exploded view drawing No. 2 and rotate column toward front of machine when work-head is used as shown in illustration No. 2 and No. 3.

The object here is to relieve the cup wheel so that it will not drag on the surface just ground by the leading edge of the grinding sheel. See drawing illustration No. 4.

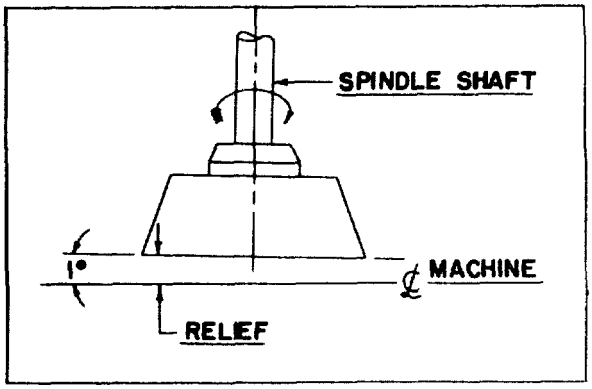


ILLUSTRATION NO. 4
RELIEVING THE GRINDING WHEEL

HEIGHT SCALE

The height scale should be set so that the pointer reads "O" when the center of the grinding wheel spindle is at the same elevation as the center of the work-head collet adaptor. This will permit setting the grinding wheel at the proper height when grinding relief angles on the outside diameter of some cutters.

CENTER STANDS AND SUB-TABLE

The sub-table is mounted directly on top of the grinder table using the shoulder screw dia. No. 8 of exploded view drawing No. 4 and two (2) hex cap screws and washer dia. No. 9 and No. 11.

The center stands can be positioned anywhere along the sub-table, depending on work to be ground. When placing center stands on the sub-table, always snug up on the take-up tabs dia. No. 5 before you tighten hold-down screws dia. No. 10. This will permit the center stands to guide on one side of the machined T-slot and, after alignment, the center stands can be moved without losing this alignment. To align centers, mount a dial indicator on the wheel guard support shaft and let the indicator touch the centers. See illustration No. 5.

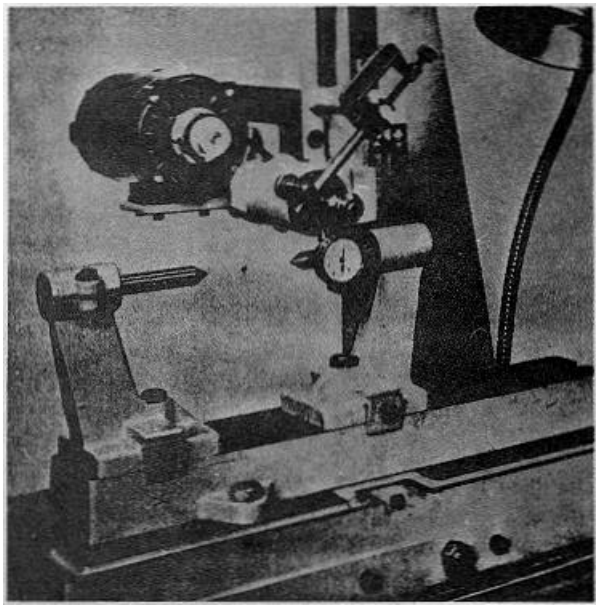


ILLUSTRATION NO. 5
LINING UP THE CENTERS

Do not tighten hold-down screw dia. No. 8 and No. 9. Leave them slightly loose so that the sub-table can be moved or rotated about the shoulder screw. Next, move the sub-table back and forth as required to achieve an indicator reading of (.001) one thousandth. Tighten the sub-table hold down screws and re-check dial indicator reading. Now the center stand can be positioned to receive the work to be ground. If desired, a scribed line may be placed on the right hand end of sub-table and the grinder table. If these lines are carefully made, it will not be necessary to re-indicate sub-table each time it is used for most applications. For very close work, the table should always be indicated in for each job. When grinding work with a taper, the sub-table can be rotated as needed up to 45°. See illustration No. 6.

GRINDING WHEELS

The 374 Router Bit Grinder uses either two or three inch diameter grinding wheels and in resinoid or vitrified bond. It is important to always use grinding wheel blotters with these grinding wheels. A blotter should be placed on both sides of the grinding wheel. In the case of diamond grinding wheels, no blotters are necessary and should not be used. When tightening the grinding

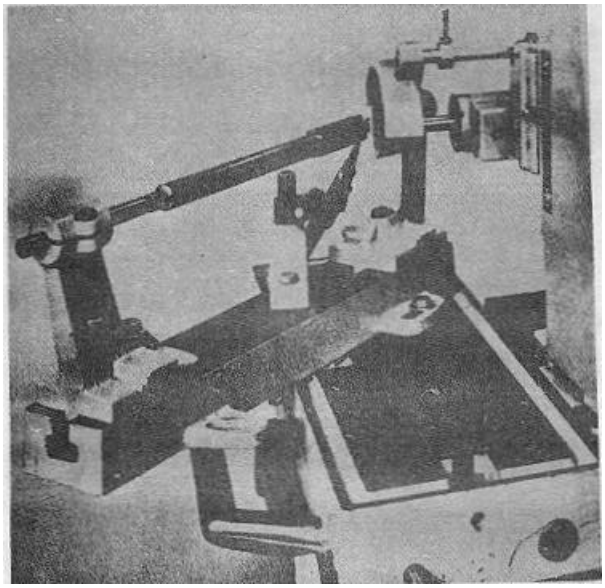


ILLUSTRATION NO. 6
GRINDING END OF REAMER

wheel spindle nut, use a light pressure. It is not necessary to over tighten spindle nut as to do so may crack the grinding wheel.

"V" BELT TENSION

The spindle drive belt on your 374 Router Bit Grinder is designed for high speed use and vibration free performance. It is not necessary to place a lot of tension on this belt. When properly adjusted, you should be able to move the belt 3/16 of an inch when grasped midway between the pulleys, using a pressure of about 3 lbs. A tension on the "V" belt greater than recommended will shorten the life of the "V" belt. *Note:* Spindle rotation is clockwise looking at wheel end of the spindle.

After making the preceding adjustments, become familiar with the grinder by positioning the spindle up and down, in and out. Note that on graduation on the feed dial equals .001 inch of feed at the grinding wheel. The two (2) stop rods at either end of the grinder table are to limit the travel of the table. They are used after the work is set up with the grinder to omit the possibility of over travel that might result in grinding wheel damage. To adjust stop rods, loosen locking knob dia. No. 22, exploded view drawing No., 1. There is also a table lock screw, dia. No. 30 that permits locking the table in any position. Its use is to hold table during set-ups and for some grinding operations. To lock table, turn screw clockwise. *Caution:* Do not over tighten a light pressure will lock the table.

GRINDING WHEEL GUARD

The grinding wheel guard is suited for use with two or three inch diameter grinding wheels. It is adjustable in and out. The guard should always be used and it will be found that with very few exceptions, the guard can be adjusted so that it will clear your work-piece and still offer good protection. It should be remembered that the rim speed on the two or three inch wheel is as great as on a larger wheel and should receive just as much respect.

WORK-HEAD

The work-head has a capacity of up to 3/4 dia. The Hardinge 4C collet size is used in the work-head. By removing the stop pin, dia. No. 44 of exploded view drawing No. 3 and loosening lock screw dia. No. 36 the work-head can be rotated about 220°. By loosening the hex nut dia. No. 40 the work-head can be rotated up to a vertical position. The work-head is equipped with a twelve (12) division index plate. By lifting the lock pin dia. No. 16, the work can be positioned at 12 equally spaced positions. This permits flute spacings of 1-2-3-4-6 and 12 positions. The index locking ring dia. No. 5 can be positioned by loosening the cap screw dia. No. 33, permitting the positioning of the index plate. There is also a locking knob on top of the work-head, dia. No. 23. This is used during set-up to hold work-piece in position while the index locking ring is adjusted. The index locking pin, dia. No. 16 may be lifted and rotated 1/4 turn so that it will not engage the index plate. This will permit free turning of the work-head collet adaptor.

STOP FINGERS

There are three stop fingers supplied with the grinder. One is for straight fluted work and saws and is spring loaded. The other two are rigid and are used for grinding spirals. Two of the stop finger plungers fit into the same stop finger body.

The stop fingers themselves are subject to rapid wear and in many cases will have to be bent or otherwise adapted to the particular set up at hand. Provision has been made for the easy removal of the stop fingers from the plungers and as new or different fingers are required, they can be screwed to plunger body.

A few possible types of finger shapes are shown in illustration No. 7. These fingers are in general used for grinding spirals. Make the fingers from 1/16 x 5/8 or 1/8 x 5/8 steel and bend as required.

The third stop finger has a cast iron arm and is used for grinding spirol router bits and end mills cutter in the work-head, see illustration No. 17. The stop finger can be positioned up and down and will permit changing from primary to secondary clearance angles when grinding the O.D. of the spirals.

MANDRELLS

General: There are two types of mandrells made, fixed and expanding. The fixed mandrells are available in nominal sizes only. The expanding mandrells are adjustable and permit a certain range of hole sizes for each mandrell. Fixed mandrells are available from Foley Manufacturing Company.

COLLETS

The work-head on the 374 Router Bit Grinder uses the Hardinge 4C size. This permits collet capacity to 3/4 diameter. Collets and collet adaptors are available from Foley Manufacturing Company.

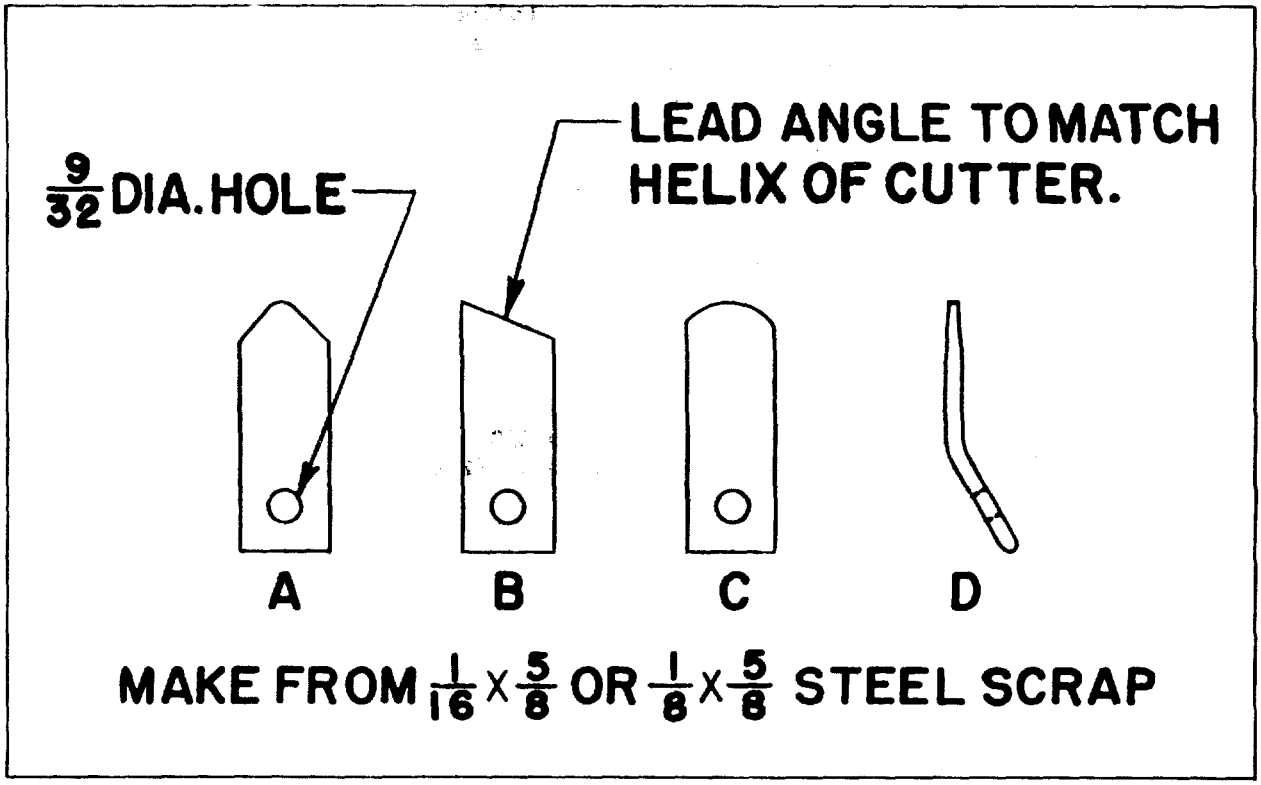


ILLUSTRATION NO. 7

MIST COOLANT

A mist coolant kit is available for the router bit grinder, Foley Part No. 357505. The use of the mist coolant will-permit a better finish grind, it will extend the life of the grinding wheels and help to eliminate excessive heat build-up when grinding cutting tools. The use of mist coolant is recommended particularly when grinding spirals or cutting tools with a large surface area such as shaper cutters and some router bits.

When using the mist coolant, direct the mist at the point where the grinding wheel contacts the work. Use a light mist with ample air supply. The hardware for mounting the mist coolant spray head is included in the kit Mounting is simple and flexible. See illustration No. 31.

AIR COMPRESSOR

A small air compressor is available for use with the mist coolant. Compressor complete with hose and fittings, Foley Part No. 374950. The air compressor is equipped with a pressure relief valve and condensation drain cock. See illustration No. 8.

DRESSING FLARING CUP GRINDING WHEELS Resinoid or Vitrified

The resinoid and vitrified grinding wheels may be dressed by using diamond dressing lick or a dressing brick.

A dressing brick is best used to shape the grinding wheels to various radii as needed when grinding fluted router bits.

The diamond dressing stick is used to dress the face of flaring cup wheels and the periphery of straight grinding wheels. A good method of dressing the flaring cup wheels and straight wheels is to cut off the handle of the diamond dressing stick and mount the body of the stick with the diamond in the collet head. By mounting the dressing stick as shown in illustration No. 9, the face of the flaring cup wheels can be dressed.

NOTE: Dress across the width of the face only, not across the entire diameter of the grinding wheel. After dressing, relieve the face of the grinding wheel by dressing back the face as shown in illustration No. 10, using a dressing stick held free hand or a dressing brick.

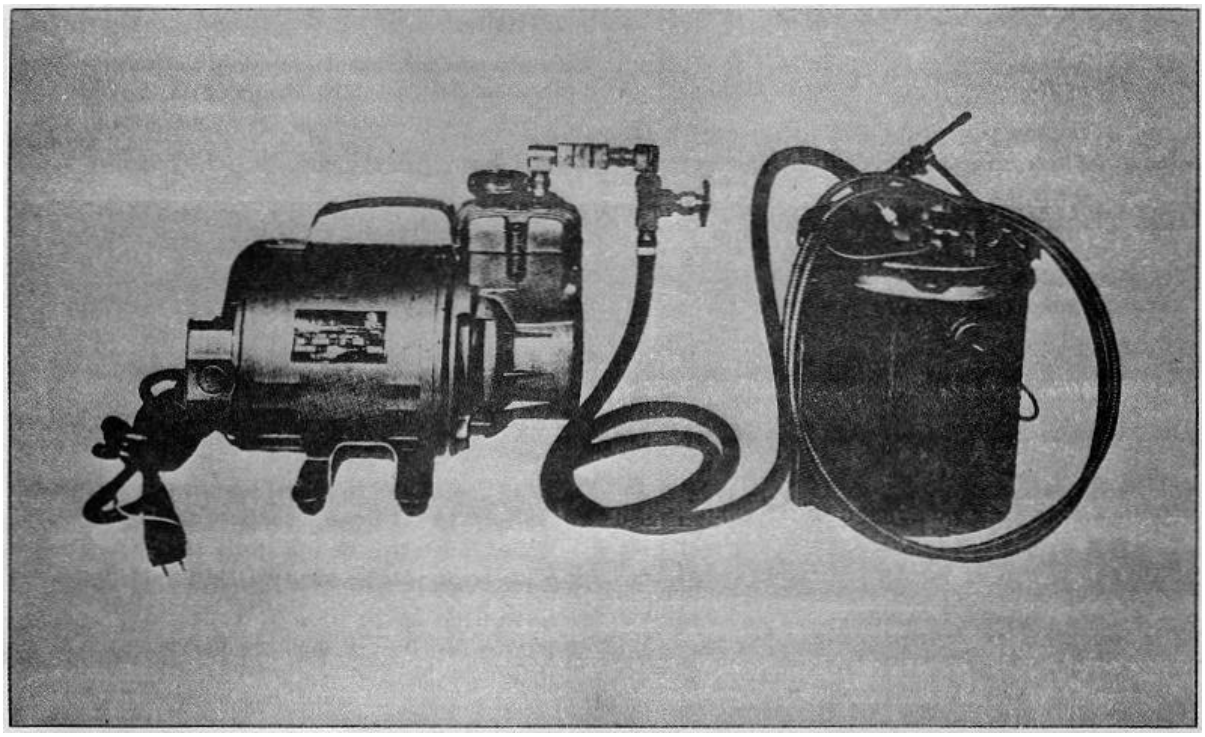


ILLUSTRATION NO. 8

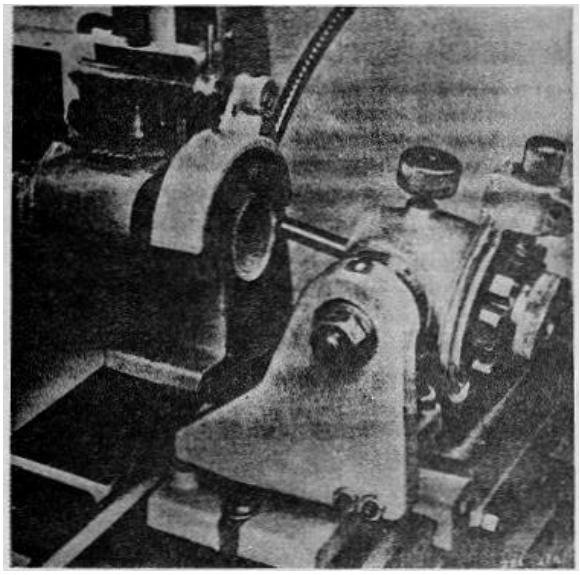


ILLUSTRATION NO. 9
DRESSING THE FACE OF FLARING CUP GRINDING WHEEL

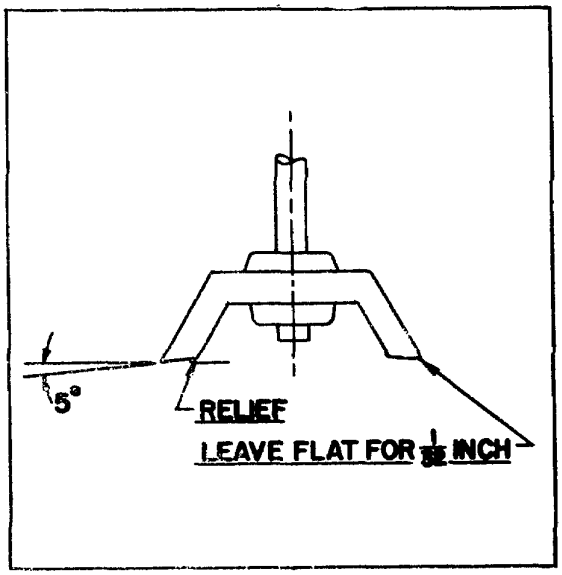


ILLUSTRATION NO. 10
WHEEL FACE RELIEF

DRESSING STRAIGHT GRINDING WHEELS
Resinoid or Vitrified

Set the work-head as shown in illustration No. 11 and lock the table of the grinder. Next feed the grinding wheel down onto the diamond and then traverse the grinding wheel back and forth across the diamond by turning cross feed handwheel.

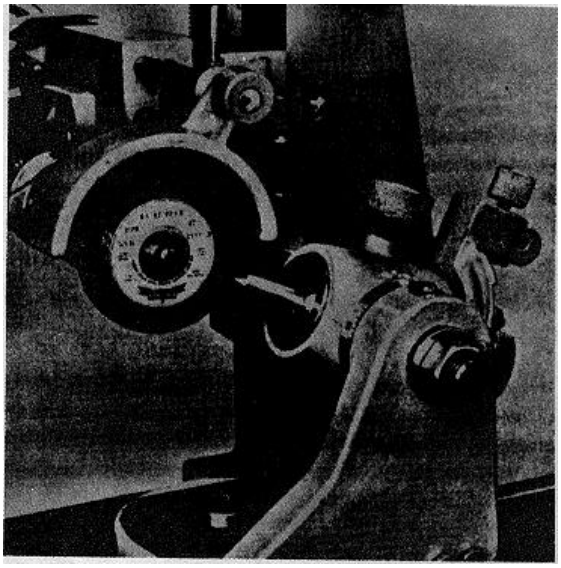


ILLUSTRATION NO. 11
DRESSING O.D. OF STRAIGHT GRINDING WHEEL

TO DRESS RADIUS ON PERIPHERY OF RESINOID OR VITRIFIED GRINDING WHEEL

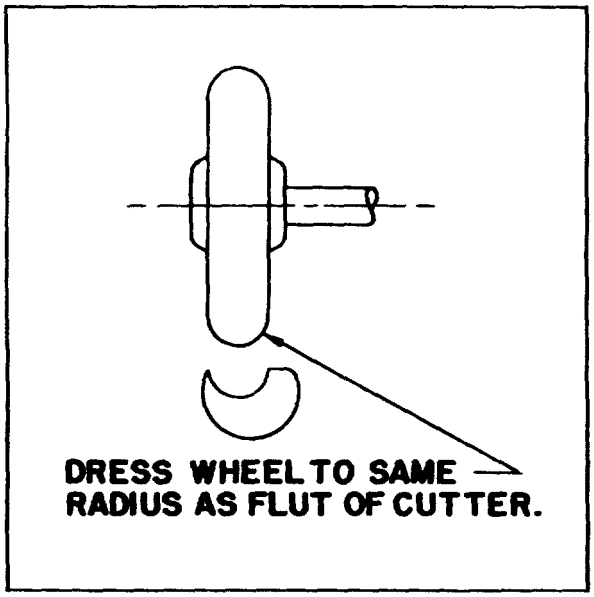


ILLUSTRATION NO. 12
DRESSING RADIUS ON GRINDING WHEEL

Use a dressing brick such as Foley Part No. R000624 to dress desired radius onto periphery of grinding wheels such as those required for flute grinding. See illustration No. 12.

CLEANING DIAMOND GRINDING WHEELS

In general you do not dress the diamond grinding wheel as such, you clean it using a cleaning stick such as the one supplied with the diamond wheel, Foley Part No. 370426. The cleaning stick should be used frequently to prevent a buildup or excessive loading of the diamond wheel, A diamond wheel will be glazed and loaded by grinding on mild steel. This is one of the main reasons for avoiding at all times the grinding of steel with your diamond wheel.

GRINDING STRAIGHT HIGH SPEED STEEL ROUTER BITS

1. Dress the flaring cup grinding wheel as shown in illustration No. 10.

2. Lock grinder table to extreme left side.

3. Position work-head near left hand end of grinder table.

4. Swing work-head to left and locate against stop pin

5. Select collet to fit shank of router bit to be ground and mount router bit and collet into work-head.

6. Mount the flaring cup wheel onto spindle shaft with face of cup wheel to back of the grinder.

7. Position flute to be ground straight up by rotating cutter and then lock with lock knob, dia. No. 23 of exploded view drawing No. 3.

8. Now position grinding wheel near work and re-lock table.

9. Sight in face of grinding wheel and face of router bit cutter flute. If set-up looks good, unlock table and set stop rods. Stop rods should be set so as to limit grinding wheel travel along the flute of the cutter. Set right hand stop rod so that router bit clears away from grinding wheel and can be rotated.

10. Turn on grinder motor and bring grinding wheel into work. Back grinding wheel off and check surface of cutter to see that grinding wheel has contacted the work at least half of the face width of the cutter. See drawing illustration No. 13. If grinding wheel is grinding only the top or bottom-edge of the router bit, loosen lock screw, dia. No. 23 and rotate collet assembly to achieve lineup.

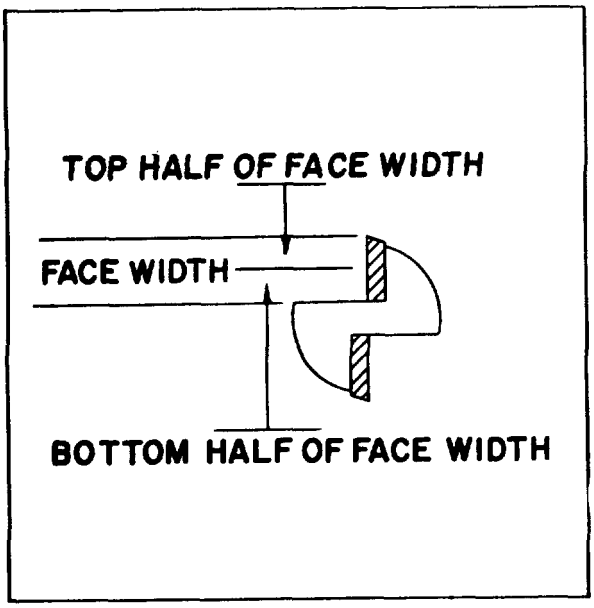


ILLUSTRATION NO. 13

11. Turn on grinder motor and bring grinding wheel up to the router bit. Now traverse table back and index to next flute. Bring the grinding wheel up to the router bit slowly. The object here is to check the spacing of the router bit flutes.

12. Start grinding on flute that checked to be nearest the grinding wheel. Take a light pass and then rotate router bit to next flute. Grind this flute and continue until flutes are cleaned up and a sharp edge is ground.

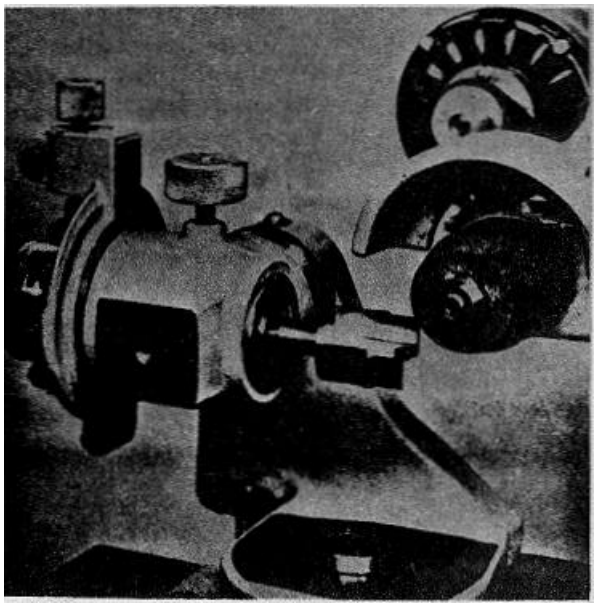


ILLUSTRATION NO. 14
GRINDING A STRAIGHT ROUTER BIT

13. Use from (.001) one thousandth to (.002) two thousandth feed on grinding wheel when grinding high speed steel cutters. An infeed of. 0005 one-half thousandth for the finish pass will produce a better finish. See illustrations No. 14 and No. 16.

14. To grind the ends of the router bit, back off grinding wheel and remove cup wheel and swing work-head around to about 95°. Remount cup wheel with face of wheel towards front of the grinder.

15. Rotate router bit in head so that flute lays flat. See illustration No. 15.

16. Loosen hex nut, dia. No. 40 of exploded view No. 3 and rotate work-head up about 5° depending on clearance on the router bit. Lock hex nut.

17. Bring grinding wheel up to the router bit and set the right hand stop rod. The edge of the grinding wheel should come to the center of the router bit in most cases.

18. Raise or lower grinding wheel so that you are grinding only on the end of one flute at a time.

19. Start grinding end of router bit indexing a flute into position each pass over the grinding wheel. See illustration No. 15.

Alternate method of grinding the flute of straight cutters is to have the work-head positioned to the right. The advantage here is that the grinding wheel does not have to be removed and turned over when the ends of cutter are to be ground. Otherwise the set-up is the same except that the surface you are grinding will be away from the operator. See illustration No. 16.

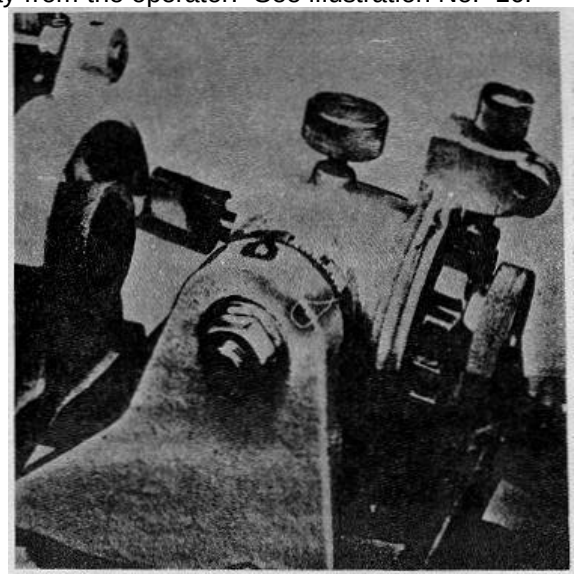


ILLUSTRATION NO. 15
GRINDING END OF STRAIGHT ROUTER BIT

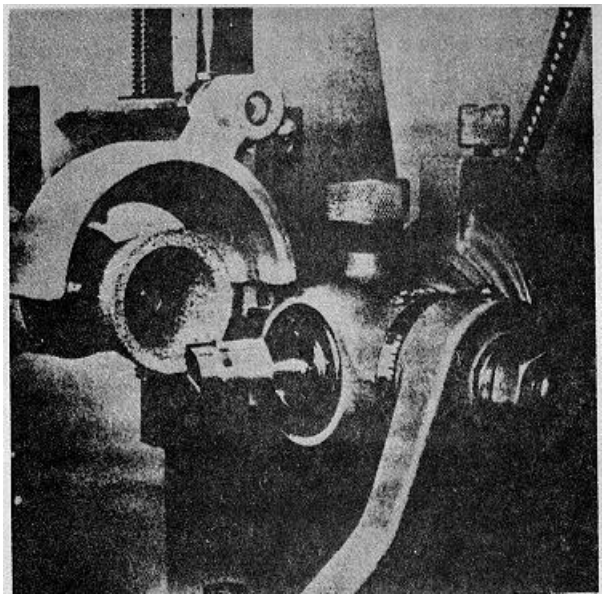


ILLUSTRATION NO. 16
GRINDING FLUTE OF STRAIGHT ROUTER BIT

GRINDING SPIRAL HIGH SPEED ROUTER BITS

1. In general, if the cutter has centers, it should be mounted on the machine using centers and suitable.

2. Work-head. Mount cutter ill work-head using appropriate collet.

3. Swing work-head to the right and locate against stop pin.

4. Mount flaring cup grinding wheel with face of wheel toward front of grinder.

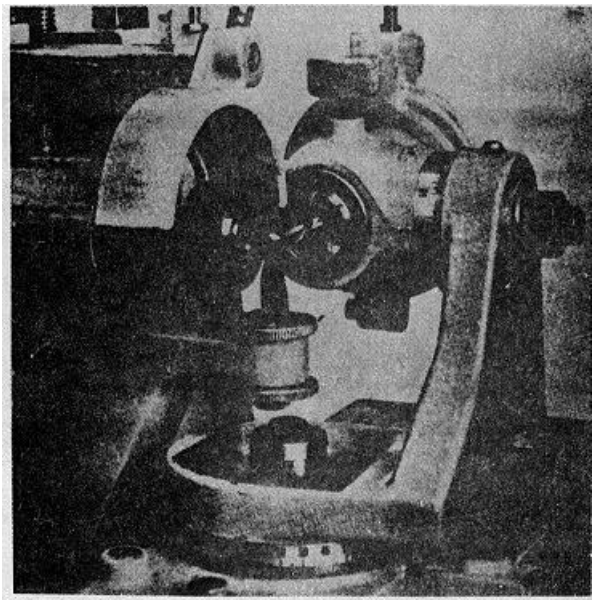


ILLUSTRATION NO. 17
GRINDING A SPIRAL CUTTER

5. Position end of router bit next to grinding wheel. Rotate router bit for clearance angle and lock table lock and work-head lock knob. See drawing illustration No. 17.

6. Set up stop finger so that finger is supporting the router bit ahead of the grinding wheel. See illustration No. 18.

7. Loosen table lock and traverse table to left until stop finger comes to end of router bit flute. Set right hand stop rod.

8. Dry run cutter over stop finger to see that stop finger is set correctly. Make sure that index pin and collet tube lock are released and work-head collet can rotate freely.

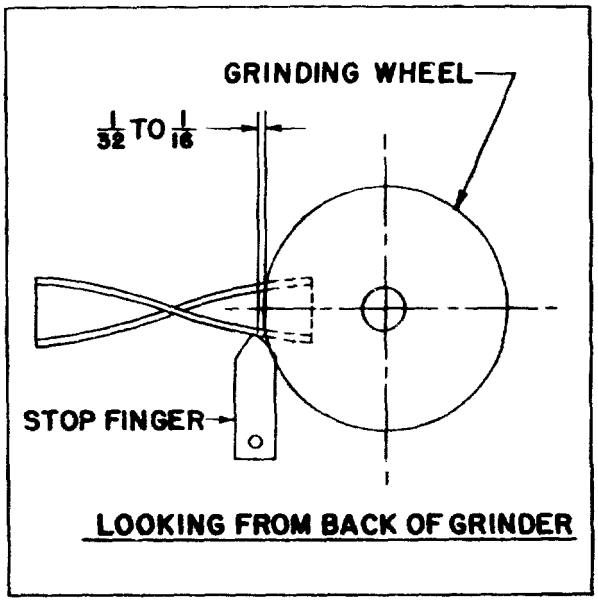


ILLUSTRATION NO. 18

9. Bring router bit onto step finger and turn on grinder motor. Bring grinding wheel up and just touch the router bit. Traverse router bit off of the stop finger and check the surface ground. If you are grinding only on the cutting edge of the router bit, lower the stop finger. If you are not grinding on full top width of cutting edge, raise the stop finger. See illustration No. 19.

10. After you are satisfied with your set-up, grind each land of the cutter for each grinding wheel setting. That is, grind each land and then feed grinding wheel in and then go around cutter again. Use an in-feed of about (.0006) one-half thousandth on finish pass.

11. T grind the ends of the. spiral cutter, use the same set-up as for straight router bits. See illustration No. 15 and No. 22.

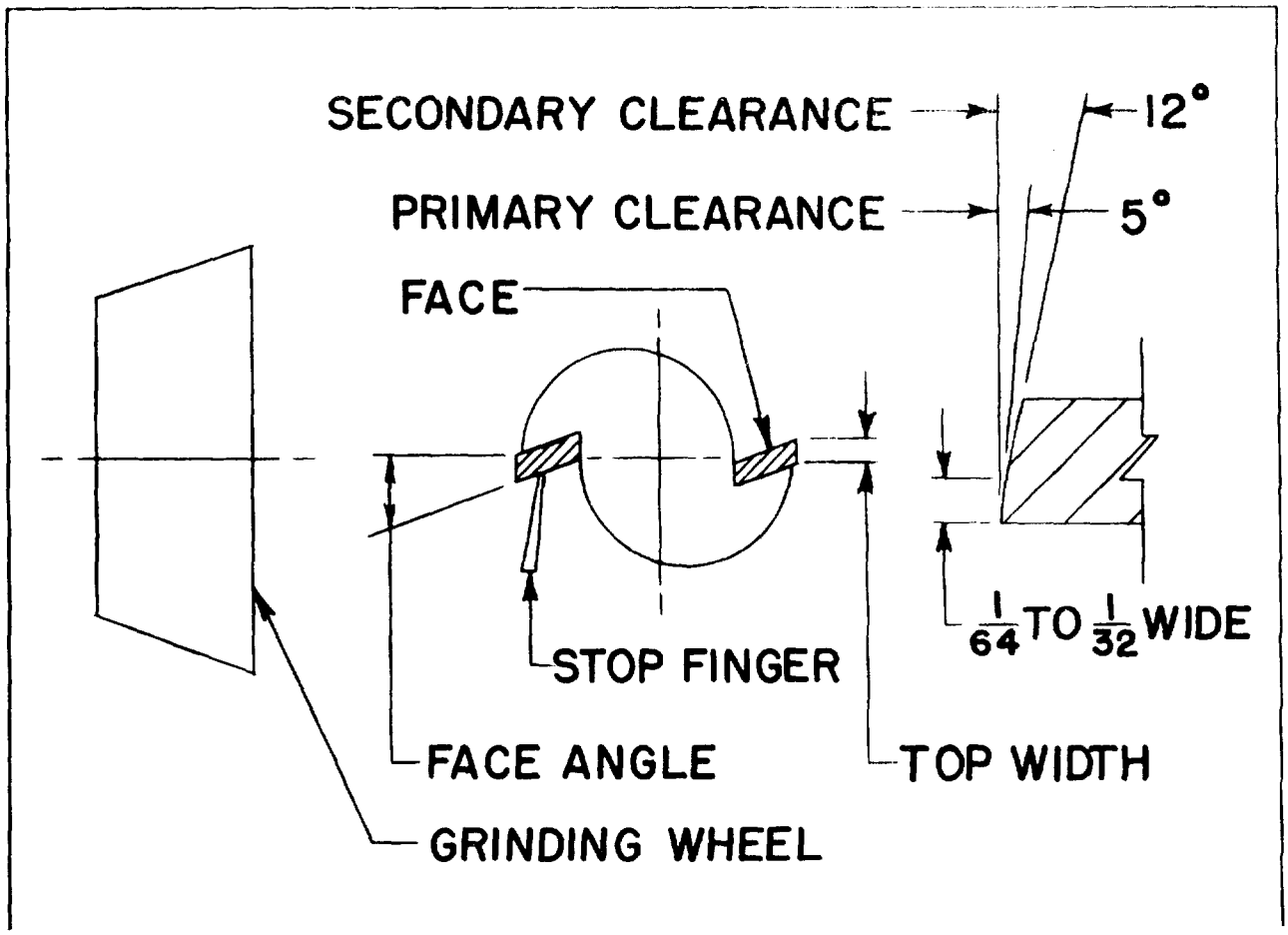


ILLUSTRATION NO. 19

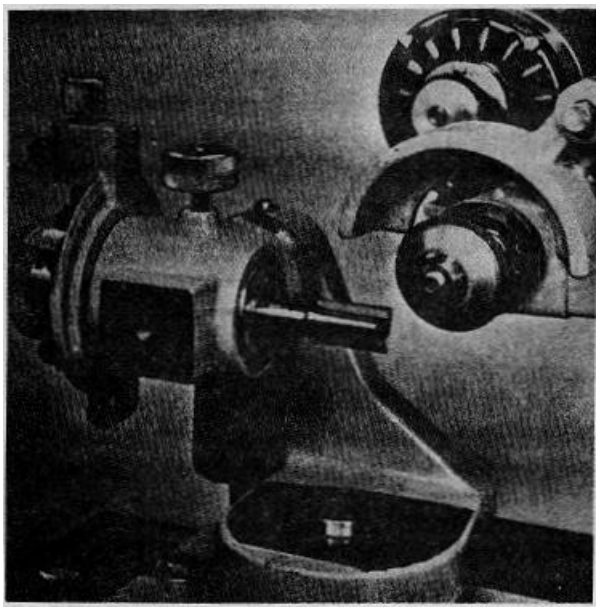


ILLUSTRATION NO. 20
GRINDING THE FACE OF A CARBIDE ROUTER BIT

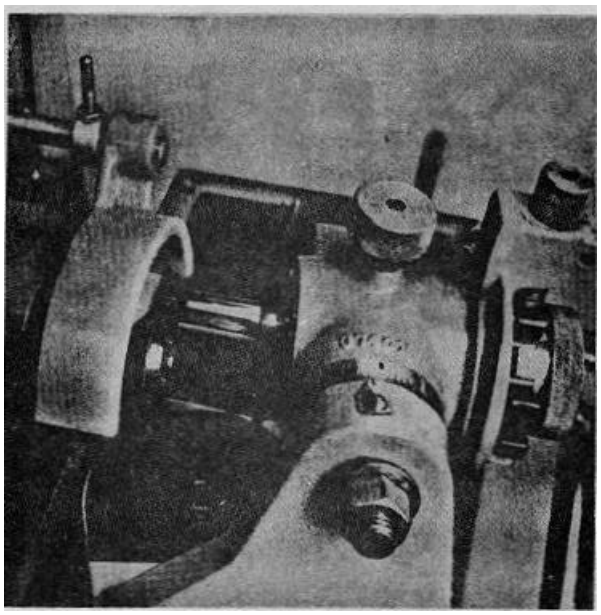


ILLUSTRATION NO. 21
GRINDING END Of CARBIDE ROUTER BIT

GRINDING STRAIGHT CARBIDE ROUTER BITS

1. In general the set-up and procedure for grinding carbide router bits is the same as for high speed steel.

2. The main difference is that the carbide router bit must be ground with a diamond wheel and that the amount of feed used on the diamond wheel should not be more than (.0005) one-half thousandth per pass of the grinding wheel. See illustration No. 20 and No. 21.

GRINDING SPIRAL CARBIDE ROUTER BITS

The set-up for grinding carbide spiral router bits is the same as for high speed steel spiral router bits. The main difference is that a diamond wheel of the D11 type (flaring cup) must be used and an in-feed of but (.0005) one-half thousandth is used. See illustration No. 17 and No. 22.

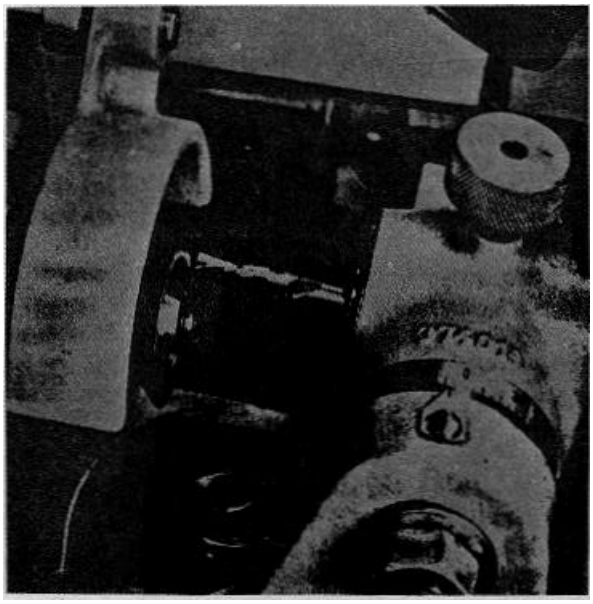


ILLUSTRATION NO. 22
GRINDING END OF SPIRAL CARBIDE ROUTER BIT

GRINDING STRAIGHT PLANER KNIVES HIGH SPEED STEEL OR CARBIDE

1. Wheel Dressing-for grinding high speed steel cutter, dress flaring cup wheel shown in illustration No. 10.

2. Set-up grinder with sub-table and centers as shown in illustration No. 23. Mount flaring cup wheel with face toward front of machine.

3. Mount cutter on appropriate mandrel or if cutter has centers, mount directly onto centers of the grinder.

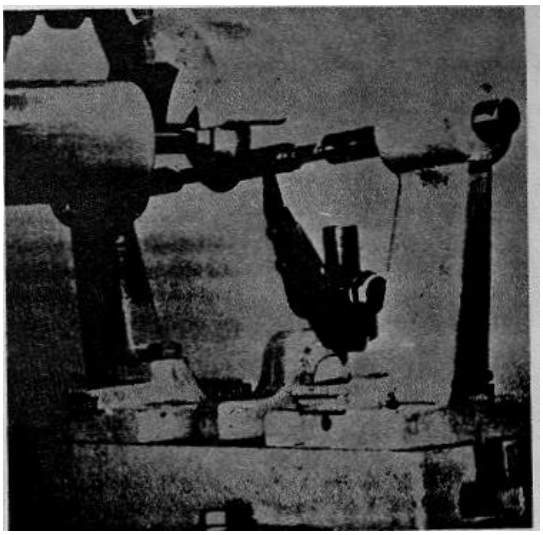


ILLUSTRATION NO. 23
GRINDING A STRAIGHT PLANER CUTTER

4. Mount spring loaded stop finger so it will clear grinding wheel. The base of the stop finger must be mounted onto the table so it will move with the work.

5. Adjust stop finger up or down to get proper clearance on cutter. See illustration No. 19.

6. Set table stops so that grinding wheel can bed when cutter is rotated. Bring grinding wheel up close to cutter and dry run to see that stops and setup are correct.

8. Turn on grinder motor and take a very light pass on cutter.

9. Readjust top finger up or down as needed to grind the entire surface of cutter.

GRINDING SPIRAL PLANER KNIVES, HIGH SPEED STEEL OR CARBIDE

1. Dress flaring cup wheel for high speed cutter as shown in illustration No. 10.

2. Set-up grinder with sub-table and centers lined for straight planer cutters.

3. Set-up stop finger base onto base of grinder. See illustration No. 24.

4. Use the rigid stop finger spirals.

5. Lock table in position so that the cutter is just clearing the grinding wheel.

6. Set stop finger so that it will pick up the cutter before the cutter engages the grinding wheel. See illustration No. 18.

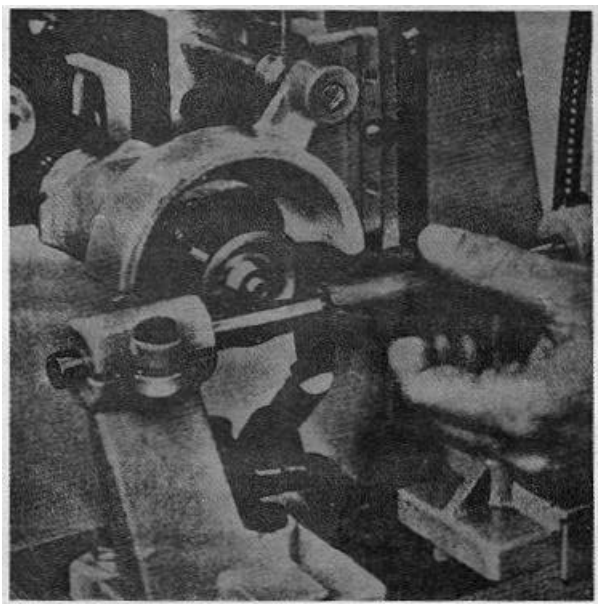


ILLUSTRATION NO. 24
GRINDING A SPIRAL PLANER CUTTER

7. Make sure that the point of contact between stop finger and cutter as well as between cutter and grinding wheel are very close together. Caution: It is very important to get stop finger to contact the work piece as near to the same point that the grinding wheel contacts the work. That is, if the stop finger is too far ahead of the grinding wheel, the cutter will drop off of the stop finger too soon at the end of the grinding stroke. This will cause a bell shape to be ground on the end of the spiral. If the stop finger is placed too far behind the grinding wheel, the cutter will engage the grinding wheel before the stop finger can pick it up.

8. Turn on grinder motor and take a very light pass on the cutter. Check the contact between grinding wheel and cutter.

GENERAL NOTES ON GRINDING STRAIGHT AND SPIRAL CUTTERS

In some cases, after grinding the cutter, the stop finger is adjusted down a small amount and the cutter is re-ground. This procedure will leave a narrow land on the cutter. The land should be from 1/32 to 1/16. wide, see illustration No. 19. This grinding procedure will produce a primary and secondary clearance angle.

When grinding spiral or straight planer knives always keep a light pressure on the cutter with your hand so that the cutter will track on the stop finger. That is, rotate the cutter against the stop finger and keep a light pressure on the cutter as it travels along the stop finger. See illustration No. 24.

Always adjust the centers so that the cutter can rotate freely and yet not have any play or looseness. If the cutter fits loosely on the centers it will be impossible to get an accurate grinding job.

GRINDING SPUR BITS

1. Set up grinder with work-head.

2. Swing work-head to the right.

3. Swing work-head up to a vertical position. See illustration No. 26.

4. Next select the collet necessary to mount spur bit into collet head.

5. Select a straight grinding wheel of the proper thickness and dress the corners so that the grinding wheel matches the end of the spur bit. See drawing illustration No. 25.

6. Re-adjust work-head as needed to permit grinding wheel to clear through end of spur bit and give proper clearance.

7. Turn on grinder motor and grind one half of the end of spur bit by feeding grinding wheel down onto the spur bit. See illustration No. 26. Be sure to back up on feed handle to take slack out of feed screw.

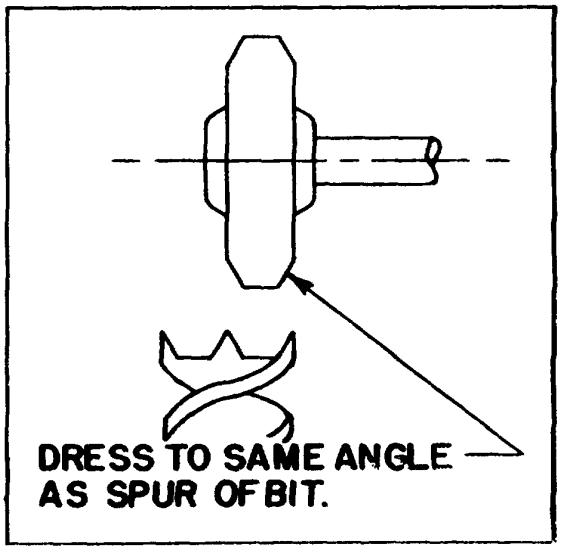


ILLUSTRATION NO. 25
DRESSING GRINDING WHEEL TO MATCH SPUR BIT

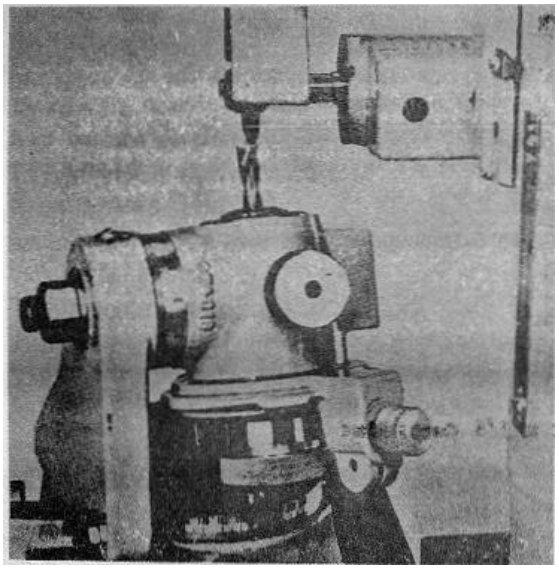


ILLUSTRATION NO. 26
GRINDING A SPUR SIT

GRINDING FLUTED ROUTER BITS

1. Mount work-head near center of grinder table.

2. Swing work-head to right against stop pin and lock.

3. Select collet and mount fluted router bit into work-head.

4. Select a straight grinding wheel of proper thickness and dress the wheel to fit flute of the fluted bit. See illustration No. 12.

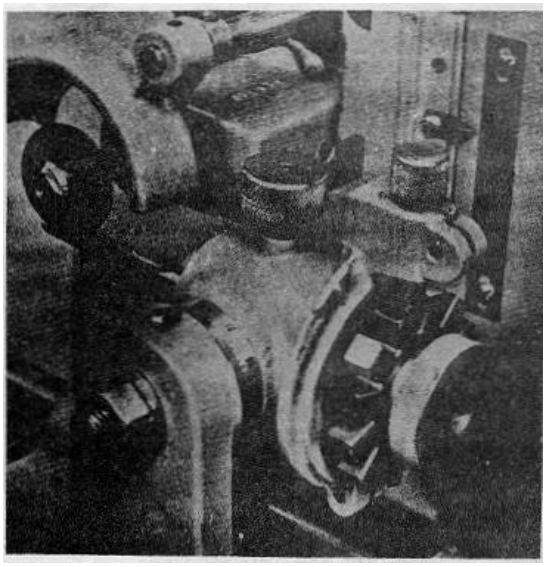


ILLUSTRATION NO. 27
GRINDING A FLUTED ROUTER BIT

5. Position the grinding wheel over router bit and set the table stops. See illustration No. 27.

6. Rotate bit in work-head as necessary to get grinding wheel to fit into flute of the router bit.

7. Turn on grinder motor and use a very light down feed on the grinding wheel. Be sure to back up feed handle to take up the slack in the feed screw.

8. Grind end of router bit using same procedure for *straight router bits*.

GRINDING END MILL CUTTERS

Grinding end mills is basically the same as grinding spiral router bits. The set-ups are the same and you should refer back to grinding high speed router bits.

1. The main difference encountered in grinding 'end mills is that there are in general 2-4 or 6 flutes. And there is usually a primary and secondary clearance angle ground on the cutters outside diameter. See illustrations No. 19 and No. 28.

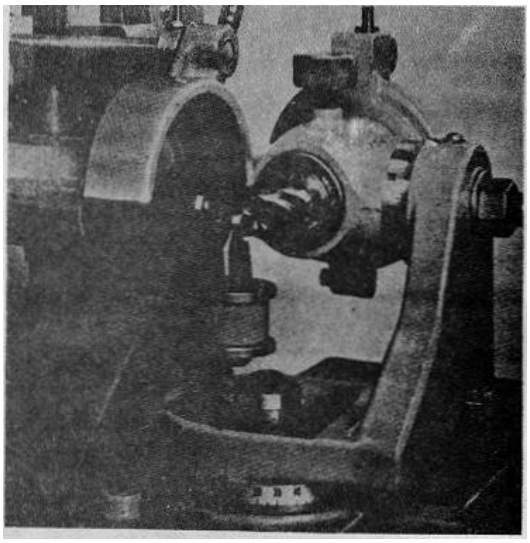


ILLUSTRATION NO. 28
GRINDING A SPIRAL END MILL CUTTER

2. A second difference is that the end of the cutter is usually ground with a primary and secondary clearance angle. See illustration No. 29.

   This can be done by first grinding the primary clearance and then re-adjust the work-head to a greater angle to grind the secondary clearance angle, using the index plate on the work-head to position the cutter.

3. In general, most wear on an end mill is at the very end, and when outside of cutter is in good condition, the end only should be ground.

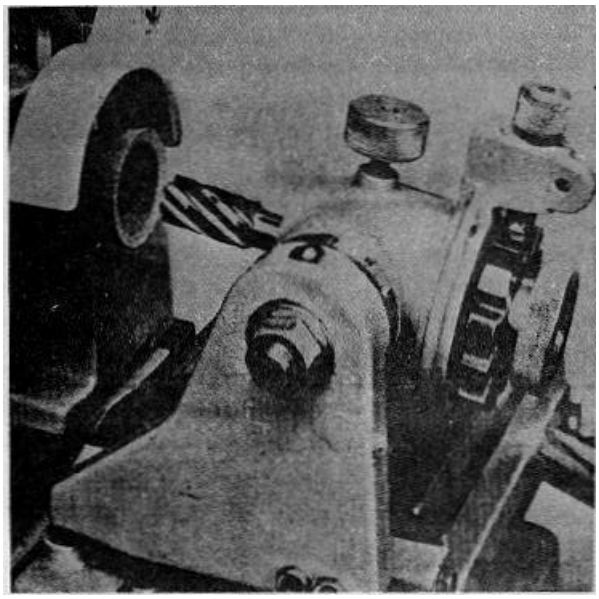


ILLUSTRATION NO. 29

GRINDING END OF SPIRAL END MILL CUTTER

4. On some end mills the center at the end of the cutter must be relieved. To accomplish this, set work-head angle bracket at 45° and bring flaring cup grinding wheel to the same elevation as the end of the cutter. See illustration No. 30. Now bring end mill up very close to grinding wheel and lock the grinder table. Next turn on the grinder motor and slowly feed the grinding wheel into the end of the cutter and at the same time, rotate cutter in the work-head. This procedure will relieve the end of the cutter and produce a spherical relief with a radius nearly equal that of the grinding wheel used to produce the radius.

GRINDING REAMERS

General: A reamer is ground only on the end and not on the outside diameter. If the outside diameter is ground, the reamer will produce a smaller hole than before grinding.

TO GRIND END OF REAMERS

1. Mount sub-table and centers onto grinder table.

2. Swing sub-table out approximately 45° and lock.

3. Set-up spring loaded stop finger and mount stop finger base to sub-table or grinder table.

4. Mount a flaring cup grinding wheel on to spindle shaft with face of wheel towards front of grinder. See illustration No. 6.

5. When you are satisfied with your set-up grind the primary clearance angle first using very light feeds on the grinding wheel, going completely around the reamer before moving the grinding wheel to a new setting.

6. Remove as little material as possible to restore cutting edges of reamer.

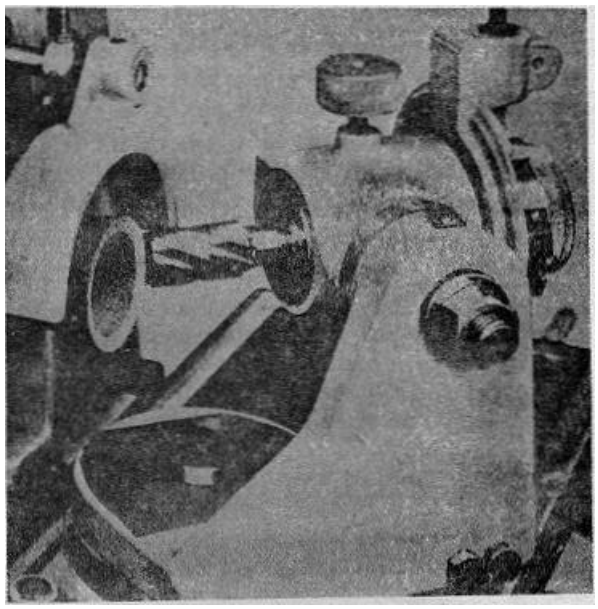


ILLUSTRATION NO. 30
RELIEVING END OF SPIRAL END MILL CUTTER

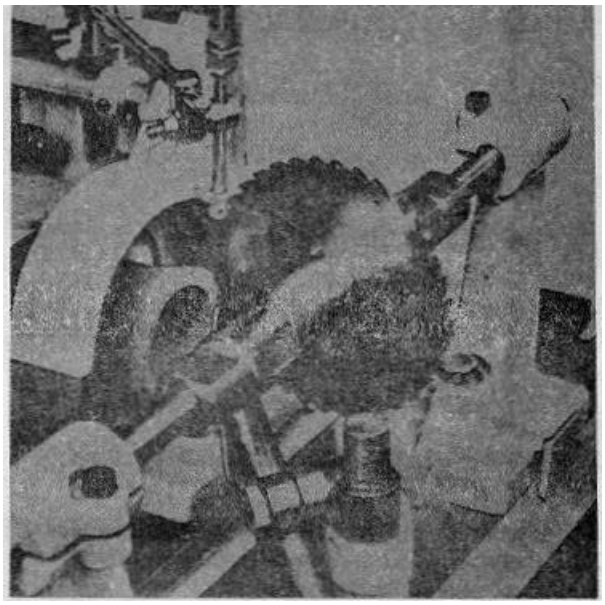


ILLUSTRATION NO. 31
GRINDING A SLITTING SAW

GRINDING SMALL SLITTING SAWS AND KEY SEATER

In general slitting saws and key seaters should be ground on the outside diameter only.

1. To grind slitting saws, mount the saw on an arbor and set arbor between centers.

2. Use the spring loaded stop finger and set stop finger on the face of tooth to be ground. See illustration No. 31.

3. Use a flaring cup grinding wheel with face of grinding wheel towards front of grinder.

4. Take light passes with the grinding wheel and go all the way around the cutter at each grinding wheel setting.

5. After you have gone around the cutter once, rotate cutter one half turn and start 'grinding on tooth opposite first tooth that was ground. *For Key Seater*: Mount key seater on centers or in the work-head. Use spring loaded stop finger to index cutter teeth. See illustration No. 32.

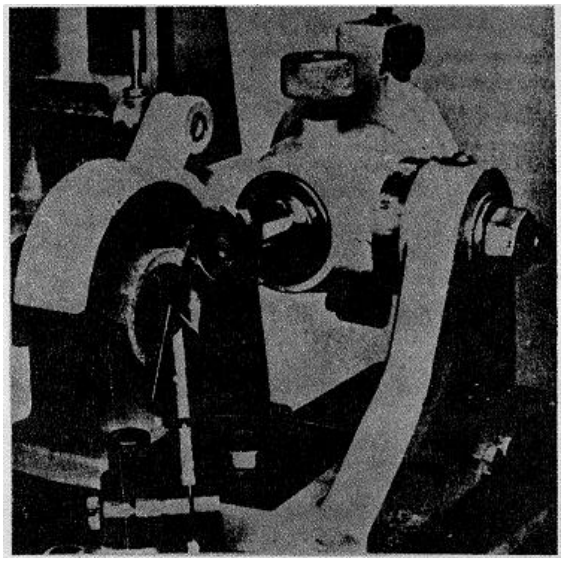


ILLUSTRATION NO. 32

GRINDING SHAPER CUTTERS

In general the shaper cutters are ground only on their face, not on the profile of the cutter. If the profile of the cutter were ground, it would change the shape that the cuter would produce in the work.

1. Set up the grinder with the work-head swung to the left

2. Select a flaring cup grinding wheel and mount it on spindle with face of grinding wheel toward rear of grinder.

3. Rotate cutter in the work-head and adjust index locking ring so that cutter face lines up with the grinding wheel. See illustration No. 33.

4. Adjust work-head up or down so that grinding wheel will clear body of cutter and permit grinding entire face of the cutter.

5. Set table stops.

6. Grind cutter, removing as little material as possible to restore cutting edges of the shaper cutter.

7. Use same grinding wheel setting when taking finish pass on each face of cutter.

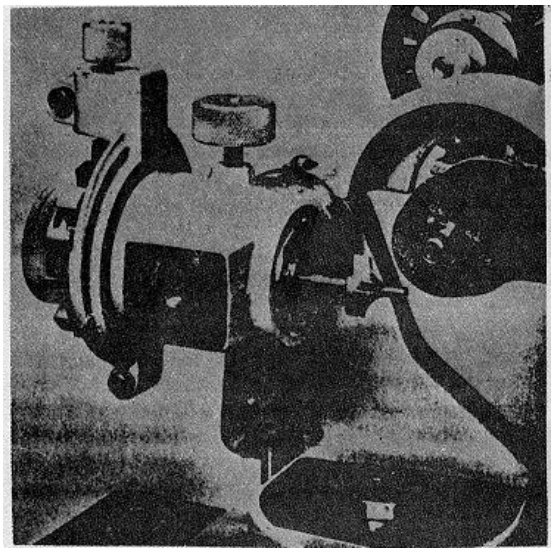


ILLUSTRATION NO. 33
GRINDING A SHAPER CUTTER

GRINDING CARBIDE SAWS

General: The 374580 Saw Grinding Attachment will permit face, top and side grinding of carbide saws to 12" diameter. A diamond wheel must be used to grind carbide saws. The 2" diameter diamond flaring cup wheel, Foley Part No. 370169 can be used for sharpening many saws with a generous gullet Re However, for saws with small gullets and a large number of teeth, you should use a 3" diameter diamond wheel such as Foley Part No. 370586.

The saw grinding attachment comes complete with stiffening plates of two (2) sizes and adaptor spacer for saw hole sizes 5/8, 3/4, 7/8, 1, 1 1/8 and 11/4. If different sizes are needed they can be made up.

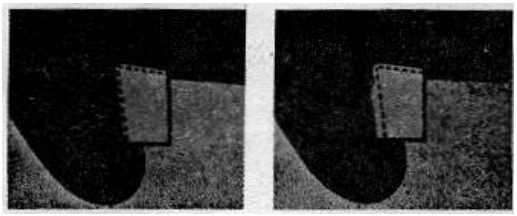
Stop finger and knuckles are supplied with the basic machine and are used when top and side grinding the saw.

In general, the sequence of saw sharpening is to grind the face of the teeth first and then to grind the tops of the teeth. The sides of the teeth are not ground except when a new tip has been brazed into the saw or very uneven side clearance exists. The following instructions will elaborate on these steps.

Note: When grinding the carbide tips, always start grinding on highest tip first to avoid too heavy a grind. Grinding heavy with the diamond wheel will drastically shorten its life.

GENERAL SAW GRINDING INFORMATION

Grinding the face and top of each tooth in the saw is mandatory when sharpening a carbide tipped saw blade. The operator should choose the combination of face and top grinding that will bring all teeth to a uniform height and sharpness with the least amount of metal removed. Unless neglected and allowed to run without re-sharpening until the cutting edges have been badly rounded or chipped, it will be necessary to grind only a few thousandths of an inch from the teeth to restore a keen cutting edge.



OPERATORS SHOULD INFORM CUSTOMERS THAT MORE FREQUENT MAINTENANCE WILL REDUCE SHARPENING AND REPLACEMENT EXPENSE, WHILE INSURING ACCURATE, CLEAN CUTTING.

Generally, face grinding requires the removal of the most metal. Top grinding assists in sharpening the tip and is also the principle means of keeping the blade perfectly round.

Normally, no side grinding of tips will be necessary on a saw with all original tips still intact. If a new tip is inserted in the saw or the teeth are of uneven width, side grinding must be done on the saw.

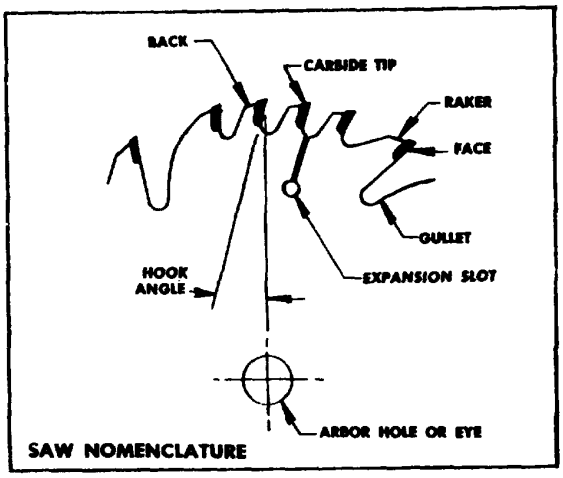
The following sharpening instructions are general as to type of saw. However, the order of operations, that is face grind first, top grind set and side grind third, should be followed for all saws

GENERAL INSTRUCTIONS FOR GRINDING CARBIDE SAWS

Before attempting to grind the saw, remove rust, gum, etc. from the blade. Gum can be easily removed by soaking the blade in a hot solution of water and household ammonia. The gum around the teeth can be removed by use of a fine brass wire brush used in a bench grinder. When using the brass wire brush, the operator must be careful not to scratch the saw body as the scratches will permit rapid build up of gum deposits when blade is used.

Badly chipped carbide tips will have to be replaced or, ground down the same as the other teeth in the saw, leaving the residual chips showing. That is, it is not reasonable to grind all of the teeth down to match a "low" or chipped tooth. Small chips may be ground out but the operator must use good judgment in deciding when.

After rust, pitch, etc. have been removed from the saw, the gullets and backs of the saw body should be ground if needed. This is best done on a grinder such as the Foley Model 314 or 360 Grinder.



SETTING UP THE GRINDER FOR FACE GRINDING SAWS

1. Set up grinder with face grinding angle bracket and work-head from basic grinder as shown in illustration No. 34.

2. Use a 3/4 inch collet in the work-head to mount the saw cup and stud

3. Align saw cup by placing a level across the top of the saw cup Set pointer on quadrant scale. Note: Machine table must have been leveled as outline previously. Also, the setting of the pointer need be done on initial set up only.

4. Select stiffening plates that will give the saw maximum support.

5. Select proper spacer for hole in saw.

6. Mount saw with the face of teeth toward the front of the grinder.

7. Mount grinding wheel. The three inch diameter diamond wheel will be more versatile and necessary on some saws with fine pitched teeth. The 2" diameter flaring cup wheel shown will prove satisfactory in many cases. Mount the grinding wheel with face of wheel toward back of grinder.

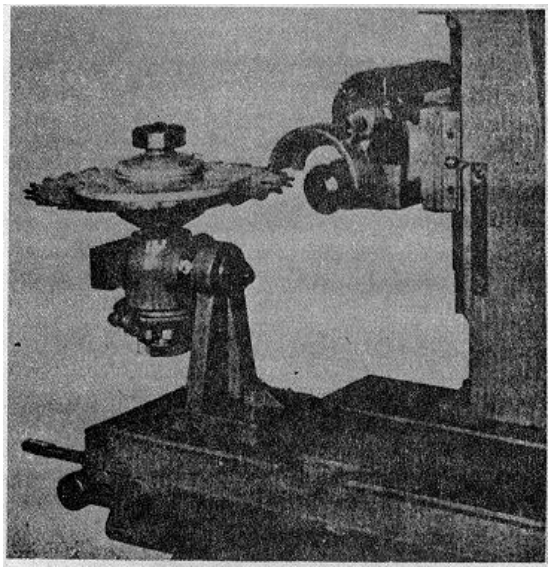


ILLUSTRATION NO. 34

8. Set work-head at proper angle if teeth are alternate face bevel.

9. Position grinding wheel at proper height, that is, so center of spindle shaft is the same height as the face of the tooth to be ground.

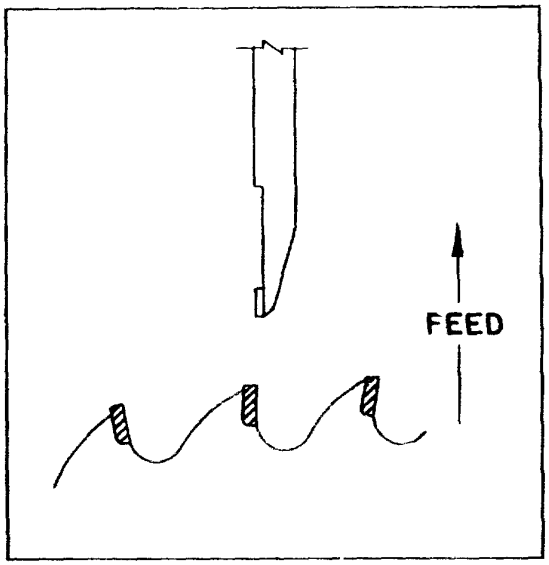
10. Line up face of grinding wheel with face of tip to be ground by rotating the saw and moving the grinding wheel in and out.

11. Set depth stop rods on each end of the grinder table. The diamond wheel should be permitted. to grind just past the bottom of the carbide tip.

12. Snug up on lock knob of the work-head to keep saw from rotating.

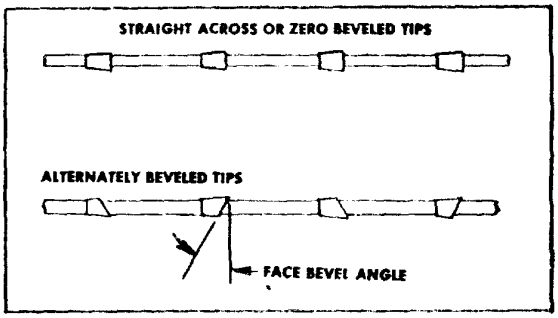
13. Back grinding wheel away from saw tip slightly and turn ox grinder motor.

14. Feed grinding wheel into face of carbide tip at the same time traversing the grinder table back and forth. Take light grinding passes of one half to one thousandth feed.



GRINDING TOOTH FACE

15. When tip is cleaned up, back grinding wheel up to first position, loosen the work-head lock and position next tip to be ground. Lock work-head and repeat. Note: When grinding alternate bevel faces, grind all one bevel and then grind the other.



SETTING UP THE GRINDER FOR TOP GRINDING SAWS

1. Set up grinder with top grinding attachment as shown in illustration No. 35.

2. Mount work-head and insert inch collet 3. Mount the saw cup adaptor and level. Note: Machine table must be level before leveling cup adaptor. Set pointer. This procedure is only necessary at initial set up.

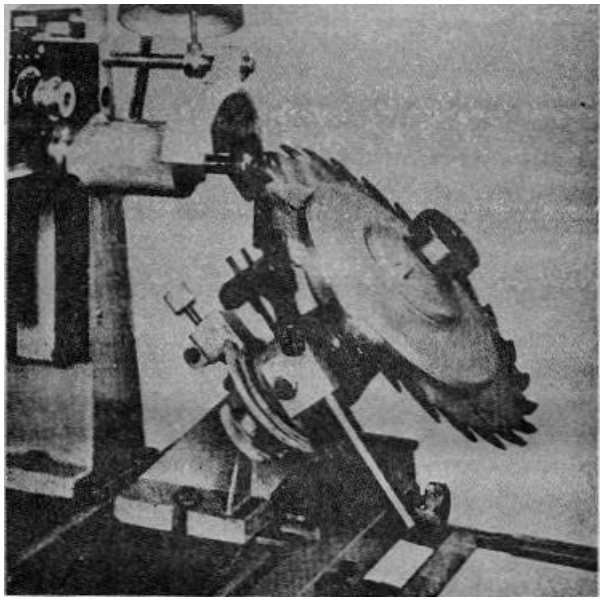


ILLUSTRATION NO. 35
TOP GRINDING

4. Mount saw using proper hole bushing and stiffening plates.

5. Mount diamond wheel with face of wheel toward front of grinder.

6. Line up saw tops with face of diamond wheel and set stop finger as shown in illustration No. 35.
Note: Set stop finger on tip you are grinding.

7. Set table stop rods.

8. Set work-head at proper bevel of saw.

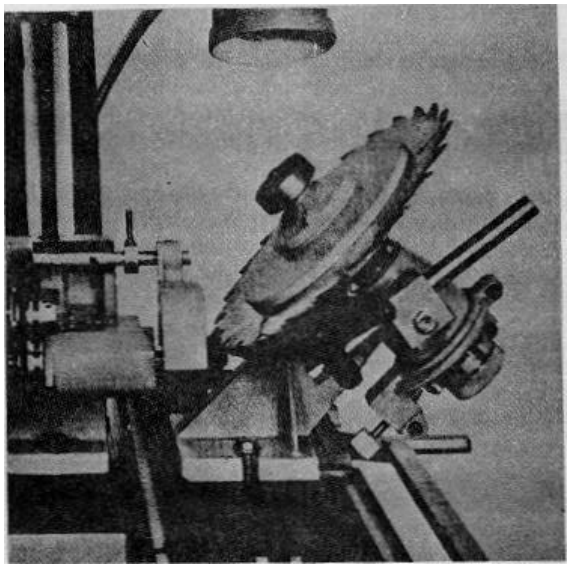


ILLUSTRATION NO. 36
TOP GRINDING

9. If alternate bevel saw is being ground, grind all one bevel than reset the work-head to opposite bevel. Note: Do not change stop finger setting.

10. Keep a slight pressure against the stop finger at all times when grinding.

11. Let the work-head rotate freely or adjust in a slight drag by use of lock knob, to suit operator feel.

GENERAL NOTES ON TOP GRINDING

When grinding the top of a combination blade, grind the alternate tops first, then set saw blade level and readjust stop finger for different hook angle on raker teeth. The rakers should be ground .015 to .020 inch lower than the cutting teeth. This can be done by first letting the tips of the alternate teeth just touch the grinding wheel while the saw is in a flat plane. Then note setting and feed the grinding wheel in .020 when grinding the raker. In general the top clearance angle of the carbide tips is twelve degrees. Note: In some cases of small diameter saws with alternate top bevel, the standard work-head base and angle bracket must be used because the grinding wheel cannot reach the saw tips.

New Carbide Tips: In some cases of new tips in the saw, these should be roughed down first by making your normal set-up and repeatedly grinding the one tip until it is near the same height as the original tips.

Caution: Repeated grinding on one tip can generate excessive heat and coolant should be used while grinding. Do not put cold water on a hot tip as it can crack. It should also be noted that excessive heat from grinding any carbide can cause heat checks in the carbide and result in early failure of the tool.

SETTING UP THE GRINDER TO SIDE GRIND SAWS

1. Remove angle bracket from work-head base plate and mount side dress angle bracket onto work-head base plate. See illustration No. 37.

2. Mount work-head onto side dress angle bracket and insert 3/4 inch collet.

3. Mount saw cup adaptor and level the adaptor, setting the pointer at the work-head. Note: Make sure that machine table is level. This procedure is only necessary the first time the attachment is used.

4. Set lower pointer at work-head base plate by lining up face of saw cup adaptor with a dial indicator mounted on the grinder wheel guard shaft or sight in face of cup with a straight edge. Set lower pointer at 0°.

5. Swing angle bracket out and mount saw with teeth facing up. Use proper hole bushing and as large a stiffening plate as feasible.

6. Swing angle bracket to read 5°.

7. Swing work-head up to read 3°.

8. With face of tooth to be ground in a horizontal position, set stop finger. See illustration No. 37.

9. Bring center of spindle shaft above face of tooth to be ground so that bottom edge of grinding wheel will clear the saw body.

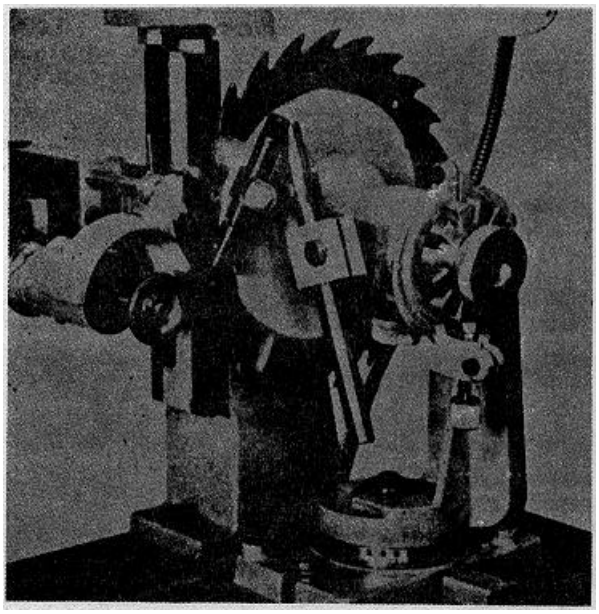


ILLUSTRATION NO. 37
SIDE GRINDING A CARBIDE SAW

10. Bring grinding wheel up to carbide tip. *Caution:* Before grinding, note that the grinding wheel rotation is such that it will tend to push saw tip away from the stop finger. You must keep pressure against the stop finger while grinding.

11. Set table stop rods so tat grinding wheel just leaves the bottom of the carbide tip when feeding into the tip. Set return stop to give sufficient room to index saw.

12. Turn on motor and grind, taking very light passes on each tip for each grinding wheel setting.

13. When left side of the carbide tips are ground, turn saw over and reset work-head to 3° down.

14. Reset stop finger and reposition the grinding wheel so that center of spindle shaft is below face of tooth being ground. See drawing illustration No. 38.

General Notes on Side Grinding

In order to get the same carbide tooth projection on each side of the saw, it is recommended that a set gage such as the Foley Part No. 357500 be used.

This will permit reading side projection of teeth directly and will enable the operator to grind both sides of the saw teeth the same.

It should be noted that in the case of alternate top bevel teeth, you will not get all the teeth the same height by top grinding unless all the teeth have the

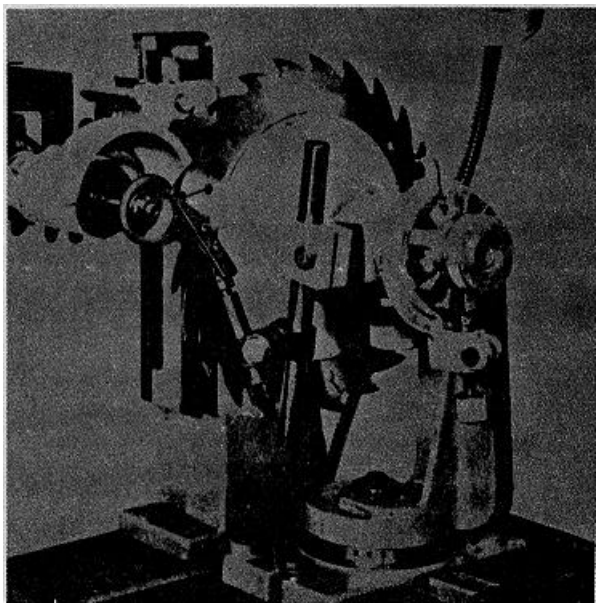


ILLUSTRATION NO. 38
SIDE GRINDING A CARBIDE SAW

same amount of side projection. This does not mean you should change the saw grinding procedure. You should keep in mind that the side projection of each tip must be the same or the saw will not be round, ad that in alternate top bevel teeth, every other tip on the same side will be a high-low reading. These two reading should be the same all around the saw. In general, the side projection of the tips should check within .003 inch of each other for *the same bevel tips in the blade*.

CARBIDE TIP REPLACEMENT

All missing tips must be replaced. Tips that are chipped or badly cracked should also be replaced as it would be uneconomical to grind all the other tips do to these low one. Teeth should also be replaced when the side clearance has been ground below the recommended width. Saws will bind or burn in the material being cut if the side clearance is insufficient.

After tip .replacement, grind all faces, sides of replaced tips only, and their tops last.

MATERIAL REQUIREMENTS

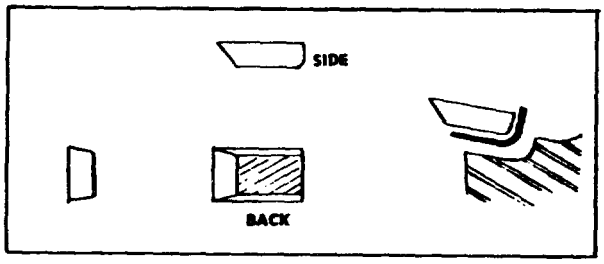
Replacement carbide tips
Silver Solder
Brazing flux
Acetylene and oxygen tanks
Holding and retipping fixture if desired
Cleaning fluid
Tweezers
Welding outfit

BRAZING IN THE TIP

Poor brazing technique causes most of the trouble with carbide tipped saws. A poor braze can easily cause a tip to be knocked out, therefore the correct brazing procedure must be followed.

Cleanliness cannot be over emphasized in every part of the brazing operation.

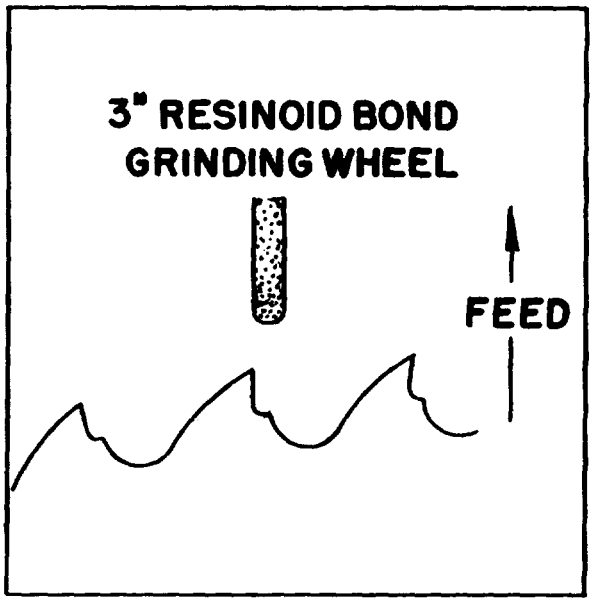
1. Rolled strip silver solder .003 of an inch thick is used for brazing in tip. The strip silver solder usually has a protective coating on it and this coating should be removed with fine steel wool or emery cloth before cutting into strip. Always prepare only the amount of silver solder that is to be used at one time.
2. Cut off pieces wide enough for the back of the tooth. Form piece around back of tooth (as shown below) and place in small cup of cleaning fluid such as carbon tetrachloride, alcohol, or trichlorethylene.



3. Rub back and bottom end of carbide tip with fine steel wool or emery cloth and place in cleaning fluid.

4. Remove tips and silver solder strips from cleaning fluid with a pair of tweezers and place on paper towel to dry. *It is extremely important that the operator does not touch the tips and silver solder with his hands after they have been cleaned*.

5. Brush silver solder flux on saw tip seat and on both sides of saw tooth being retipped and place silver solder shim in tip seat. Pick up new tip with tweezers, and dip back of tip in flux and set tip up against silver solder shim
6. Apply pressure to tip face and apply heat to tip only. Heat tip only until silver solder flows. Do not apply heat to saw body. Be sure that tip is located properly in seat with enough tip projecting out for finish grinding.
7. After soldering in the tips, clean the tips and the saw body around the tip by wire brushing, preferably with a brass wire brush, either power driven in a bench grinder or a hand brush.



GRINDING SEATS FOR CARBIDE TIPS

MAINTENANCE OF THE ROUTER BIT GRINDER

General: It is a good practice to keep the grinder free of grinding grit at all time by frequent dusting or brushing. The following schedule will extend the life of your machine and ensure that it will perform satisfactorily.

1. Once a week or every (8) eight hours of grinding thoroughly dust machine free of grinding grit.
2. Wipe V ways clean and reoil sparingly with a few drops of 30 wt. engine oil.
3. Wipe lead screw clean and oil sparingly with a few drops of 30 wt. engine oil.
4. Check V belt tension.

Every 100 hours of operation:

1. Perform eight hour cleaning and oiling schedule.
2. Remove all attachments from grinder table.
3. Remove table feed handle and cam track.
4. Loosen two set screws on either end of grinder table dia. No. 31 of exploded view No. 1.
5. Slide out table traverse rod and wipe rod clean with cotton waste.
6. Lift grinder table and slide toward front of machine. Lift table free of grinder base.
7. Thoroughly clean table and base, being careful not to get any grit into the ball bushings.
8. Clean wiper felts and re-oil generously with a 30 wt. engine oil.
9. Oil ball bushings generously with a 30 wt. engine oil.
10. Grease cam follower track with a light weight cup grease.
11. Reassemble table to grinder base, being careful so as not to damage the cam track wiper felts.
12. Insert table traverse rod and tighten set screws.
13. Clean and grease feed handle and cam track.
14. Replace feed handle and cam track.
15. Adjust gib plates, items No. 9 and No. 38 of exploded view drawing No. 2.
16. Adjust jam nuts on lead screw to remove end play at the thrust bearings, item No. 10 of exploded view No. 2.
17. Remove work-head from angle bracket.
18. Remove angle bracket.
19. Clean parts and reassemble using a film of light weight cup grease on base plate quadrant faces.
20. Oil felt seals on the work-head using a few drops of SAE 10 wt. engine oil. See illustration No. 31.
21. Remove stop screw and brass lock pin from workhead and insert a generous amount of SAE 10 wt. oil into work-head. See drawing illustration No. 39.

GENERAL NOTE

The work-head is a sealed unit and cannot be readily disassembled. Should the work-head not function properly, return to the factory for inspection and repair.

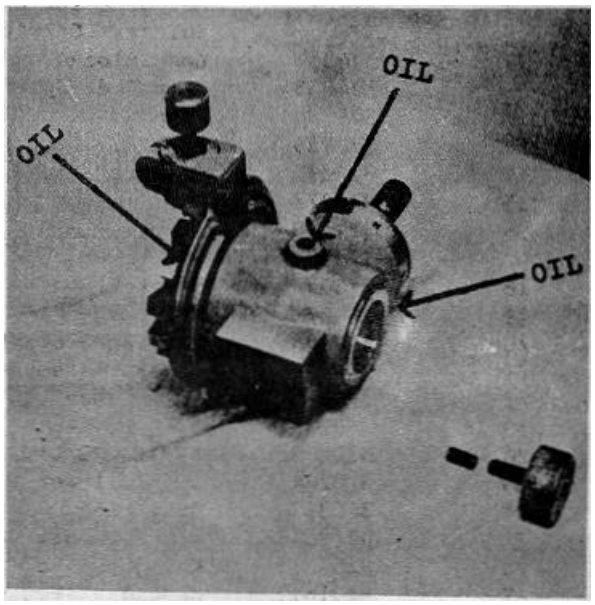


ILLUSTRATION NO. 39
OILING THE WORK-HEAD

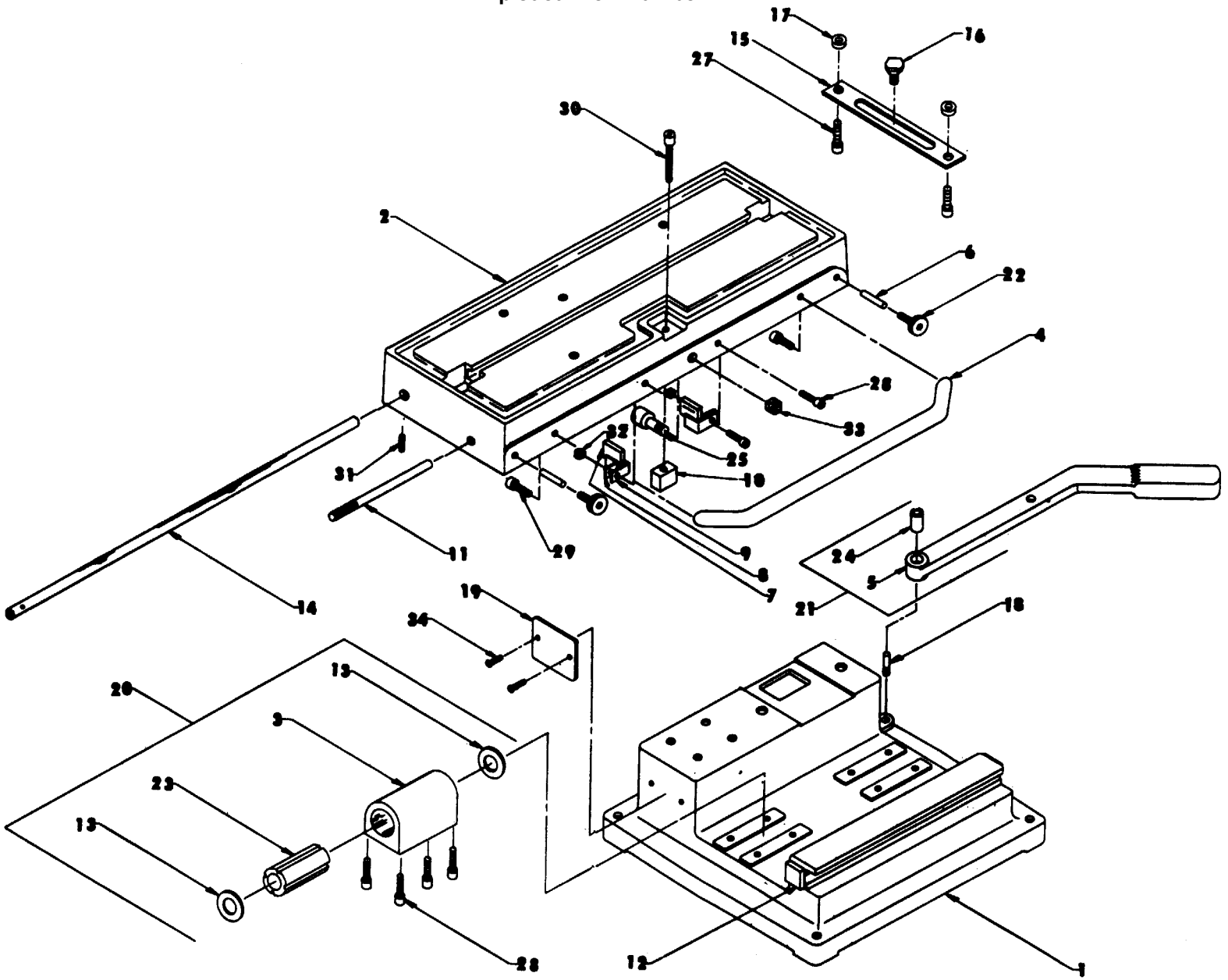
RECOMMENDATIONS FOR PUBLICATION IMPROVEMENT

Reports of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to: The Commanding General, Headquarters, U.S. Army Weapons Command, ATTN: AMSWE-SMM-P, Rock Island, Illinois 61201.

ROUTER BIT GRINDER

Diagram Number	Part Number	Part Name
1	374001	Base
2	374002	Table
3	374004	Bearing Block
4	374012	Handle
5	374021	Feed Handle
6	374038	Brass Plug
7	374041	Wiper - Roller
8	374045	Holder - Inside
9	374046	Holder - Outside
10	374047	Lock Block
11	374053	Stop Rod
12	374056	Stop
13	374059	Felt Seal
14	374071	Traverse Rod
15	374072	Can Plate
16	374073	Shoulder Pin
17	374074	Spacer
18	374075	Pivot Pin
19	374079	Nameplate
20	374504	Bearing Block Assembly
21	374522	Handle Assembly
22	374556	Thumb Wheel
23	370208	Ball Bushing
24	370243	Bearing 1/2 ID x 5/8 OD x 5/8 long
25	370244	Cam Follower
26	370310	Grip Ring
27	B190805	F1. Hd. Sock. Cap Screw #10 24 NC x 1/2 long
28	B251211	Kn. Sock. Hd. Cap Screw 1/4 20 NC x 3/4 long
29	B251611	Kn. Sock. Hd. Cap Screw 1/4 20 NC x 1
30	B252411	Kn. Sock. Hd. Cap Screw 1/4 20 NC x 1-1/2 long
31	C250627	Set Screw 1/4-20 NC x 3/8 Nylok Cup Point
32	J251000	Hex Nut 1/4-20 NC
33	J432100	Jan Nut 7/16 - 20 NF Jam Nut Cad Plate
34	R601018	Drive Screws #2 x 3/16

Router Bit Grinder
Exploded View Number 1

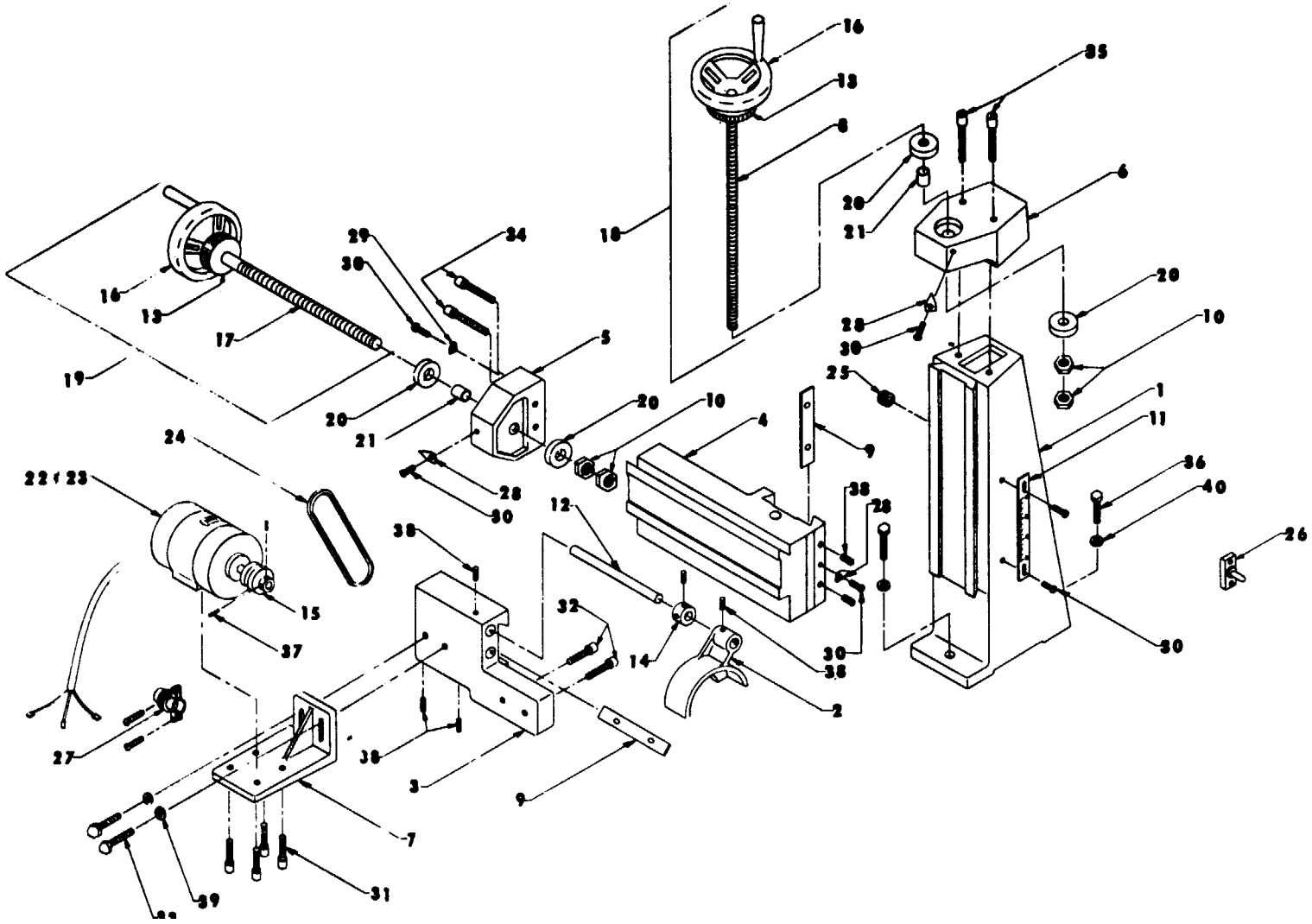


COLUMN

ROUTER BIT GRINDER

Diagram Number	Part Number	Part Name
1	374003	Column
2	374005	Guard
3	374006	Saddle
4	374007	Cross Feed Slide
5	374008	End Cap Cross Feed
6	374009	End Cap Vert Feed
7	374010	Motor Mount
8	374030	Vert Feed Screw
9	374031	Gib Plate
10	374036	Hex Jam Nut
11	374044	Height Scale
12	374051	Guard Support
13	374052	Feed Dial
14	374055	Collar For Mist Coolant
15	374067	Motor Sheave
16	374069	Handwheel
17	374070	Horz. Feed Screw
18	374530	Vert. Feed Screw Assembly
19	374570	Horz. Feed Screw Assembly
20	370042	Thrust Bearing
21	370243	Bearing
22	370590	Motor 110 V. 50-60 Cycle Single Phase
23	370591	Motor 220 V. 50-60 Cycle Single Phase
24	370680	Poly V Belt
25	370765	Grommet
26	370974	Switch
27	370976	Flexible Conduit Connector
28	357028	Pointer
29	357050	Pointer
30	A190602	Rd. Hd. Screw #10-24 NC x 3/8
31	B191011	Kn. Sock. Ed. Cap Screw #10 24NC x 5/8 Long
32	B251611	Kn. Sock. Hd. Cap Screw 1/4 - 20 NC x 1" long
33	B252001	Hex Cap Screw 1/4 - 20 NC x 1-1/4 Long
34	B252411	Kn. Sock. Hd. Cap Screw 1/4 - 20NC x 1-1/2 Long
35	B252811	Kn. Sock. Hd. Cap Screw 1/4 - 20NC x 1-3/4 Long
36	B432001	Hex Cap Screw 7/16 - 14NC x 1-1/4 Long
37	C190420	Set Screw #10-24NC X 1/4 Cup Point
38	C250627	Set Screw 1/4-20NC x 3/8 Nylok Cup Point
39	R000523	Washer 1/4 Cut Washer
40	R000535	Washer 7/16 Cut Washer

Router Bit Grinder Column
Exploded View Number 2



ROUTER BIT GRINDER

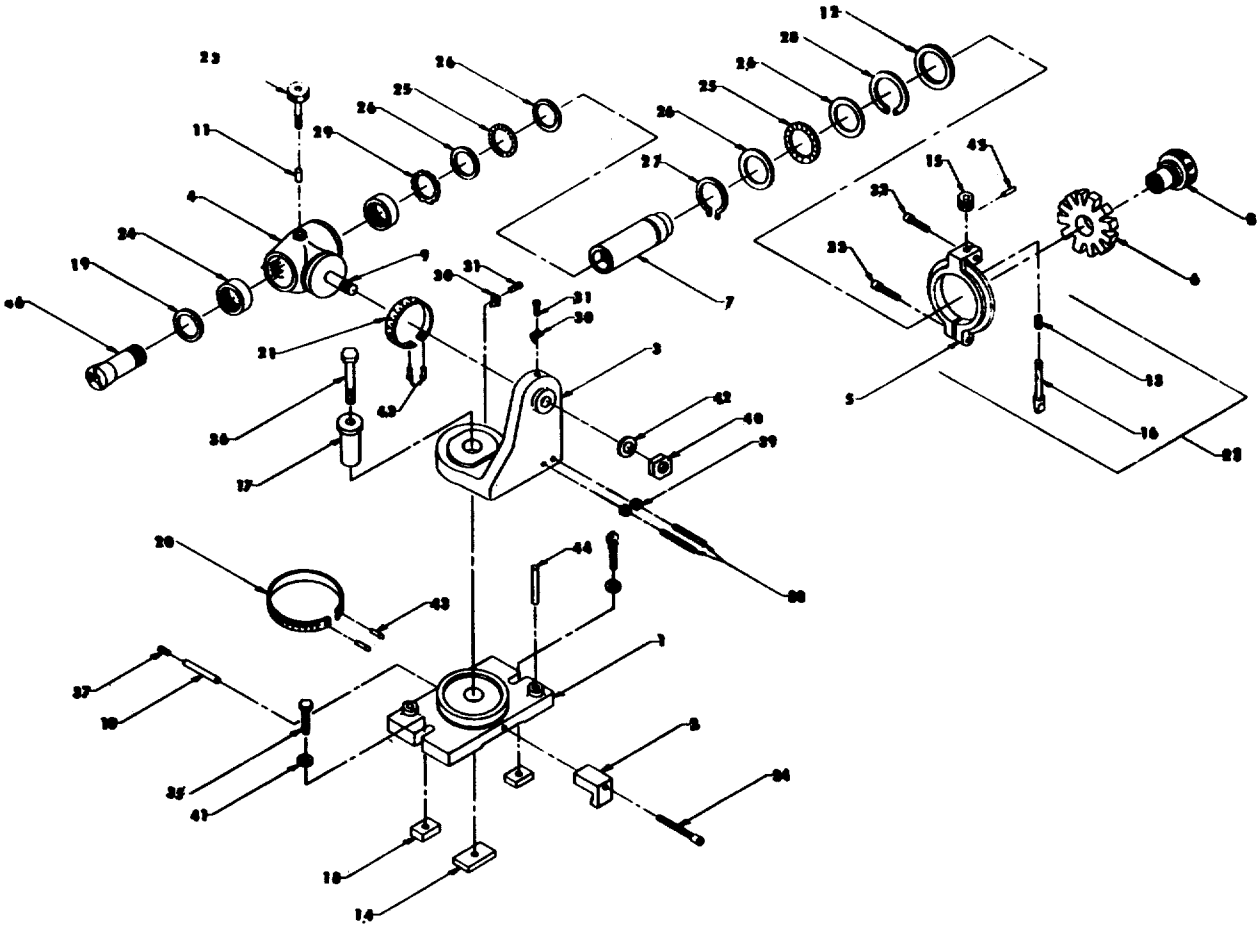
BASE PLATE - WORK HEAD

Diagram Number	Part Number	Part Name
1	374013	Base Plate - Work Head
2	374014	Take-Up Block
3	374015	Angle Bracket
4	374016	Collet Head
5	374017	Index Locking Ring
6	374033	Index Plate
7	374034	Collet Adaptor
8	374035	Collet Locking Knob
9	374037	Stud-Work Head
10	374038	Brass Plug
11	374039	Brass Plug
12	374040	Felt Seal
13	374042	Index Spring
14	374043	Bar Nut
15	374048	Index Knob
16	374049	Lock Pin
17	374050	Shoulder Pivot Pin
18	374054	Bar Nut
19	374057	Felt Seal
20	374065	Quadrant Scale
21	374068	Quadrant Scale
22	374517	Index Assembly
23	374556	Thumb Wheel Assembly
24	370240	Needle Bearing
25	370241	Needle Thrust Bearing
26	370242	Needle Raceways
27	370321	Retaining Ring 1-1/2
28	370322	Retaining Ring 2-3/16
29	370872	Thrust Spring
30	357050	Pointer
31	A190602	Rd. Hd. Screw #10 - 24 NC x 3/8
32	B251011	Kn. Sock. Hd. Cap Screw 1/4 - 20 NC x 5/8 Long
33	B251411	Kn. Sock. Rd. Cap Screw 1/4 - 20 NC x 7/8 Long
34	B314011	Kn. Sock. Rd. Cap Screw 5/16 - 18 NC x 2-1/2 Long
35	B372801	Hex Cap Screw 3/8 - 16 NC x 1-3/4
36	B374001	Hex Cap Screw 3/8 - 16 NC x 2-1/2
37	C310627	Set Screw 5/16 - 18 NC Nylok Cup Point
38	C312841	Set Screw 5/16 - 18 NC 1-3/4 Long Sq. Head Flat Point
39	J311000	Hex Nut 5/16 - 18 NC
40	J621000	Hex Rut 5/8 - 11 NC Hex Mach. Nut
41	R000527	Washer 3/8 Cut Washer
42	R000528	Washer 5/8 Cut Washer
43	R601018	Drive Screws #2 x 3/16
44	R805000	Dowel Pin 3/8 Dia. x 1-3/4
45	R840050	Roll Pin 3/32 x 1/2 long
46	370081	Collet 1/4 #4C Hardinge
* 47	370082	Collet 3/8 #4 Hardinge
* 48	370083	Collet 1/2 #4 Hardinge
* 49	370084	Collet 1/8 #4 Hardinge
* 50	370085	Collet 3/16 #4 Hardinge
* 51	370087	Collet 5/16 #4 Hardinge
* 52	370091	Collet 7/16 #4 Hardinge
* 53	370092	Collet 9/16 #4 Hardinge
* 54	370093	Collet 5/8 #4 Hardinge
* 55	370094	Collet 11/16 #4
* 56	370095	Collet 3/4 #4 Hardinge

* - Optional Equipment

Router Bit Grinder Base Plate Work Head

Exploded View Number 3

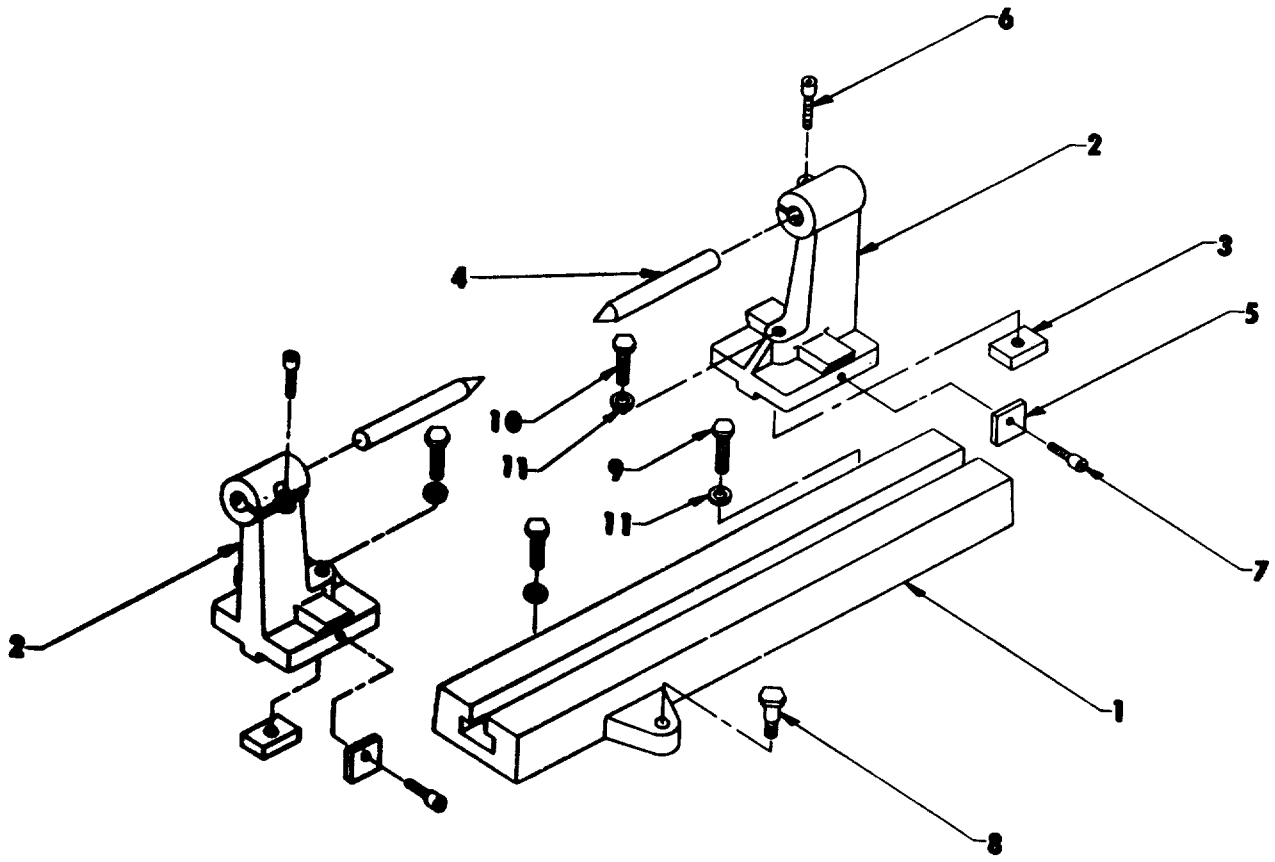


ROUTER BIT GRINDER

Diagram Number	Part Number	Part Name
1	374018	Sub Table
2	374019	Center Stand
3	374054	Bar hut
4	357317	Center
5	357318	Lock Plate
6	B251011	Kn. Sock. Hd. Cap Screw 1/4 - 20 NC x 5/8 long
7	B251211	Kn. Sock. Hd. Cap Screw 1/4 - 20 NC x 3/4 long
8	3371012	Sock. Hd. Shoulder 3/8 - 16 NC thd. 1/2 dia. x 5/8
9	B311601	Hex Cap Screw 3/8 - 16 NC x 1" long
10	B373601	Hex Cap Screw 3/8 - 16 NC x 2-1/4 long
11	R000527	Washer 3/8 Cut Washer

Router Bit Grinder Sub Table

Exploded View Number 4

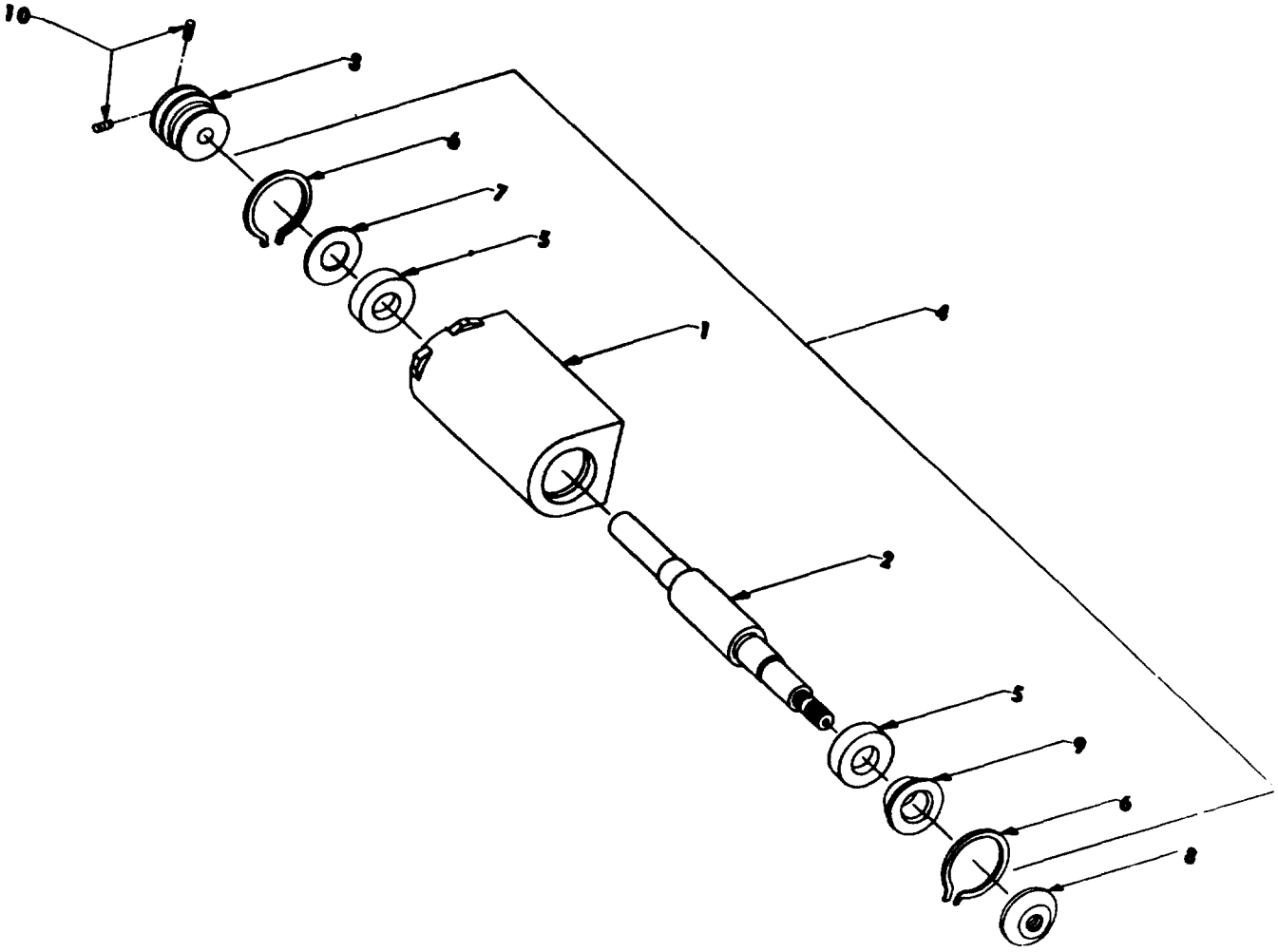


ROUTER BIT GRINDER

Diagram Number	Part Number	Part Name
1	374011	Spindle Housing
2	374032	Wheel Shaft
3	374066	Spindle Sheave
4	374511	Spindle Head. Assembly
5	370041	Ball Bearing
6	370320	Retaining Ring
7	370871	Thrust Ring
8	357177	Outer Flange
9	357195	Inner Flange
10	C190420	Set Screw #10 24 NC x 1/4 Cup Point

Router Bit Grinder Spindle Head Assembly

Exploded View Number 5



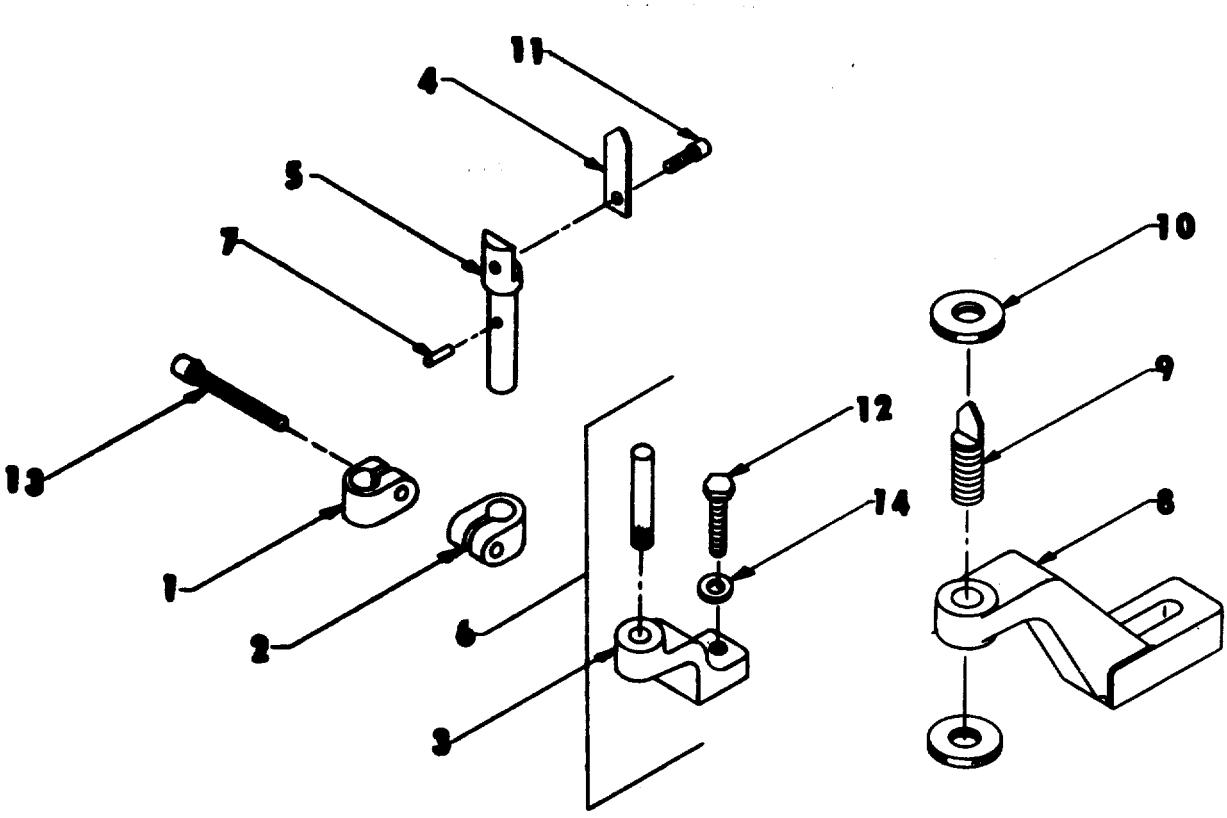
ROUTER BIT GRINDER

STOP FINGER BASE ASSEMBLY

Diagram Number	Part Number	Part Name
1	357025	Knuckle
2	357026	Tapped Knuckle
3	357316	Stop Finger Base
4	357321	Stop Finger
5	357322	Stop Finger Body
6	357568	Stop Finger Base Assembly
7	370186	Spirol Pin
8	374024	Stop Finger Base
9	374060	Stop Finger
10	374061	Thumb Wheel
11	B250811	Kn. Sock. Hd. Cap Screw 1/4 - 20 NC x 1/2 long
12	B372001	Rex Cap Screw 3/8 16 NC x 1-1/4
13	B372814	Ferry Cap Screw 3/8 16 NC x 1-3/4
14	R00527	3/8 Cut Washer

Router Bit Grinder Stop Finger Base Assembly

Exploded View Number 6



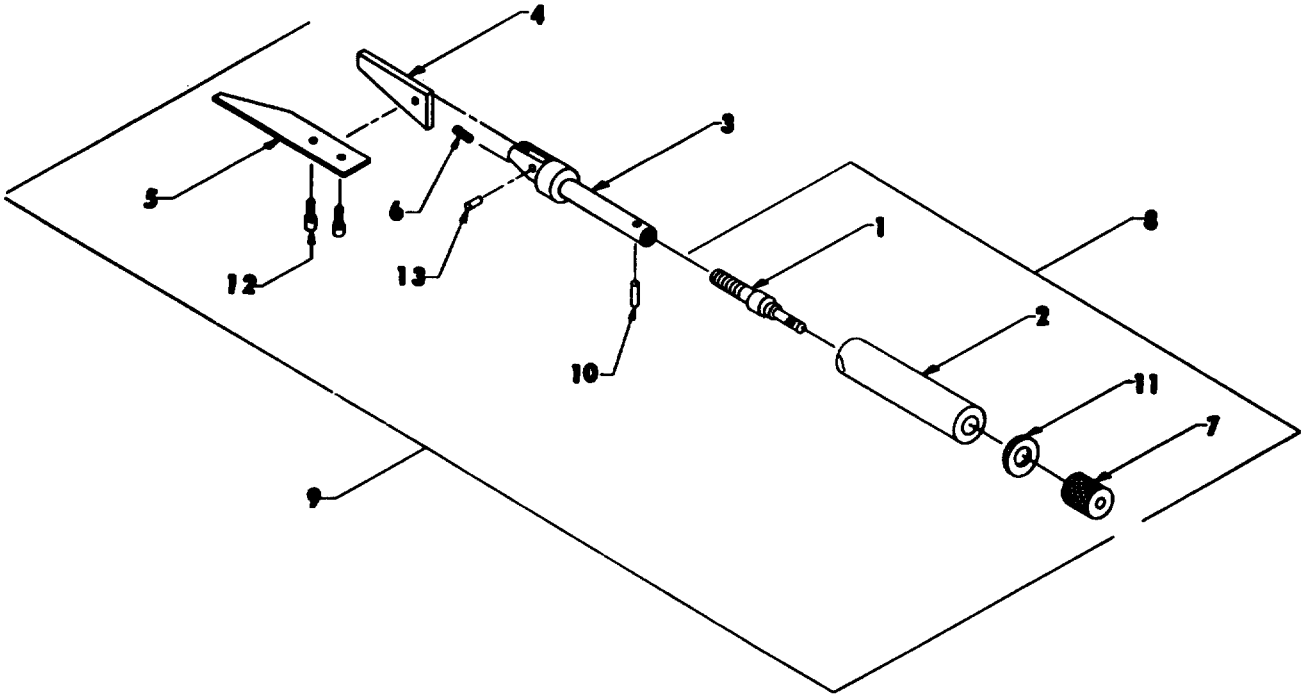
ROUTER BIT GRINDER

357583 STOP FINGER ASSEMBLY

Diagram Number	Part Number	Part Name
1	357100	Shaft
2	357101	Body
3	357102	Plunger
4	357103	Latch
5	357104	Stop Finger
6	357105	Spring
7	357111	Knob
8	357530	Feed Knob Assembly
9	357583	Stop Finger Assembly
10	370186	Spirol Pin 1/8 x 3/8 Med.
11	370873	Speed Nut
12	B160411	Kn. Sock. Hd. Cap Screw 8 - 32 NC x 1/4
13	R731050	Drive Lock Pin 1/8 x 1/2 Type C

Router Bit Grinder Stop Finger Assembly

Exploded View Number 7



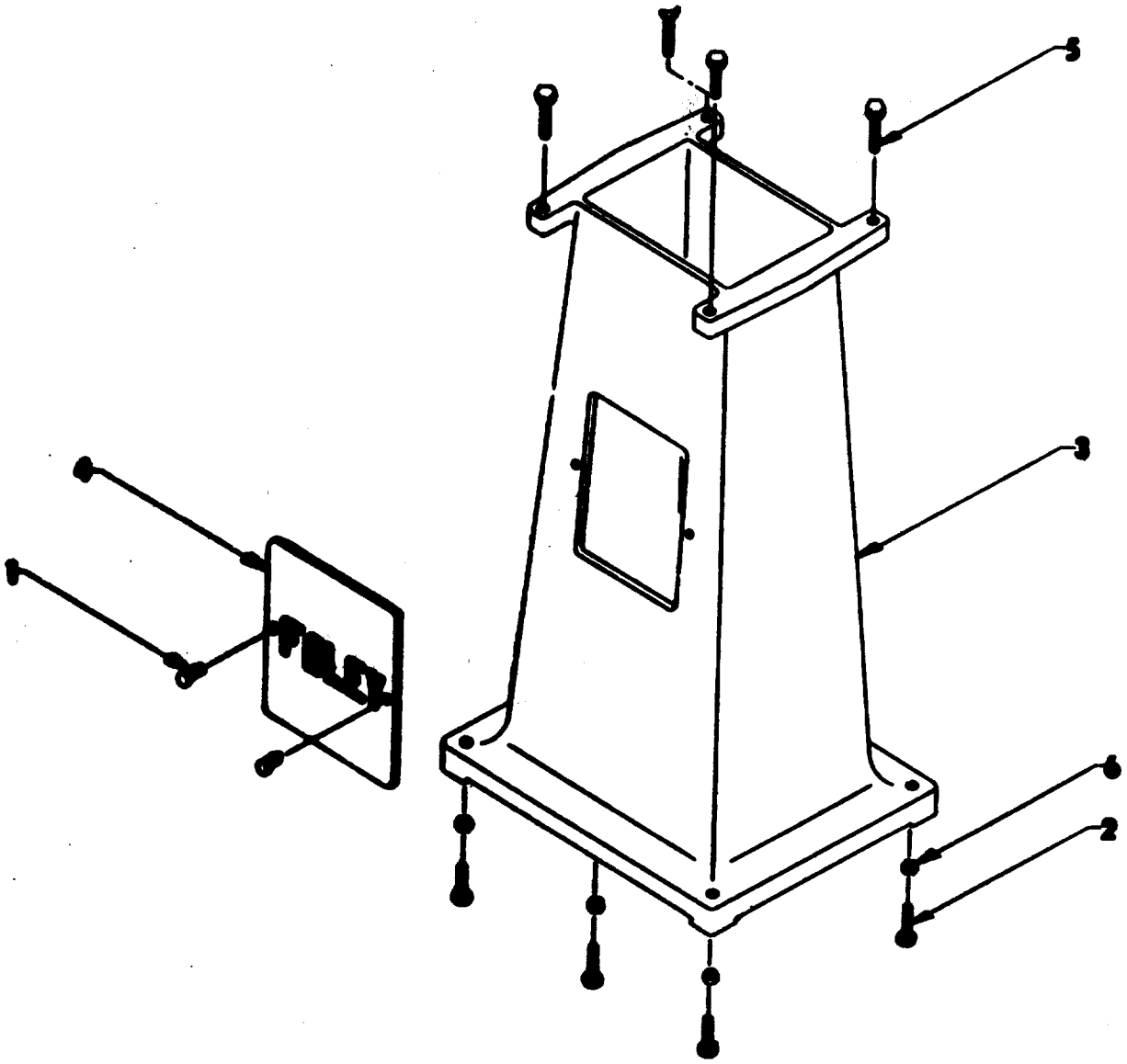
FLOOR STAND

(Router Bit Grinder)

Diagram Number	Part Number	Part Name
1	353426	Stud Locking Screw Ass'y.
2	370563	Leveling Screw
3	374022	Floor Stand
4	374023	Door
5	B312401	Hex Hd. Cap Screw 5/16 - 18 NC x 1-1/2
6	J501000	Hex Nut 1/2 - 13 NC

Floor Stand 374

Exploded View Number 8

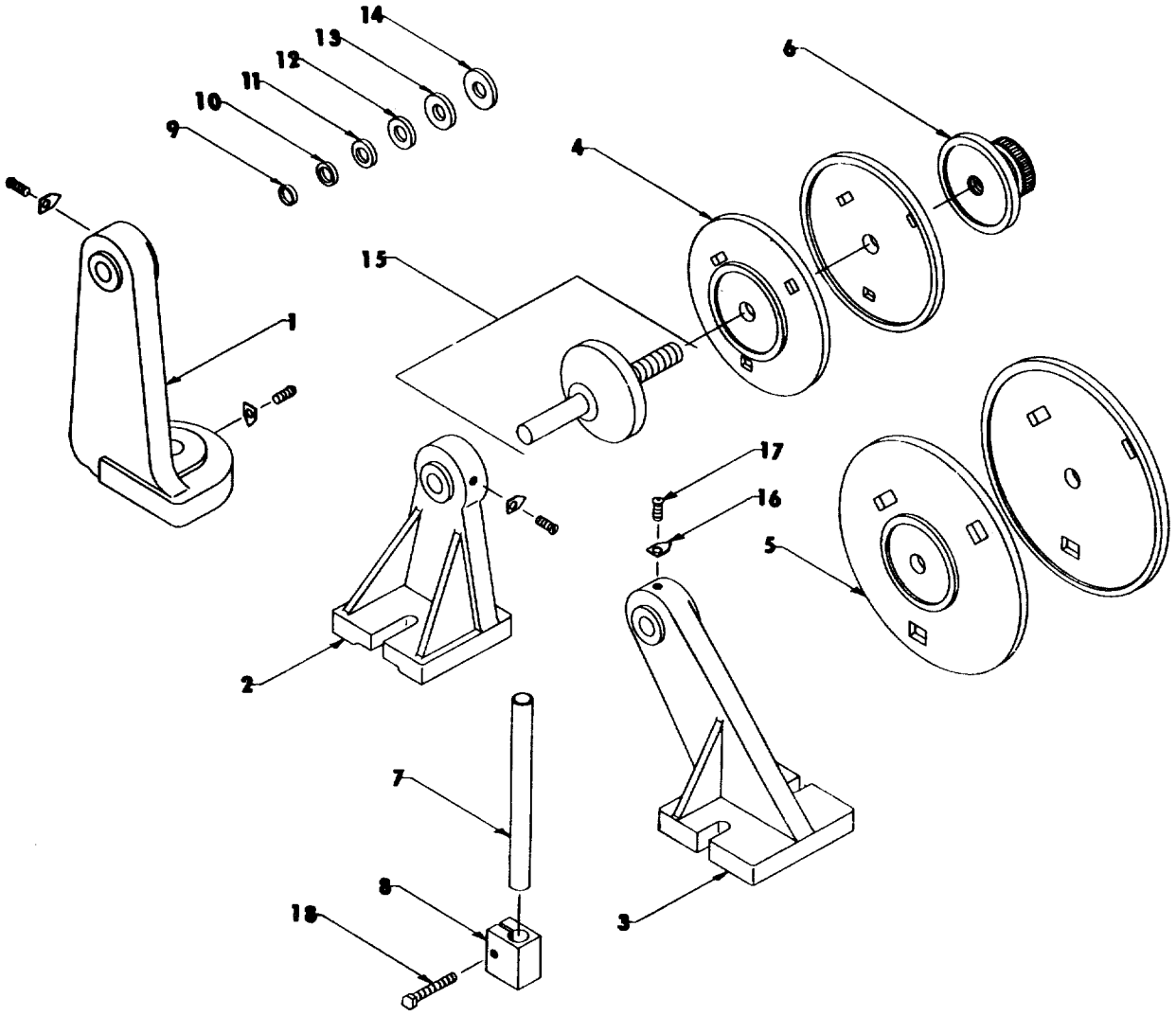


374580 SAW GRINDING ATTACHMENT

Diagram Number	Part Number	Part Name
1	374080	Angle Bracket for Side Grinding
2	374081	Angle Bracket for Face Grinding
3	374082	Angle Bracket for Top Grinding
4	374083	Stiffening Plate
5	374084	Stiffening Plate
6	374085	Locking Flange
7	374088	Stop Finger Post
8	374089	Stop Finger Slide Block
9	374091	5/8 Spacer
10	374092	3/4 Spacer
11	374093	7/8 Spacer
12	374094	1" Spacer
13	374095	1-1/8 Spacer
14	374096	1-1/4 Spacer
15	374540	Cup & Stud Assembly
16	357028	Pointer
17	A190602	Rd. Hd. Screw #10-24 NC x 3/8
18	B372401	Hex Cap Screw 3/8-16 NC x 1-1/2 long

Saw Grinding Attachment for Router Bit Grinder

Exploded View Number 9



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P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

TM 9-3415-230-10 GRINDING MACHINE, TOOL AND CUTTER, UNIVERSAL TYPE - 1968

PIN: 018477-001