

**TECHNICAL MANUAL**

**OPERATOR'S, ORGANIZATIONAL, DIRECT  
SUPPORT AND GENERAL SUPPORT MAINTENANCE  
MANUAL INCLUDING REPAIR PARTS LIST  
FOR  
GRINDING MACHINE  
MODEL 37401  
NSN 3415-01-030-1534**

**(FOLEY MANUFACTURING CO.)**

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**HEADQUARTERS, DEPARTMENT OF THE ARMY**

**OCTOBER 1981**

Technical Manual }  
No.. 9-3415-235-14&P }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, DC, 16 October 1981

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MANUAL INCLUDING REPAIR PARTS LIST  
FOR  
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MODEL 37401  
(NSN 3415-01-030-1534)**

**REPORTING OF ERRORS**

**You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2, located in the back of this manual direct to: Commander, US Army Armament Materiel Readiness Command, ATTN: DRSAR-MAS, Rock Island, IL 61299. A reply will be furnished direct to you.**

**NOTE**

**This manual is published for the purpose of identifying an authorized commercial manual for the use of the personnel to whom this grinding machine is issued.**

Manufactured by: Foley Manufacturing Company  
3300 Fifth Street N. E.  
Minneapolis, MN 55418

Procured under Contract No.. DAAA09-79-C-4763

**This technical manual is an authentication of the manufacturer's commercial literature and does not conform with the information and content specified in AR 310-3, Military Publications. This technical manual does, however, contain available information that is essential to the operation and maintenance of the equipment.**

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## INSTRUCTIONS FOR REQUISITIONING PARTS

### NOT IDENTIFIED BY NSN

When requisitioning parts not identified by National Stock Number, it is mandatory that the following information be furnished the supply officer.

- 1 - Manufacturer's Federal Supply Code Number - 22831
- 2 - Manufacturer's Part Number exactly as listed herein.
- 3 - Nomenclature exactly as listed herein, including dimensions, if necessary.
- 4 - Manufacturer's Model Number - Model 37401
- 5 - Manufacturer's Serial Number (End Item)
- 6 - Any other information such as Type, Frame Number, and Electrical Characteristics, if applicable.
- 7 - If DD Form 1348 is used, fill in all blocks except 4, 5, 6, and Remarks field in accordance with AR 725-50.

Complete Form as Follows:

- (a) In blocks 4, 5, 6, list manufacturer's Federal Supply Code Number- 22831 followed by a colon and manufacturer's Part Number for the repair part.

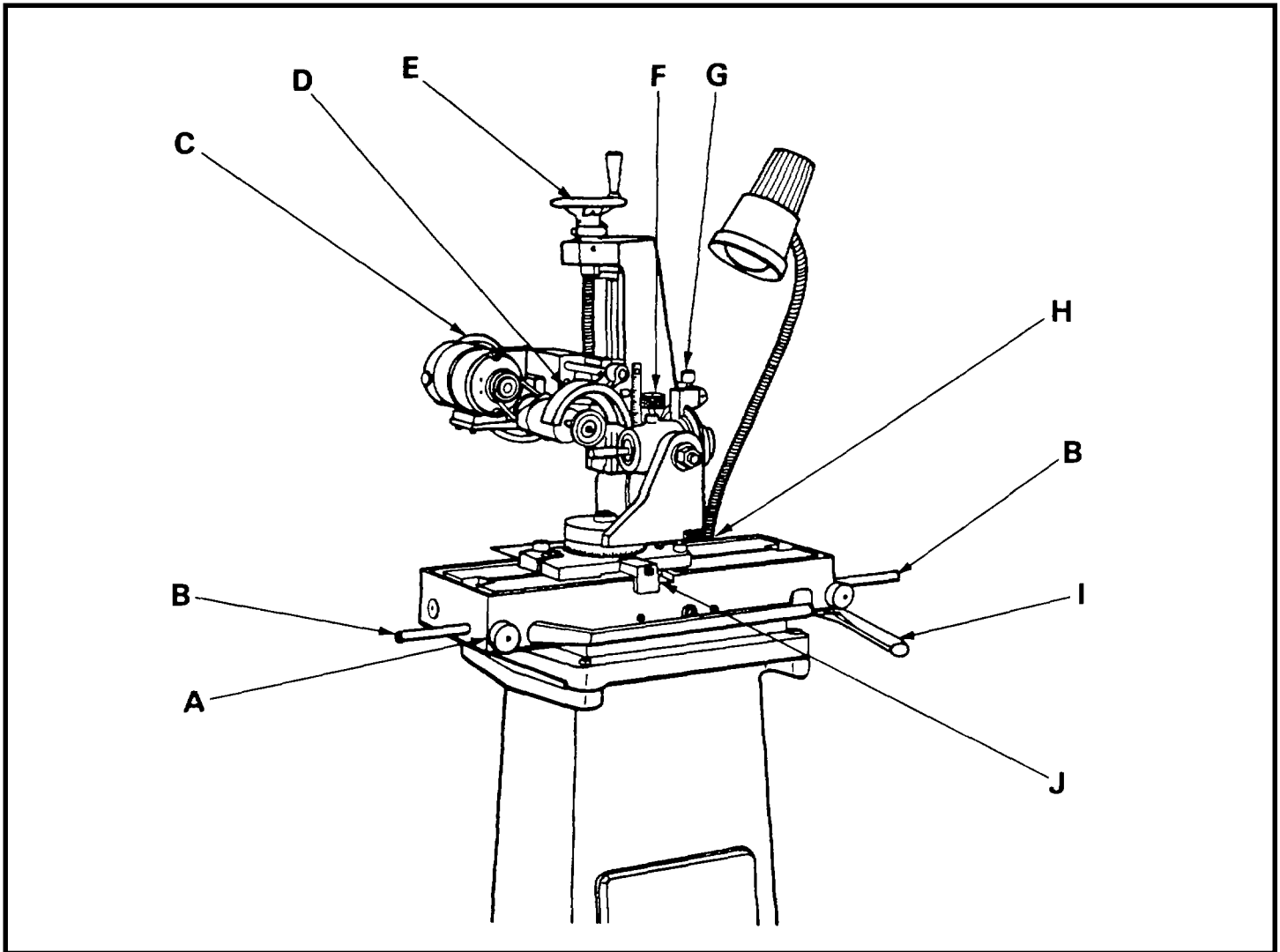
- (b) Complete Remarks field as follows:  
Noun: (nomenclature of repair part)  
For: NSN: 3415-01-030-1534  
Manufacturer: Foley Manufacturing Company

Model: 37401  
Serial: (of end item)

Any other pertinent information such as Frame Number, Type, Dimensions, etc.

**iii/(iv blank)**

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 in-transit damage. Look particularly for cracked castings, bent or broken parts. Any loss of or damaged parts should be reported to the freight agent immediately. Secure the freight agent's notation of loss or damage on the freight bill. Traffic regulations require the transportation company to stand cost of repair or replacement.

### REPAIR OR REPLACEMENT OF DAMAGED MACHINE

You may elect to file your own claim against the transportation company. In case of damage to easily replaced parts, order and pay for the new parts needed; enter your claim for their value against the delivering carrier. Return entire machine to Minneapolis for complete rebuilding only. In case of serious damage.

Alternatively, you may ask the factory to repair or replace without cost to you. In this case, the following papers must be sent to Minneapolis so parts replacement may be assessed against the transportation company.

- (a) Itemized report showing nature and extent of damage.  
See exploded view drawing for parts identification
- (b) Paid freight bill, bearing agent's notation of damage.
- (c) Original bill of lading, and invoice (if available).

### 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 of illustration 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 movable 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 movable 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 (dia 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

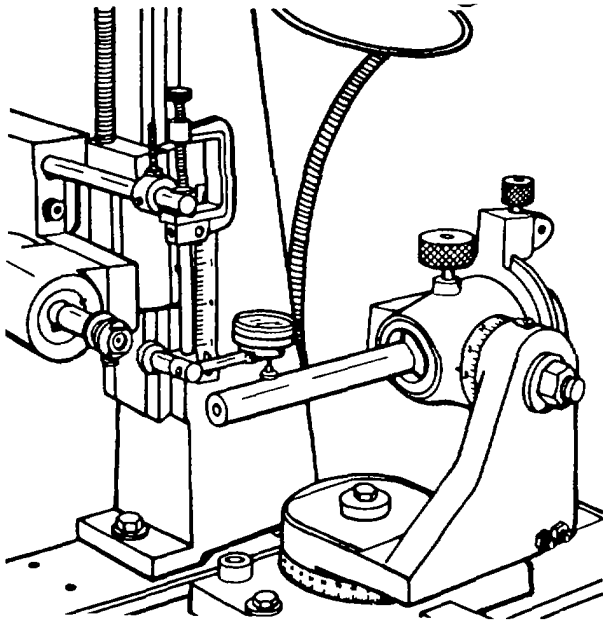
After bolting the grinder to floor stand, take a machine level and place it lengthwise on the grinder table. Adjust floor legs as necessary to bring machine table level. Next level across table and adjust floor legs as needed to bring machine table level.

### MACHINE LINE UP

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

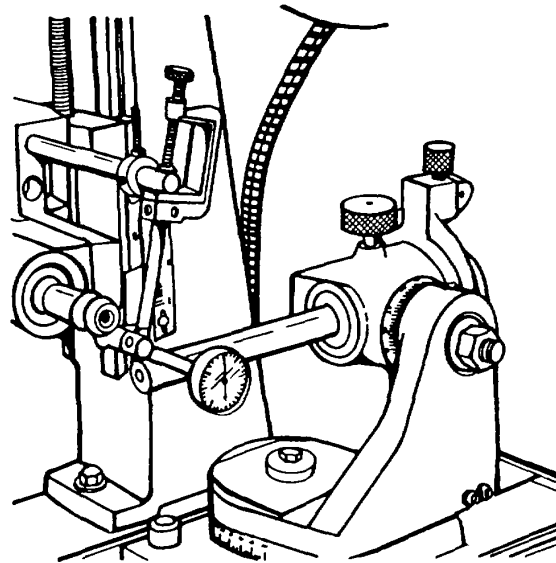
Mount work-head assembly to grinder table by first placing work-head onto table and then snugging up on cap screw (dia No. 34 of exploded view No. 3) to pull work-head base plate against key slot. Next, lock work-head base plate to table using two (2) hex cap screws (dia No. 35) and bar nuts (dia No.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

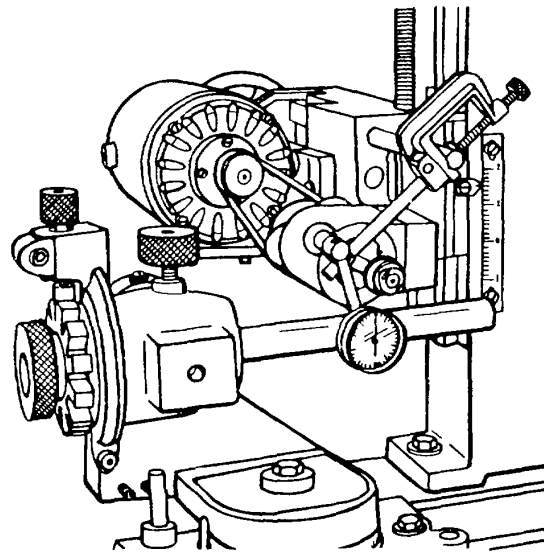
2. The next step is to reposition dial indicator as shown in *illustration No. 2* so that work-head may be align with the grinder table. Using the same 8" piece shafting, traverse table back and forth until dial indicator reading of not more than (.002) two thousand of an inch difference is read. Rotate work-head and 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 brack 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 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

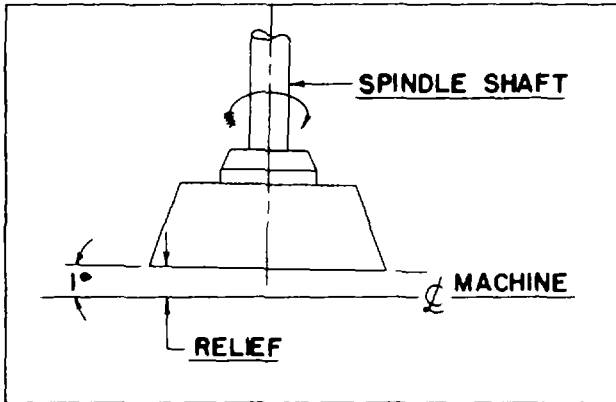


**ILLUSTRATION NO. 3  
LINING UP THE WORK-HEAD**

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 wheel. See drawing illustration No. 4.



**ILLUSTRATION NO. 4**  
**RELIEVING THE GRINDING WHEEL**  
**HEIGHT SCALE**

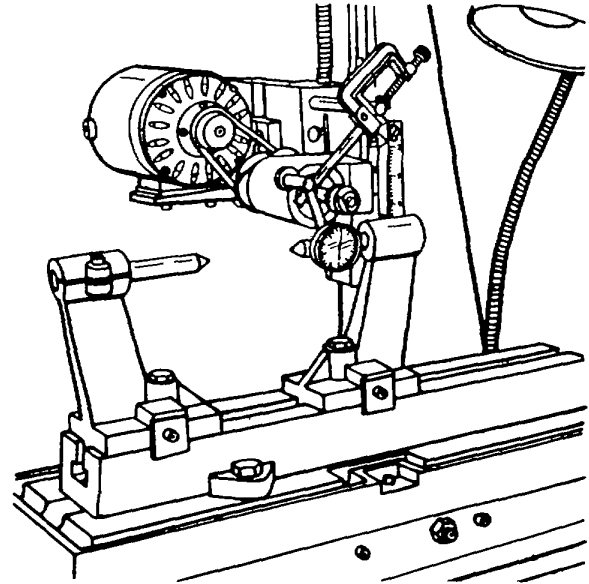
The height scale should be set so that the pointer reads "0" when the center of the grinding wheel spindle is at the same elevation as the center of the work-head collet adapter. This will permit setting the grinding wheel at the proper height when grinding relief angles on the outside diameter of some 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.



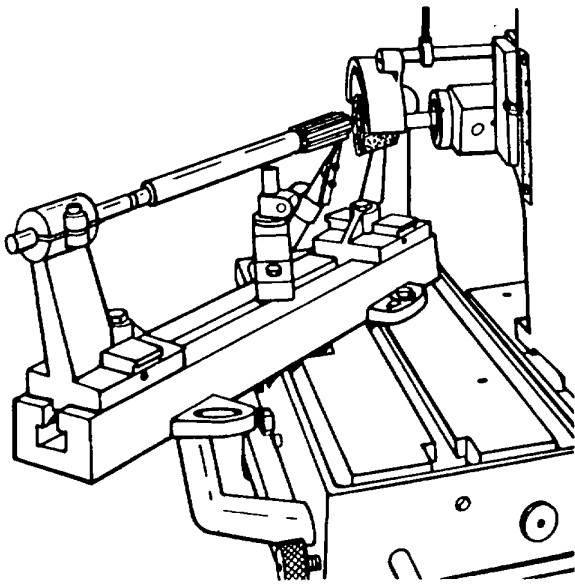
**ILLUSTRATION NO. 5**  
**LINING UP THE CENTERS**

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





**ILLUSTRATION NO. 6  
GRINDING END OF REAMER**

grinding 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  $\frac{3}{16}$  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 one 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 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  $\frac{3}{4}$ " 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  $220^\circ$  B) 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  $\frac{1}{4}$  turn so that it will not engage the index plate. This will permit free turning of the work-head collet adapter.

## 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  $\frac{1}{16} \times \frac{5}{8}$  or  $\frac{1}{8} \times \frac{5}{8}$  steel and bend as required. The third stop finger has a cast iron arm and is used for grinding spiral router bits and end mill cutters 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.

## MANDRELS

General There are two types of mandrels made, fixed and expanding. The fixed mandrels are available in nominal sizes only. The expanding mandrels are adjustable and permit a certain range of hole sizes for each mandrel.

## COLLETS

The work-head on the 374 Router Bit Grinder uses the Hardinge 4C size. This permits collet capacity to 3/4 diameter.

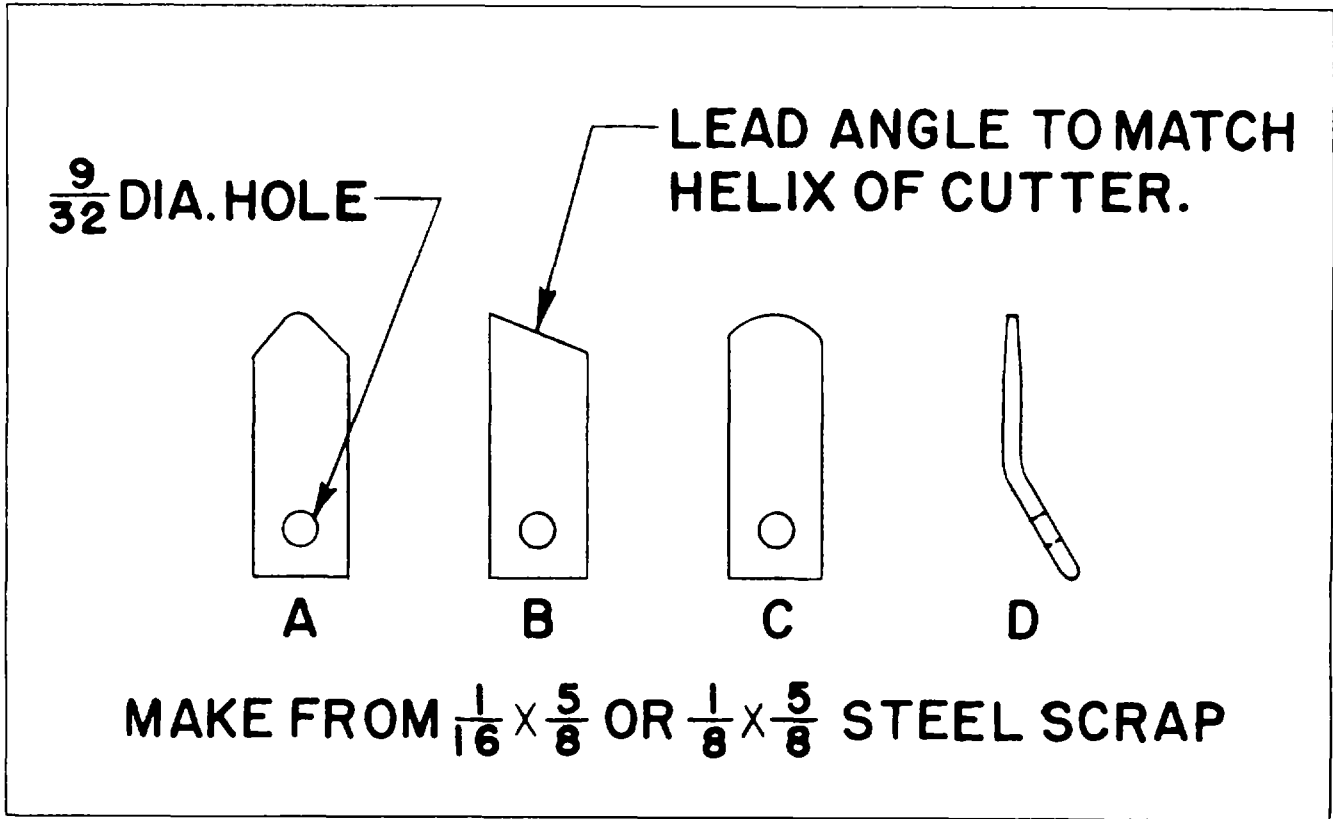


ILLUSTRATION NO. 7

## MIST COOLANT

A mist coolant nut is available for the router bit grinding, Part No. 357410. 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.

## DRESSING FLARING CUP GRINDING WHEELS Resinoid or Vitrified

The resinoid and vitrified grinding wheels may be dressed by using diamond dressing stick 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. 8 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. 9 using a dressing stick held free hand or a dressing brick.**

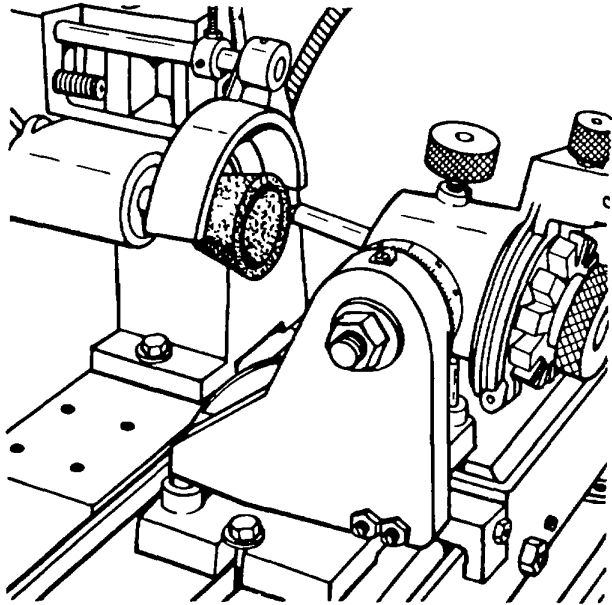


ILLUSTRATION NO. 8  
DRESSING THE FACE OF FLARING CUP GRINDING  
WHEEL

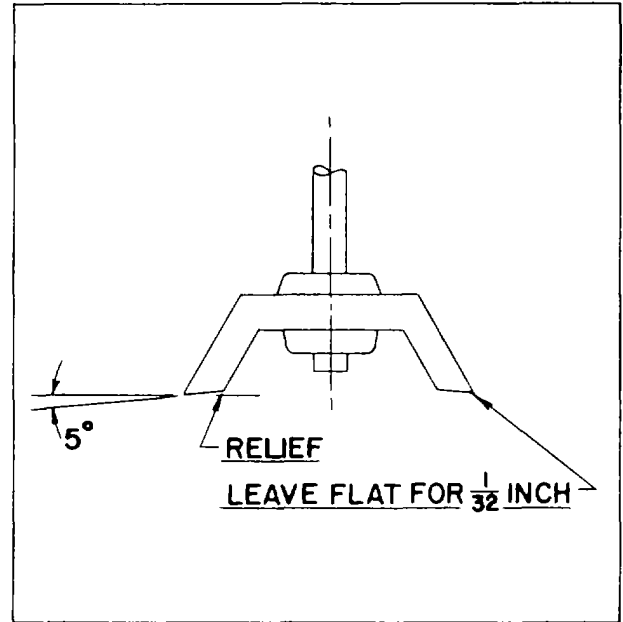


ILLUSTRATION NO. 9  
WHEEL FACE RELIEF

## 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.

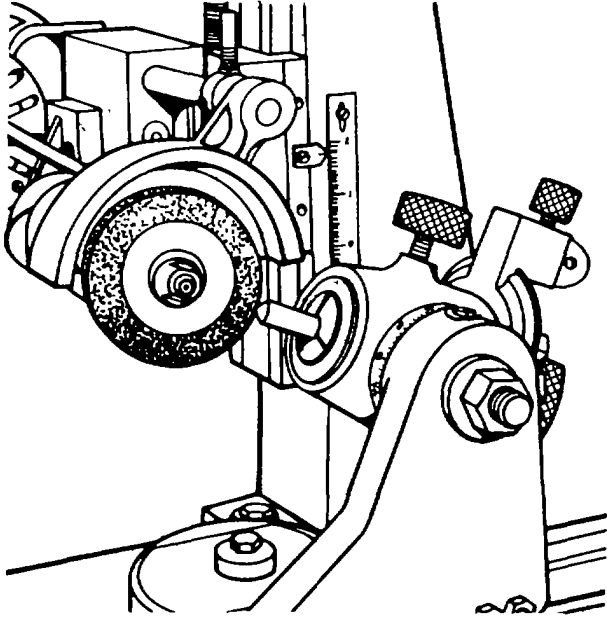


ILLUSTRATION NO. 11  
DRESSING O. D. OF STRAIGHT GRINDING WHEEL

## TO DRESS RADIUS ON PERIPHERY OF RESINOID OR VITRIFIED GRINDING WHEEL

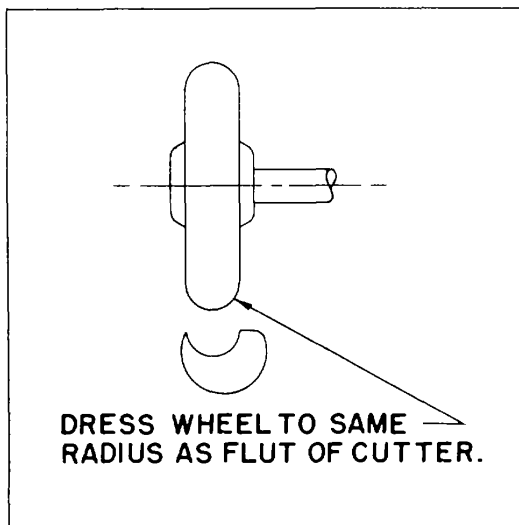


ILLUSTRATION NO. 12  
DRESSING RADIUS ON GRINDING WHEEL

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

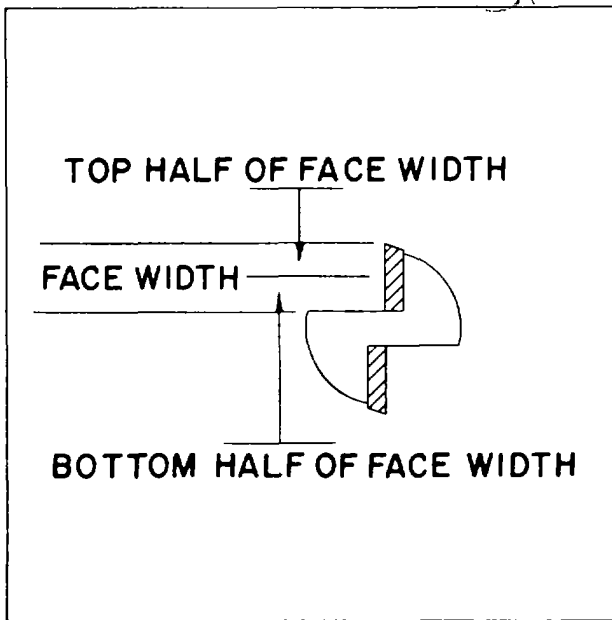
## CLEANING DIAMOND GRINDING WHEELS

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, 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.

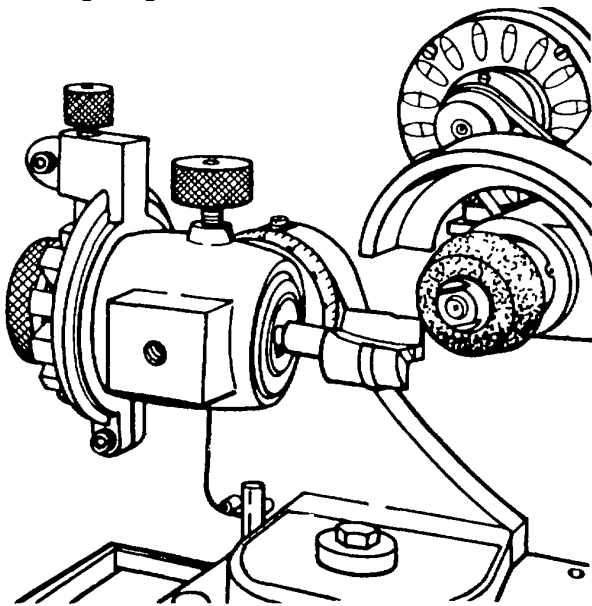
## GRINDING STRAIGHT HIGH SPEED STEEL ROUTER BITS

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. 12**

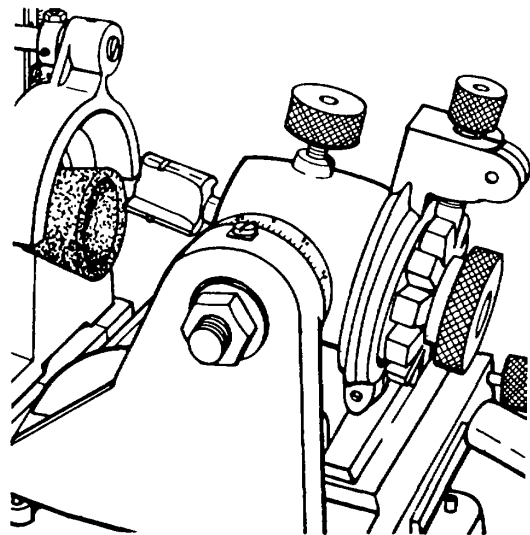
11. Turn on grinder motor and bring grinding wheel up to the router bit. Now traverse table back and index to next flute. Bring the grinding wheel up to the router bit slowly. The object here is to check the spacing of the router bit flutes.
12. Start grinding on flute that checked to be nearest the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



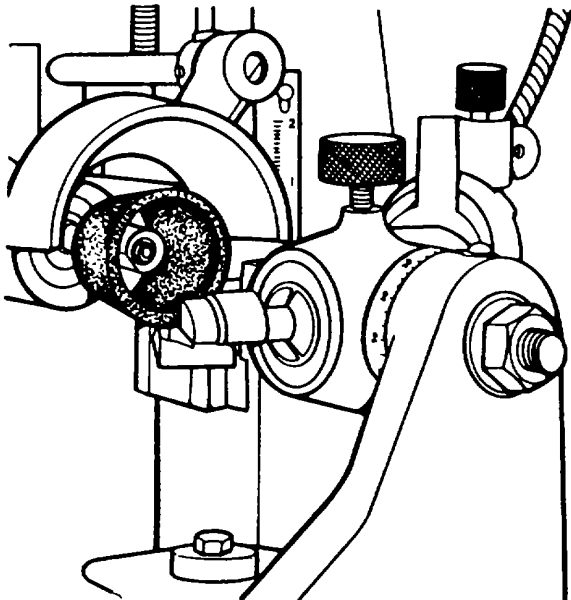
**ILLUSTRATION NO. 13  
GRINDING A STRAIGHT ROUTER BIT**

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. 13 and No. 15.
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. 14.
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. 14.

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. 15.



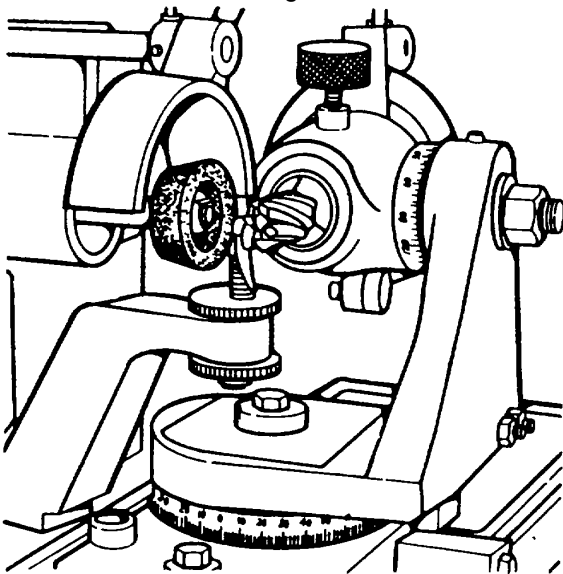
**ILLUSTRATION NO. 14  
GRINDING END OF STRAIGHT ROUTER BIT**



**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 subtable.
2. Work-head Mount cutter in 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.

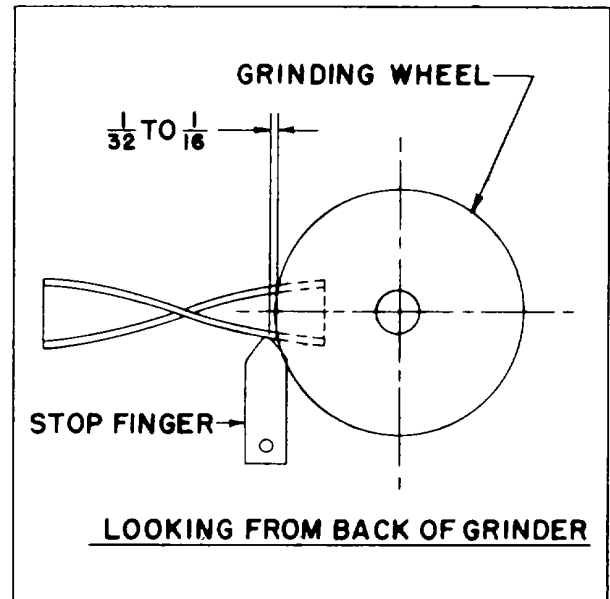


**ILLUSTRATION NO. 17**  
**GRINDING A SPIRAL CUT**

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 stop 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 (.0005) one-half thousandth on finish pass.
11. To grind the ends of the spiral cutter, use the same set-up as for straight router bits. See illustration No. 15 and No. 22.

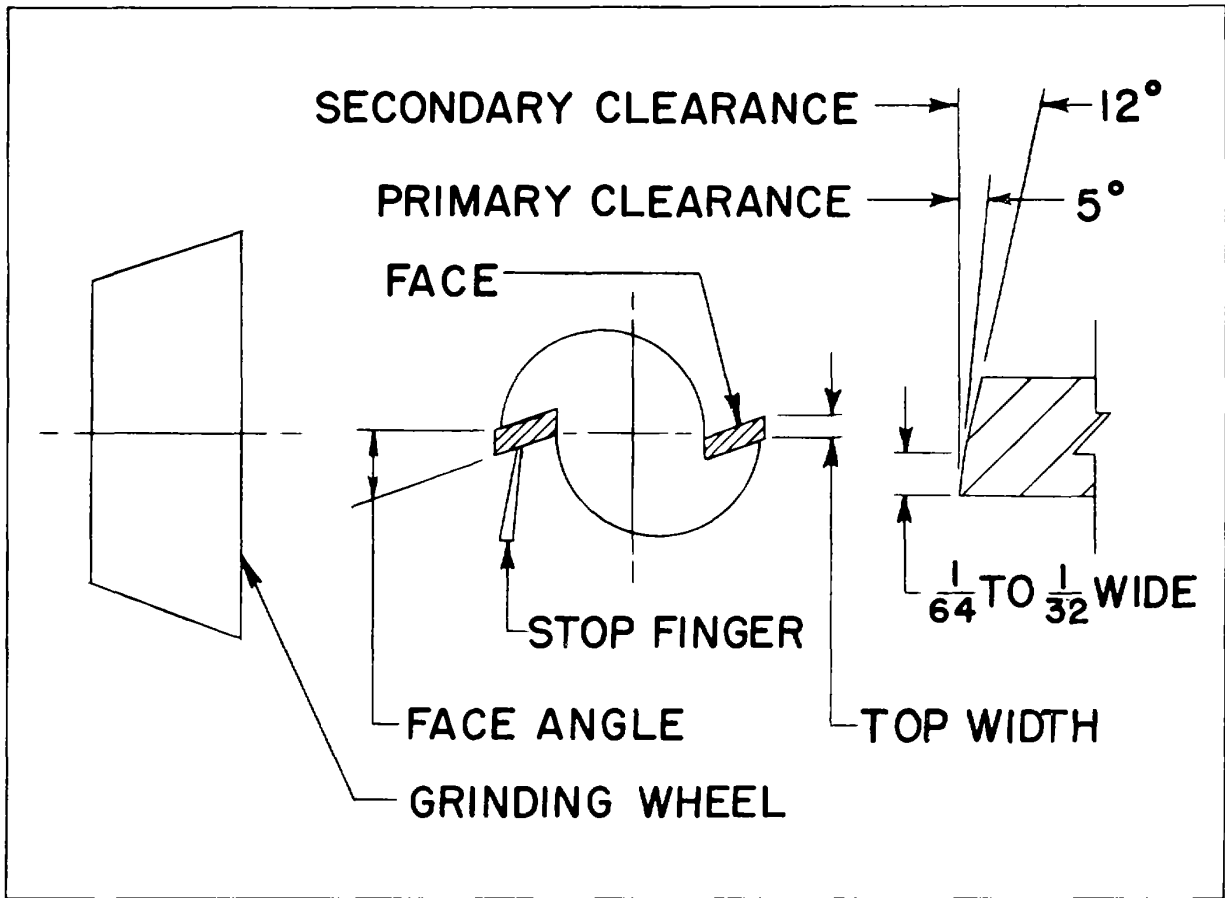


ILLUSTRATION NO. 18

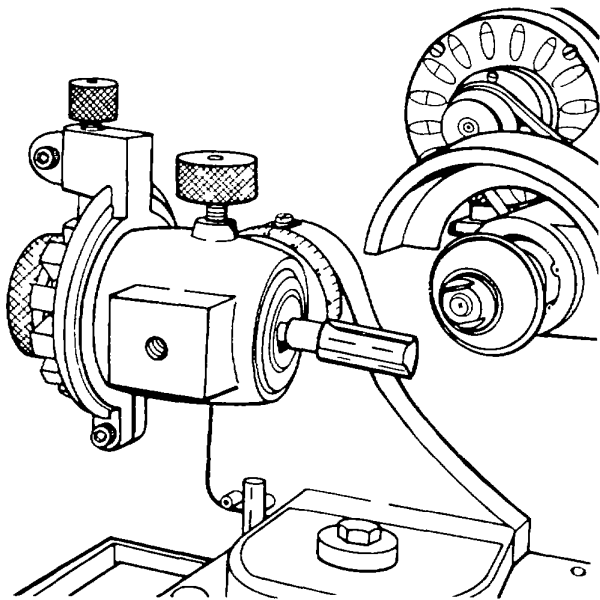


ILLUSTRATION NO. 19  
GRINDING THE FACE OF A CARBIDE ROUTER BIT

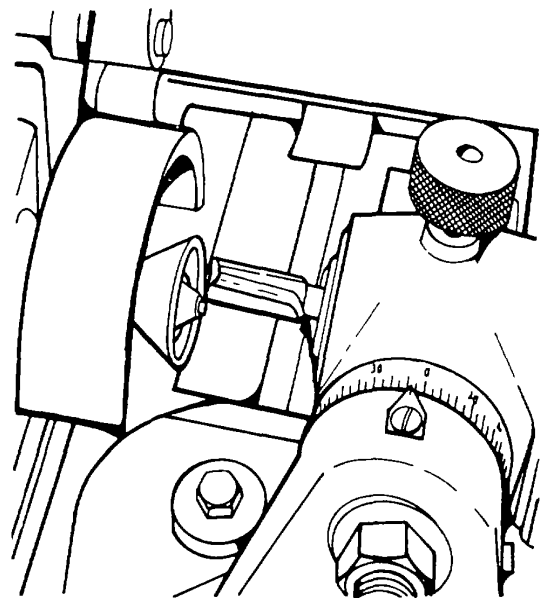


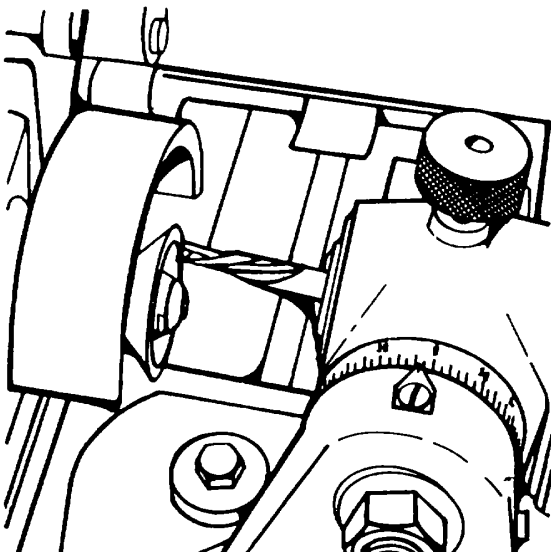
ILLUSTRATION NO. 20  
GRINDING END OF CARBIDE ROUTER BIT

## 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. 2. and No. 21.

## GRINDING SPIRAL CARBIDE ROUTER BITS

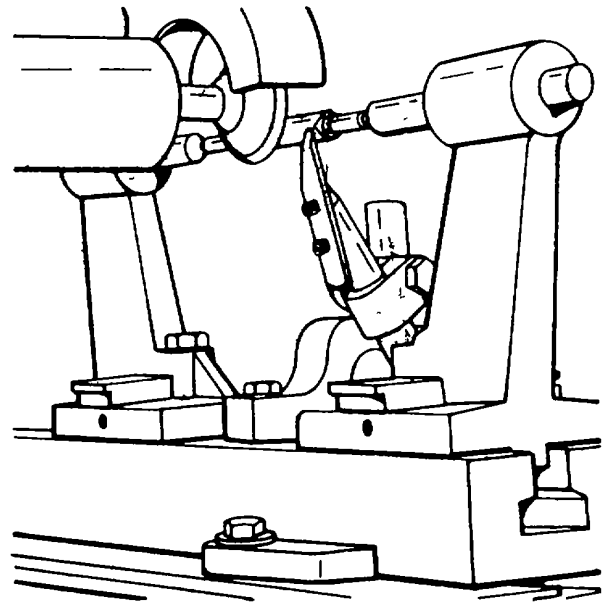
The set-up for grinding carbide spiral router bits is the same as for high speed steel spiral router bits. The main difference is that a diamond wheel of the D11 type (flaring cup) must be used and an in-feed of but (.0005) one-half thousandth is used. See illustration No. 17 and No. 22.



**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 as shown in illustration No. 10.
2. Set-up grinder with sub-table and centers as show 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**

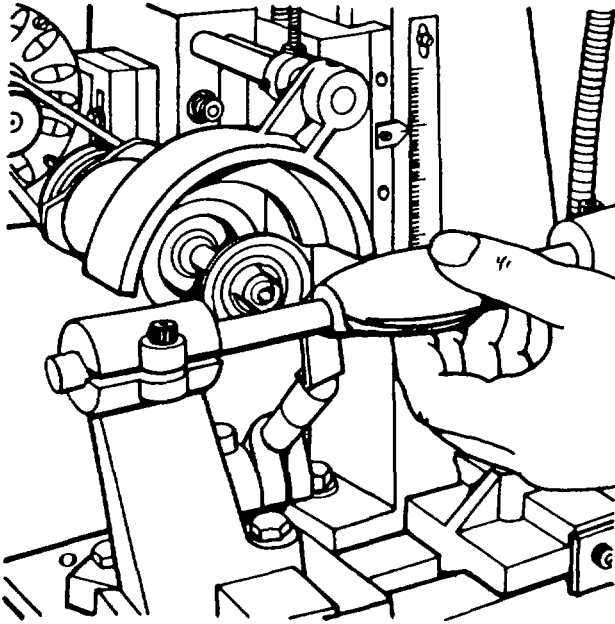
4. Mount spring loaded stop finger so it will clear grinding wheel. The base of the stop finger must be mounted onto the table so it will move with the work.
5. Adjust stop finger up or down to get proper clearance on cutter. See illustration No. 19.
6. Set table stops so that grinding wheel can be cleared when cutter is rotated.
7. Bring grinding wheel up close to cutter and dry run to see that stops and set-up are correct.
8. Turn on grinder motor and take a very light pass on cutter.
9. Re-adjust stop 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 cutters as shown in illustration No. 10.
2. Set-up grinder with sub-table and centers as outlined for straight planer cutters.
3. Set-up stop finger base onto base of grinder. See illustration No. 24.
4. Use the rigid stop finger for spirals.
5. Lock table in position so that the cutter is just clearing the grinding wheel.



- Set stop finger so that it will pick up the cutter before the cutter engages the grinding wheel. See illustration No. 17.



**ILLUSTRATION NO. 23  
GRINDING A SPIRAL PLANER CUTTER**

- 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.
- 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. 18. This grinding procedure will produce a primary and secondary clearance angle.

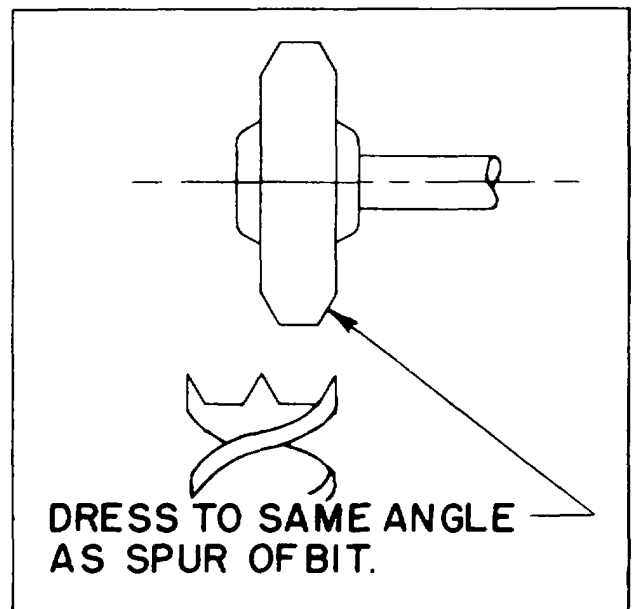
When grinding spiral or straight planer knives always keep a light pressure on the cutter with your hand so that the cutter will track on the stop finger. That is, rotate the cutter against the stop finger and keep a light pressure on the cutter as it travels along the stop finger.

See illustration No. 23.

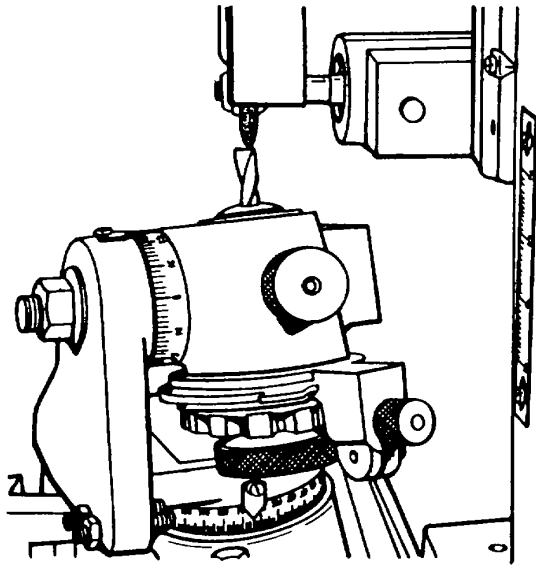
Always adjust the centers so that the cutter can rotate freely and yet not have any play or looseness. If the cutter fits loosely on the centers it will be impossible to get an accurate grinding job.

**GRINDING SPUR BITS**

- Set up grinder with work-head.
- Swing work-head to the right.
- Swing work-head up to a vertical position. See illustration No. 25.
- Next select the collet necessary to mount spur bit into collet head.
- 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. 24.
- Re-adjust work-head as needed to permit grinding wheel to clear through end of spur bit and give proper clearance.
- Turn on grinder motor and grind one half of the end of spur bit by feeding grinding wheel down onto the snug bit. See illustration No. 25. Be sure to back up on feed handle to take slack out of feed screw.



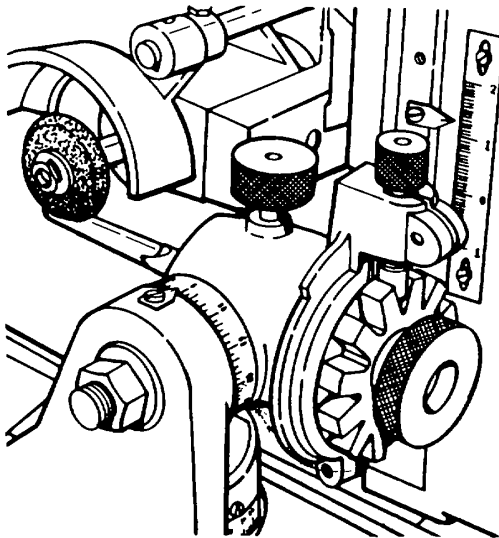
**ILLUSTRATION NO. 24  
DRESSING GRINDING WHEEL TO MATCH SPUR BIT**



**ILLUSTRATION NO. 26  
GRINDING A SPUR BIT**

### 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**

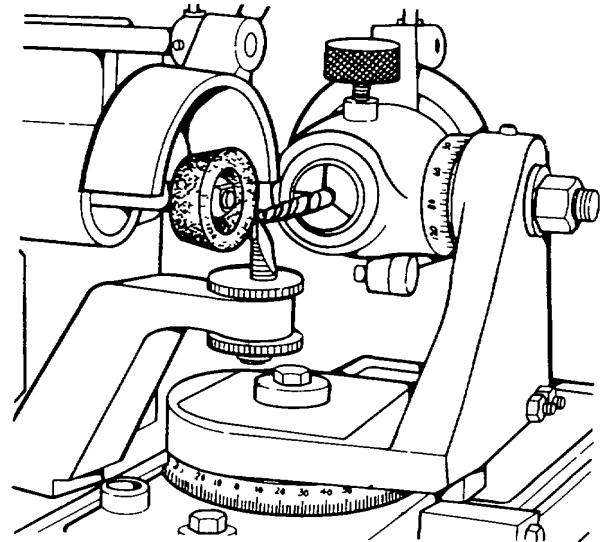
5. Position the grinding wheel over the router bit and

6. 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.

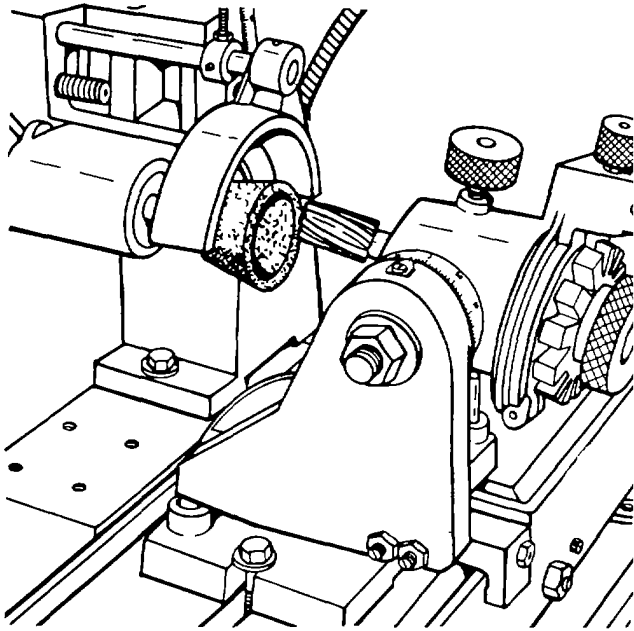


**ILLUSTRATION NO. 28  
GRINDING A SPIRAL END MILL CUTTER**

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

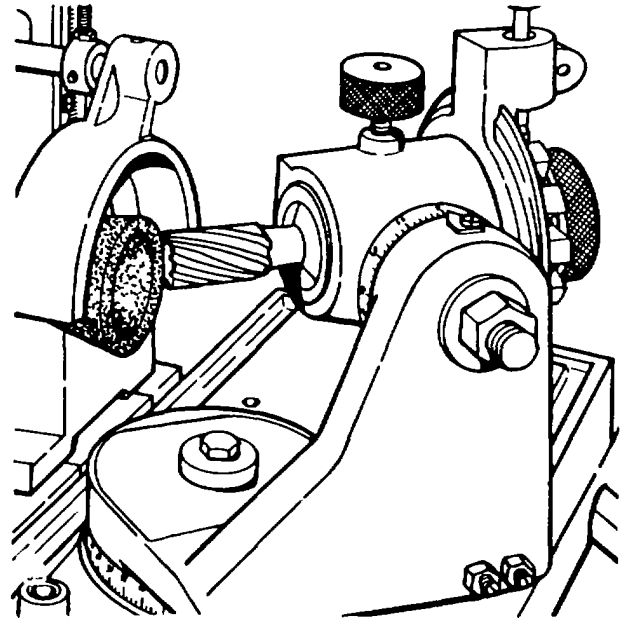
General: A reamer is ground only on the end and not on the outside diameter. If the outside diameter is ground, the reamer will produce a smaller hole than before grinding.

#### TO GRIND END OF REAMERS

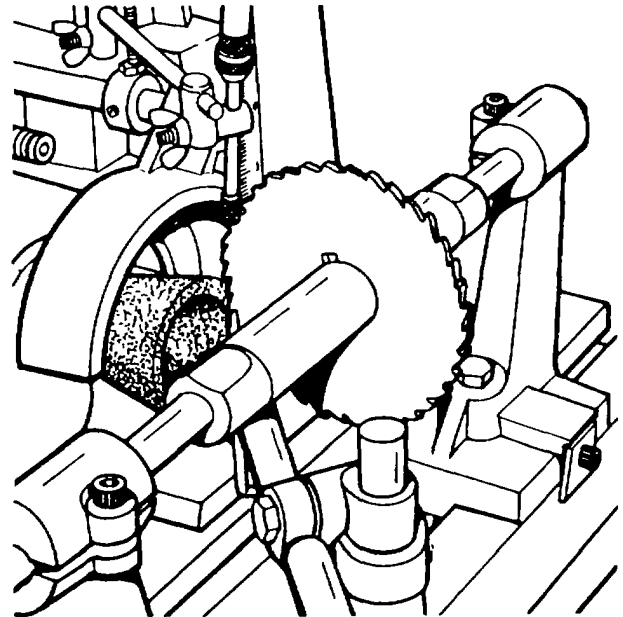
1. Mount sub-table and centers onto grinder table.
2. Swing sub-table out approximately 45° and lock.
3. Set-up spring loaded stop finger and mount stop finger base to sub-table or grinder table.
4. Mount a flaring cup grinding wheel on to spindle shaft with face of wheel towards front of grinder. See 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. 30.
3. Use a flaring cup grinding wheel with face o 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. 31.

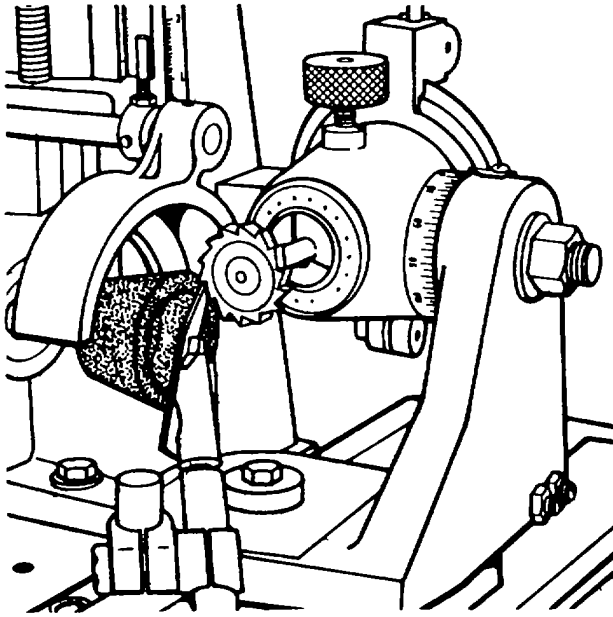


ILLUSTRATION NO. 31

## 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 cutter 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. 32.
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.

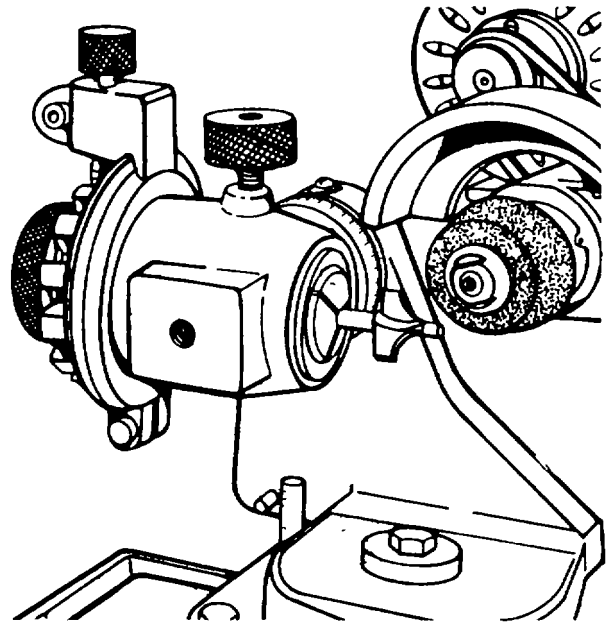


ILLUSTRATION NO. 32  
GRINDING A SHAPER CUTTER

## MAINTENANCE OF THE ROUTER BIT GRINDER

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

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

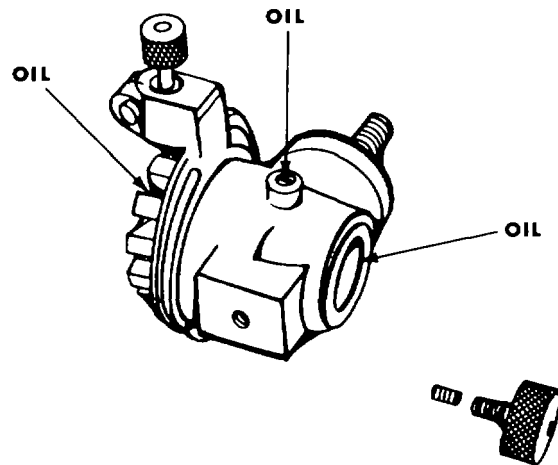
### Every 100 hours of operation:

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 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 screw.

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 work-head 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.



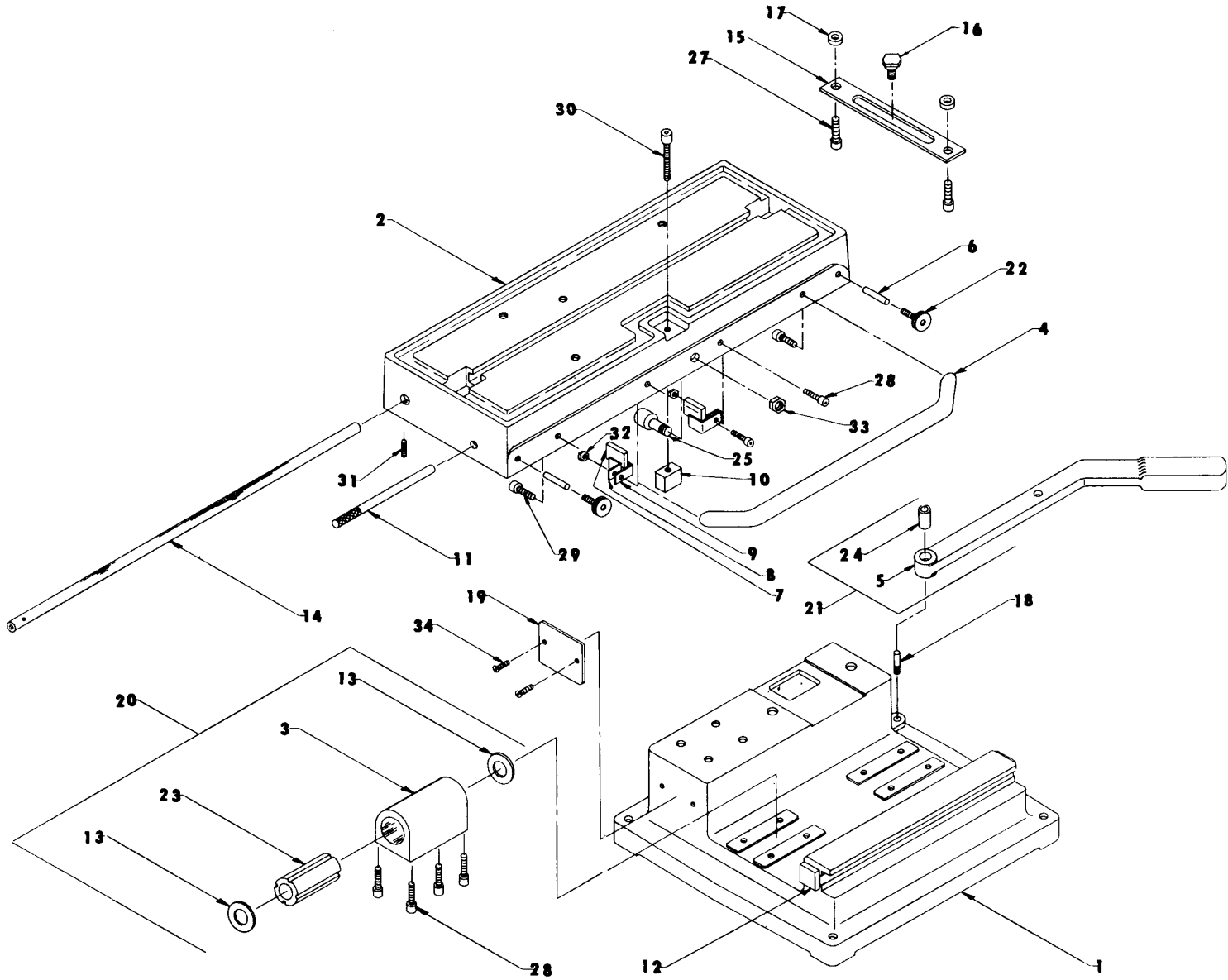
**ILLUSTRATION NO. 39  
OILING THE WORK-HEAD**

**PARTS LIST**  
**Table and Base**  
**ROUTER BIT GRINDER 374000**

---

<u>DIA. NO.</u>	<u>PART NO.</u>	<u>PART NAME AND DESCRIPTION</u>
1	374501	Base with 374075 Pivot Pin
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	Cam 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	370756	Knob
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 (not shown)
27	B190805	Fl. Hd. Sock Cap Scr. No.. 10 24 NC x 1/2 Long
28	B251211	Kn. Sock Hd. Cap Scr. 1/4 20 NC x 3/4 Long
29	B251611	Kn. Sock Hd. Cap Scr. 1/4 20 NC x 1
30	B252411	Kn. Sock Hd. Cap Scr. 1/4 20 NC x 1-1/2 Long
31	C250627	Set Scr. 1/4 - 20 NC x 3/8 Cup Point
32	J251000	Hex Nut 1/4 - 20 NC
33	J432100	Jam Nut 7/16 - 20 NF Jam Nut Cad Plate
34	R601018	Drive Screws No.. 2 x 3/16

Router Bit Grinder  
Exploded View Number 1



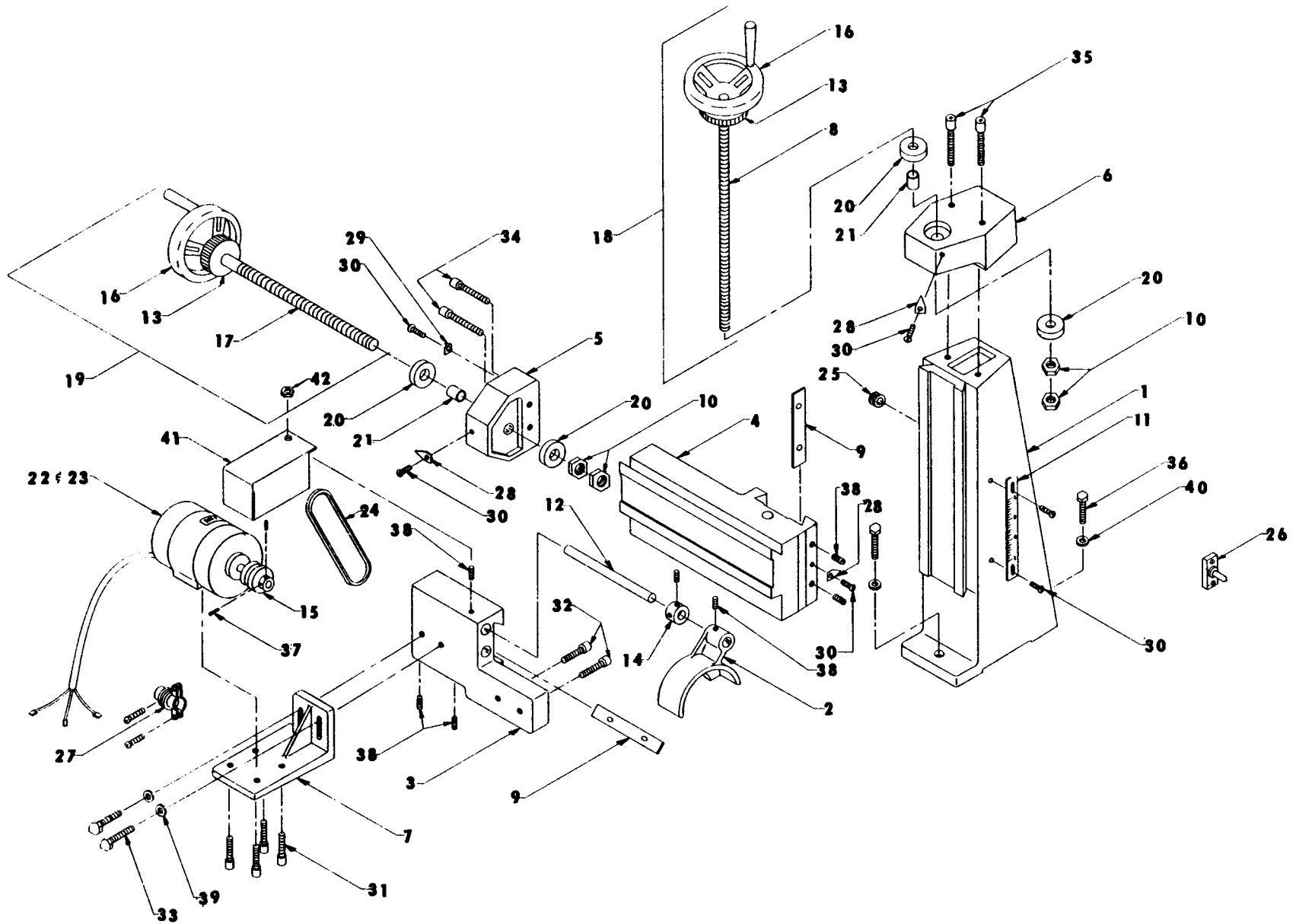
**PARTS LIST FOR ROUTER BIT GRINDER 374000**

<u>DIA. NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>
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	370641	Mtr. 110V 50-60 Cycle Single Phase
23	370591	Mtr. 220V 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 No.. 10 - 24 NC x 3/8
31	B191011	Kn. Sock Hd. Cap Scr. No.. 10 - 24NC x 5/8 LONG
32	B251611	Kn. Sock Hd. Cap Scr. 1/4 - 20NC x 1 Long
33	B252001	Hex Cap Scr. 1/4 - 20NC x 1-1/4 Long
34	B252411	Kn. Sock Hd. Cap Scr. 1/4 - 20NC x 1-1/2 Long
35	B252811	Kn. Sock Hd. Cap Scr. 1/4 - 20NC x 1-3/4 Long
36	B432001	Hex Cap Scr. 7/16 - 14NC x 1-1/4 Long
37	C190420	Setscrew No.. 10 - 24NC x 1/4 Cup Point
38	C250627	Setscrew 1/4 - 20NC x 3/8 Cup Point
39	R000523	Washer 1/4 Cut Washer
40	R000535	Washer 7/16 Cut Washer
	* 374100	Motor Support Plate
41	374101	Belt Guard
42	J251000	Hex nut 1/4 - 20NC

\*Not Shown in Exploded View Number 2



Router Bit Grinder Column  
Exploded View Number 2

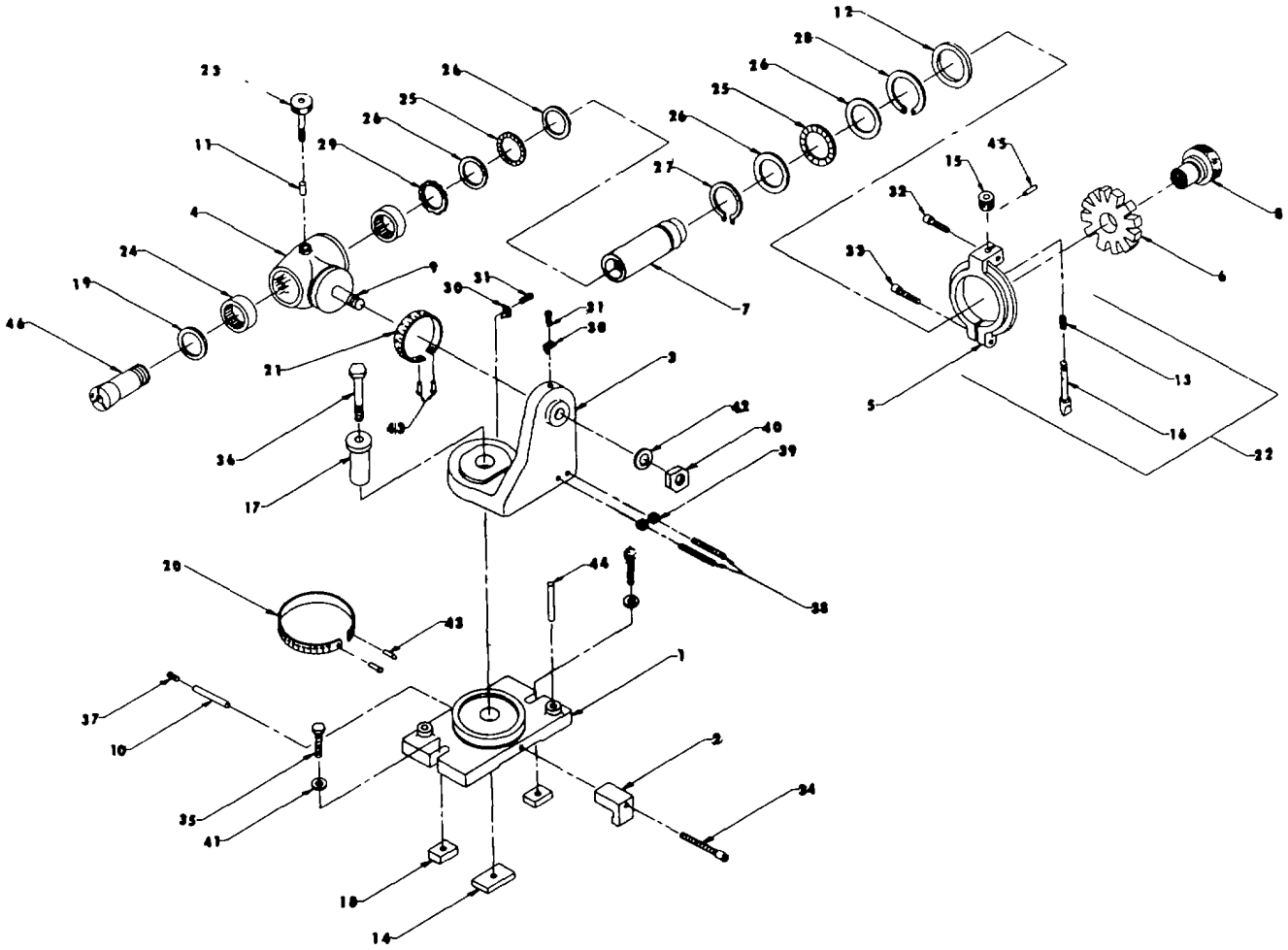


**PARTS LIST**  
**BASE PLATE - WORK HEAD**  
**Router Bit Grinder 374000**

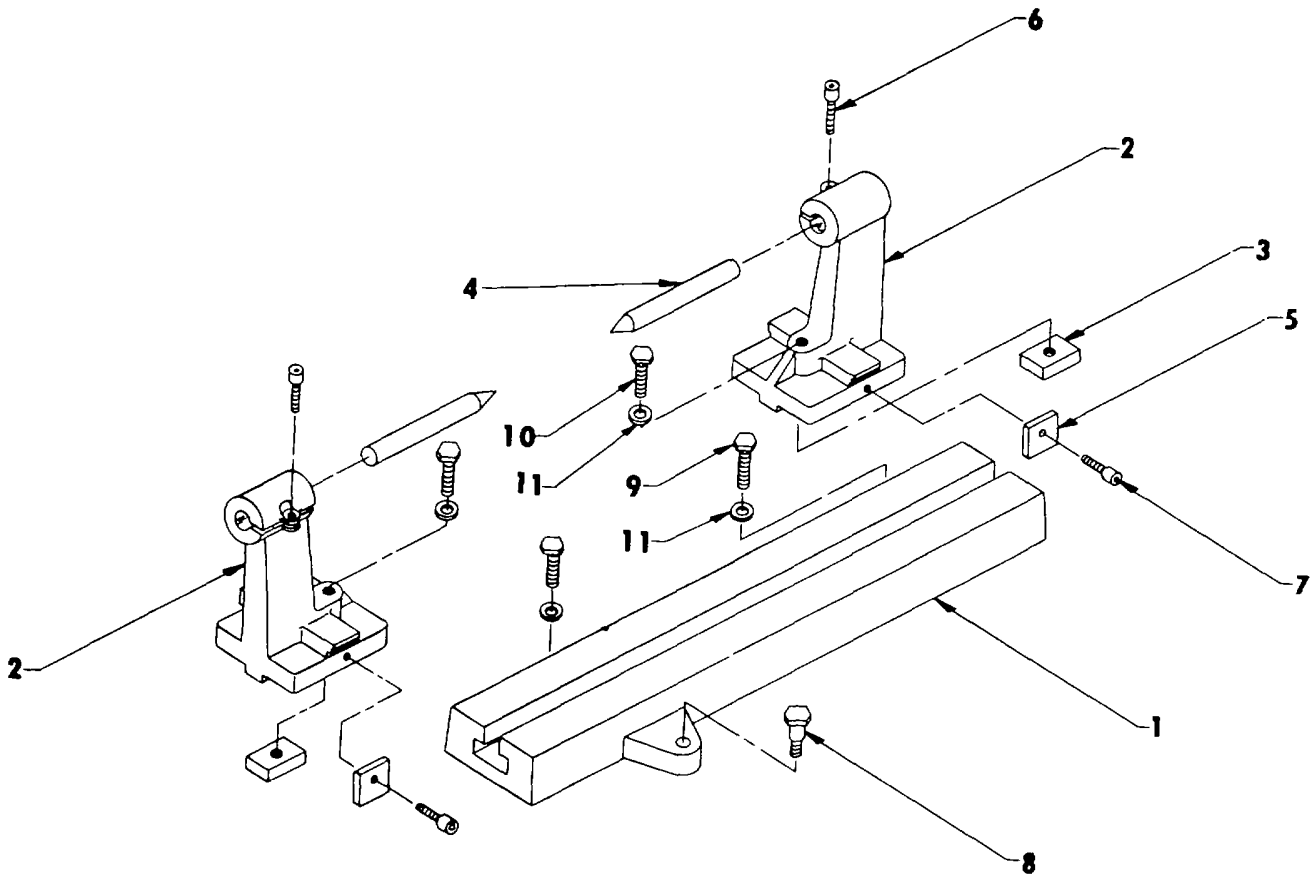
DIA. NO.	PART NO.	PART NAME AND DESCRIPTION	DIA. NO.	PART NO.	PART NAME AND DESCRIPTION
1	374013	Base Plate-Work Head	33	B251411	Kn Sock Hd Cap Screw 1/4-20NC x 7/8 Lg
2	374014	Take-Up Block			
3	374015	Angle Bracket	34	B314011	Kn Sock Hd Cap Screw 5/16-18 NC x 2-1/2 Lg
4	374016	Collet Head			
5	374017	Index Locking Ring	35	B372801	Hex Cap Screw 3/8-16NC x 1-3/4
6	374033	Index Plate			
7	374034	Collet Adapter	36	B374001	Hex Cap Screw 3/8-16 NC x 2-1/2
8	374035	Collet Locking Knob			
9	374037	Stud-Work Head	37	C310627	Set Screw 5/16-18NC Cup Point
10	374038	Brass Plug			
11	374039	Brass Plug	38	C312841	Set Screw 5/16-18NC 1-3/4 Lg
12	374040	Felt Seal			
13	374042	Index Spring			Sq Head Flat Point
14	374043	Bar Nut	39	J311000	Hex Nut 5/16-18NC
15	374048	Index Knob	40	J621000	Hex Nut 5/8-11 NC
16	374049	Lock Pin			Hex Mach Nut
17	374050	Shoulder Pivot Pin	41	R000527	Washer 3/8 Cut Washer
18	374054	Bar Nut	42	R000528	Washer 5/8 Cut Washer
19	374057	Felt Seal	43	R601018	Drive Screws No..2x3/16
20	374065	Quadrant Scale	44	R805000	Dowel Pin 3/8 Dia x 1-3/4
21	374068	Quadrant Scale	45	R840050	Roll Pin 3/32 x 1/2 Lg
22	374517	Index Assembly	46	370081	Collet 1/4 No..4C
23	370756	Knob	47*	370082	Collet 3/8 No.. 4
24	370240	Needle Bearing	48*	370083	Collet 1/2 No.. 4
25	370241	Needle Thrust Bearing	49*	370084	Collet 1/8 No.. 4
26	370242	Needle Raceways	50*	370085	Collet 3/16 No.. 4
27	370321	Retaining Ring 1-1/2	51*	370087	Collet 5/16 No.. 4
28	370322	Retaining Ring 2-3/16	52*	370091	Collet 7/16 No.. 4
29	370872	Thrust Spring	53*	370092	Collet 9/16 No.. 4
30	357050	Pointer	54*	370093	Collet 5/8 No.. 4
31	A190602	Rd Hd Screw No.. 10-24NC x 3/8	55*	370094	Collet 11/16 No.. 4
32	B251011	Kn Sock Hd Cap Screw 1/4-20NC x 5/8 Lg	56*	370095	Collet 3/4 No.. 4

\*Optional Equipment

Router Bit Grinder Base Plate Work Head  
Exploded View Number 3



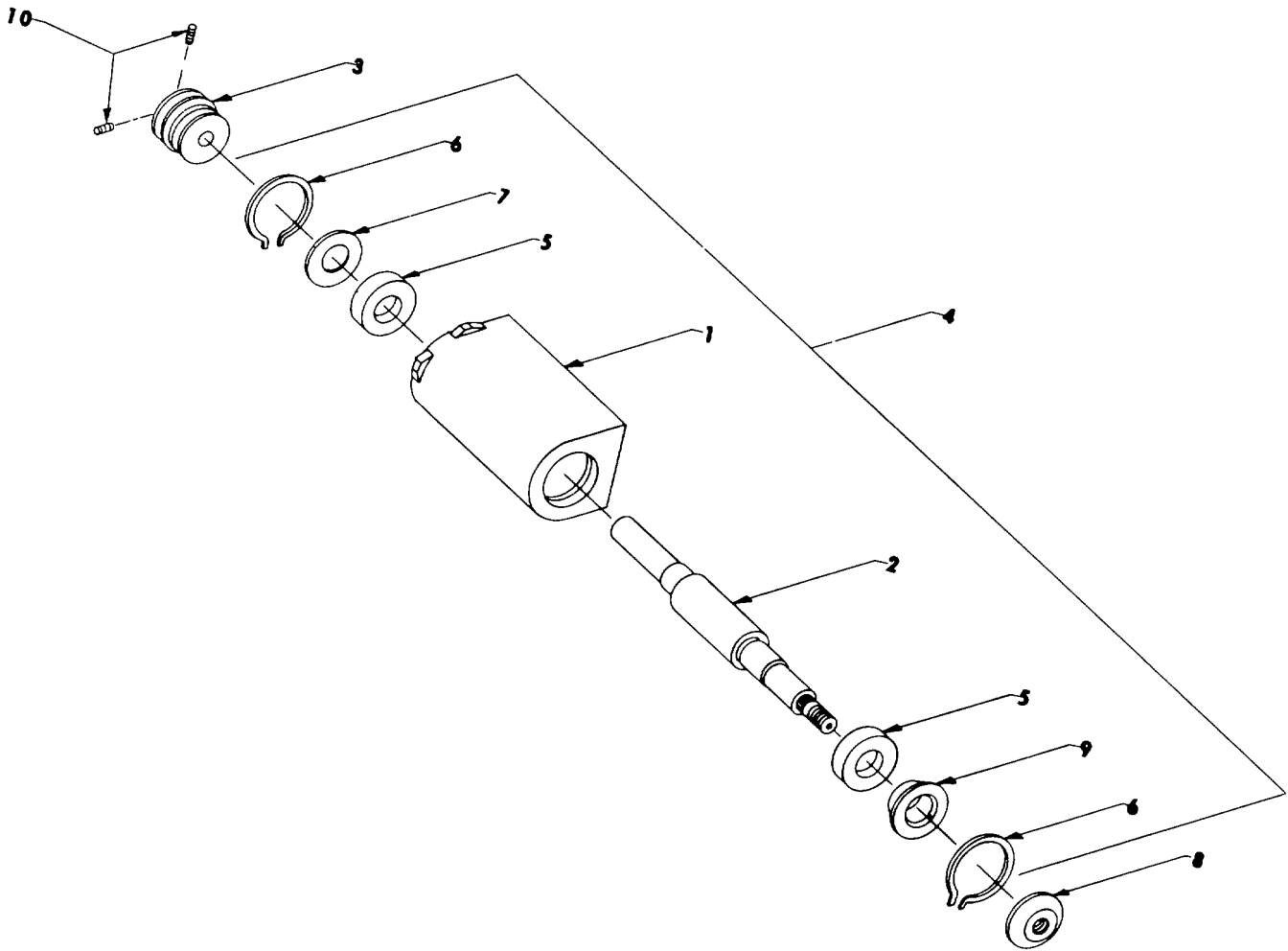
**PARTS LIST**  
**ROUTER BIT GRINDER 374000**  
**Sub Table**



DIA NO	PART NO	PART NAME AND DESCRIPTION	DIA NO	PART NO	PART NAME AND DESCRIPTION
1	374018	Sub Table	7	B251211	Kn Sock Hd Cap Scr 1/4-20NC x 3/4 Long
2	374019	Center Stand	8	B371012	Sock Hd Shoulder 3/8-16NC thd 1/2 dia x 5/8
3	374054	Bar Nut	9	B371601	Hex Cap Scr 3/8-16NC x 1 Long
4	357317	Center	10	B373601	Hex Cap Scr 3/8-16NC x2-1/4 Long
5	357318	Lock Plate	11	R000527	Washer 3/8 Cut Washer
6	B251011	Kn Sock Hd Cap Scr 1/4-20NC x 5/8 Long			

Exploded View Number 4

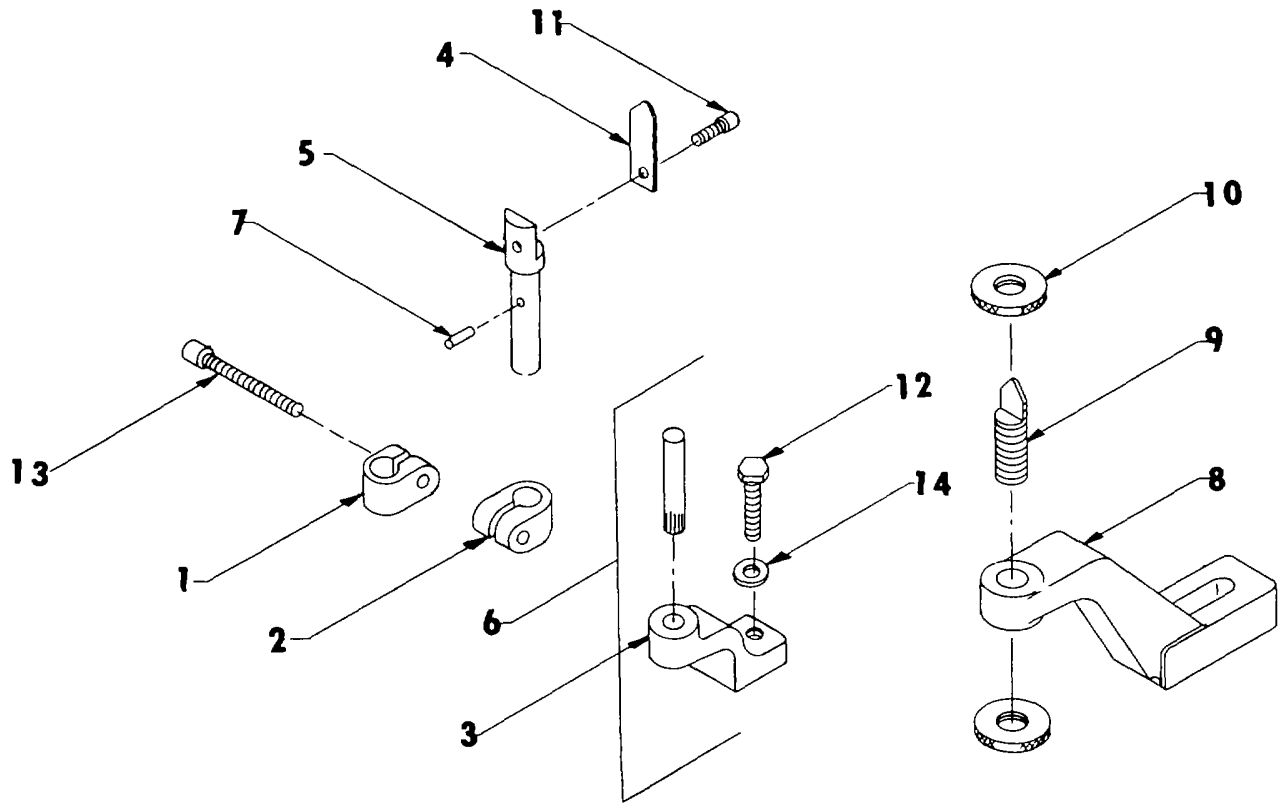
**PARTS LIST**  
**ROUTER BIT GRINDER 374000**  
**Spindle Head Assembly**



DIA NO	PART NO	PART NAME AND DESCRIPTION	DIA NO.	PART NO.	PART NAME AND DESCRIPTION
1	374011	Spindle Housing	6	370320	Retaining Ring
2	374032	Wheel Shaft	7	370871	Thrust Ring
3	374066	Spindle Sheave	8	357177	Outer Flange
4	374511	Spindle Hd Assembly	9	357195	Inner Flange
5	370041	Ball Bearing	10	C190420	Set Screw No.. 10 24NC x 1/4 Cup Point

Exploded View Number 4

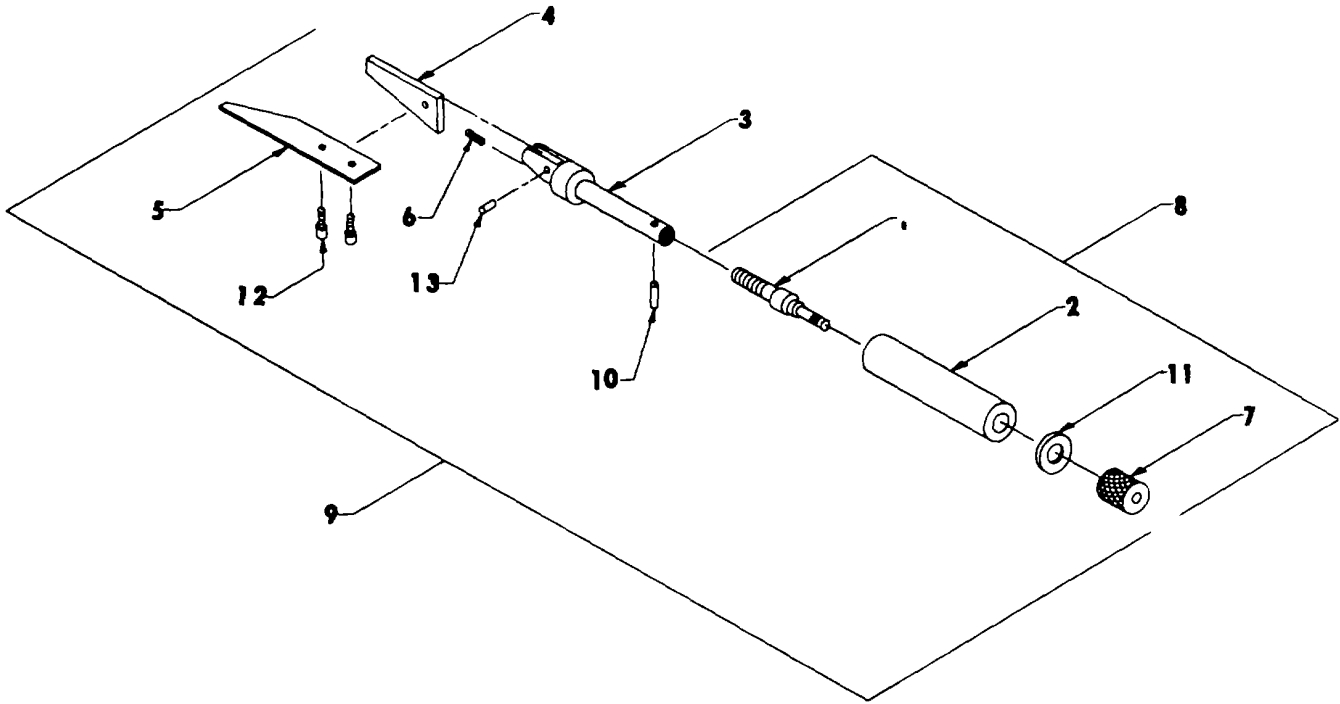
**PARTS LIST**  
**ROUTER BIT GRINDER 374000**  
**Stop Finger Base Assembly**



DIA NO	PART NO	PART NAME AND DESCRIPTION	DIA NO.	PART NO.	PART NAME AND DESCRIPTION
1	357025	Knuckle	8	374024	Stop Finger Base
2	357026	Tapped Knuckle	9	374060	Stop Finger
3	357316	Stop Finger Base	10	374061	Thumb Wheel
4	357321	Stop Finger	11	B250811	Kn Sock Hd Cap Scr 1/4-20NC X 1/2 Long
5	357322	Stop Finger Body	12	B372001	Hex Cap Scr 3/8-16NC x 1-1/4
6	357568	Stop Finger Base Assembly	13	8372814	Cap Screw 3/8-16NC x 1-3/4
7	370186	Spirol Pin	14	R00527	3/8 Cut Washer

Exploded View Number 6

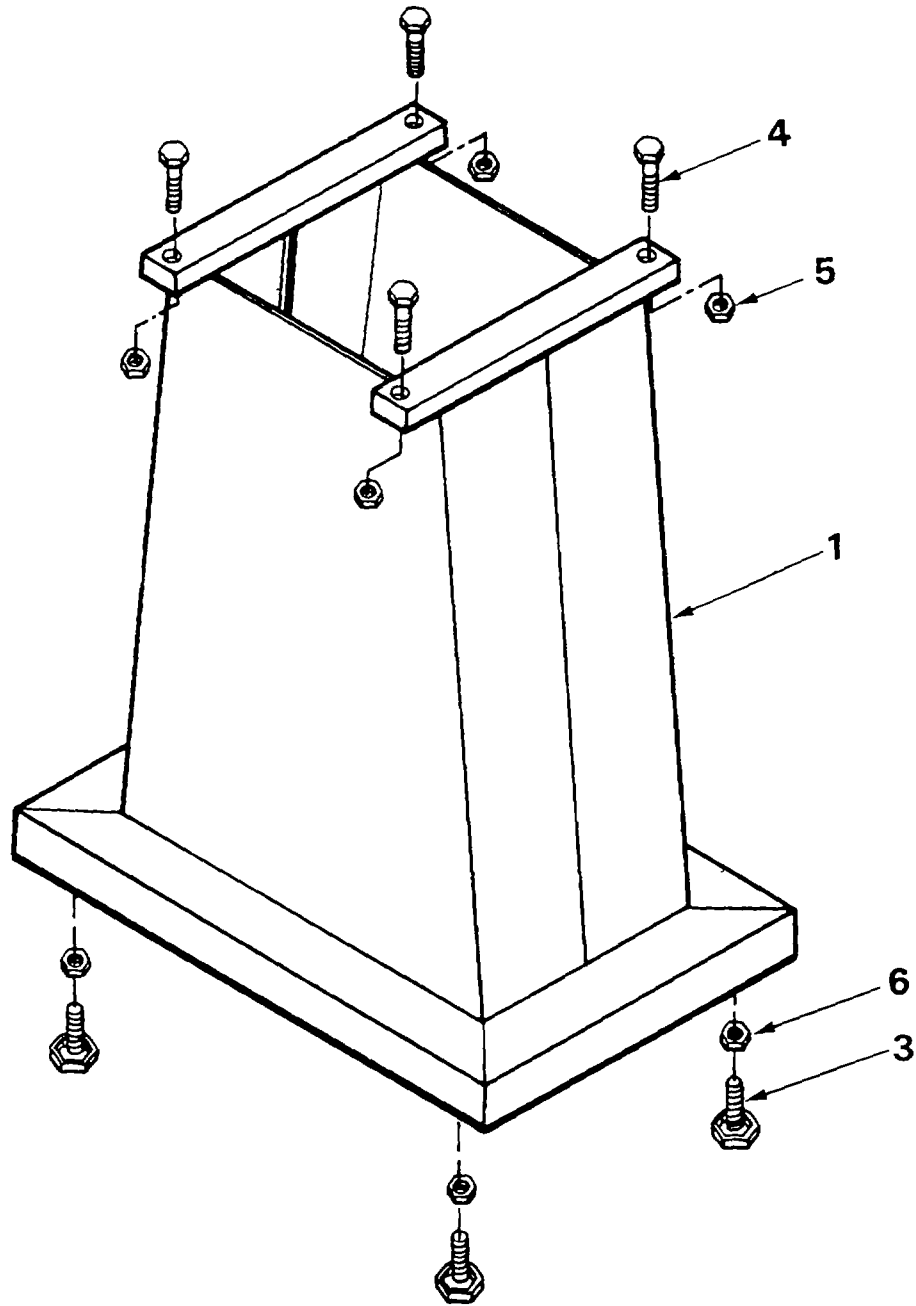
**PARTS LIST**  
**ROUTER BIT GRINDER 374000**  
**Stop Finger Assembly**



DIA NO	PART NO	PART NAME AND DESCRIPTION	DIA NO.	PART NO.	PART NAME AND DESCRIPTION
1	357100	Shaft	8	357530	Feed Knob Assembly
2	357101	Body	9	357583	Stop Finger Assembly
3	357102	Plunger	10	370186	Spiral Pin 1/8 x 3/8 Med
4	357103	Latch	11	370873	Speed Nut
5	357104	Stop Finger	12	B160411	Kn Sock Hd Cap Screw 8 - 32NC x 1/4
6	357105	Spring	13	R731050	Drive Lock Pin 1/8x1/2 Type C
7	357111	Knob			

Exploded View Number 7

ROUTER BIT GRINDER, 374524  
Floor Stand



PARTS LIST FOR 374524 WELDED FLOOR STAND

<u>DIA. NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>
1	374022	Floor Stand Weldment
3	370563	Leveling Screw
4	312401	Hex Cap Screw 5/16-18 NC x 1-1/2 Long
5	J311000	Hex Nut 5/16-18 NC
6	J501000	Hex Nut 1/2-13 NC



**By Order of the Secretary of the Army:**

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*Chief of Staff*

**ROBERT M JOYCE**  
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