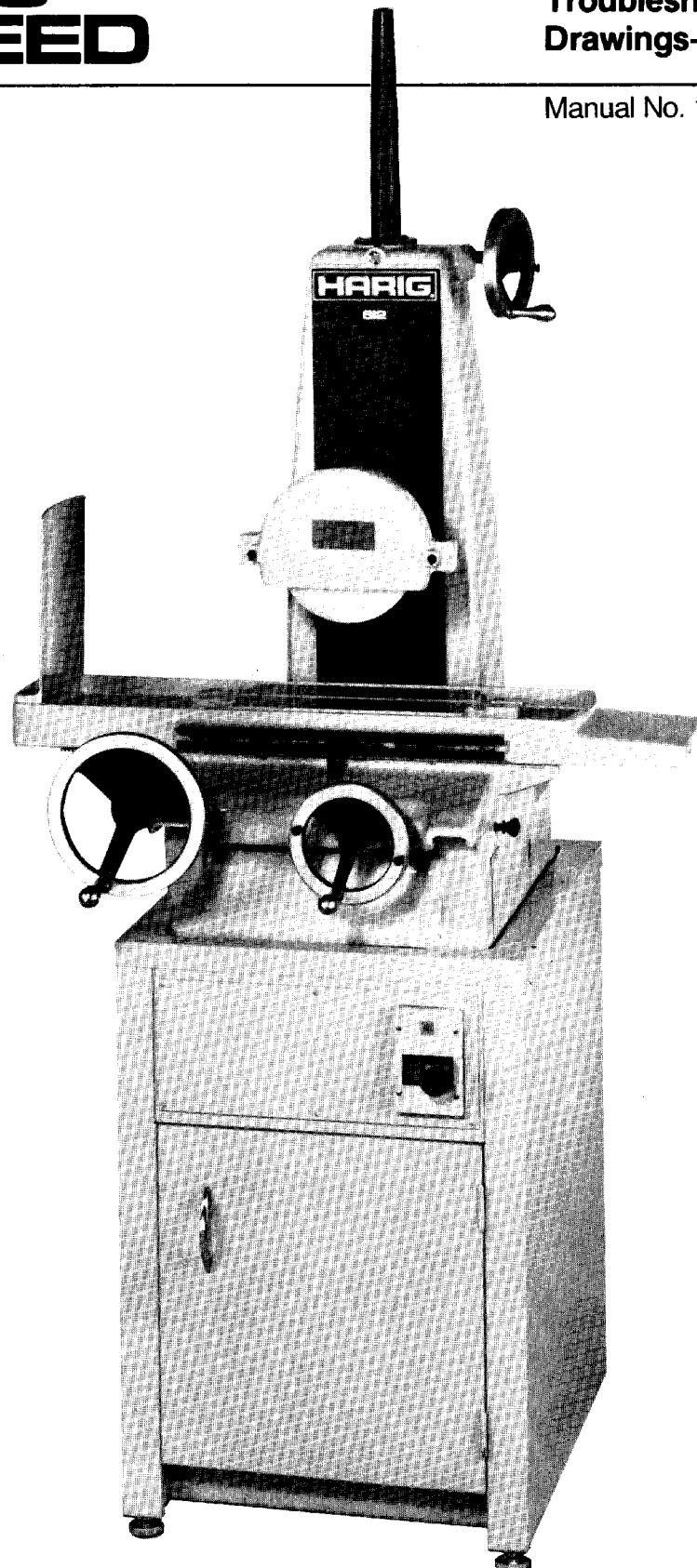


# HARIG®

## 612 & 618 HAND FEED

Nomenclature  
Installation & Set Up  
Operation  
Maintenance  
Troubleshooting  
Drawings—Part Numbers

Manual No. 17799100 Rev. 1



Model 612

# OPERATION

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## Safety First

**We, like most American manufacturers, go to great lengths to make our products as safe as possible. But operators still get hurt. In virtually every case the injury is the result of:**

- Not knowing how to operate the machine properly.
- Not following proper operating and safety procedures.
- Carelessness or inattentiveness.
- Trying to "take a short cut."
- Poor maintenance.

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**For your personal safety, and to get maximum efficiency out of this precision machine, read and follow operation instructions carefully.**

**Standard Safety Precautions for Operating the Harig® 612 and 618 Autostep.**

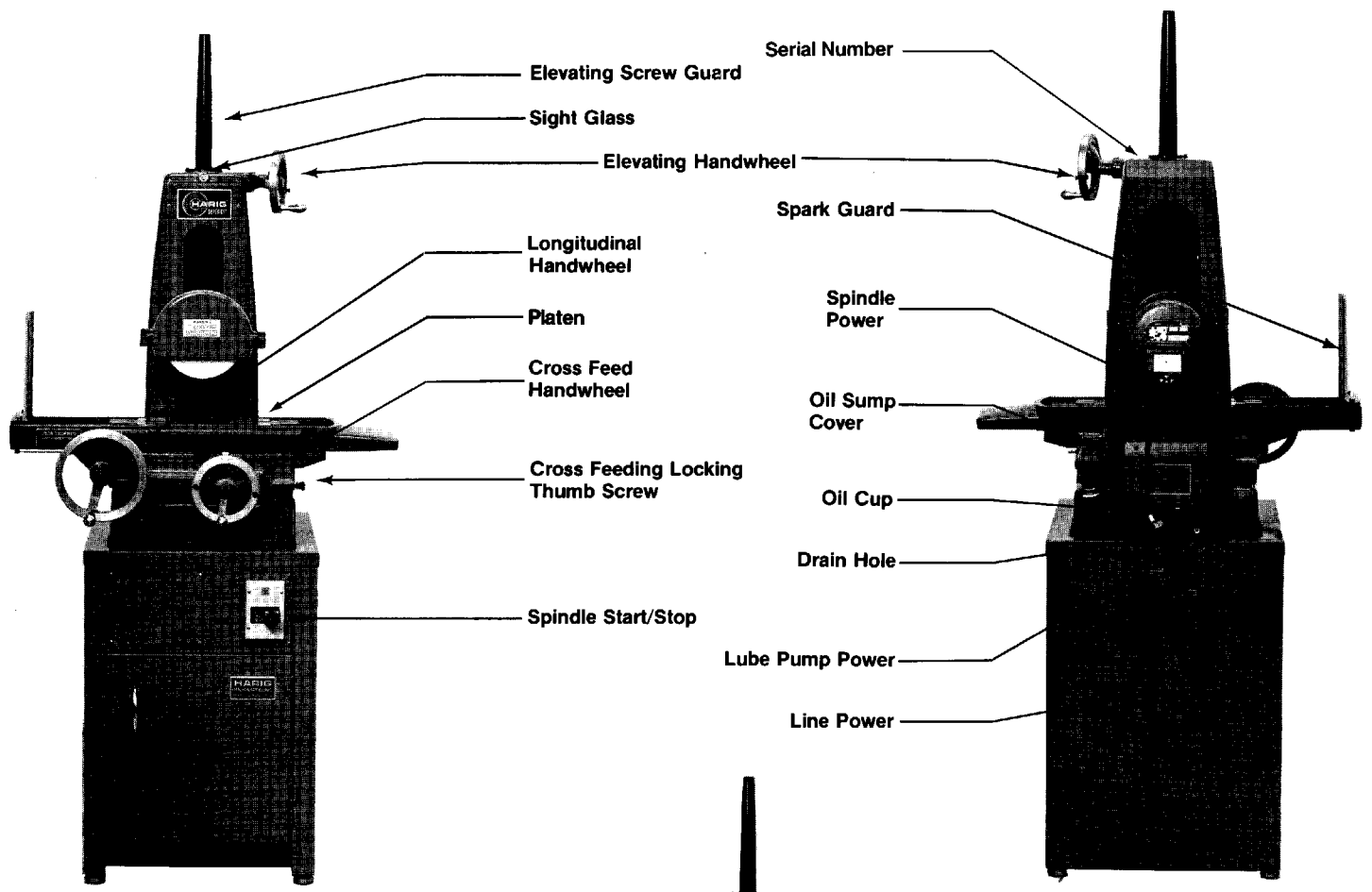
- NEVER operate machine without safety glasses.
- NEVER operate machine without wheel guard in place.
- DO NOT wear tie, scarf, ID bracelet, neck chain or other object that could become entangled in the machine or workpiece.
- Always wait for wheel to STOP before bringing your hands to table or workpiece.
- Make certain workpiece is SECURELY held in place.
- NEVER attempt to hand hold or hand feed a workpiece.
- NEVER exceed machine's capacity.
- Use proper grade grinding wheels and keep them dressed.
- Stop machine and correct any malfunction IMMEDIATELY (see troubleshooting section).
- Inspect and maintain machine by schedule—not by chance.
- Keep hands (and clothing) away from table when operating.
- If you're not a qualified electrician, do NOT tamper with electrical connections or wiring. Report any suspected electrical malfunction immediately.

**612 & 618  
HAND FEED  
SURFACE  
GRINDER**

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# NOMENCLATURE



Front View \*

Figure 1

Rear View\*

Figure 2

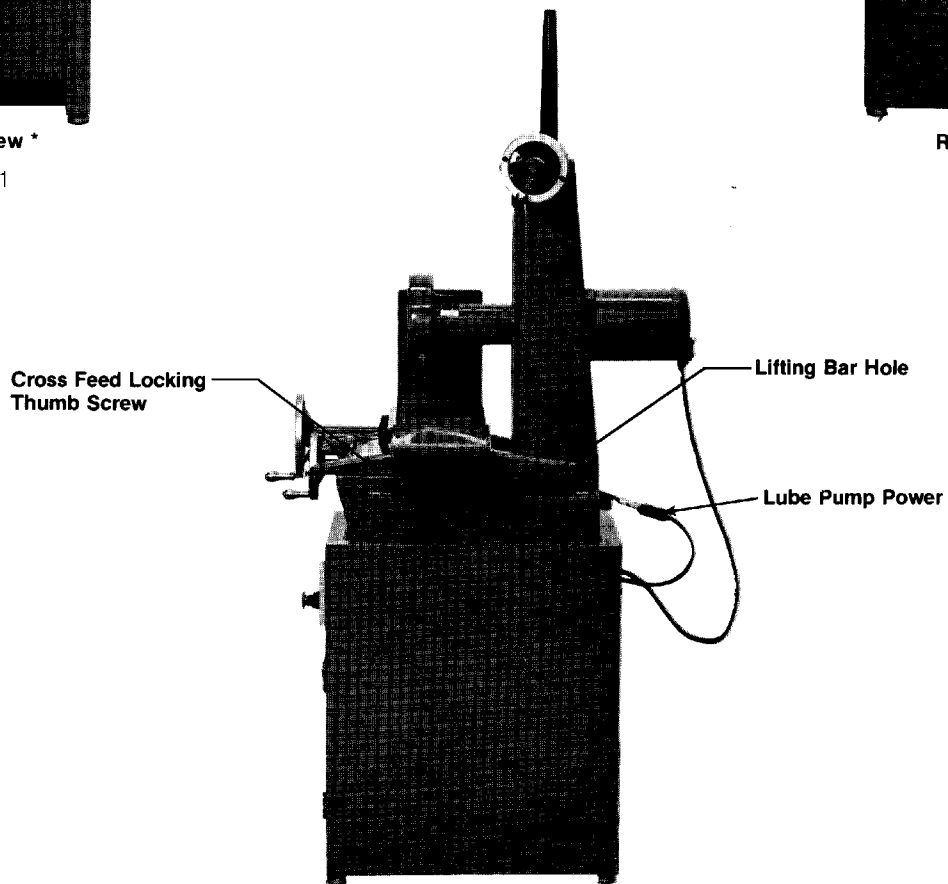


Figure 3

Side View\*

\*Model 612 Hand Feed



# INSTALLATION AND SET UP

**Step 1. Do Not Remove Skid** until machine has been moved adjacent to its installation site.

**Step 2. To Lift Grinder From Skid and Position:**

Before moving the elevating handwheel to remove the wood brace between the table and spindle housing, remove the plastic temporary dust cover from the top of the column and slowly pour in 2 ounces (1/4 cup) of way oil (the gallon container in the "standard accessory box" found on the left rear corner of the machine skid) over the bevel gear.

2.1 Place 3/4" steel bar through holes near bottom of grinder base. (Fig. 3, page 2)

2.2 Attach chain or rope to ends of bar and join near top of column. Strap to top of column. Pad machine adequately to prevent damage to finish. (Fig. 4)

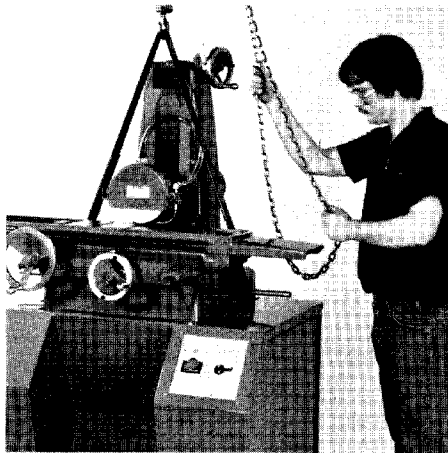


Figure 4

2.3 Remove four 1/2-20 Hex head bolts that are holding base cabinet to skid.

2.4 Lift slightly from skid. Balance machine by turning cross feed handwheel. (Loosen locking thumb screw, A, Fig. 10, page 4)

**Caution:** Do not lift by motor, spindle, table or saddle.

2.5 Screw 4 leveling legs (in "standard accessory box") into the holes in the base cabinet to project 5/8" below the bottom.

**Step 3. Position Machine**

where desired. No special pad, floor reinforcement or drip pans are needed.

**Step 4. Clean Machine.** Remove grease from table, handwheels and exterior surfaces with clean rag. It is not necessary to disassemble anything as all interior surfaces are factory prepared. Do not use solvents or abrasives that may damage machine's finish.

**Step 5. Level Machine.**

5.1 Crank table all the way to the right.

5.2 Raise left front leveling leg 1/4" off the floor.

5.3 Place level on table platen and adjust the three remaining legs to level the table in both directions.

5.4 Lower left front leg to floor and give it an additional 1/8 turn.

**Step 6. Assembly.**

Use three round head screws (furnished) to fasten Elevating Screw Guard to Column Cap. (Fig. 5)

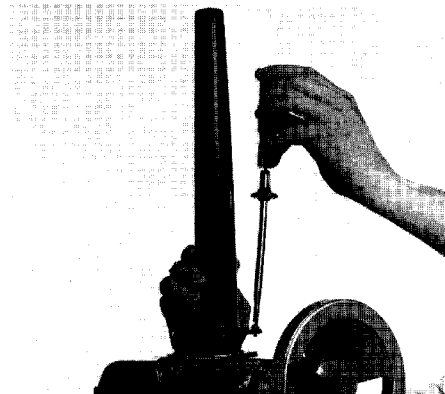


Figure 5

**Step 7. If Wet Coolant Attachment**

has been purchased with a 618, loosen the three 1/4 turn coolant compartment screws (Fig. 6) and

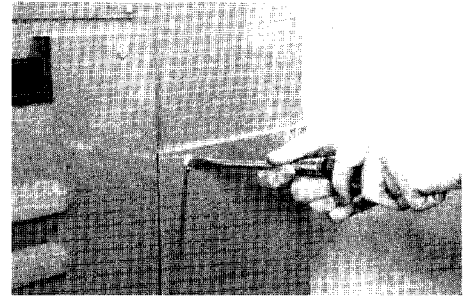


Figure 6

assemble as per instructions packed with the system. A wet coolant system purchased with a 612 is placed along side the machine. (Fig. 7)

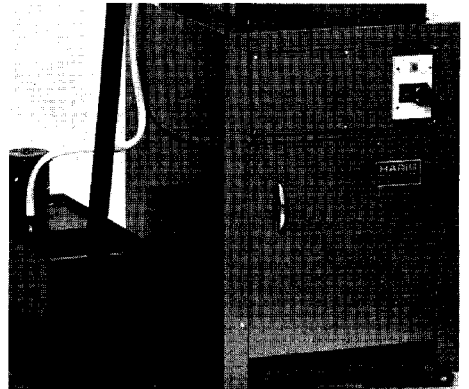


Figure 7

**Step 8. Lubrication.**

Ways and feed screws are automatically lubricated. The spindle and motor bearings are permanently lubricated.

If machine has a rack and pinion type longitudinal table travel, this assembly was greased at the



Figure 8

## OPERATION

### Power On

### Longitudinal Feed, Cross Feed, Elevating Mechanism, Grinding Wheel Mounting

factory. A small amount of grease should be added to the rack each month.

**Note:** Check oil reservoir (see cup at rear of machine). If needed, add way oil to bring level to nearly full. (Fig. 8, page 3)

#### Step 9. Electrical Connections.

**Caution:** To preclude personal injury or extensive machine damage, all electrical work should be done by a qualified electrician.

9.1 Compare rating label on the back of the spindle motor with house current to make certain they correspond.

9.2 Connect three main line wires to house current system.

9.3 Stand in front of machine. Turn Spindle Motor on. It should rotate CLOCKWISE. If not, switch any two of the three live wire connections.

9.4 Ground machine by connecting the green wire to a steam or water pipe. **Caution:** Do NOT ground the machine to a gas pipe.

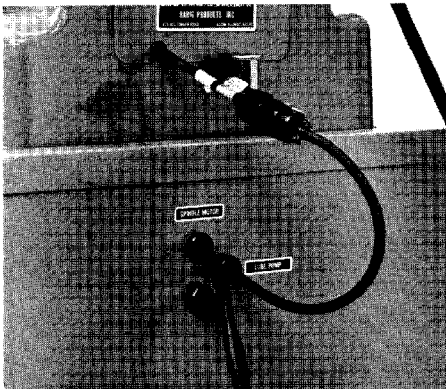


Figure 9

**Note:** If it is not desired to use the line power cable furnished with the machine, access to the line connections is made by removing (4) screws on the cover of the Spindle Start/Stop switch and removing the cover. The line connectors are the (3) screws at the top of the switch.

#### Power On.

To turn the spindle motor on, depress "start" button located on front of cabinet. (B, Fig. 10) This also starts the lubricating system oil pump. After 1 minute, the oil level should rise to the mid-point of the sight glass in the column cap of the machine. This shows that the machine is ready for operation.

The 1 HP motor furnished as standard with this machine has enough power to take as heavy a cut as you will normally wish when cross feeding and grinding without coolant. When plunge grinding or grinding with coolant, it is relatively easy to overload the motor. The switch incorporates overload protection. If the overload switch trips, allow sufficient time for the overload to cool, then press the start button to restart the motor.

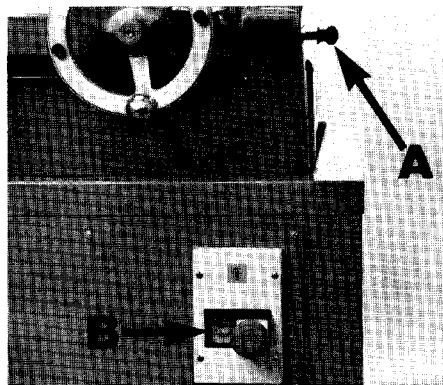


Figure 10

#### Longitudinal Feed.

Feed the table by operating the large handwheel. If your grinder has a cable drive (rather than a rack and pinion drive) you can readjust the position of the handle on the wheel by cranking the table to the end of its travel and continuing to turn the wheel (slipping the cable) to the desired position.

It is a good practice to distribute oil evenly over entire length of ways before using grinder. Simply turn on spindle and run table back and

forth a few times. (Spindle switch activates oil pump.)

#### Cross Feed.

Achieve manual cross feed by loosening the cross feed travel locking thumb screw (A, Fig. 10) on the right side of the base under the table 1 turn, and operating the cross feed handwheel.

#### Elevating Mechanism.

Raise or lower grinding head assembly by turning handwheel (A, Fig. 11) on the right side of top of column.

To change zero setting, loosen two knurled screws (B, Fig. 11) projecting from face of wheel, slide calibrated slipping to desired position and retighten screws.

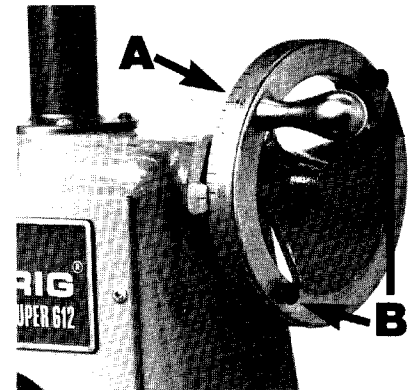


Figure 11

To engage "fine feed" (optional equipment), tighten large knurled screw. (A, Fig. 12) One revolution of the "fine feed" knob will change the elevating screw setting by .001 inches. To disengage "fine feed", loosen knurled screw 1/2 turn.

#### Grinding Wheel Mounting.

The grinding wheel furnished with your machine was chosen to satisfy average shop work requirements. It was dressed on both sides and bottom, and was balanced with the Harig wheel balancer 17794350.

## MAINTENANCE

### Grinding Magnetic Chucks Cleaning

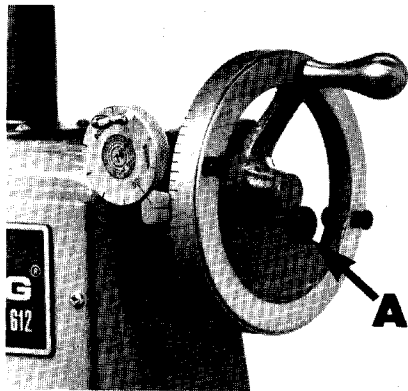


Figure 12

Before removing this wheel from the grinder, dress the bottom face and grind a piece of soft tool steel to check the machine set-up and performance.

Use only balanced wheels to ensure getting the maximum quality this precision machine is capable of producing. When specific problems regarding wheel selection are encountered, contact a grinding wheel manufacturer or his local representative for recommendations.

The spanner wrenches (furnished) fit the wheel nut which holds the grinding wheel on the adaptor, and the two holes in the back of the adaptor. Unless a right-hand thread has been specially ordered, the wheel nut has a left-hand thread (letters LH stamped on face of nut) so that the wheel will tend to tighten under starting torque. When chang-

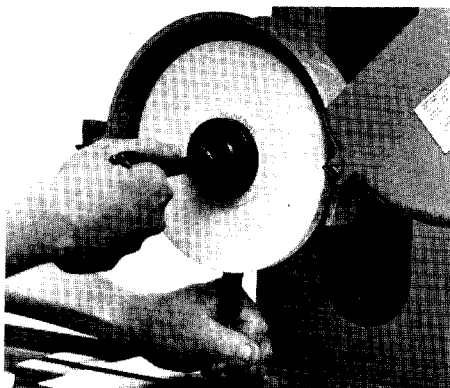


Figure 13

ing wheel, be sure adaptor is retightened. If left loose, wheel may shift and cause chatter marks.

The socket on one spanner wrench fits the nut holding the adaptor on the spindle. To remove adaptor, unscrew nut completely (left-hand thread) and screw in the "puller" (furnished) until the center screw hits the spindle end. Tighten center screw until adaptor is free. (Fig. 13)

#### Grinding Magnetic Chucks.

A magnetic chuck with an untrue bottom can distort a surface grinder table to which it is clamped. For this reason, the bottom should be wiped dry, placed on a surface plate and checked for bow. If the chuck rocks or pivots rather than having an even drag, it should be placed face down on the platen and the bottom ground flat. If a surface plate is not available, use the grinder's platen.

**Caution:** Never grind the platen, as this can impair accuracy.

Grinding the chuck surface requires special technique and great care. The "lead" filling between the magnetic poles tends to load the wheel and will cause the unsupported areas of the chuck over the magnet to move with any temperature difference created by grinding. Follow these instructions carefully:

1. Use a relatively coarse grit wheel of medium grade and open structure with a vitrified bond. The 9A-46-H8-V52 wheel furnished with the machine works well if used with a mist or wet coolant and can be used dry if care is used to prevent heat build-up. If difficulty is experienced, use a still softer and more open wheel such as a 32A46-G12VBEP.

2. Dress wheel rather coarsely with a sharp diamond. Cross feed the diamond at a fairly rapid rate and do not pass under wheel unless down-fed at least .0005 inches. Tighten screws holding chuck to table with minimum force needed to keep

chuck in place. Overtightening may cause warping.

3. Chuck must be in "on position" while being ground.

4. Set depth of each cut to .0002".

5. Turn cross feed handwheel at least 1/16 for each pass, and move table rapidly while grinding.

6. Dress wheel after each cut across chuck to remove any "lead."

7. A loaded wheel, whether caused by heavy cuts, improper dressing or wrong type of wheel, can create heat build-up sufficient to warp center of chuck up into the wheel and seriously affect grinder accuracy.

#### MAINTENANCE.

This precision surface grinder is equipped with an automatic "Flo-Clean" oil system. Unlike other grinders, this completely separate system circulates, filters and re-circulates the cleaning/lubricating oil. All moving mechanical and wear surfaces are automatically and continuously flushed with filtered oil whenever the spindle is running.

#### Cleaning.

This machine requires only surface cleaning. All internal parts are cleaned automatically by the built-in system mentioned above. When cleaning the external surface:

1. Center table to prevent dirt and grit from being brushed onto ways.
2. Never use an air blast to clean machine. Use a vacuum and/or treated dusting cloth. Remove dirt—don't just move it.

3. Make certain that exhaust from vacuum or dust collector is not directed toward grinder and particularly not at underside of table.

4. If solvents must be used to clean surface, use caution not to drip on ways. Do not use a lacquer base or other solvent which may damage machine's baked enamel finish.

**Note:** We recommend centering the table when machine is not in use

## MAINTENANCE

### Lubrication

## TROUBLESHOOTING

### Chatter

to provide a dust cover for table ways.

#### Lubrication.

Since moving mechanical parts of this machine are automatically lubricated, and the motor and drive are permanently lubricated and sealed, the only lubrication maintenance required are the following periodic checks:

#### EVERY 100 HOURS OF OPERATION:

Check the large oil cup in rear of machine. If less than half full, add enough Harig Way Oil (No. 16211245, furnished with machine) to bring level to nearly full. (Fig. 8, page 3) A standard 150 to 225 SUS viscosity way oil may be used in place of Harig's 16211245, but it will have 10% less "stick-slip" efficiency.

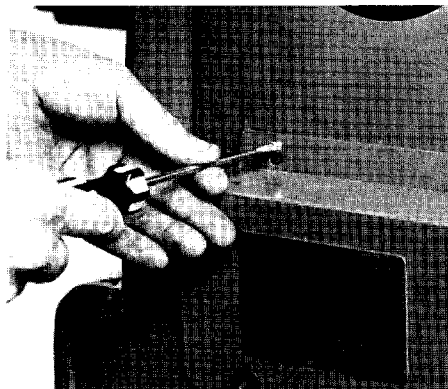


Figure 14

#### EVERY 1000 HOURS OF OPERATION:

Clean the oil pump filter. Unscrew dust guard retaining screws one turn. (Fig. 14) Lift dust guard up to permit screw heads to pass through key-holes and remove. Tip pump unit as shown and unscrew 10-32 cap screw. Move filter cover assembly to one side. Remove rubber gasket and filter screen. (Fig. 15) Clean screen and check sludge in bottom of sump. If there is 1/8 inch or more, remove drain plug and flush. A 1/8 inch pipe screwed into hole (A, Fig. 15) will facilitate cleaning.

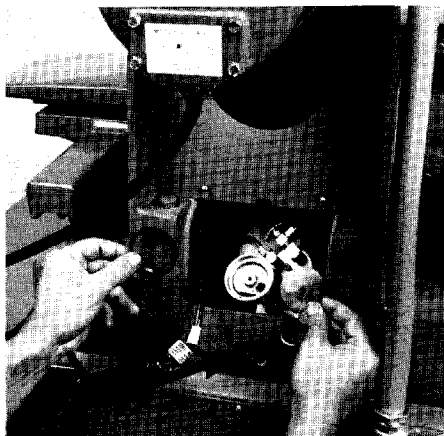


Figure 15

#### TROUBLESHOOTING — Adjustments.

Your Harig® surface grinder has been designed and manufactured to give a long life of accurate finish surface grinding. It has been thoroughly checked during manufacture and final assembly, and has been run in and given a performance test. A final inspection report showing the actual deviations found in six of the many checks performed on this machine is included with this manual.

The following section is set up to assist you in getting maximum performance from the machine. Each trouble or malfunction is listed, followed by possible causes, together with suggested adjustments or changes you can make.

**Caution:** Electrical tests with the current on should be made only by a qualified electrician.

#### Ordering Replacement Parts.

When repair parts are ordered, be sure to include the serial number of the machine as well as the part number shown in the following drawings. The machine serial number is stamped into the column cap casting next to the elevating handwheel.

#### 1. CHATTER OR VIBRATION MARKS IN FINISH.

**A. Wheel loose on sleeve.** Put additional tension on wheel adaptor nut. Even if this nut is not loose, motor starting torque may be causing wheel to shift slightly. Re-dress after adding tension to the wheel nut.

**B. Wheel out-of-balance.** All grinding wheels are out-of-balance, it is only a question of how much. (One can verify this by holding the projecting part of the spindle housing while the grinder is running with the wheel, wheel nut and washer removed, and by comparing the vibration with the wheel mounted in place.) Balance the wheel with a Harig Wheel Balancer (No. 17794350) or comparable unit.

If the wheel has not been balanced, the chatter can be minimized by dressing the wheel at the grind point and taking a finishing cut that puts the same drag on the wheel as the dressing operation. The wheel is dressed out-of-round to compensate for the amount of vibration. If a heavier cut is taken, however, the chatter will occur because of the "hammering" of the out-of-round wheel at a different vibration rate.

If a Harig Accu-Dresser or Presto-Dress™ is used to dress an unbalanced wheel, a chatter in the finish will result because the wheel is dressed round and will "hammer" by the amount of vibration. A balanced wheel will give you more pieces between dresses because of the elimination of this "hammering."

**C. Wheel not dressed on sides.**

If the wheel has not been dressed on the sides, a chatter or vibration pattern can result because of the side-to-side movement of the edges of the wheel, and because the surfaces of a wheel next to the mold are harder than the rest of the wheel.

**D. Wheel in need of dressing.** If chatter appears after the wheel has been used for a time, it is probably due to the fact that most grinding wheels vary in hardness around the

## TROUBLESHOOTING

### Chatter

#### Longitudinal Lines Inaccurate Grinding

periphery. Since this chatter appearance is usually only a few millionths of an inch high, weigh the economics against the slight loss of appearance.

**E. Loss of preload.** Occasionally, due to a phenomenon called fretting corrosion (usually caused by out-of-balance wheels), the rear bearing outer race will freeze in the spindle sleeve, and the wave springs will no longer hold the spindle shaft tightly back against the front bearings. To check for loss of preload, place an indicator against the spindle nose as shown in Figure 16 below. Push against wheel guard with thumbs, pulling wheel forward while watching indicator. When released, needle should instantly return to original position. If needle will return to original position only by rotating wheel by hand, return spindle to factory for repair. Be sure to state that there was a loss of preload on this test.

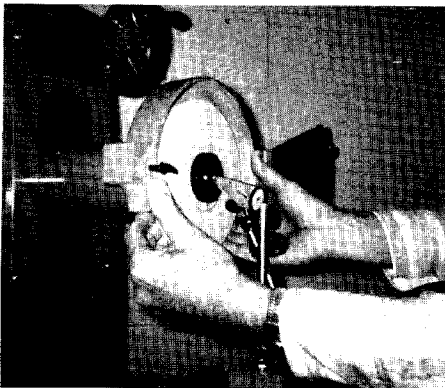


Figure 16

**F. Grade of wheel too hard.**

Loading up or glazing of the wheel, particularly if grinding without coolant, can cause chatter. Replace wheel with one of a softer grade.

**G. Taper of adaptor sleeve in error.**

If the taper in the wheel adaptor sleeve is not the same as that on the spindle nose, or if a piece of dirt or grit has been

assembled on the taper, a chatter can appear on the work. Check the adaptor sleeve by putting a thin film of Prussian blue inside the sleeve and press it on the spindle. The spindle taper should show contact all around the circumference on two separate rings.

**H. Single-phase motor or supply.**

If a single-phase rather than the regular 3-phase motor has been purchased for the spindle, a poorer finish may result. Because of its design, a 3-phase motor runs more smoothly than a single-phase motor. The six poles of the 3-phase motor give a smoother pull than the two poles of the single-phase motor. The moving part of the switch for cutting out the starting circuit of the single-phase motor does not always move to exactly the same position, slightly changing the balance of the motor. A phase converter used to run a 3-phase motor on a single-phase supply will also affect finish and motor sound because of the unbalanced current a converter delivers. The type of converter that switches out of the circuit after starting the motor will cause a poorer finish than a single-phase motor. The type of converter that stays connected, and is rated to run the spindle motor, will give a better finish than a single-phase motor.

**I. Ball bearing failure.**

The super precision bearings used in the Harig Spindle are sized to give an average life of many years of service. If a failure of either the spindle or motor bearings does occur, a chatter will appear on the work being ground, and a noise will be heard when the spindle is running. (Wheel, wheel nut, and washer should be removed to make certain an unbalanced wheel is not causing the noise.) Replacement of all bearings on the spindle assembly, or a new motor, is required. It is recommended that the

spindle assembly be returned to the factory for this repair so that dynamic balance of the unit can be checked.

**J. Unbalanced electric supply.**

If the 3-phase current supplied to the machine is not reasonably uniform, a poorer finish will result.

## 2. LONGITUDINAL LINES— SCRATCHY FINISH.

**A. Wheel too soft for material being ground.**

The grains in too soft a wheel will pull out before they have really dulled. The dressed surface will be lost too quickly and the few remaining pointed grains will give a scratchy appearance. Replace with a harder wheel.

**B. Wheel dressed too finely, or wheel too hard.**

If wheel is not cutting freely, longitudinal lines in the finish, sometimes discolored or burnt, will result. Replace with a softer grade wheel or pass the diamond across the wheel at a faster speed when dressing. Do not dress the wheel without a down feed before each pass.

**C. "Hard-sheel" sides on wheel.**

Break the corners of the grinding wheel with an abrasive stick.

**D. Grinding swarf in coolant.**

Clean out coolant tank.

## 3. INACCURATE GRINDING.

**A. Magnetic chuck clamped too tightly or too loosely.**

A chuck or fixture clamped too tightly may warp the table, causing it to rock in the saddle ways rather than tracking smoothly. If chuck is not clamped tight enough, it could shift position and lift up and over dirt. Tighten one of the clamps firmly to hold the chuck in position when the table reverses. Then tighten the other clamp only enough to keep the chuck down on the table.

**B. Wheel glazed and not cutting freely.**

Re-dress wheel, or replace wheel with a softer grade.

## TROUBLESHOOTING

### Inaccurate Grinding Motors Do Not Run

**C. Machine out-of-level.** Be sure that base cabinet was leveled according to installation instructions. The thickness of the four vibration isolation pads that support the grinder on the base cabinet has been adjusted to support the grinder base so that the plane of the V-ways are exactly parallel with the plane of the flat ways. If grinder base is located on anything other than its own base cabinet and vibration isolation pads, base ways should be checked for twist by laying a small surface plate on two 1.000 inch rolls in the V-ways and two .582 inch parallels on the flat ways of the base. If the two rolls are placed in the ends of the V-ways and one of the parallels put in the center of the flat way, the height of the pads should be adjusted until one gets the same "feel" at either end of the flat way with the other parallel.

**D. Magnetic chuck in need of dressing.** See "Grinding magnetic chucks" in the operating instructions of the manual on page 5.

**E. Grinding wheel shifted in adaptor.** If the wheel is not tight enough on the adaptor, it can shift when the grinder is turned on and off, or when a heavy cut is being taken. This could cause the grinder to cut an additional few thousandths, as well as giving a chatter appearance on the surface.

**F. Down feed inaccurate.** See section "Uneven Down Feeding Response" on page 9.

**G. Side grinding not square.** If the cartridge spindle has been replaced in the machine, it may be necessary to realign the spindle in its housing by adjusting the tension on the five set screws that hold it in place. (The five 5/16" diameter by 5/16" long set screws shown in Figure 18.) To check the squareness of the spindle to the longitudinal travel of the table, an angle plate can be indicated parallel to the table

travel as shown in Fig. 5 of our Final Inspection Report, and an indicator fastened to the nose of the spindle can then be swung as shown in this Fig. If the indicator had a higher reading for the right-hand position shown in Fig. 5, the upper right and lower left set screws on top of the spindle housing would be tightened to shift the spindle slightly.

The angle plate can also be used to check the spindle axis parallelism to the work table as shown in Fig. 3 of the Final Inspection Report. Varying the tension applied by the bottom set screw, against the tension of the four top set screws, can change this indicator reading slightly.

**H. Workpiece not parallel.** If the machine does not grind parallel front-to-back be sure the cross feed lock screw (A, Fig. 10) has been loosened enough so the pressure pin is not rubbing on the carriage locking strap.

**I. Long spark out time.** If the grinder does not "spark out" after a reasonable number of passes, make sure that a way oil of less than 225 SUS viscosity is being used. The pressure oiling system floods the ways with so much oil that a higher viscosity lubricant can lift the table a few tenths when light cuts are taken.

#### 4. MOTORS DO NOT RUN.

**A. Fuses blown out.** If the spindle motor will not run, or if it is running at a slow speed, one or more fuses may be blown out. Check the line leading to the machine to make sure plant circuit fuses are not blown.

**Caution:** All checks of the electrical system should be made by qualified personnel.

On rare occasions a fuse will blow

under normal machine usage. If a fuse blows repeatedly, however, the cause must be found and corrected. **Note:** A stalled motor can blow a fuse. Wiring to the motors should be inspected to make sure there are no loose connections. Check particularly in the connection box to the motor that insulation has not been worn through causing grounding out to the machine frame.

**B. Overload relay tripped.** The spindle may stop because its overload relay is tripped. To restart the spindle, allow sufficient time for the overload to cool, then press the start button. If a special electric option has been chosen, either the spindle overload or the lube pump overload may cause the spindle to stop. To reset, press the reset button on the appropriate relay, unless they are set for automatic reset.

If the spindle motor overload is tripping regularly, chances are that too heavy a cut is being taken with the grinding wheel, or that the wheel is loading up and putting extra strain on the motor. A 1 HP motor will have enough power to take as heavy a cut as the operator normally wishes if table is cross feeding and coolant is not being used. If coolant is used when cross feeding, or if plunge grinding is being done, it is easy to take a cut that will require more than 1 HP. Under these conditions, the current consumption of the spindle motor should be checked to make certain it is not drawing more than the full load motor current before increasing current capacity. To readjust the trip point, remove the Start/Stop switch cover (Fig. 1) by removing four screws. Reset the red dial with a small screwdriver.

The oil pump has an automatically resetting thermo overload in the motor housing itself. If way oil level

## Oil Dripping Uneven Down Feeding Response

in the sump drops below the pump intake, motor will not be able to pump oil through its self-cooling circuit. The motor will overheat, causing thermo overload to shut off the current until the motor cools back to proper temperature. The only indication that this is happening will be that the oil level in the sight glass at the top of the column will not stay above the middle when the machine is running. If oil is not added to the oil filling cup at the back of the machine, (see Fig. 8) motor insulation will deteriorate until it eventually shorts out.

**C. Motor burnt out.** All motors used on your grinder have a design life of many years. The motor most likely to fail is the oil pump motor because it depends on the oil level being maintained to keep it from overheating. A burnt out motor will usually draw an excess of current and trip the motor overloads, blow fuses, or overheat in one spot. It may, however, overheat an internal connection and cause a wire to break loose. Checking motor circuits with an ohmmeter should locate any internal breaks. An ammeter check on motor current on each of the three legs of a three-phase motor will show a shorted out section of winding by drawing more than the rated full load current.

**Caution:** All electrical checks should be made by qualified personnel. The maximum temperature at which a motor can be safely operated depends on the class of insulation of its windings. A motor stamped Class A can reach a temperature of 203°F on its shell, and one stamped Class B can reach 239°F and still be within the manufacturer's specifications.

### 5. OIL DRIPPING.

**A. Machine not level.** Oil dripping from the underside of the table ways can be caused by machine being

improperly leveled. Re-check leveling and follow installation instructions if machine is not level.

**B. Restricting valve opened too wide.** Check the setting of the restricting valve (17778007 in Fig. 17). Remove dust guard (Part No. 16213072) by loosening the two screws and sliding the guard up so the screw heads will pass through the key hole slot in the guard. The valve should be reset by closing it down completely and then reopening 1/2 turn. If dripping from the ways continues, close the valve back to the point where it is opened approximately 1/3 of a turn.

### 6. UNEVEN DOWN FEEDING RESPONSE.

**A. Wheel too loose.** If grinder has been stopped and re-started with the wheel insufficiently tight, the wheel may have shifted slightly when the motor was re-started, cutting an additional amount because of being off center. Retighten grinding wheel.

**B. No oil on column ways.** Check oil level in sight glass at the top of the column shortly after spindle motor is turned on. If oil does not appear, make sure that oil cup on the back of machine base is nearly filled. Add oil if necessary.

If oil is at the proper level, see that pump is running and that filter screen is clean. (See *Lubrication under Maintenance*.) Check that oil lines are intact and on their proper fittings as shown in Figures 17 and 18.

#### **C. Spindle housing assembly sticking in column ways.**

The exceptional rigidity of the Harig grinder is obtained by an extremely close fit on the column ways. Since there is only a few tenths clearance between the spindle housing and column, any dirt or grit, or a very small

warping of the back plate, could cause spindle housing to "hang up" in the ways.

Check for this condition by mounting an indicator on the wheel guard or spindle housing to touch a block on the grinder table. Turn the down feed handwheel and note the response on the indicator. The 100 lb. combined weight of the motor, spindle and housing, and guard assembly should keep the bevel gear carrying the elevating screw firmly seated in the thrust ball bearing in the column cap. (See Figure 19) The only slack that should be seen as the column is raised and lowered with the handwheel should be the small amount between the bevel gear and the pinion on the handwheel shaft. If the response between the handwheel readings and the indicator show a slack of several thousandths rather than the normal half thousandth slack between the pinion and bevel gear, the spindle housing assembly is probably "hanging up" in the column ways until the bevel gear is backed up to the pinion and forces the elevating screw down.

To inspect column ways, the grinding wheel should be removed from the spindle. Then remove the wheel guard by loosening its clamping screw and sliding it off the end of the spindle. The five 5/16 set screws holding the spindle cartridge in the housing should be loosened approximately 1/8". The spindle cartridge and motor assembly can now be removed from the back of the machine. The six Phillips head screws that hold the back dust guard retainer in place should be taken out and dust slides and retainer removed. Crank the saddle away from the column and remove the six Phillips head screws holding the front dust guard retainer. The front dust slides can now be removed. Now alternately crank the spindle housing to the top and then to the bottom of the travel,



## TROUBLESHOOTING

### Improper Longitudinal Feed

wipe off the ways with a clean cloth and inspect. Any dirt or grit should be removed. Check to see if a piece of grit has scored the ways. If so, they should be dressed with a fine stone to remove any ridges.

If the column way surfaces are clean and smooth and the spindle assembly is still sticking, either the spindle slide back plate has warped or the column uprights have moved closer together by a few tenths. If the spindle housing is tight in only a small area, the back ways of the column should be scraped to remove the high spot. The high areas of the way can be found by applying a thin layer of red lead to the ways and running the housing assembly up and down.

If the assembly is tight over the entire column, the back plate should be removed from the spindle housing by taking out the six 5/16 screws holding it in place. Crank the spindle housing to the bottom position and push the housing just far enough away from the column to inspect the 45° ways. If there is no evidence of scoring or a piece of grit lodged in the casting, grind .0003" off the two surfaces of the back plate that ride on the back column ways. Accurately check the step between the way surface of the back plate and the center part that is screwed to the spindle housing before grinding the way surface so the entire back plate can be re-ground if found to be warped.

Reassemble the back plate to the spindle housings. If still too tight, remove an additional .0003" from the way surface.

If the 45° way of the spindle housing is scored, remove the housing from the column as follows: Mark the elevating screw at the point where it is entering the spindle housing so that it can be turned to the same point when the grinder is reassembled. Loosen the 1/4-20 by 1 cap screw that holds the

elevating screw in place. (See Fig. 18) Unscrew the elevating screw from the housing and run it up to clear by holding the screw with one hand and turning the elevating handwheel with the other. The spindle housing can then be removed from the column and any score marks stoned off smooth.

#### **D. Spindle housing too loose.**

If the error in down feed response is less than .001", spindle housing assembly may be too loose in the column ways. Remove motor spindle assembly and dust guards as outlined in the previous paragraph.

The amount of looseness can then be determined by placing an indicator on the grinder table to read against the part of the spindle housing projecting to the front of the grinder. With the column ways wiped clean of oil, alternately twist the spindle housing from one side to the other. The difference of the indicator reading when the twisting pressure is released should be less than a half a thousandth. Make this check at both the top and bottom positions of the spindle housing, as well as in the middle, and use the lowest reading. Remove the back plate from the spindle housing. Then remove 3/4 of the difference between the at-rest indicator readings from the center area of the back plate that is clamped against the spindle housing. For example, if .0012" slack is found, .0009" is removed from the center area of the plate.

#### **E. Spindle assembly creeps down.**

Because of the exceptionally smooth action of the down feed mechanism, it would be possible for the spindle assembly to creep down or "unwind" itself if a frictional drag were not used. This creep is most likely to occur if a vibration caused by an off balance wheel is occurring.

The wave spring No. 17748702 adds a drag to the system by pressing the

nylon washer No. 16213102 against the moving thrust bearing inner race and the second washer No. 16213128 against the stationary top column bridge. (See Fig. 18) If extra drag is wanted for an out of the ordinary problem where the wheel balance cannot be corrected, order a 'C' spring No. 16213088 and install by removing the three screws that hold the elevating screw guard in place and lifting the guard off. Drop the open end of the C spring under the bevel gear. Push the back end of the C spring down with a screwdriver until the spring is horizontal, and move the spring sideways to snap across the high point of the gear and fit in the angular space between the bearing race and the bevel gear.

## **7. IMPROPER LONGITUDINAL FEED.**

### **A. Improper longitudinal feed (cable drive machines only).**

If table does not move when handwheel is turned, tighten cable. Loosen cable hook locknut (see Fig. 21) and tighten the adjusting nut to pull the cable tighter. Do not overtighten, as this may cause cable to break prematurely, or wear a flat surface into the nylon cable covering. Tighten only enough to pull the table without slip.

### **B. 612 Cable broken or worn.**

To replace cable, run table to the right and loosen the nut on the back of the hook until the cable loop can be slipped off. Remove the loop from the post under the left end of the table. Slip the two coils of cable off the roll of the handwheel shaft and pull the cable out.

To install new cable, pass a stiff soft wire through the cable space from the right side of the machine. Bend over a loop or hook to attach the wire to a loop of the new cable and pull it back through the space. Form two coils in the cable and



## Cross Feed Malfunction

slip them over the cable roll. Put the loop over the post on the left, draw the cable to the right and slip the other cable loop onto the hook. Tighten the nut to put tension on the cable.

Run the table back and forth and observe the cable on the roll. If it runs partly off the back end when the table is run to the left, grasp the hook with a large adjustable wrench and turn the hook post to angle the hook forward enough to make the cable track properly.

**C. 618 Cable broken or worn.** To replace cable, remove Table Safety Stop 16813012 (*Fig. 20*). Remove cable Longfeed Eyebolt 16213053 (*Fig. 21*) and slip cable off cable post 16213039.

Move table to extreme right, and lift off table. Place table top down on a bench.

Remove old cable. (Note the direction of wind of the two loops of cable over cable roll 16213037. If cable is out of place, refer to middle view of *Fig. 21* for proper direction for assembly.)

Tape an end of the new cable to the left underside of the carriage, near the front way. Bring the cable to the top of the cable roll and wind two clockwise turns onto the roll. Lead the cable on to the right and tape the end to the right underside of the carriage. Clean off the entire underside of the table so no grit will fall on the carriage, and place the table in position on the right side of the carriage.

Remove the tape from the left end of the cable and, taking care to keep moderate tension on the cable (so it will not slip off the end of the cable roll), slip the cable over the cable post 16213039. Move the table to the left only enough to maintain tension on the cable. Remove the tape from the right end of the cable, hook it over the Longfeed Eyebolt, slip the

eyebolt through the inner cable post 16213038 and tighten the 1/4-20 nut to get moderate tension on the cable. (Light tension must be maintained on the cable during the above so the cable does not slip off the end of the cable roll.)

Grasp the cable under the left side of the table and pull to the front of the machine while cranking the table back and forth until the cable tracks evenly on the cable roll when observed from under the left side of the table. (It may be necessary to readjust tension.)

Do not put more tension on the cable than is necessary, since this will cause a flat to wear on the cable and can pull the table into a bow and cause inaccurate grinding. It should be possible to reposition the handwheel by running the table to an end stop and slip it to the new position with very little extra force.

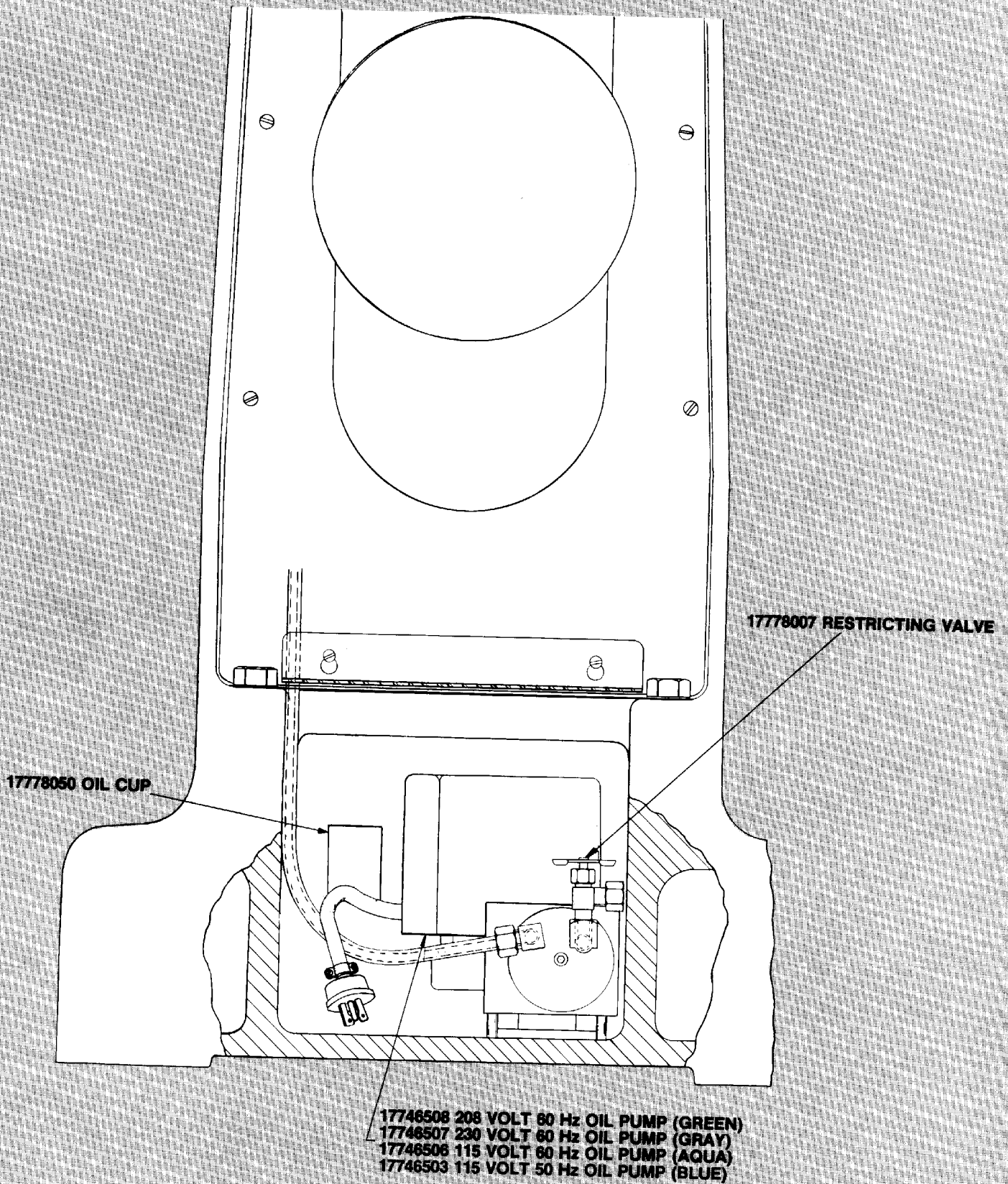
Tighten the locknut on the eyebolt, and replace the table safety hook.

### 8. CROSS FEED MALFUNCTION.

#### A. Hand feed wheel turns hard.

Be sure the cross feed lock thumbscrew has been loosened. (*Right side of the base just under the saddle, A, Fig. 10.*)

# Lubrication System



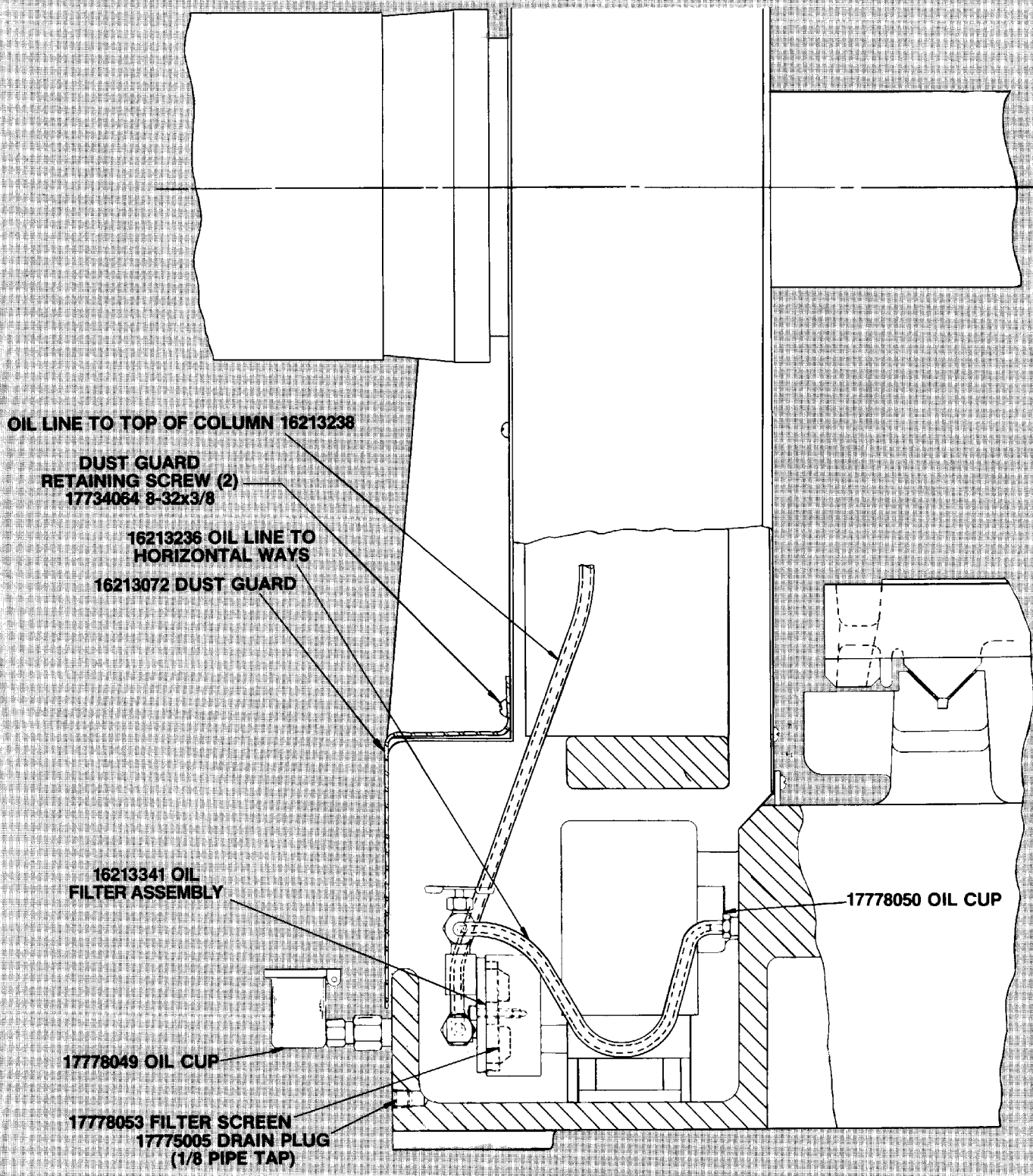
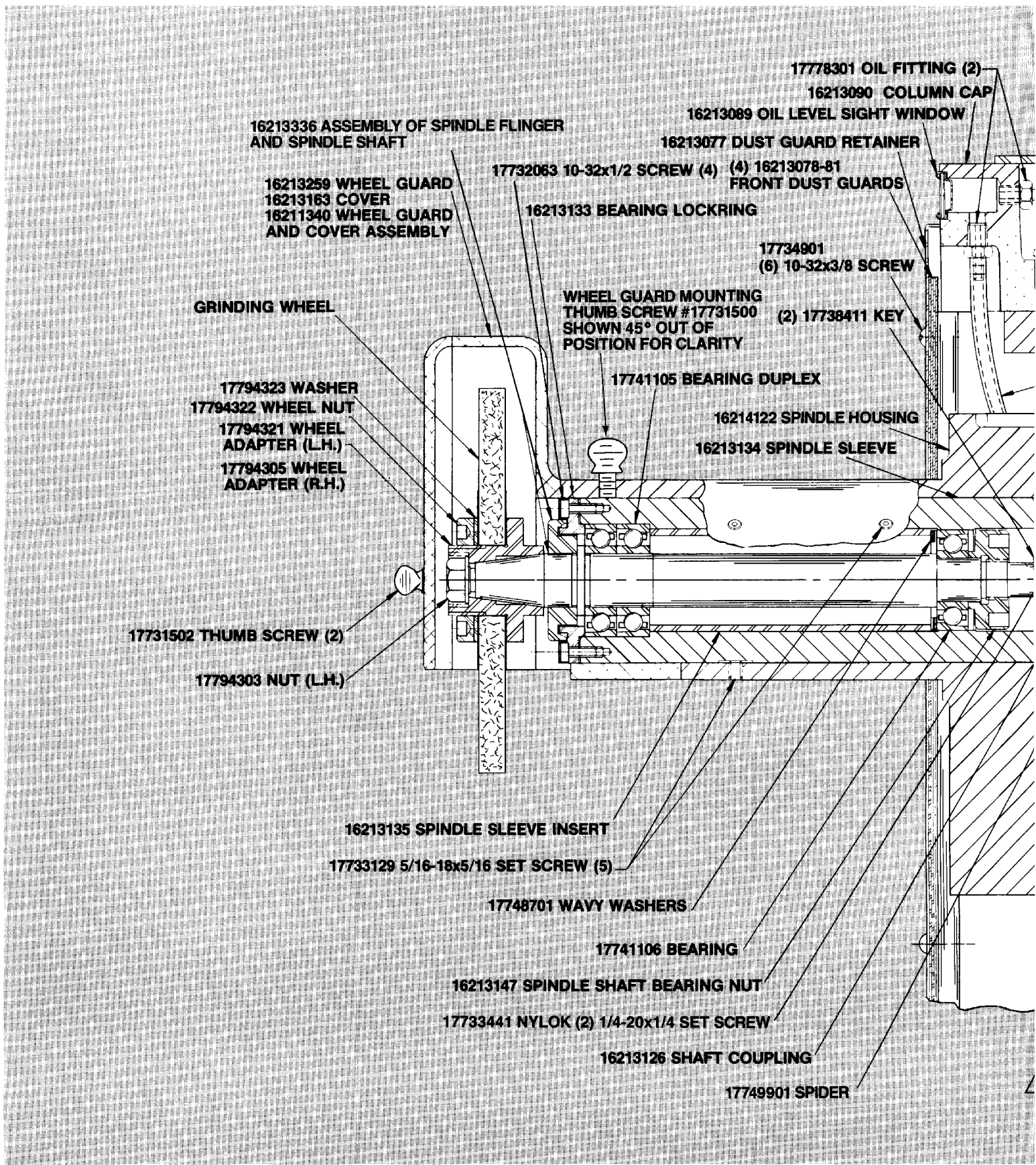


Figure 17



# Spindle and Elevating Assemblies



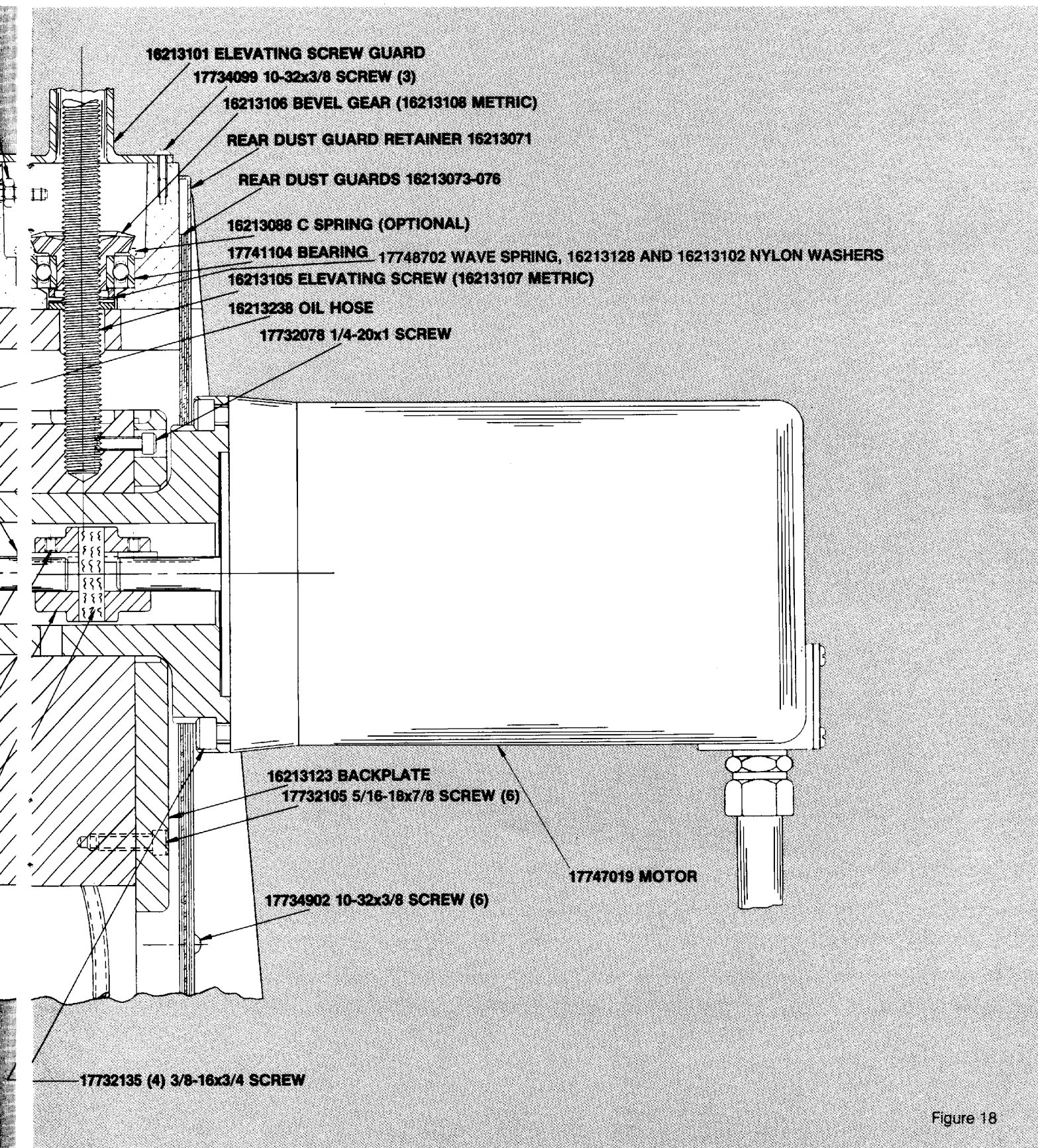
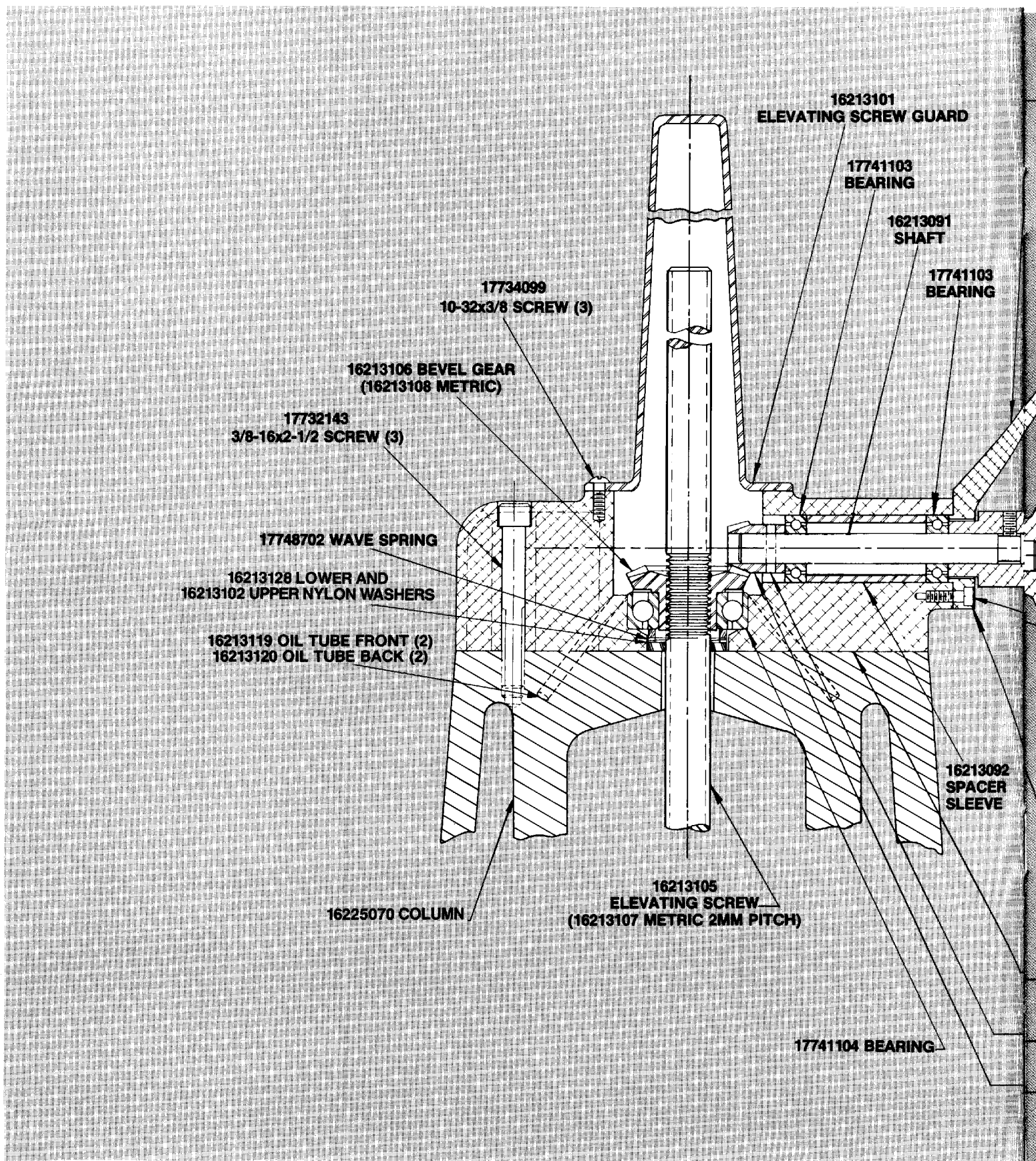
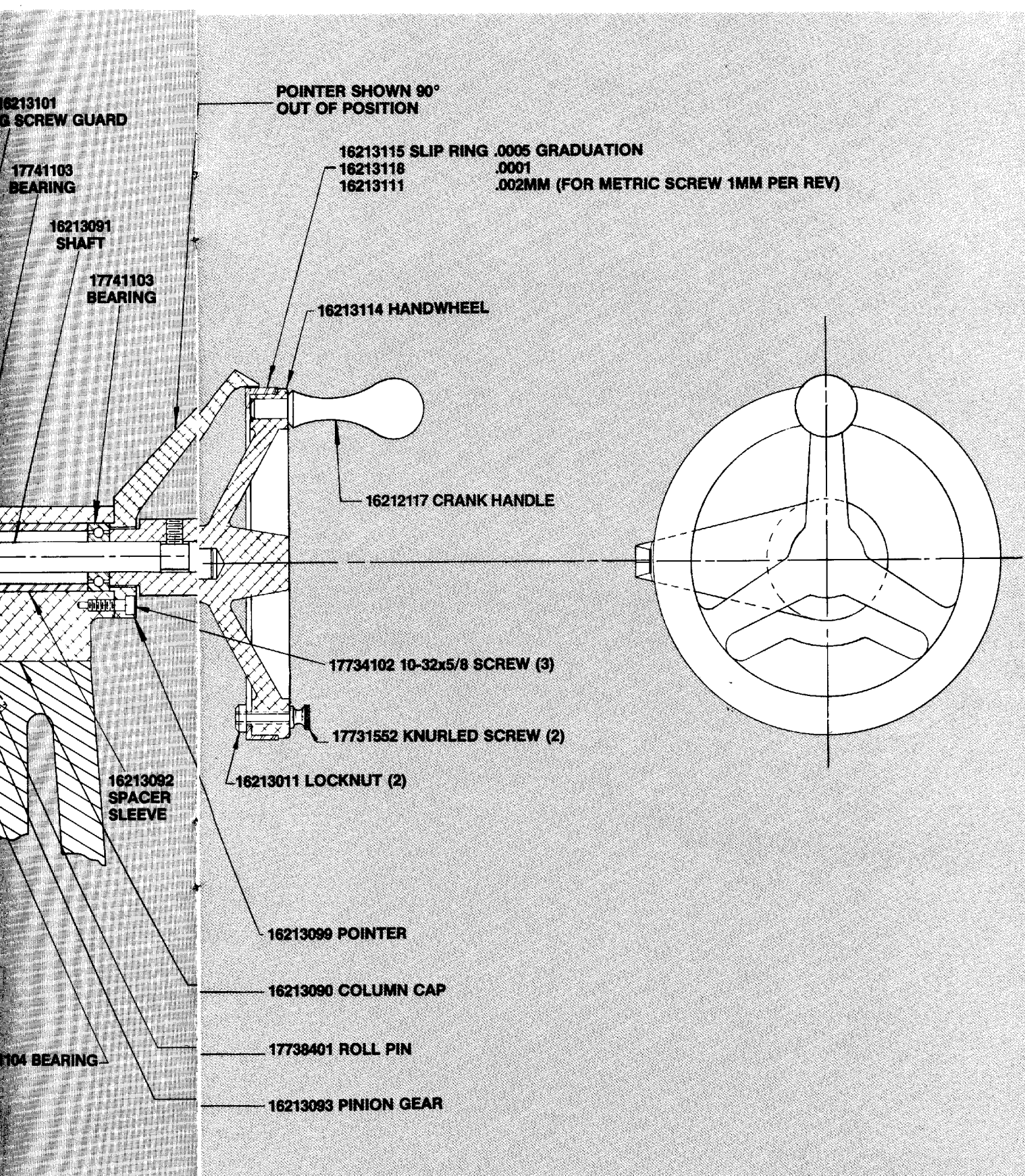


Figure 18



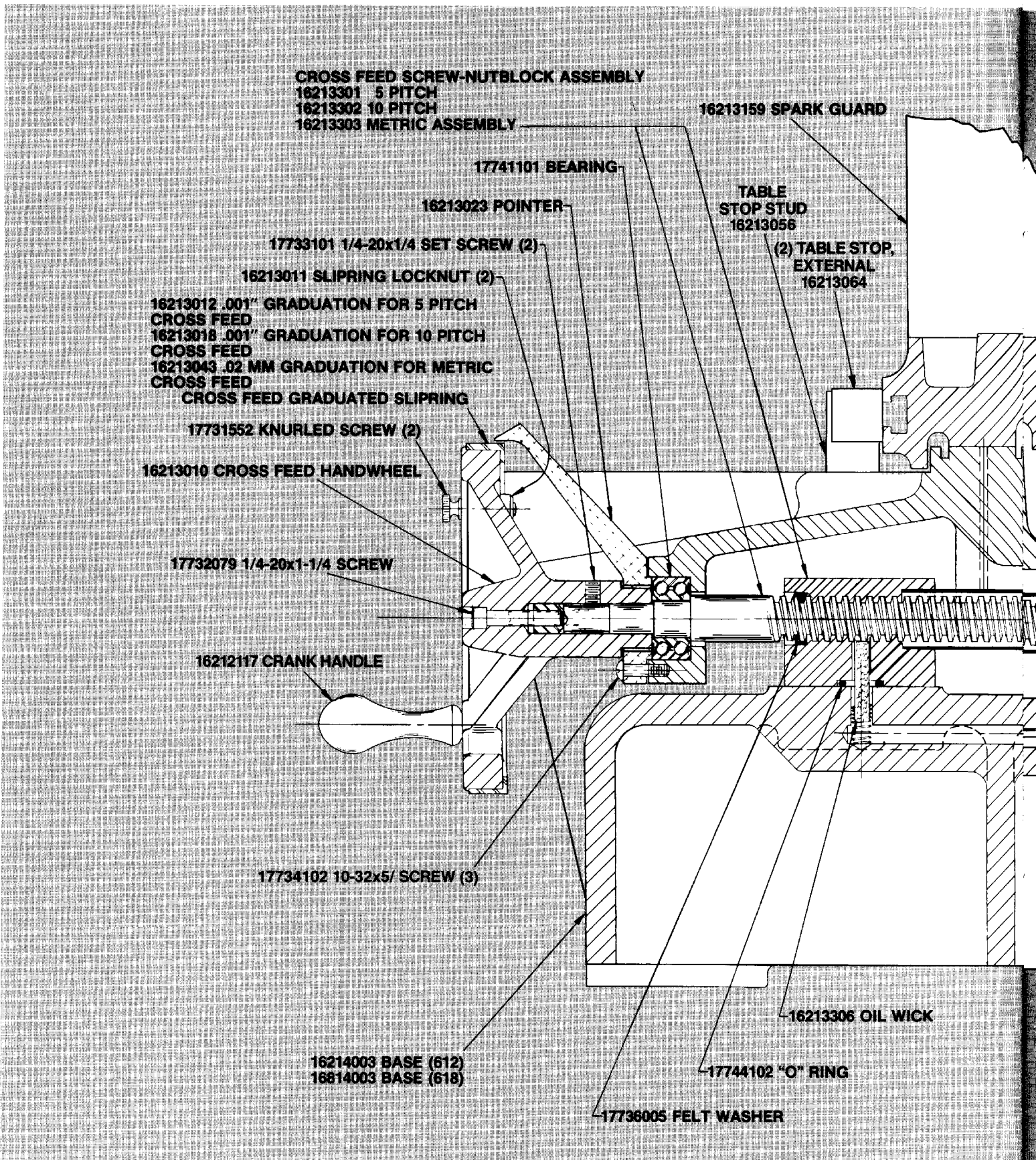
# Elevating Screw and Handwheel Assembly







# Cross Feed





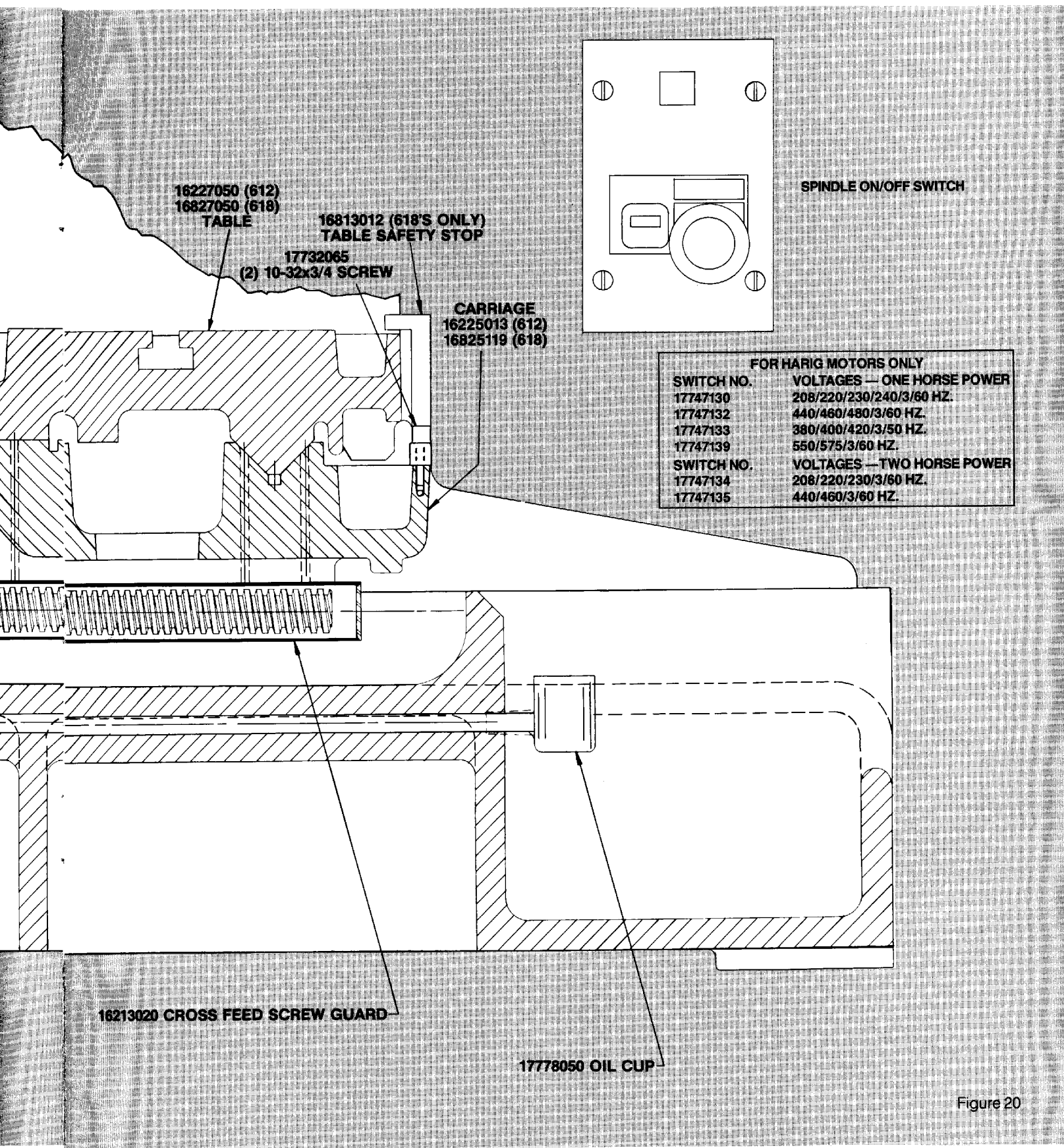


Figure 20

# Longitudinal Feed

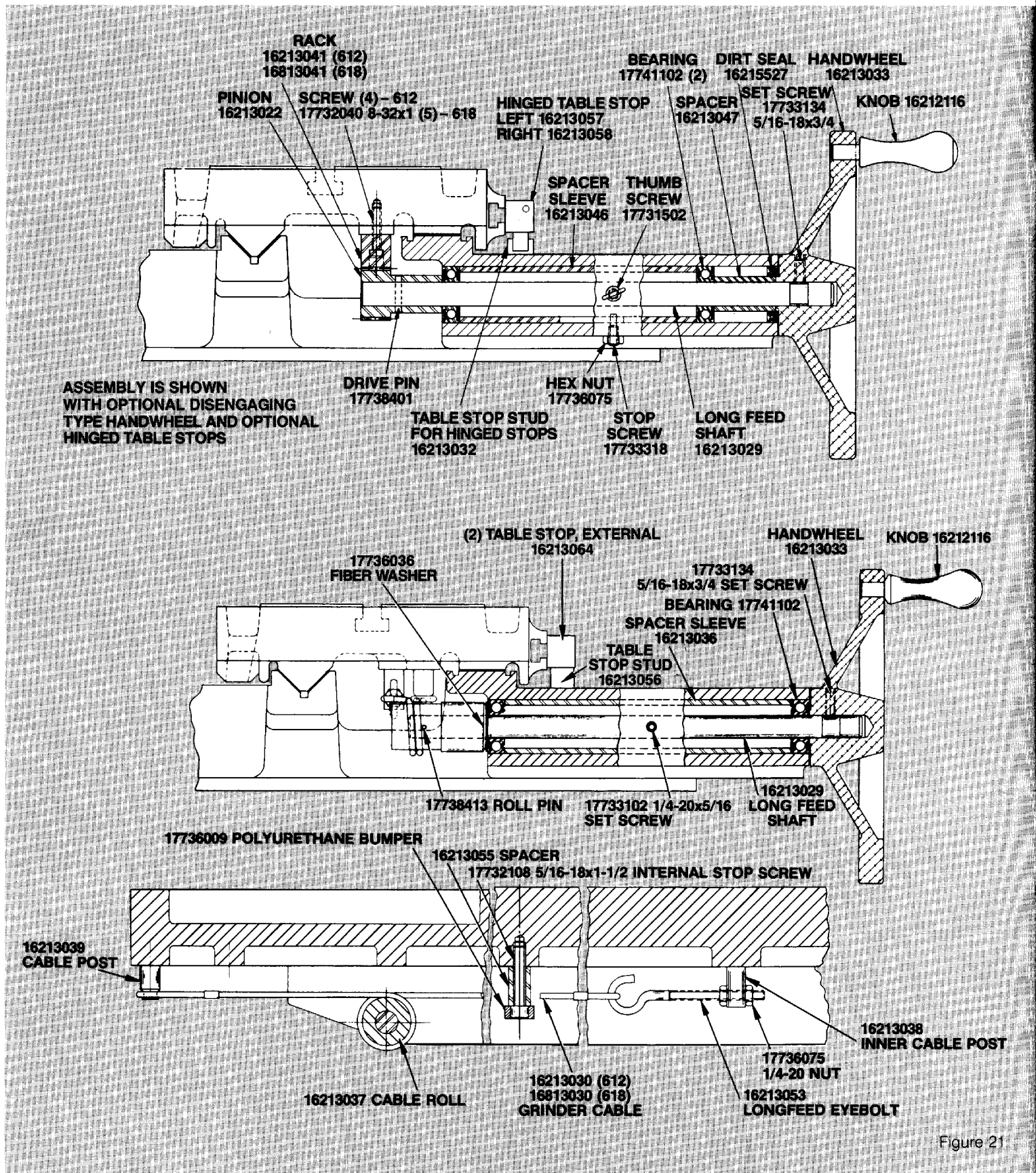
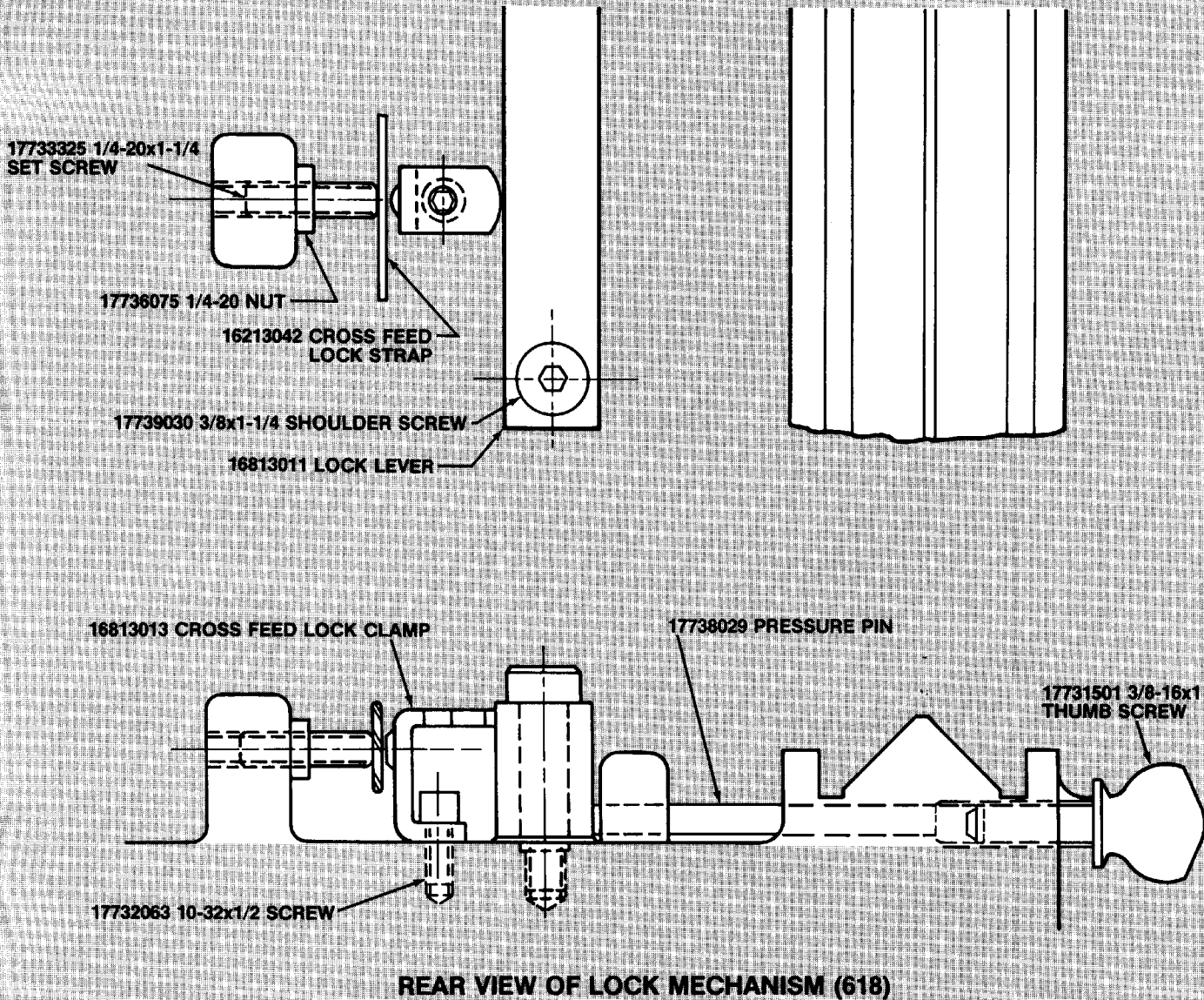


Figure 21



# Cross Feed Lock Clamp Assembly

## BOTTOM OF CARRIAGE LOCK MECHANISM DETAIL (618)



## REAR VIEW OF LOCK MECHANISM (618)

### 612 CROSS FEED LOCK PARTS

- 17731501 3/8-16x1 THUMB SCREW
- 16213044 1/4 DIA. x 2-3/8 PRESSURE PIN
- 16213042 CROSS FEED LOCK STRAP
- 17736115 (2) 1/4 WASHERS
- 17732400 (2) 1/4-20x1/2 HEX HEAD SCREWS
- 17733107 1/4-20x3/4 SET SCREW
- 17736075 1/4-20 NUT

Figure 22

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