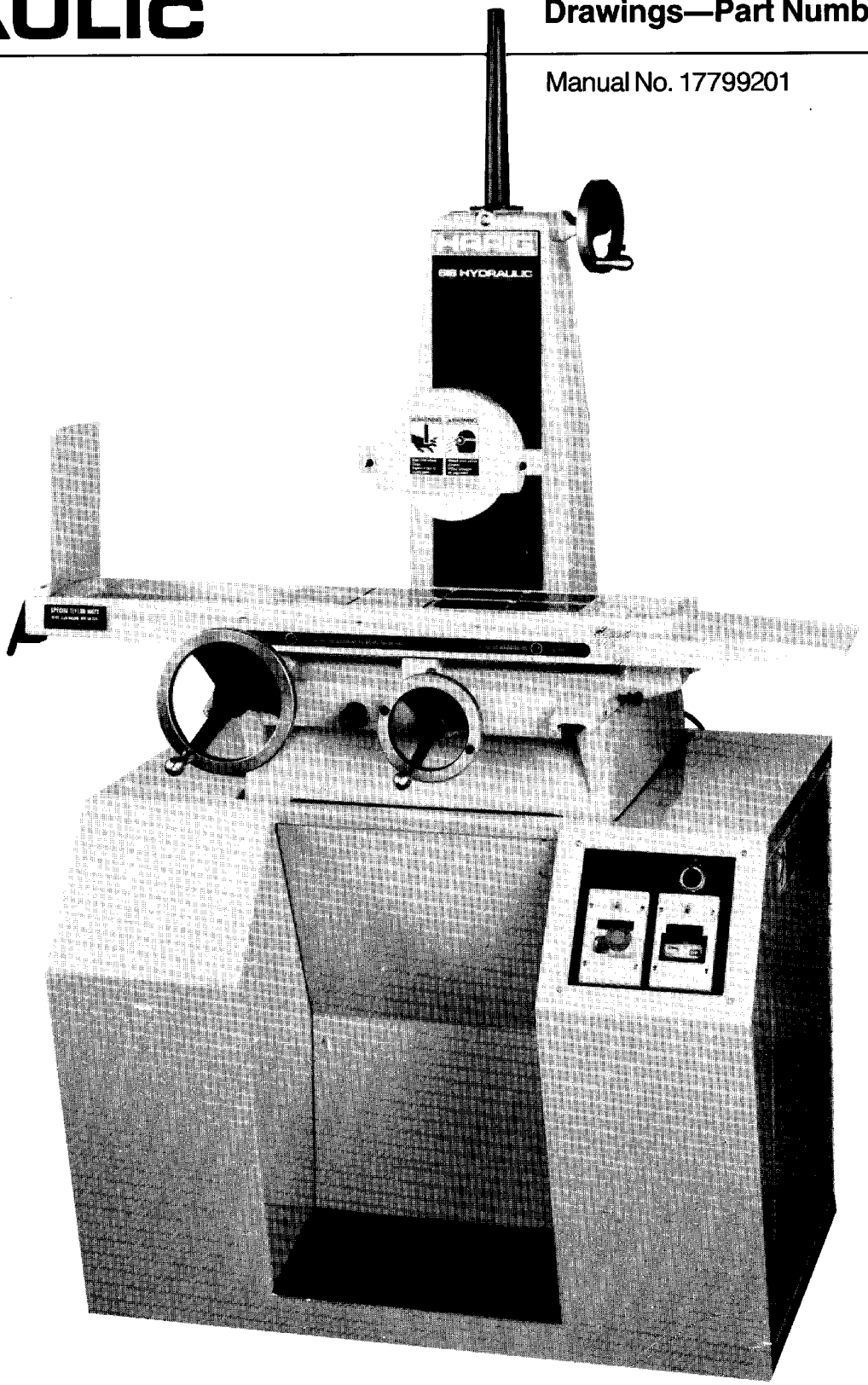
HARIG®

612 & 618 HYDRAULIC

(Power Longitudinal Feed.)

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

Manual No. 17799201



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.

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® Surface Grinder.

- 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 HYDRAULIC SURFACE GRINDER

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NOMENCLATURE

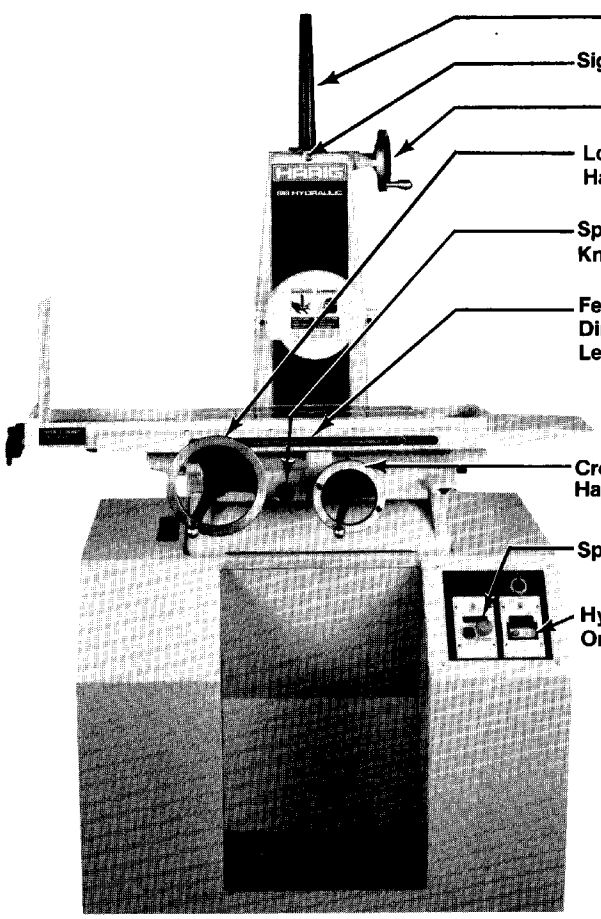
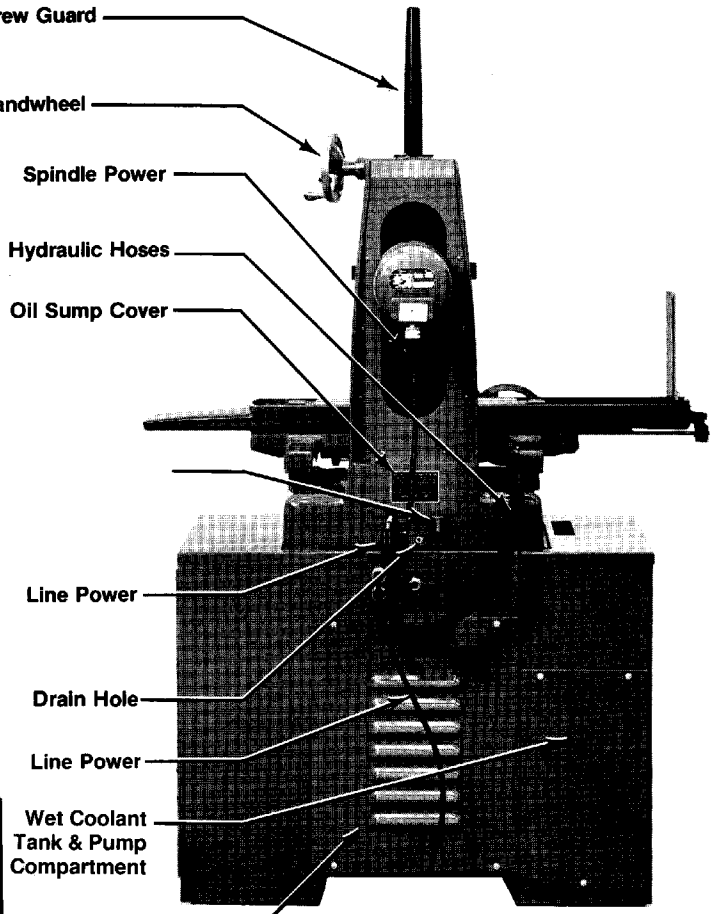


Figure 1 **Front View**



Rear View Figure 2

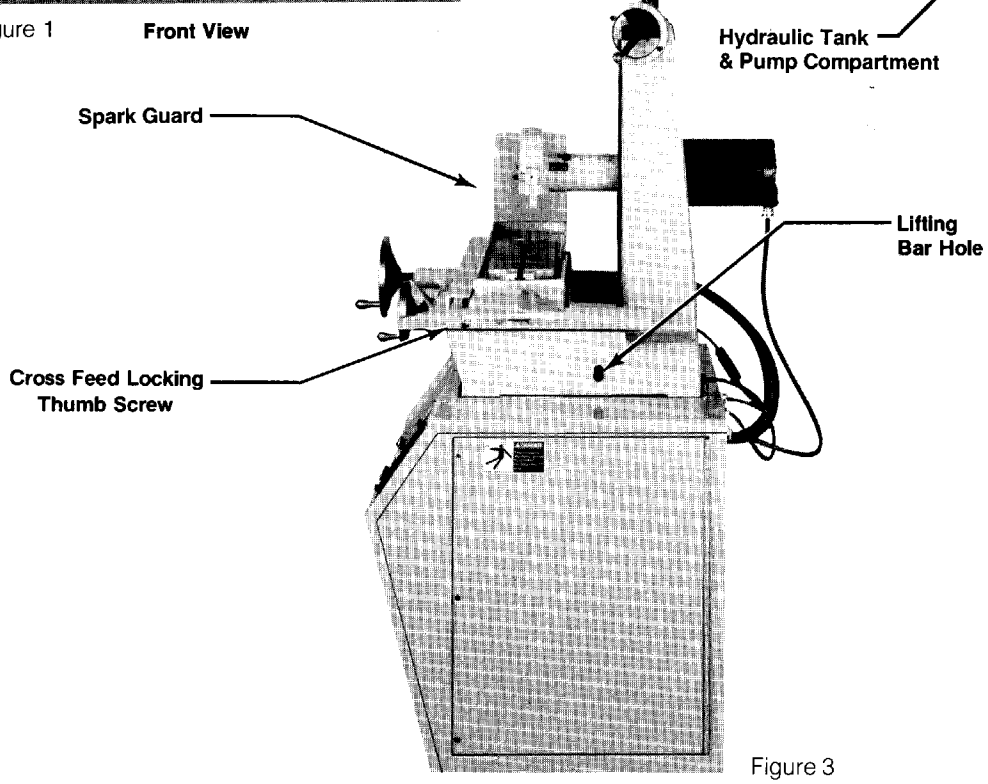


Figure 3

Side View

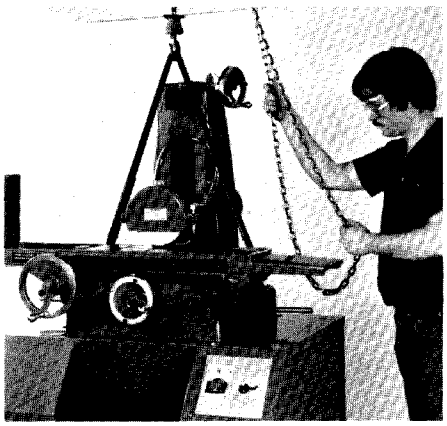


Figure 4

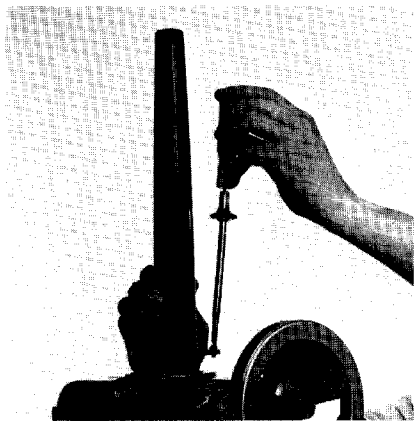


Figure 5

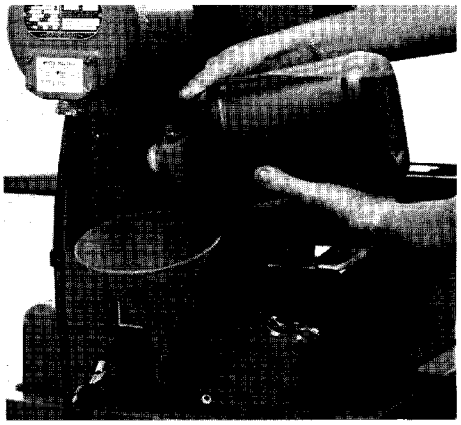


Figure 6

Step 1. Do Not Remove Skids.
Do not remove skids until machine has been moved adjacent to its installation site.

Step 2. 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 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.

2.2 Attach 1800 lb. lifting strap to ends of bar and join near top of column. Pad machine adequately to prevent damage to finish. *(Fig. 4)*

2.3 Remove the four 1/2-20 hex head bolts that hold the base cabinet to the skid.

2.4 Lift slightly from skid. Balance machine by turning cross feed handwheel. (loosen locking thumb screw.) For safety, support machine on two 4 ft. pieces of 4 x 4 while placing leveling legs.

2.5 Screw four leveling legs (located in "standard accessory box") into the holes in the base cabinet. They should project 5/8" below the bottom.

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

Step 3. Position Machine.
Position machine where desired. No special pad, floor reinforcement or drip pans are required.

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

Step 5. Level Machine.
5.1 Crank table all the way to the right and all the way toward the column.

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

5.3 Place level on the 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.

5.5 Recheck level of machine.

Step 6. Assembly.
6.1 Use three round head screws (furnished) to fasten elevating Screw Guard to Column Cap. *(Fig. 5)*

Step 7. Wet Coolant.
If wet coolant attachment has been purchased with this machine, remove it from coolant compartment (loosen three 1/4 turn screws) and assemble as per instructions packed with system.

Step 8. Lubrication.
8.1 Fill lube oil reservoir through the oil cup at the rear of the machine *(Fig. 6)* from the gallon container furnished (about 36 oz. or 4-1/2 cups are required). The oil cup should be nearly full. It will take about eight minutes for the oil to reach the sight glass at the top of the column the first time the pump is turned on because of air in the pump.

8.2 Ways and feed screws are automatically lubricated.

8.3 The spindle and motor bearings are permanently lubricated.

8.4 If machine has a rack-and-pinion type longitudinal table travel, this assembly was greased at the factory. A small amount of grease should be added to the rack each month.

Figure 7

Step 9. Electrical Connections.
Caution: To preclude personal injury or extensive machine damage, all electrical work should be performed by a qualified electrician.

9.1 Ground machine by connecting heavy gauge wire from panel mounting screw (that has green wires attached) to a satisfactory ground. If the ground wire from the machine is over 10 feet, it should be at least 10 gauge or larger. (some hot water heaters are insulated to help control corrosion and sediment. A hot water pipe to that kind of system is not a satisfactory ground.) The building structure is not an adequate ground. If a satisfactory ground is not available, drive an 8 foot ground rod into the ground and securely clamp the ground wire to it.

9.2 Loosen ¼ turn screws and open control compartment.

Caution: Make sure the power is turned OFF before plugging or unplugging any connectors to electronic logic units. Failure to observe this precaution may result in permanent damage to the unit.

9.3 Check that the printed circuit card is seated firmly in its socket and has not vibrated loose during shipment.

9.4 Compare rating label on Spindle Motor with house current to make certain they correspond.

9.5 Connect main line power wires to the plant electrical system.

9.6 Stand in front of machine. Turn Spindle Motor ON. It should ROTATE CLOCKWISE. If not, switch two of the line wire connections. (Do NOT switch motor leads as this will damage hydraulic system by making it run backward.)

GRINDING WHEEL MOUNTING.
Use only balanced wheels to ensure getting the maximum quality this 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 adapter, and the two holes in the back of the adapter. Unless a right-hand thread has been specially ordered, the wheel nut has a left-hand thread (letters LH stamped on the face of the nut) so that the wheel will tend to tighten under starting torque. When changing wheel, be sure adapter is retightened. If left loose, wheel may shift and cause chatter marks.

The socket on the spanner wrench fits the nut holding the adapter on the spindle. To remove adapter, unscrew nut completely (left-hand thread) and screw in the "puller" (furnished) until the center screw hits the spindle end. Tighten center screw until adapter is free. *(Fig. 7)*

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-G12BEP.

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 inch. Tighten screws holding chuck to table with minimum force needed to keep chuck in place. Over-tightening may cause warping.

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

4. It is best to grind chuck with hand feeding so any increase of cut caused by heat can be detected. If power feeding, use 3/4 of maximum speed.

5. Take a cross feed cut of at least 1/16 inch for each pass, and set depth-of-cut to .0002 inch.

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 chuck flatness.

OPERATION
Power On
Longitudinal Feed
Cross Feed

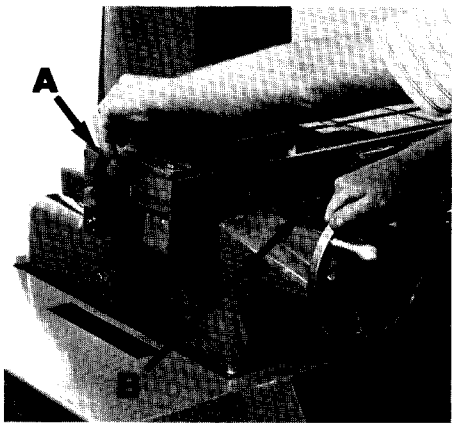


Figure 8

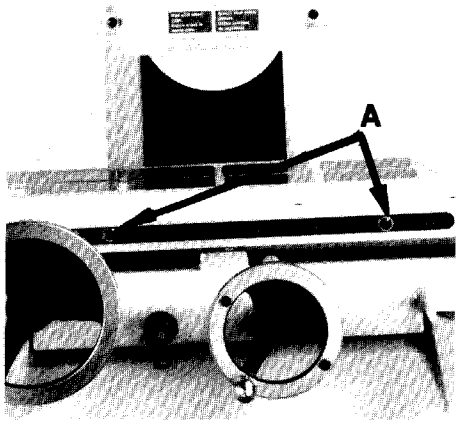


Figure 9

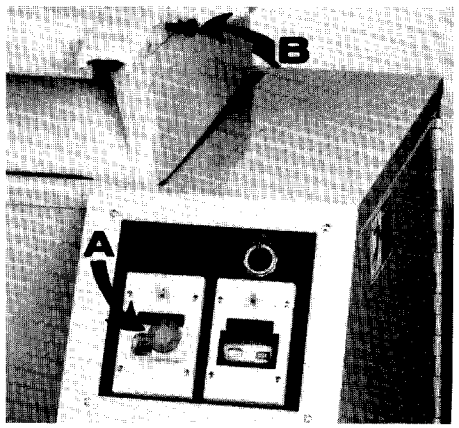


Figure 10

POWER ON

To turn the spindle motor on, depress "start" button located on front of cabinet. *(A, 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.

To stop the spindle, depress the red "stop" button. If the hydraulic pump motor is running, it will also be shut off when the spindle stop button is pushed.

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.

LONGITUDINAL FEED

WARNING: When first starting table to run automatically, make certain proximity sensors are between trip dogs. To connect powered longitudinal feed, crank table to right as far as it will go. Bring locking lever *(A, Fig. 8)* forward and down into slot in bracket to engage groove in the pilot nut on the end of the cylinder rod. Be sure lever is seated all the way into the groove. Adjust the two dogs *(A, Fig. 9)* to within a few inches less than the desired table travel. Press "hydraulic start" button. Disengage handwheel by loosening thumb screw *(B, Fig. 8)* on left side of cross travel saddle and pull longitudinal feed handwheel out about 1-1/4 inches. *(Fig. 8)* Momentarily rotate the "table" switch on the push button panel to the "start" position. (The handwheel electrically locks out the hydraulic feed when engaged.) Once the table is started, the control will keep track of directions and reversals until the main disconnect is turned off, even if the proximity switch is tripped while moving the table manually. The table will now power feed (back and forth) at a speed determined by the speed control knob. *(B, Fig. 9)*

The maximum feed rate will be 70 feet per minute. Turning knob clockwise reduces feed rate. When grinding a piece the full length of the chuck it may be necessary to readjust table reversing dogs (compensating for heat expansion) to prevent the table from hitting the internal table stops. To convert grinder back to hand feed, stop table by momentarily rotating the "table" switch to the "stop" position while table is feeding to right. Turn off hydraulic system by pushing red "Hydraulic Off" button. Re-engage handwheel. Crank table to right until table hits internal stop. Lift up locking lever *(A, Fig. 8)* to clear the pin and flip it to its back disengage position.

Note: The speed control valve should be rotated fully counter-clockwise in order to permit manual movement of the table via the longitudinal feed handwheel. 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 *(B, Fig. 10)* on the right side of the base under the table, one turn, and operate the cross feed handwheel.

ELEVATING MECHANISM

To raise or lower grinding head assembly turn hand-wheel *(A, Fig. 11)* on the right side of column. To change zero setting, loosen two knurled screws *(B, Fig. 11)* projecting from the face of wheel, slide calibrated slipring to desired position and retighten screws.

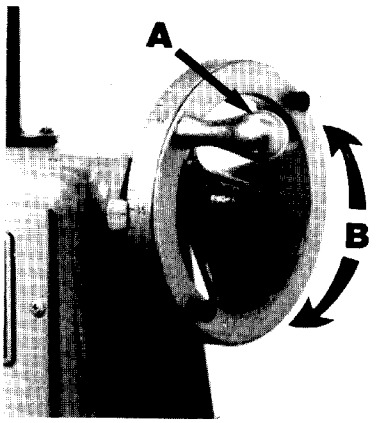


Figure 11

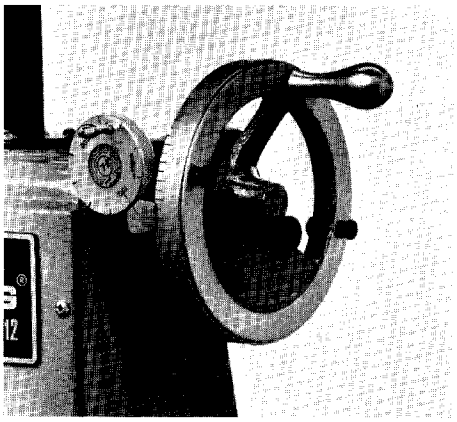


Figure 12

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.

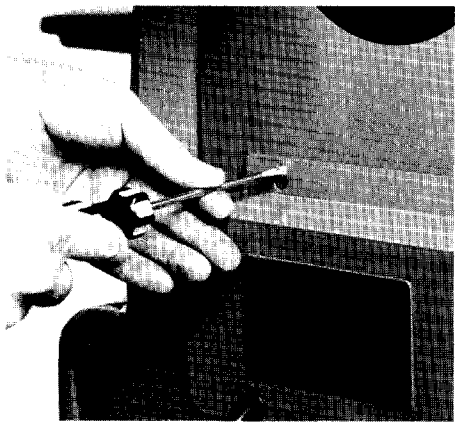


Figure 13

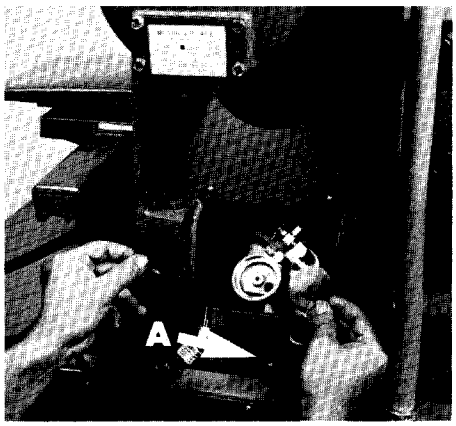


Figure 14

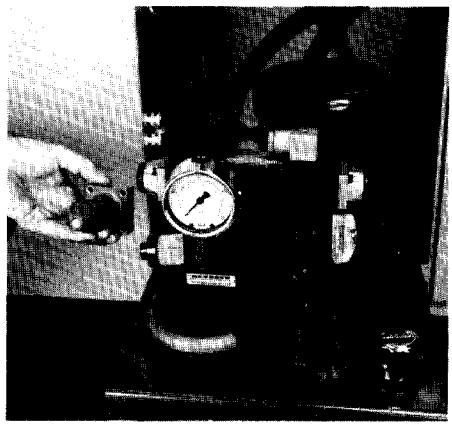


Figure 15

CLEANING

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

1. Center table to prevent dirt and grit from being brushed into 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 under side 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 urethane finish.

Note: We recommend centering the table when machine is not in use to provide a dust cover for carriage ways.

LUBRICATION

Since moving mechanical parts of this machine are automatically lubricated, This precision surface grinder is equipped with an automatic "Flo-Clean" oil system. Unlike other grinders, this completely separate system circulates, filters and recirculates the cleaning/lubricating oil. All moving mechanical and wear surfaces are automatically and continuously flushed with filtered oil whenever the spindle is running. 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 nearly full. *(Fig. 6, page 3)* A standard 150 to 225 SUS viscosity oil may be used in place of Harig's 16211245, but it will have 10% less "stick-slip" efficiency. If another way oil is used, check with the manufacturer to be sure the viscosity falls in the above range. The 325 SUS viscosity way oil some manufacturers recommend will cause burn-out of the oil pump, besides creating an oil film thickness that may cause inaccurate grinding.

EVERY 1000 HOURS OF OPERATION:
Clean the oil pump filter. Remove the dust guard retaining screws. *(Fig. 13)* Lift up the dust guard and remove. Tip pump unit as shown and unscrew 10-32 cap screw. Move filter assembly to one side. Remove rubber gasket and filter screen. *(Fig. 14)* 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. 14)* will facilitate cleaning.

Hydraulic System Maintenance.

EVERY 100 HOURS OF OPERATION:
Check hydraulic tank oil level. Remove back center panel of base cabinet by loosening four 1/4 turn screws. Sight gauge *(Fig. 21)* should indicate at least above the half-way point. If not, add any good grade of hydraulic oil (100 to 150 SUS) to bring level to full.

EVERY 1000 HOURS OF OPERATION:
Check hydraulic pump filter. *(Fig. 15)* Remove back center panel as above. While the pump is running examine the filter indicator (red button at left side of manifold assembly) to see if it has popped out. The button will extend about 1/16" in normal operation, it will pop out to about 1/4" extended when the filter is clogged. If button has popped out, replace filter element. To replace the filter element (Harig #17746557) remove the four screws holding the filter indicator assembly to the manifold. Replace the filter and reinstall the filter assembly.

Caution: To protect gauge: Leave valve closed except when taking pressure reading!

Note: Hydraulic oil can be used indefinitely. Drain and replace oil only if it becomes contaminated with water, dirt or other foreign material.

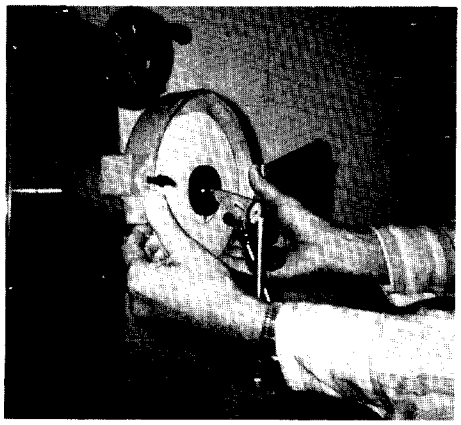


Figure 16

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 this 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 electrican.

Ordering Replacement Parts.
When repair parts are ordered, be sure to include 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 adapter nut. Even if this nut is not loose, motor starting torque may be causing wheel to shift slightly. Redress 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 of the outside surfaces of a wheel 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 periphery. Since this chatter appearance is usually only a few millionths of an inch high, weigh the economics of more frequent wheel dressing 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. 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 loss of preload on this test.

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 adapter sleeve in error.
If the taper in the wheel adapter 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 adapter 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 three 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 a 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 three 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 only the spindle motor, will give a better finish than a single phase motor.

I. Ball bearing failure.
The 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 an audible 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 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 poor 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 cut.

C. "Hard-shell" 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.
Redress wheel, or replace wheel with a softer grade.

C. Machine out-of-level.
Be sure that the 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.

E. Grinding wheel shifted in adapter.
If the wheel is not tight enough on the adapter, 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 response in down feeding" (Page 12).

G. Gouge in workpiece.
If the power longitudinal feed is being used, and the grinder is set to reverse near one end of the stroke, grinder table may be occasionally hitting the internal stop. Adjust table reversing "dog" to shorten stroke slightly.

H. Workpiece not parallel.
If the machine does not grind parallel front-to-back, be sure the cross feed lock screw has been loosened enough so the pressure pin is not rubbing on the lock strap 16213042. *(See Fig. 26).*

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.

J. 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 Fig. 23.) Care must be taken during this procedure, when an air bearing spindle is employed, not to over-tighten the screws, or the air bearing may be damaged. 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 figure. 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.

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 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 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. 6)* 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 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 per-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 manufacturers 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. 18).* Remove dust guard *(part no. 16216563)* by

removing the two screws. 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.

C. Oil level too low.
If the oil level in the sump of the lubricating system is allowed to get below the level of the white plastic part of the pump assembly in the sump, oil from the bleed hole in the pump can splash onto the underside of the removable guard on the back of the machine and drip down into the well of the base cabinet. Add oil as shown in Fig. 6, page 3.

D. Hydraulic system leaking.
A leak in the hydraulic system can be recognized by the lighter color of the oil. If the saddle is cranked all the way forward (toward the operator) hydraulic lines can be inspected to determine where the leak is occuring. Loose fittings should be tightened. Replace any defective hose or tubing.

If it is necessary to remove the saddle in order to get at the hydraulic fittings, lift the table off the saddle.

The hydraulic hoses may be removed from fittings on the carriage, or the hydraulic unit taken out of the compartment and placed in a position to allow the saddle to be handled within a range that the hose will flex. If hoses are removed, they should be tagged so that they can be reconnected to the proper fittings. Then crank the saddle all the way up to the column. Remove the screw in the end of the cross feed handwheel, loosen set screws in the side of the handwheel at least 1/8, and pull the handwheel off its shaft. Now pull the saddle forward until it hits the cross feed stop, which pulls the bearing off the cross feed screw shaft. Remove the tubing connector that fastens the lubricating oil line between the base and the saddle from the saddle fitting. The saddle can now be lifted off the machine base.

The entire underside of the table, saddle and the ways in the base and saddle should be carefully cleaned before reassembling the machine to be sure that grit cannot fall into the ways when table and saddle are being put back into place.

6. UNEVEN DOWN FEEDING RESPONSE.

A. Wheel too loose.
If grinder has been stopped and restarted with the wheel insufficiently tight, the wheel may have shifted slightly when the motor was restarted, 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 18,19,22 and 23.

C. Spindle housing assembly sticking in column ways.
The exceptional rigidity of the BRIDGEPORT/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, 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 ball bearing in the column cap. *(See Fig. 23)* 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. Move the dust guard retainer away from the column.

Note: The front dust guard retainer has been sealed at the bottom with silicone rubber sealant. Care must be used while removing the retainer to avoid bending it. If the retainer is removed, seal it along the bottom edge with silicone sealant, at installation.

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; 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 or stoned 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 five 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 to the spindle housing, and if 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 is can be turned to the same point when the grinder is reassembled. Loosen the 1/4-20 by 3/4 cap screw that holds the elevating screw in place. *(See Fig. 23)* 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 spindie 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 the motor spindle assembly and dust guards as outlined in the previous section. 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 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 occuring. The wave spring 17748702 adds drag to the system by pressing against the nylon washers, which in turn press against the bridge of the column casting and the inner race of the elevating screw bearing. *(See Fig. 23)* If it is necessary to increase this drag, a C spring 16213088 should be ordered and installed between the outer bearing race and bevel gear in position shown in Fig. 23.

To assemble this in the machine, the elevating screw guard is removed from the machine, the open end of the C is dropped under the bevel gear, the back of the C spring is then pushed down with a screwdriver until the spring is horizontal, and then the spring is moved sideways to snap across the high point of the gear to fit the angular space between the bearing outer race and gear.

7. IMPROPER LONGITUDINAL FEED.

A. Table Runs Slow or Stops.
See that the hydraulic pump is running in the direction indicated by the arrow on the motor. *(If motor is not running, see heading* page 11, Motors Do Not Run.) If the motor is turning in the wrong direction, check to make sure the spindle motor is turning in the proper direction. If not, reverse any two of the line wire connections to the machine. If the spindle motor is running correctly, reverse any two of the electrical connections to the hydraulic motor to change its direction of rotation.

If the pump motor is turning in the correct direction, make certain the speed control valves is open and the table drive handwheel is pulled all the way out. If the table still will not start, the following checks may be used to determine the problem.

If the machine has just been set up, check the hose connections to the pump and to the machine to make sure they are connected properly.

Check the hydraulic pressure by opening the black valve next to the gauge while the pump is running. The pressure should be between 200 and 250 PSI. (Note: Gauge should be turned off when not in use.) If the pressure is too low, adjust according to directions listed under table too slow.

If the pressure is correct, briefly depress the rubber button on the end of either solenoid. The table should move while the button is depressed. Release button before reaching end of travel. If the table will not move by depressing the button (Note: button is difficult to push), the valve should be replaced. If the table travels by manually activating the solenoid, proceed to the electrical checks.

Caution: All electrical checks should be made by qualified personnel.

First check transformer supplying current to the hydraulic unit and associated fuse (refer to electrical schematic). If voltage is not present replace transformer or fuse as necessary.

If voltage is present (about 24 VAC at the input to the hydraulic control card terminals 1 and 2) turn the table selector switch to "start". Check the voltage at terminals 105 & 106 or 105 and 107. One set of terminals should show a potential of approximately 24 VDC. If 24 VDC is present at the terminals and at the associated solenoid valve, the associated solenoid valve is bad and should be replaced. (Note: Due to the nature of the solenoid drive system, no voltage can be measured on the output with the solenoid disconnected.)

If 24 VDC is not present at the aforementioned terminals, check the proximity switches, check the handwheel interlock proximity switch across terminals 108 and 111. A meter should read approximately 6 VDC with the handwheel pushed in and 11 VDC with the handwheel pulled out. If voltage at these terminals does not agree with these readings, replace the handwheel proximity switch. If the table still will not start, replace the hydraulic control card.

If the machine has been operating properly for a period of time and then starts to run slow, check the level of the hydraulic oil in the tank. Be sure the speed control knobs are rotated fully counterclockwise.

If the grinder is still running a little slow, its speed can be increased by adjusting the relief valve on the hydraulic pump unit to allow higher pressure in the system. To adjust relief valve, remove the sealing cap from the adjusting screw. *(See Fig. 21)* Turn the adjusting screw one-half turn. Turn on the grinder and check the speed. If additional speed is desired, make another half turn adjustment. When the grinder is running the proper speed, replace the seal cap. The pressure of the hydraulic system is normally operating at 200 lbs. per square inch when the table is feeding at the rate of 70 feet per minute. The grinder should require less than 225 PSI to operate at this speed. If more pressure is required, check that the oil level is proper, that there are no mechanical obstructions for feeding, or that there is not obstruction in the hydraulic lines.

B. Table will not reverse.

If the table will not reverse, first check the clearance from the proximity switches to the table reversing dogs. The clearance should be between 0.010" and 0.070".

If the clearance is incorrect, loosen the locknut on the threaded proximity switch(es) and adjust the clearance by turning the switch. If the clearance is correct, check the proximity switches at terminals 108 and 109 (right switch) or terminals 108 and 110 (left switch). When not activated by the reversing dogs, switches should read about 11 VDC. When a dog is positioned over a switch, the voltage reading should be approximately 6VDC. If the readings are not correct, replace the proximity switch(es) in question. If the readings are correct, replace the hydraulic control card.

C. Jerky Table Reversal

The hydraulic direction valve design has been optimized to give the smoothest table reversal under all conditions. Because the grinder base is mounted on flexible vibration pads, some movement of the grinder during table reversal is normal. Since this occurs when the grinding wheel is off the work, it does not effect the surface finish of the piece being ground and can be ignored.

D. Jumpy Table Movement.

If the grinder is being operated at a very slow speed (speed control valve turned way down), an irregular movement or "jump" may be seen. If the grinder has not been operated for a long period of time, this may be due to air in the cylinder. The air can be removed from the cylinder by setting the table travel for almost maximum stroke and operating the grinder at full speed for a short period of time.

Insufficient lubrication of the longitudinal ways can also cause this problem. More oil can be fed to the ways by opening the restricting valve an additional 1/3 turn. *(See* paragraph B under No. 5, pg. 12, *Oil Dripping)* Running the table back and forth a few times before taking a cut will help distribute the oil evenly over the ways to minimize this condition. A grinder with Teflon ways will not have this problem, which is caused by the "stick-slip" effect, since Teflon has the same friction for starting to move as it has when running with an oil film.

E. Noisy or Vibrating Pump.

A noise or vibration in the hydraulic pump unit can be caused by a resonance of the relief valve. If the noise changes as the machine warms up, or as the feed speed control setting is changed, first check that the oil level is proper and that the filter is clean. If the level is full and the filter is clean, adjust the relief valve while the noise is occurring as outlined in last paragraph 7A Table Runs Slow or Stops.

8. CROSS FEED MALFUNCTION

A. Hand feed wheel turns hard.

Be sure the cross feed lock thumb screw has been loosened *(B, Fig. 10, page 6).*

Longitudinal Hand Feed

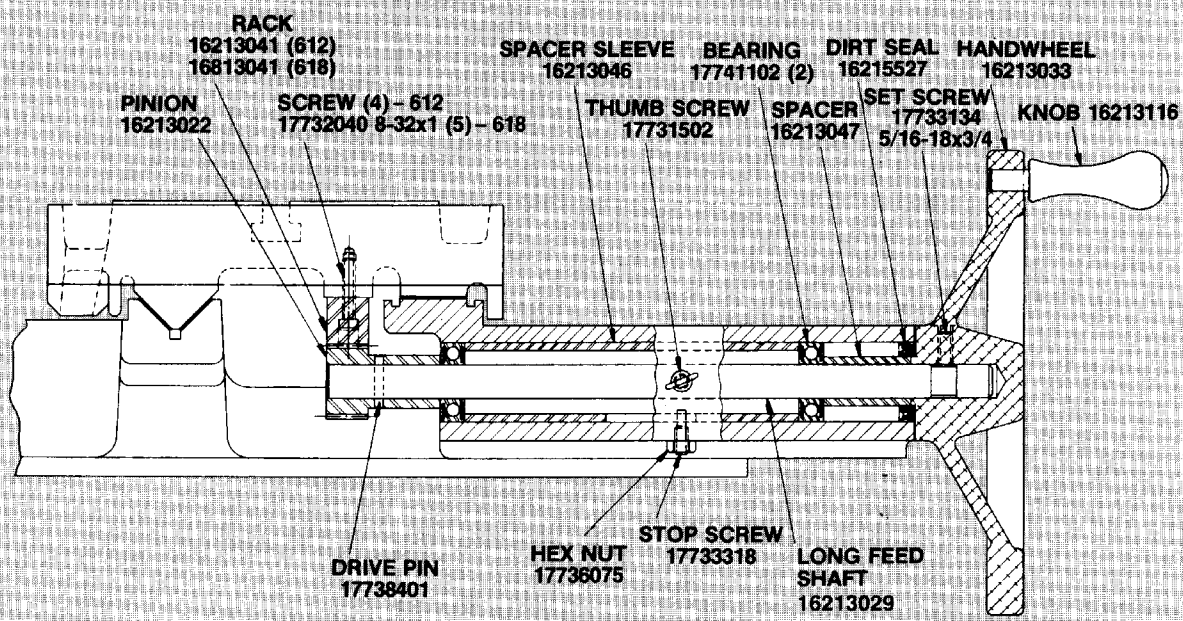


Figure 17

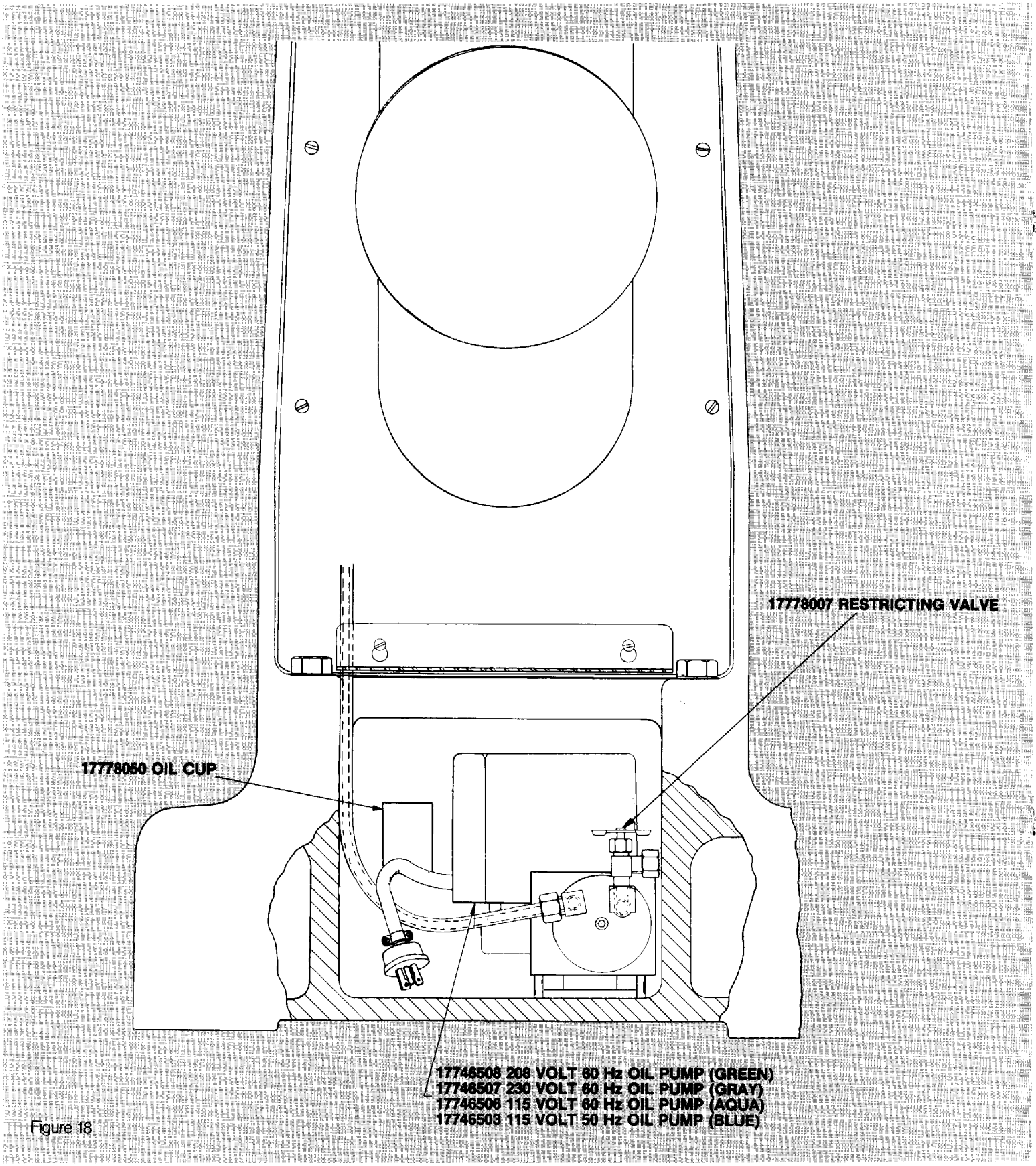

17778007 RESTRICTING VALVE
17778050 OIL CUP
17746508 208 VOLT 60 Hz OIL PUMP (GREEN)
17746507 230 VOLT 60 Hz OIL PUMP (GRAY)
17746506 115 VOLT 60 Hz OIL PUMP (AQUA)
17746503 115 VOLT 50 Hz OIL PUMP (BLUE)

Figure 18

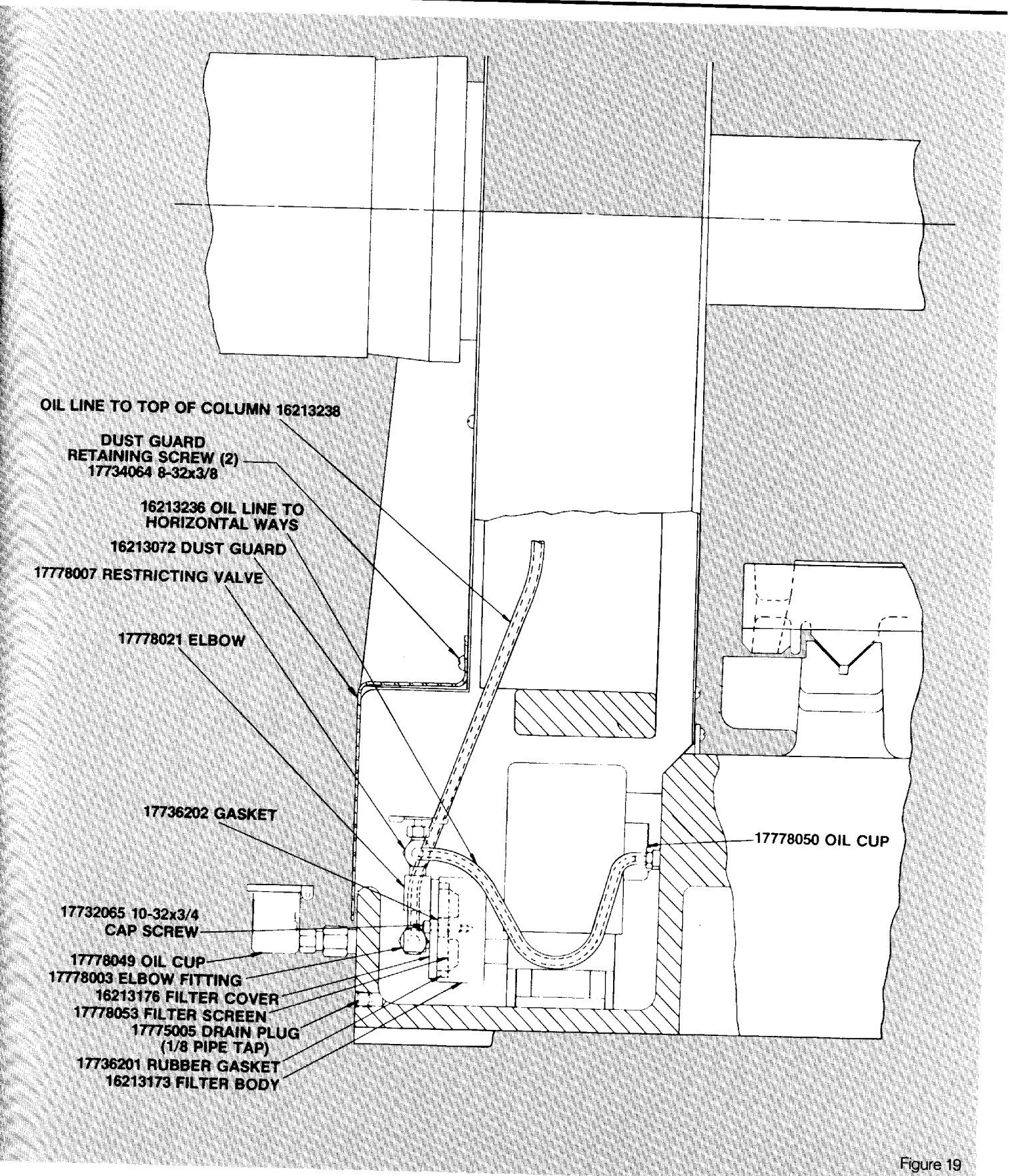

OIL LINE TO TOP OF COLUMN 16213238
DUST GUARD RETAINING SCREW (2) 17734064 8-32x3/8
16213236 OIL LINE TO HORIZONTAL WAYS
16213072 DUST GUARD
17778007 RESTRICTING VALVE
17778021 ELBOW
17736202 GASKET
17778050 OIL CUP
17732065 10-32x3/4 CAP SCREW
17778049 OIL CUP
17778003 ELBOW FITTING
16213176 FILTER COVER
17778053 FILTER SCREEN
17775005 DRAIN PLUG (1/8 PIPE TAP)
17736201 RUBBER GASKET
16213173 FILTER BODY

Figure 19

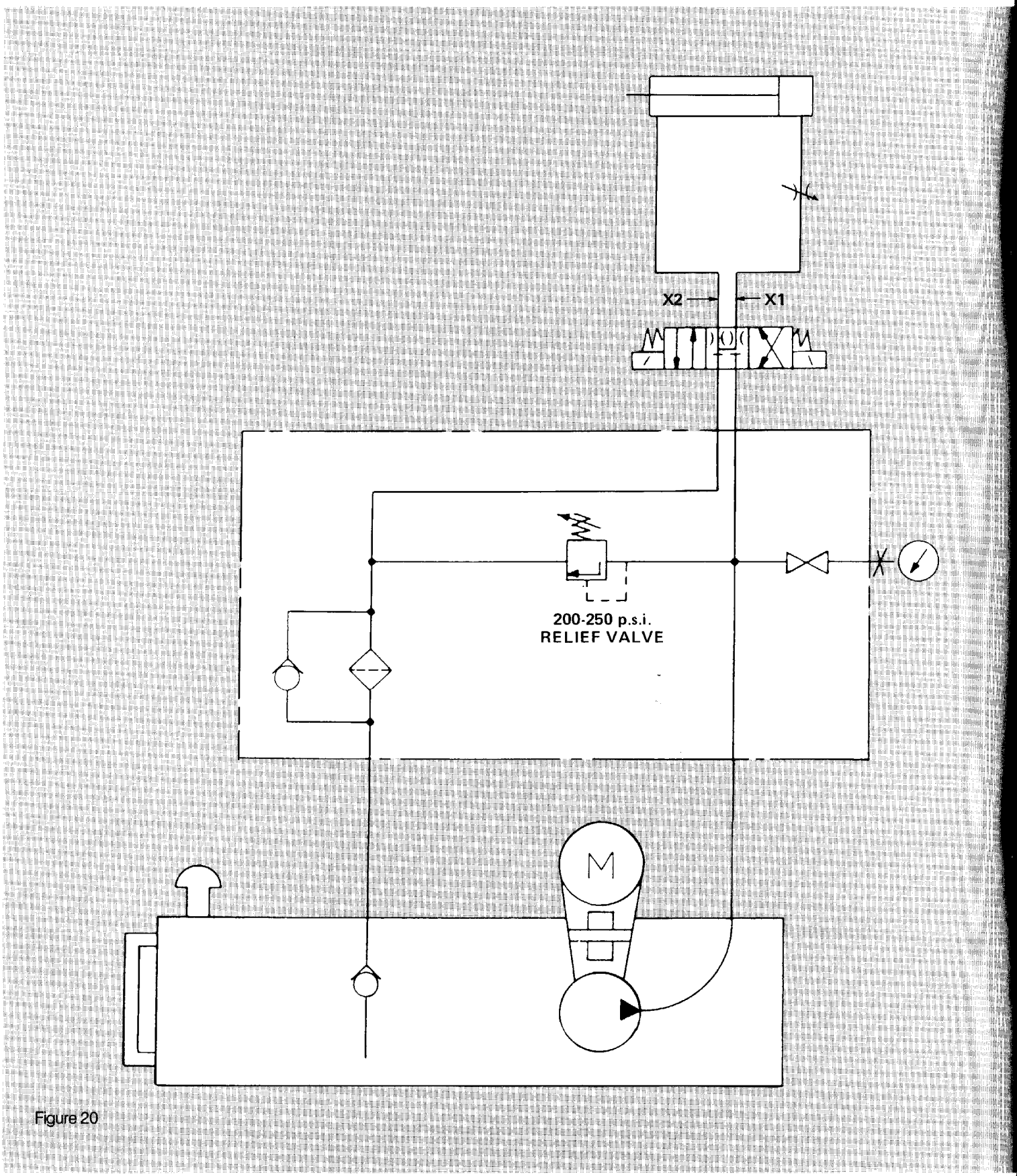


Figure 20

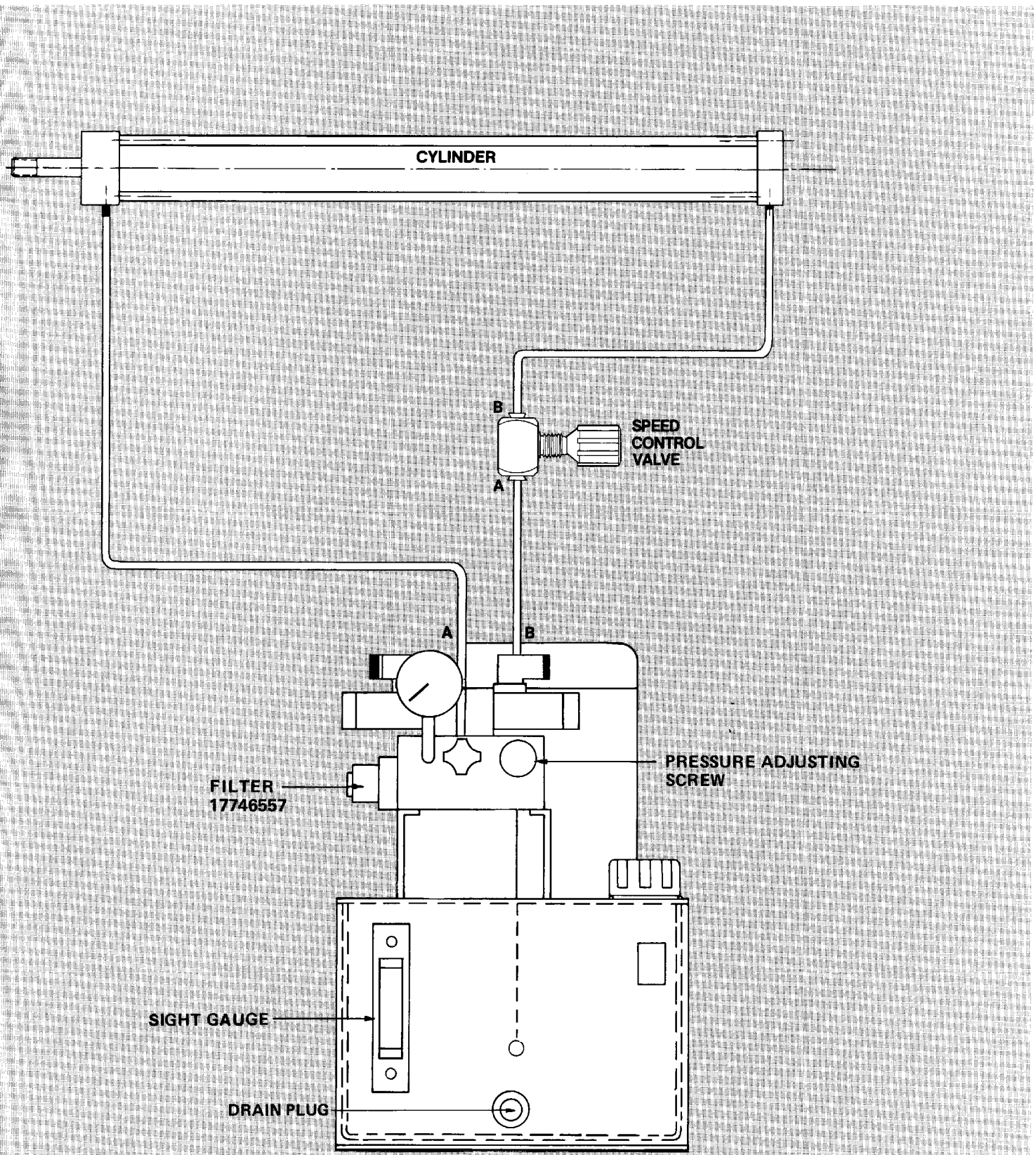
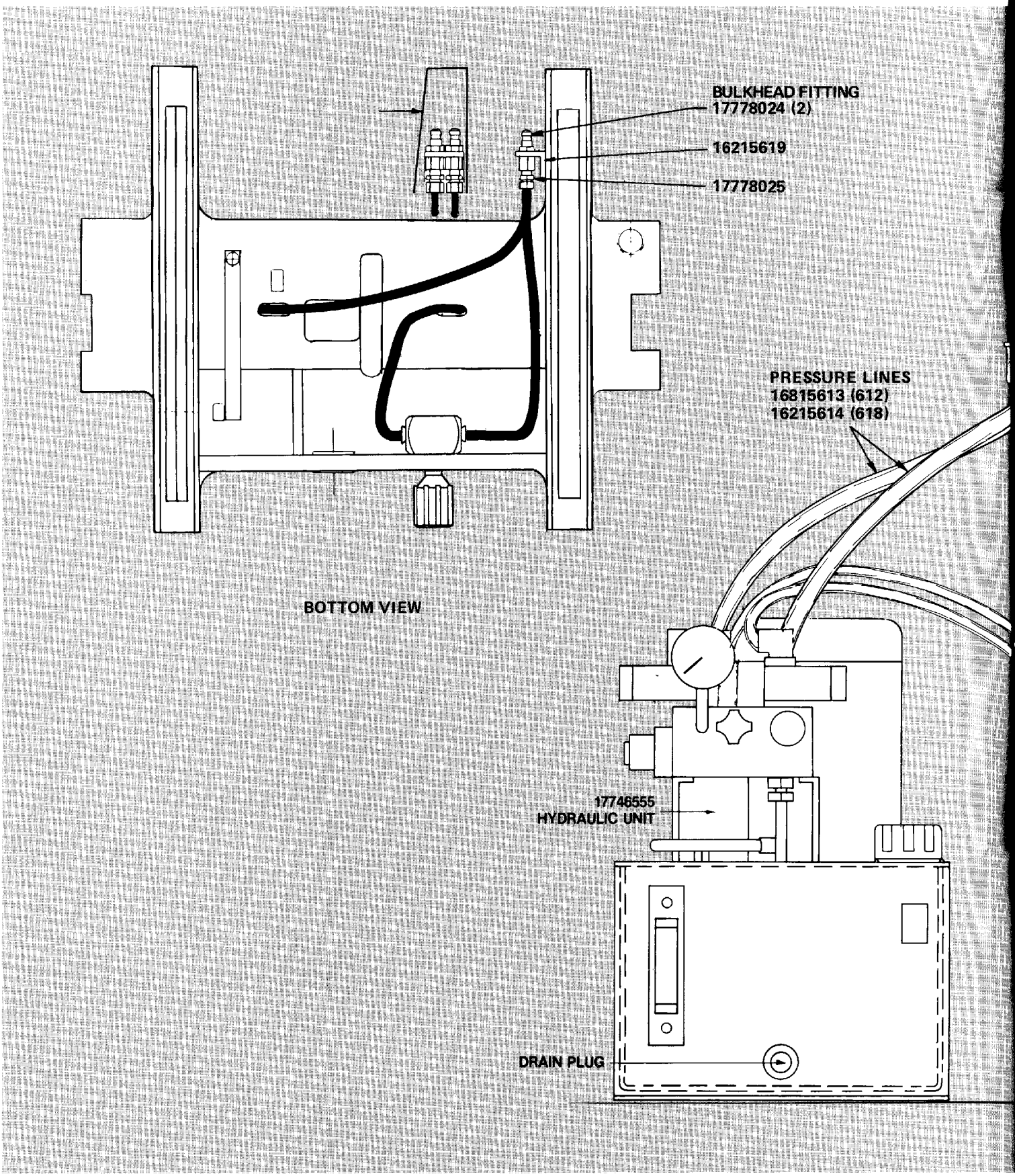

CYLINDER
B
SPEED
CONTROL
VALVE
A
A
B
PRESSURE ADJUSTING
SCREW
FILTER
17746557
SIGHT GAUGE
DRAIN PLUG

Figure 21


BULKHEAD FITTING
17778024 (2)
16215619
17778025
PRESSURE LINES
16815613 (612)
16215614 (618)
BOTTOM VIEW
17746555
HYDRAULIC UNIT
DRAIN PLUG

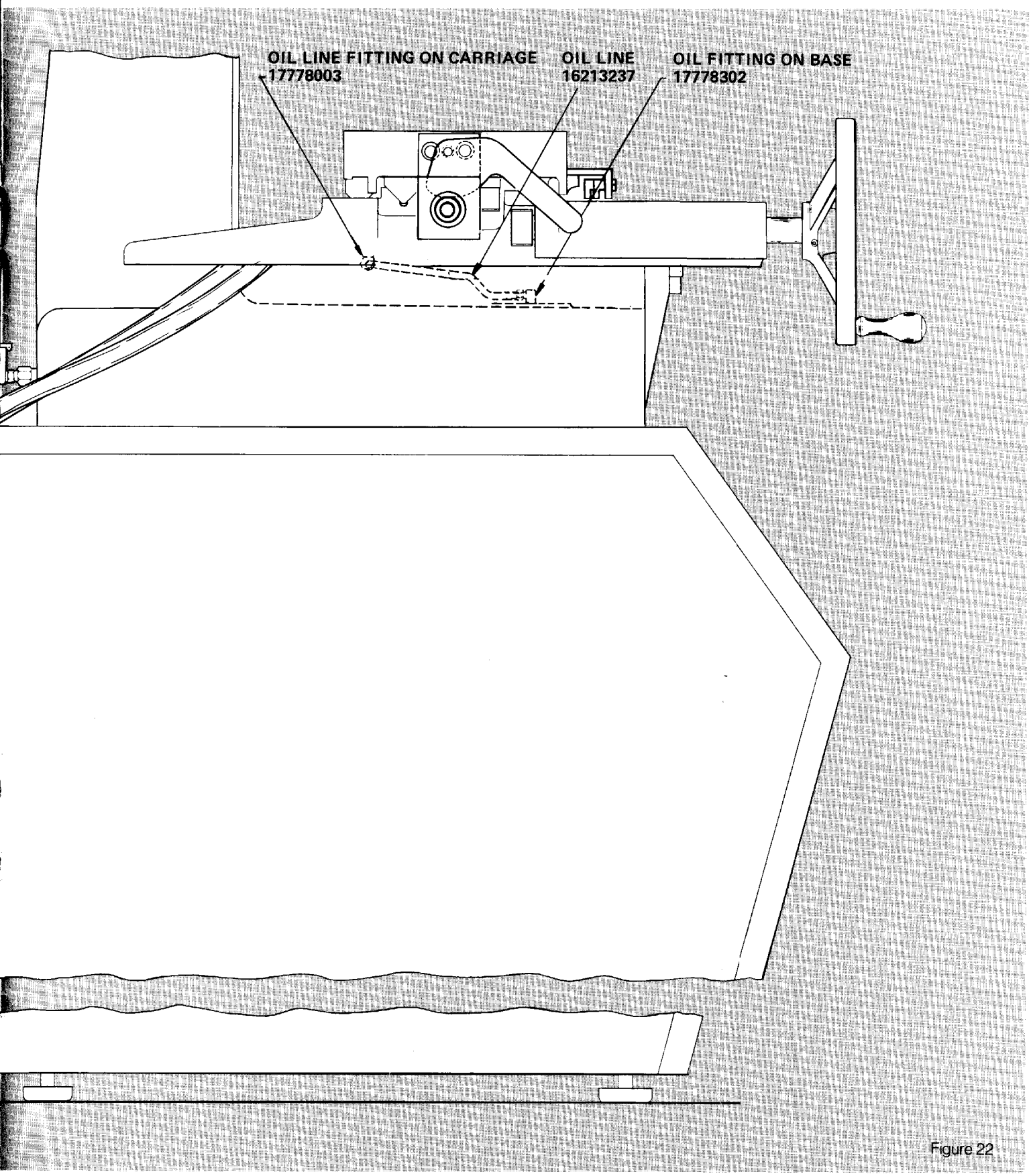
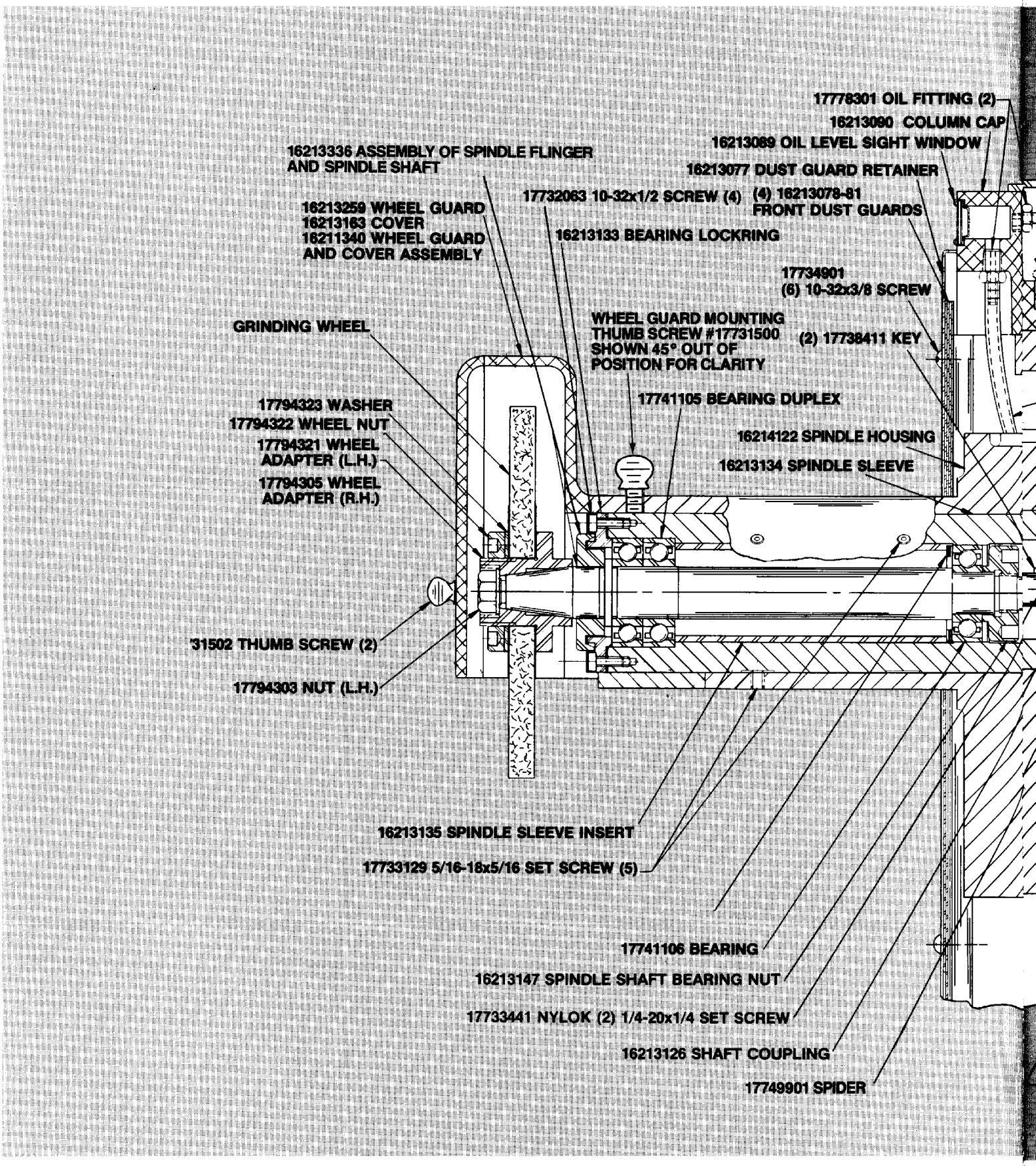

OIL LINE FITTING ON CARRIAGE
17778003
OIL LINE
16213237
OIL FITTING ON BASE
17778302

Figure 22

Spindle and Elevating Assemblies



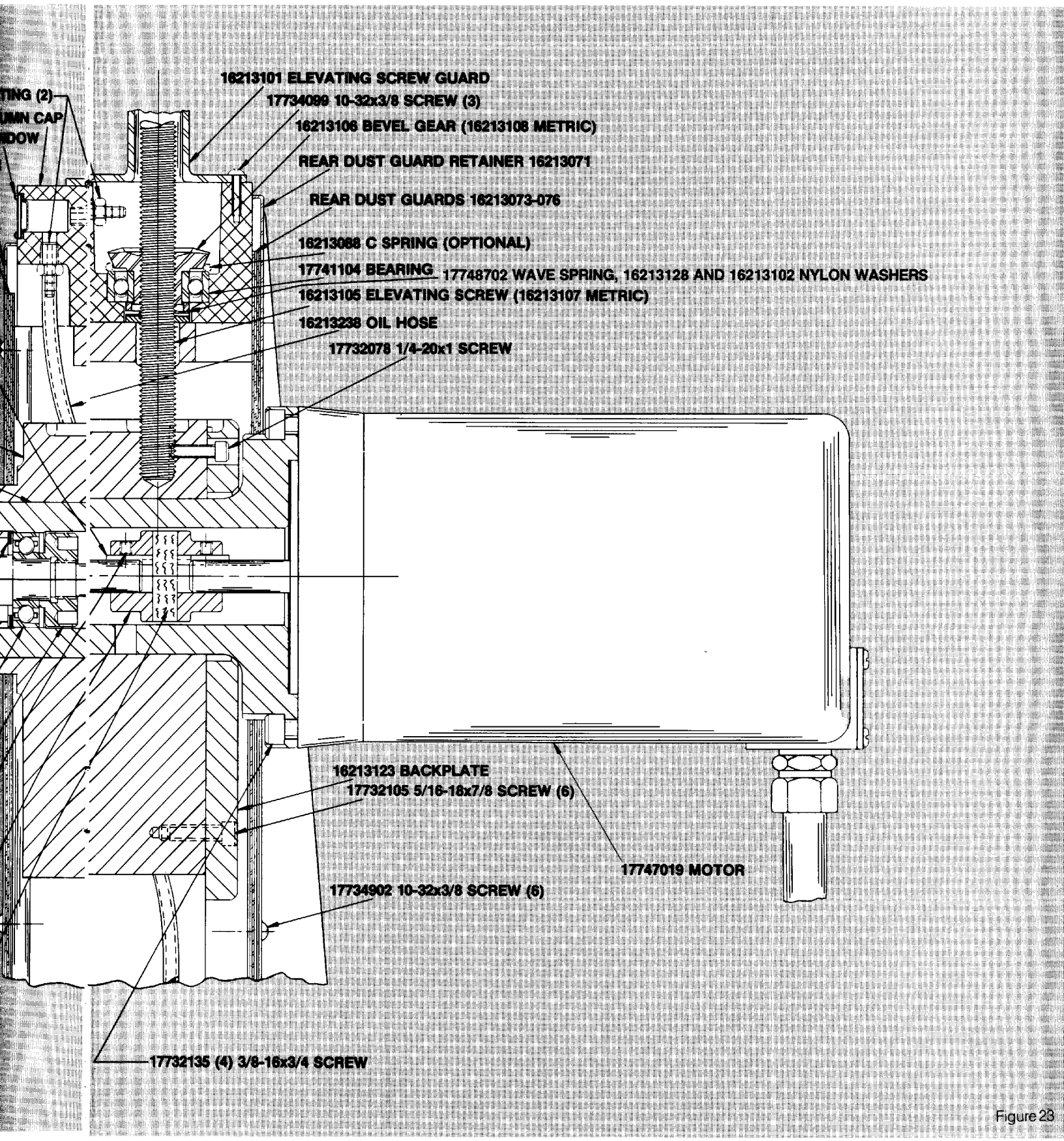
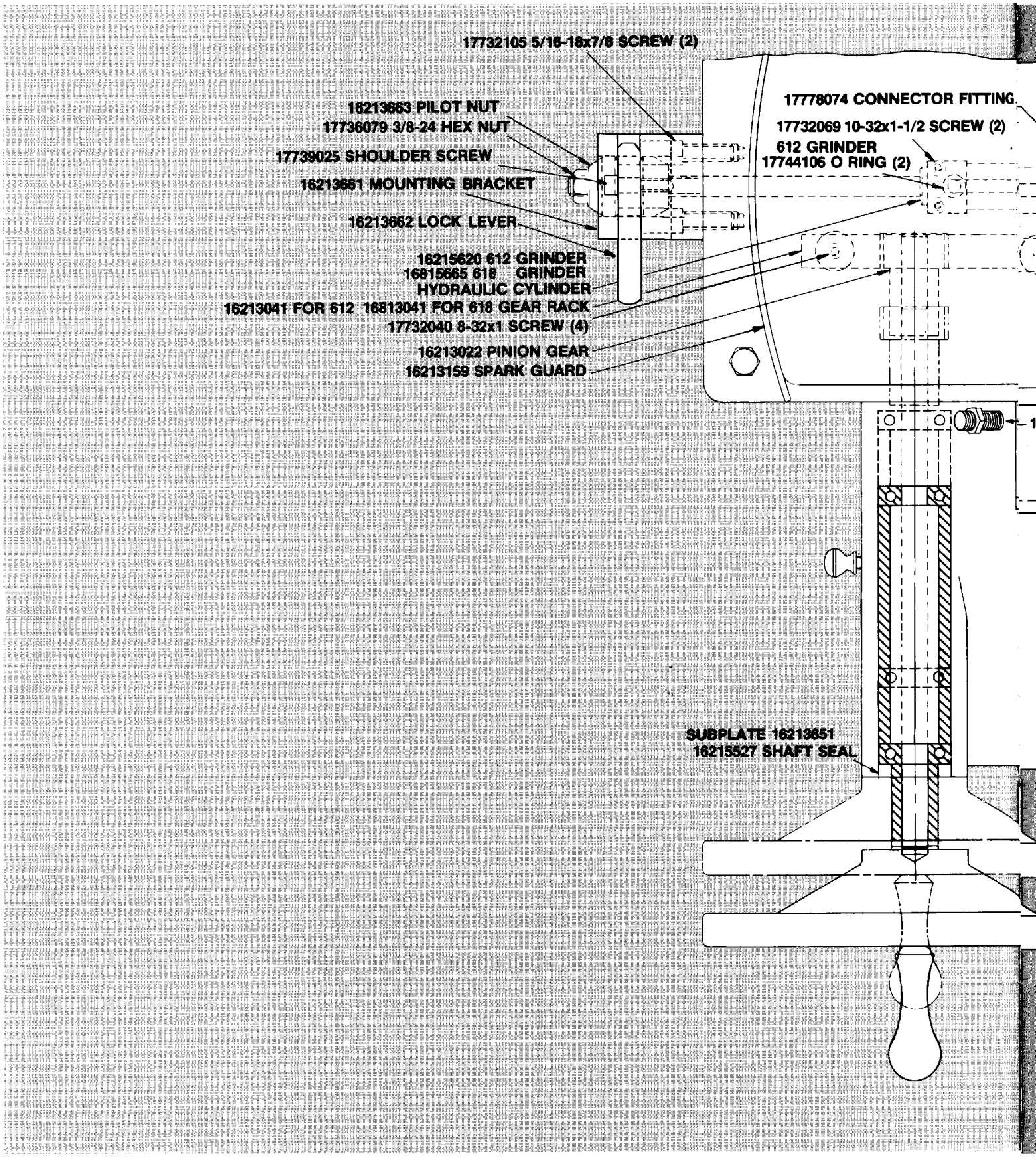
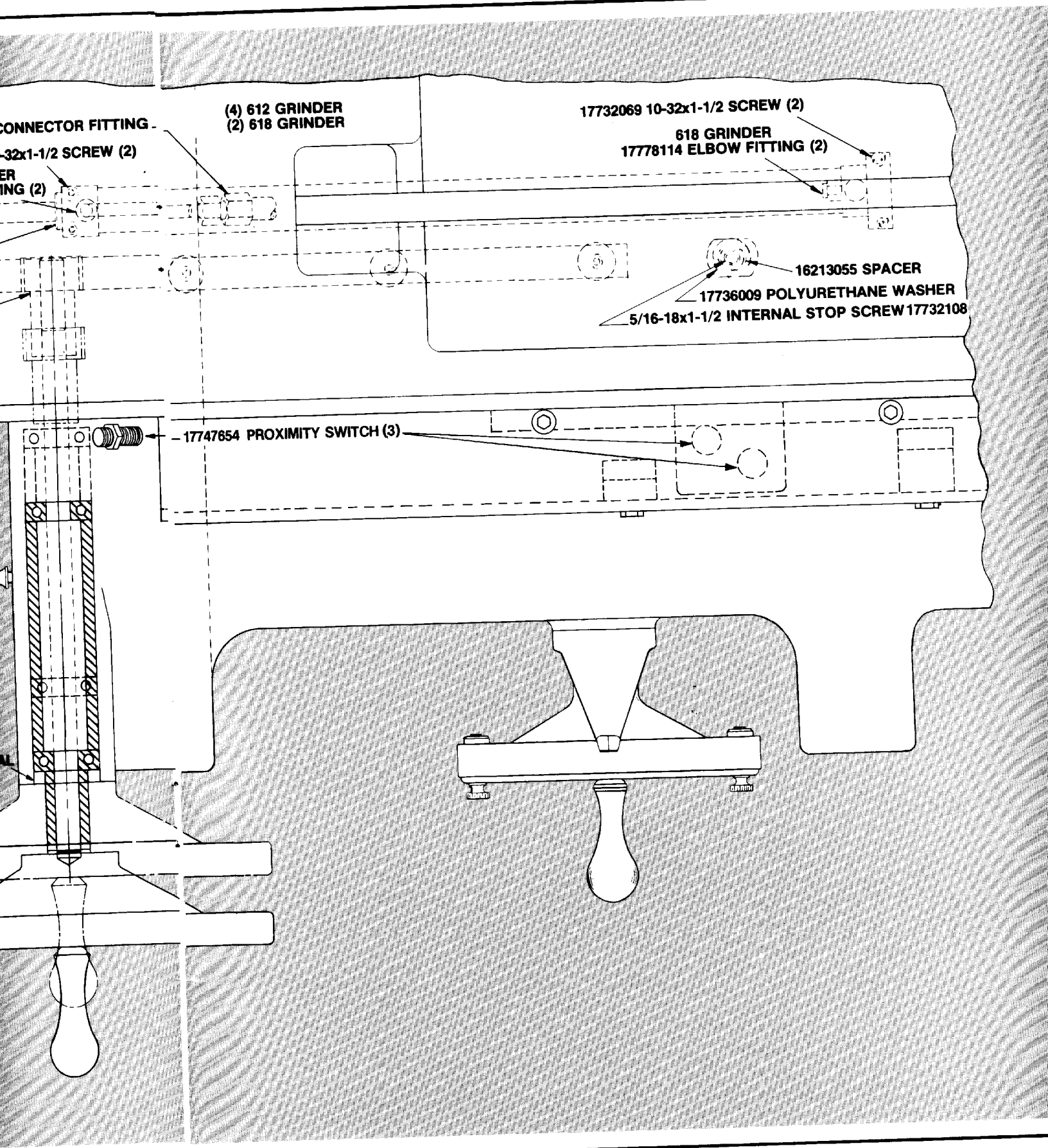
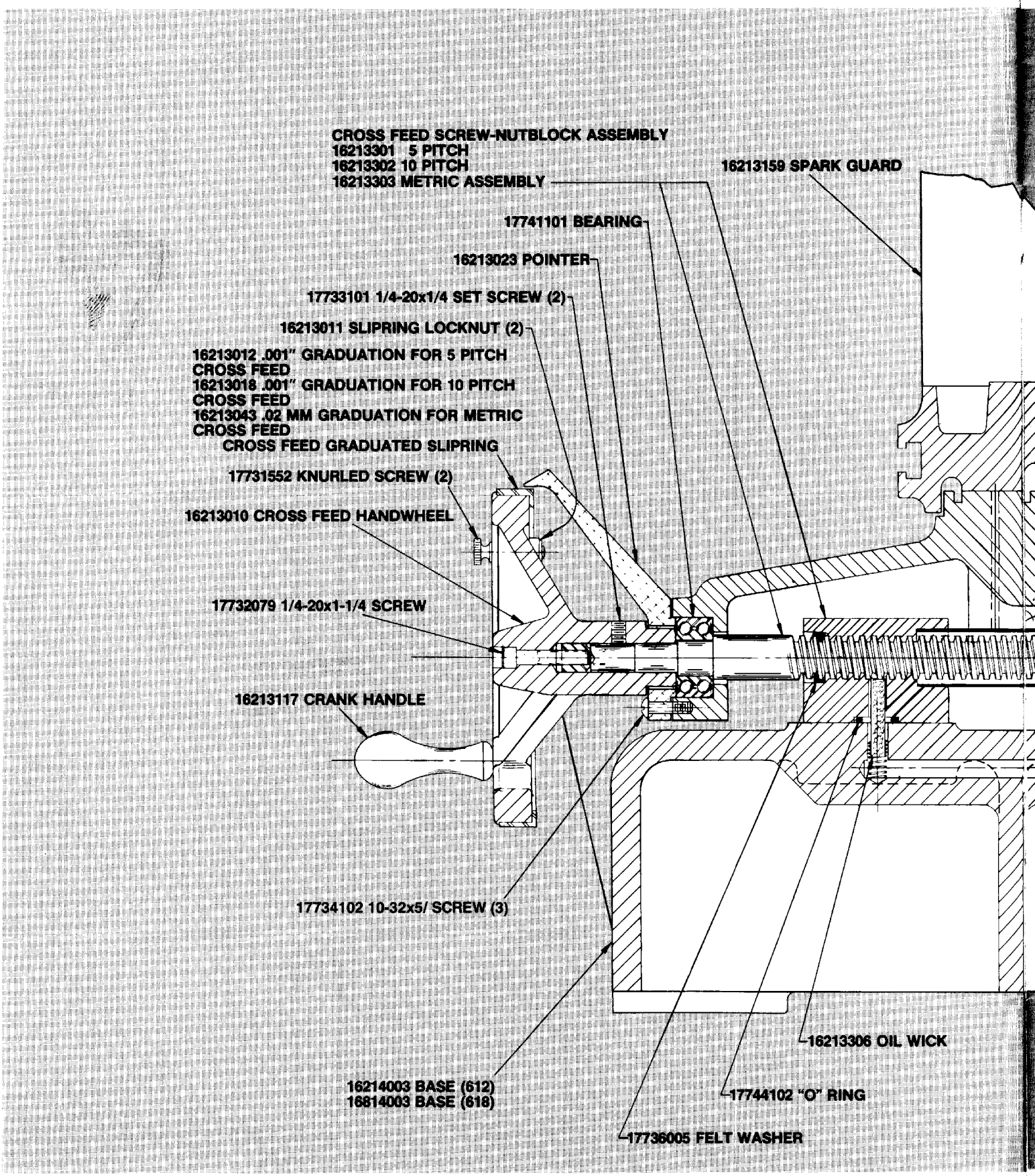

16213101 ELEVATING SCREW GUARD
17734099 10-32x3/8 SCREW (3)
16213106 BEVEL GEAR (16213108 METRIC)
REAR DUST GUARD RETAINER 16213071
REAR DUST GUARDS 16213073-076
16213088 C SPRING (OPTIONAL)
17741104 BEARING
17748702 WAVE SPRING, 16213128 AND 16213102 NYLON WASHERS
16213105 ELEVATING SCREW (16213107 METRIC)
16213238 OIL HOSE
17732078 1/4-20x1 SCREW
16213123 BACKPLATE
17732105 5/16-18x7/8 SCREW (6)
17747019 MOTOR
17734902 10-32x3/8 SCREW (6)
17732135 (4) 3/8-16x3/4 SCREW

Figure 28


17732105 5/16-18x7/8 SCREW (2)
16213663 PILOT NUT
17736079 3/8-24 HEX NUT
17739025 SHOULDER SCREW
16213661 MOUNTING BRACKET
16213662 LOCK LEVER
16215620 612 GRINDER
16815665 618 GRINDER
HYDRAULIC CYLINDER
16213041 FOR 612 16813041 FOR 618 GEAR RACK
17732040 8-32x1 SCREW (4)
16213022 PINION GEAR
16213159 SPARK GUARD
17778074 CONNECTOR FITTING
17732069 10-32x1-1/2 SCREW (2)
612 GRINDER
17744106 O RING (2)
SUBPLATE 16213651
16215527 SHAFT SEAL


CONNECTOR FITTING
-32x1-1/2 SCREW (2)
ER
ING (2)
(4) 612 GRINDER
(2) 618 GRINDER
17732069 10-32x1-1/2 SCREW (2)
618 GRINDER
17778114 ELBOW FITTING (2)
16213055 SPACER
17736009 POLYURETHANE WASHER
5/16-18x1-1/2 INTERNAL STOP SCREW 17732108
17747654 PROXIMITY SWITCH (3)

Cross Feed Assembly
Cross Feed Locking Clamp



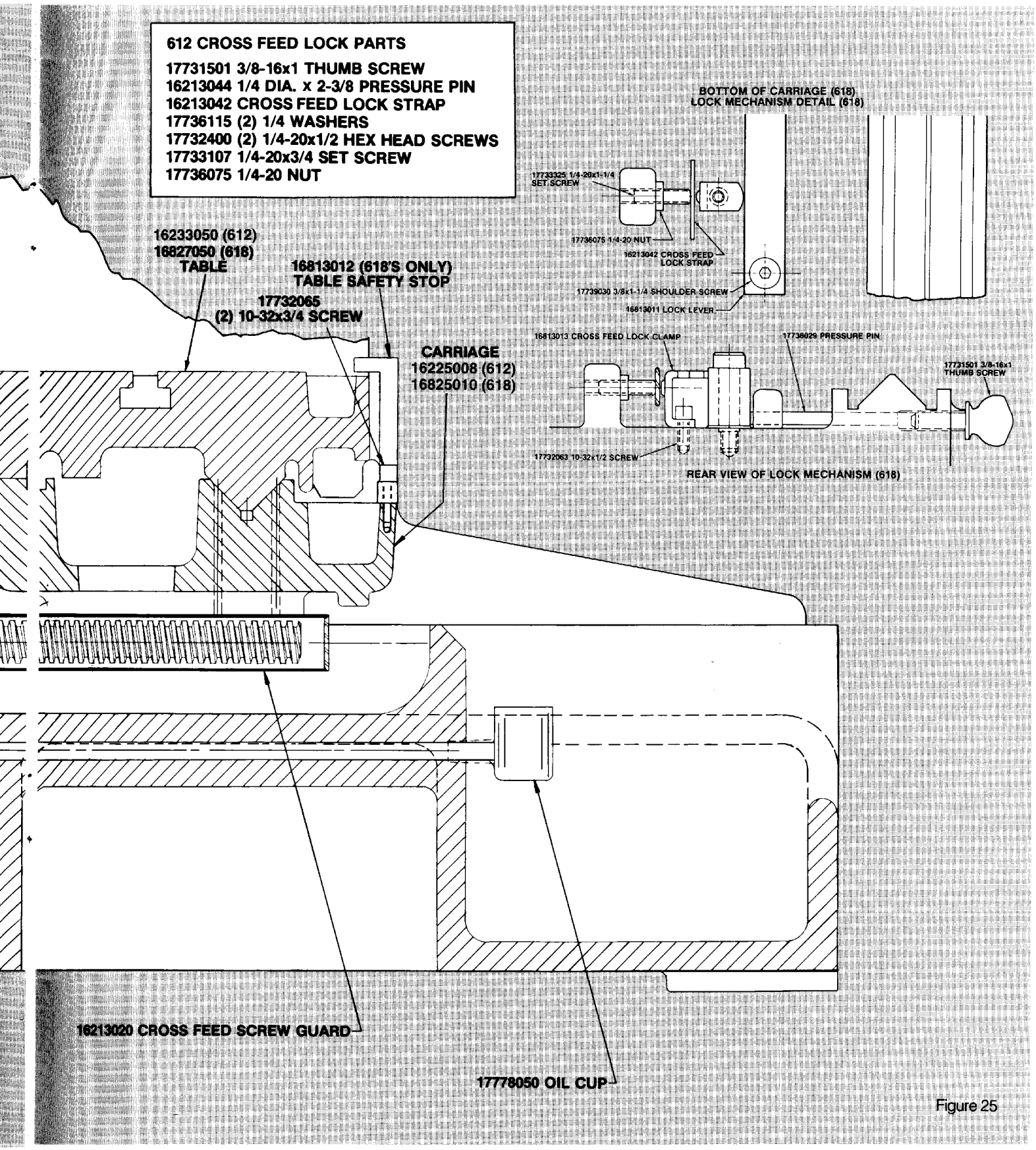
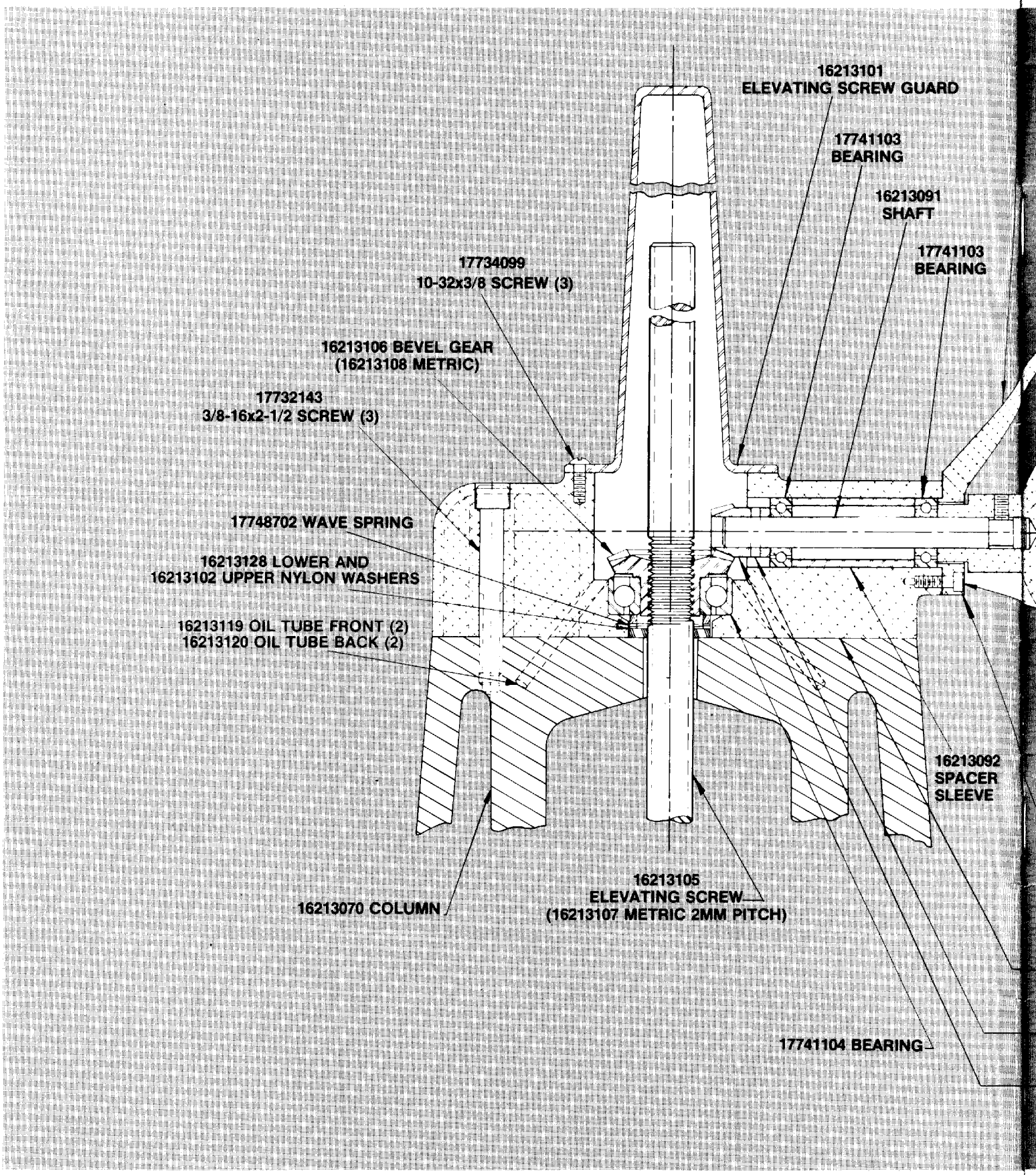

612 CROSS FEED LOCK PARTS
17731501 3/8-16x1 THUMB SCREW
16213044 1/4 DIA. x 2-3/8 PRESSURE PIN
16213042 CROSS FEED LOCK STRAP
17736115 (2) 1/4 WASHERS
17732400 (2) 1/4-20x1/2 HEX HEAD SCREWS
17733107 1/4-20x3/4 SET SCREW
17736075 1/4-20 NUT
BOTTOM OF CARRIAGE (618)
LOCK MECHANISM DETAIL (618)
17733325 1/4-20x1-1/4 SET SCREW
17736075 1/4-20 NUT
16213042 CROSS FEED LOCK STRAP
17739030 3/8x1-1/4 SHOULDER SCREW
16813011 LOCK LEVER
16233050 (612)
16827050 (618)
TABLE
16813012 (618'S ONLY)
TABLE SAFETY STOP
17732065
(2) 10-32x3/4 SCREW
CARRIAGE
16225008 (612)
16825010 (618)
16813013 CROSS FEED LOCK CLAMP
17736029 PRESSURE PIN
17731501 3/8-16x1 THUMB SCREW
17732063 10-32x1/2 SCREW
REAR VIEW OF LOCK MECHANISM (618)
16213020 CROSS FEED SCREW GUARD
17778050 OIL CUP

Figure 25

Elevating Screw and Handwheel Assembly



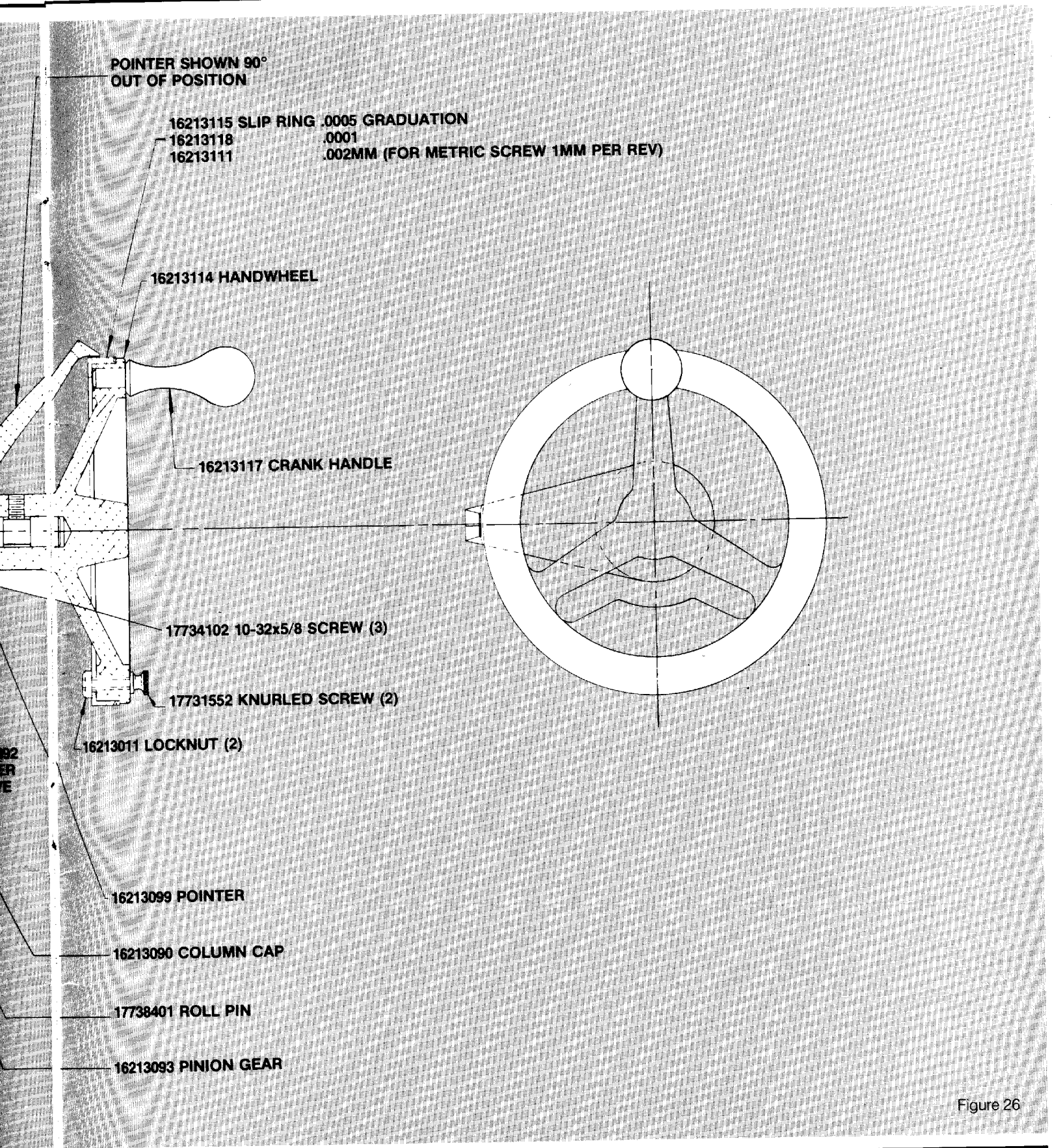

POINTER SHOWN 90° OUT OF POSITION
16213115 SLIP RING .0005 GRADUATION
16213118 .0001
16213111 .002MM (FOR METRIC SCREW 1MM PER REV)
16213114 HANDWHEEL
16213117 CRANK HANDLE
17734102 10-32x5/8 SCREW (3)
17731552 KNURLED SCREW (2)
16213011 LOCKNUT (2)
16213099 POINTER
16213090 COLUMN CAP
17738401 ROLL PIN
16213093 PINION GEAR

Figure 26

Harig Products
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