TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS LIST

FOR

HONING MACHINE
MODEL LBB-1810
(NSN 3419-00-102-5438)

HEADQUARTERS, DEPARTMENT OF THE ARMY

JULY 1983

WARNINGS

The following summary list is adapted from Warnings within the manual. However, all warnings should be observed as noted in the text.

Make sure HONE START lamp is not on before performing next step.

Be sure power is off (amber light out) before inserting Honing Unit into spindle.

Do not attempt to rotate the mandrel by hand when HONE START lamp is on. If pedal is depressed, the mandrel will rotate with full power. Push STOP switch and then depress pedal to release brake. Only then should you attempt to rotate the mandrel.

When removing filter element, the wire bale may fall out due to the weight of the clogged filter element. To prevent injury, protect hands and remove filter element by grasping its sides and turning and lifting simultaneously until element is clear of canister.

Disconnect grinder from electrical power source to prevent accidents.

Technical Manual

No. 9-3419-233-14&P

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington DC, *26 July 1983*

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS LIST FOR

HONING MACHINE MODEL LBB-1810

REPORTING OF ERRORS

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

NOTE

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

Manufactured By: Sunnen Products Company
7910 Manchester Ave.
St. Louis, MO 63143

Procured under Contract No. DAAA09-78-C-4459

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

INSTRUCTIONS FOR REQUISITIONING PARTS

NOT IDENTIFIED BY NSN

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

1 - Manufacturer's Federal Supply Code Number 58436.

2 - Manufacturer's Part Number exactly as listed herein.

3 - Nomenclature exactly as listed herein, including dimensions, if necessary.

4 - Manufacturer's Model Number LBB-1810.

5 - Manufacturer's Serial Number (End Item).

6 - Any other information such as Type, Frame Number, and Electrical Characteristics, if applicable.

7 - If DD Form 1348 is used, fill in all blocks except 4, 5, 6, and Remarks field in accordance with AR 725-50.

Complete Form as Follows

(a) In blocks 4, 5, 6, list manufacturer's Federal Supply Code Number - 58436 followed by a colon and manufacturer's Part Number for the repair part.

(b) Complete Remarks field as follows:

Noun:	(nomenclature or repair part)
For:	NSN: 3419-00102-5438
Manufacturer:	Sunnen Products Co. 7910 Manchester Ave. St. Louis, MO 63143
Model:	LBB-1810
Serial:	(of end item)

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

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS - Continued

LIST OF TABLES AND CHARTS

CHAPTER 1 - Model LBB-1810

SECTION I - Installation Instructions

1-1 INSTALL MACHINE.

a. After the honing machine has been placed in the desired location, shim the base of the machine if necessary to steady it. Do not tilt machine to make spindle horizontal.
b. Remove Reservoir Retainers (1, Figure 1) and discard cardboard packing.
c. Pull reservoir out far enough to remove all packing paper and tape from reservoir.

NOTE

Remove relief hose if it prevents reservoir from coming out far enough.

d. Push reservoir all the way in and install Retainers.
e. Pull Drain Pipe (2) down.
f. Remove paper and tape from Work Tray.
g. Reinstall relief hose, if removed.

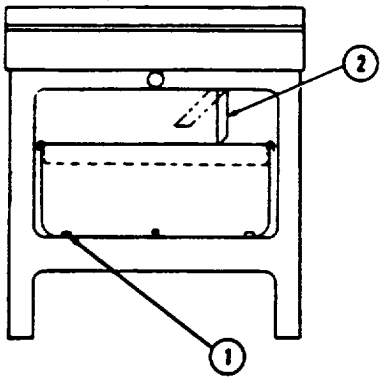


FIGURE 1

1-2 CONNECT POWER SUPPLY.

a. Wiring is complete on all machines for the voltage indicated on the tag. Machine is to be operated on 3-phase power.
b. An entrance hole for the supply cord (not furnished) must be provided by the user. To preserve the oil tightness of the enclosure, all fittings must be oil tight.
Cut or punch hole for electrical power supply near bottom corner of Electrical Control Box, as shown in Figure 2. It is preferable to cut the hole in the bottom of the Box to assure that oil does not enter Box even if fittings are not perfectly tight. It is least preferable to cut the hole near the top of the Box, although it is permissible. Do not cut the hole anywhere else; components inside the Box will prevent you from making the proper connections. Make sure fittings are packed tightly to prevent oil or chips from entering Box.

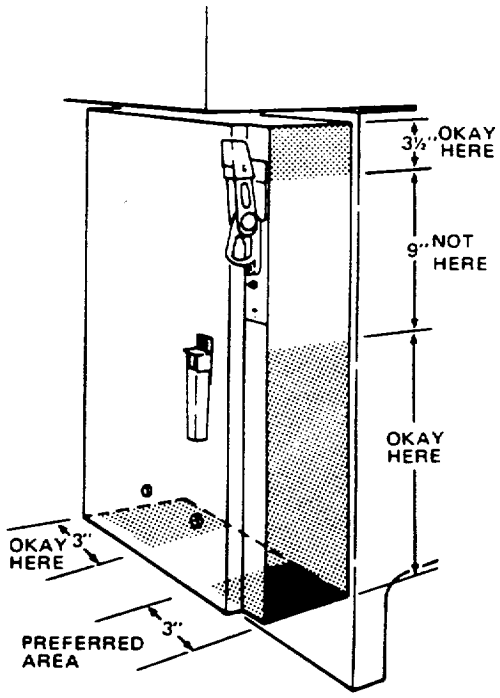


FIGURE 2

NOTE

The electrical data plate attached to the control enclosure provides helpful data, including maximum current requirements. The wiring diagram number for the machine is stamped on this plate . . . should additional copies be needed, specify the WD-_ _ _ _ form number with your request.

d. Turn machine on and check that spindle rotates counterclockwise as shown by the arrow on the spindle nose. If spindle rotates clockwise, reverse any two power line connections (not motor leads from the starter).

1-3 FILL HONING OIL SYSTEM. Maximum capacity of the honing oil reservoir at overflow is 28 gallons (106 liters). Minimum capacity for pump operation is 10 gallons (38 liters) if you remove the sediment tray. We recommend operating the machine with 20 to 25 gallons (75 to 95 liters) of honing oil in the system.

b. Use a continuous and ample supply of Honing Oil to ensure accurate, fast honing and the desired finish. Do not dilute, cut, or change the honing oil in any way. Consistent results cannot be expected if anything except the full-strength recommended oils are used.

(1) See Figure 3. Open left rear machine lid and remove Filter Cover.

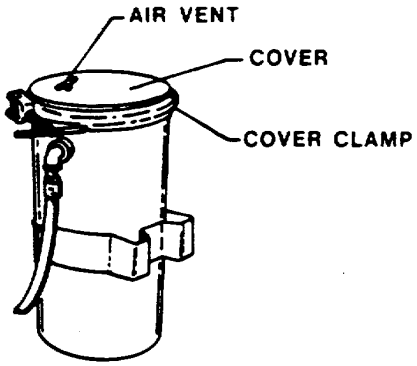


FIGURE 3

(2) See Figure 4. Insert filter element into container. Rotate element slightly while inserting to make it slide down center post more easily.

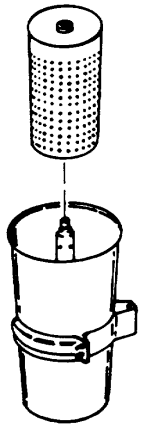


FIGURE 4

(3) Make sure the rubber gasket is in its groove in the Cover. Open Air Vent.
(4) Replace Clamp.
(5) Fill reservoir - easiest way is to pull Work Tray to fully extended position and pour the oil into Tray.
(6) Point oil jets down toward anti-splash pad.
(7) Depress HONE START switch to start pump motor and wait a few seconds for oil pressure to build up. As oil fills filter container. Air will escape through Air Vent.
(8) When oil appears in air vent, close It.
(9) See Figure 5. Turn Total Volume Control Valve slowly counterclockwise.
(10) Adjust oil flow to each jet with its individual Oil Jet Control Valve; open Total Volume Valve further as needed. Total Volume Valve may then be used to shut entire supply off, leaving individual settings unchanged.

NOTE

Dump oil from sediment tray into reservoir to prevent spillage when moving machine to new location.

1-4 INSTALL LEFT-HAND TRAY. (See Figure 5)
Remove Nuts on left-hand side of Work Tray and install Left-Hand Tray with same Nuts. Inner edge of Tray must overlap Splash Guards. Install Tray Pad.

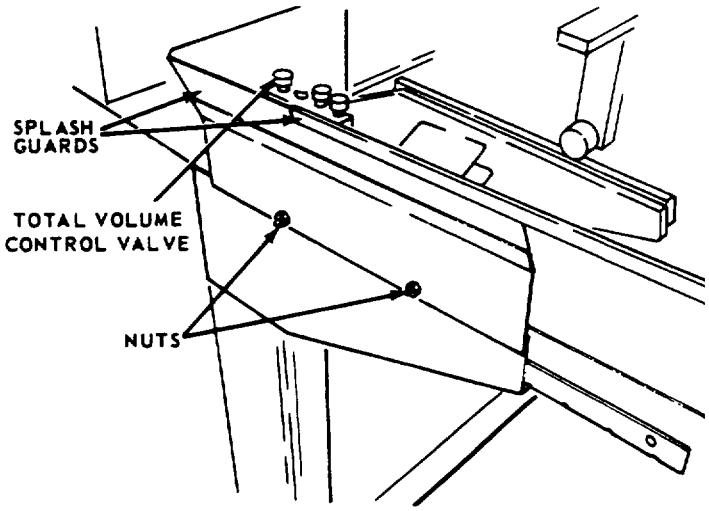


FIGURE 5

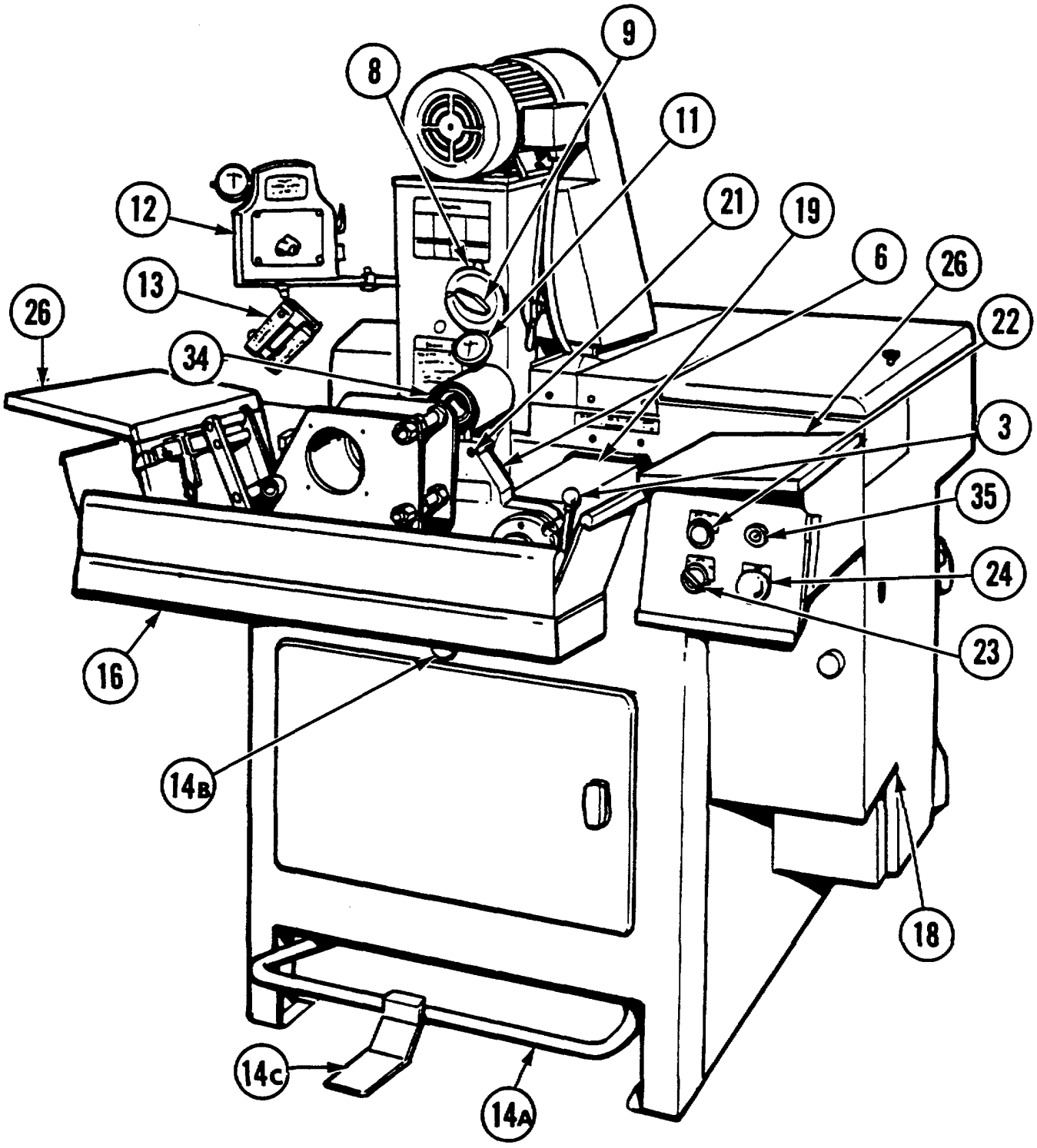
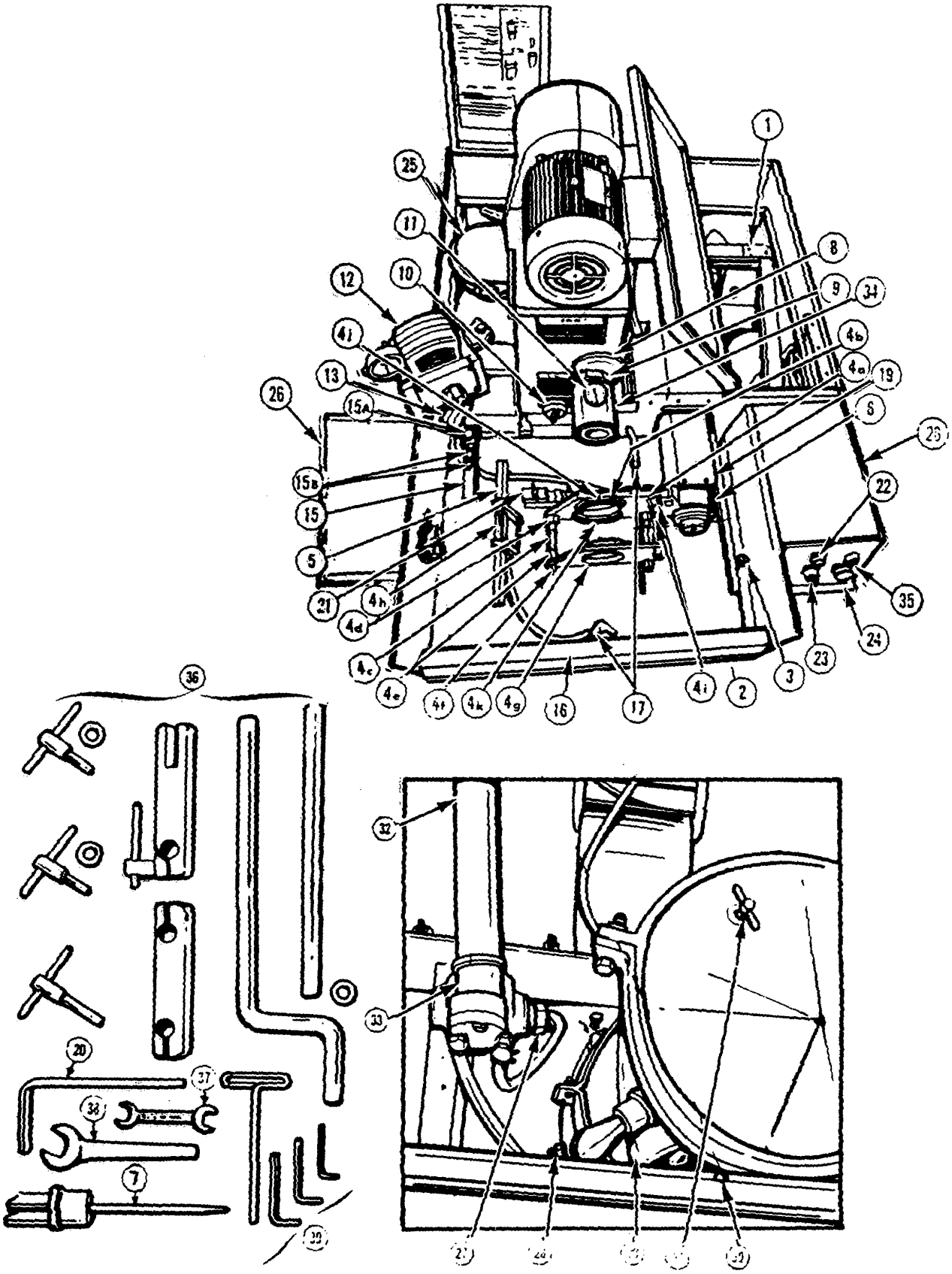


FIGURE 6. Location & Function of Components
(Pages 1-3 and 1-4)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CHAPTER 1

SECTION II - Operating Instructions

1-5 GENERAL

a. The Model LBB-1810 Power-Stroked Heavy Duty Precision Honing. Machine is intended for power honing connecting rods with inside diameters from 1.900 to 3.300 (48 to 84 mm).

b. The stroking arm can be raised from its working position for safe storage during manual honing (an automatic safety switch prevents power stroking while the stroking arm is raised). Diameters from .370 to 4.700 (9 to 119 mm) can be honed manually for applications such as pin fitting, king pin fitting, small-bore engines, etc.

NOTE

Metric dimensions shown in this instruction manual are conversion equivalents only . . . Items are not graduated in metric dimensions unless specifically identified as Metric Models.

Metric Models are graduated in metric units only, and their ranges may way slightly from the Inch Models.

c. LOCATION AND FUNCTION OF COMPONENTS (see pages 1-3 & 1-4)

1. **CROSS BEAM.** Provides a means of adjusting stroke length within each range.
2. **ARM POSITION KNOB.** Adjusts stroke position; can be used to correct taper.
3. **STROKER RELEASE HANDLE.** Disconnects Arm from stroking power source.
4. **CONNECTING ROD FIXTURE.** Provides a means to power stroke the journal bore of connecting rods of various sizes, to absorb honing torque, and to hone the bore square with the face of the rod.
   - **4a. BACK PLATE**
   - **4b. CLAMP BAR (2)**
   - **4c. SPACING STUDS (3)**
   - **4d. LOCKING NUTS (3)**
   - **4e. SPACING NUTS (3)** } **interchangeable**
   - **4f. FRONT NUTS (3)**
   - **4g. FRONT PLATE**
   - **4h. ROD TORQUE SUPPORT**
   - **4i. BRASS SLEEVE (3)**
   - **4j. LOCKING SCREW (2)**
   - **4k. SUPPORT BAR (2)**
5. **KNEE SUPPORT.** Absorbs honing torque through Connecting Rod Fixture.
6. **STROKING ARM.** Provides a means for mounting Connecting Rod Fixture or other workholding fixture. Arm is shown in working position, but may be swung out of the way for manual honing.
7. **INDICATOR SUPPORT BAR.** Used for aligning the stroker and for squaring Connecting Rod Fixture.
8. **FEED MARKER.** Marks feedup for reference.
9. **FEED DIAL.** Expands or retracts honing stone in honing tool. The setting of this dial limits the maximum honing stone expansion, and allows the honing stone to feed out automatically during the honing operation until the preset point is reached. Actual stone expansion in thousandths depends upon the type of honing unit.
10. **CUTTING PRESSURE CONTROL.** Adjusts to control the cutting pressure of the honing stone against the work. Use in conjunction with Feed Dial and Honing Dial to ensure maximum efficiency.
11. **HONING DIAL.** Works in conjunction with the Feed Dial. With workpiece on the honing unit and Feed Dial set for desired stock removal, the Honing Dial needle shows the amount of stock to removed. It measures the expansion of the stone as the wedge moves forward.
12. **PRECISION GAGE.** Used for measuring the bore before and after honing.
13. **GAGE SETTING FIXTURE.**
14. **PEDAL ASSEMBLY.** After pushing HONE START switch, depressing the pedal starts spindle motor, starts stroking motor, and expands honing stone. Releasing the pedal stops spindle rotation and retracts the stone.
    - **A. ADJUSTABLE PEDAL BAR.** Extends and retracts for operator comfort and to correspond with position of Work Tray. Pedal Bar may be operated directly with either foot, or with the Pedal.
    - **B. PEDAL BAR TENSION CONTROL.** Adjusts to provide desired pedal pressure and Pedal Bar return.
    - **C. PEDAL.** Adjusts for use with either right or left foot. Can be inverted for easier control when operator is sitting.
15. **OIL FLOW CONTROL MANIFOLD.** Provides independent regulation of oil flow to each jet through Total Volume Control Valve (15A) and individual Oil Jet Control Valves (15B). Total Volume Valve is used to turn oil on and off, eliminating readjustment of the Individual Control Valve settings.
16. **MOVABLE DRIP TRAY.** Adjusts to accommodate workpieces of varying lengths.
17. **HONING OIL NOZZLES.** Apply honing oil to workpiece and mandrel. Two independently controlled oil jets are easily positioned to assure an even flow of honing oil through the part being honed and over the full length of the mandrel.
18. **POWER STROKING UNIT.** Power source for stroking arm.
19. **SHAFT COVER.** Protects shaft from dirt.
20. **OIL SUPPORT BAR.** Attaches to Arm with Clamp Screw to hold oil nozzles.
21. **CLAMP SCREWS.** Used to attach Torque Support Bar, Oil Support Bar, etc.
22. **HONE START SWITCH.** Turns machine "ON" and starts oil pump motor.
23. **STROKE SWITCH.** Has two positions - MANUAL for manually-stroked honing; POWER for power-stroked honing.
24. **STOP SWITCH.** Stops oil pump motor and opens spindle and stroker motor circuits.
25. **FILTER.**
26. **WORK TRAYS.**
27. **RELIEF VALVE.**
28. **BYPASS VALVE.** Dumps excess honing oil from filter into reservoir to cut down pressure at Oil Flow Control Manifold.
29. **FILTER CONTAINER.**

30. **COVER CLAMP.**
31. **AIR VENT.**
32. **PUMP MOTOR.**
33. **PUMP.**
34. **SPINDLE COVER.**
35. **AMBER LIGHT.** Goes on when HONE START switch is pushed to indicate machine is "ON"
36. **V8 ROD SUPPORT.** Used when manually honing V8 connecting rods.
37. **SPECIAL THIN WRENCH.** Used to adjust support bushings.
38. **LOCKING NUT WRENCH.** Used on Connecting Rod Fixture Locking Nuts.
39. **HEX WRENCHES.**

1-4 SETUP FOR POWER STROKING CONNECTING RODS

Detailed instructions for setting up your Honing Machine for power stroking connecting rods are covered on the following pages. The sequence of steps is as follows:

1. Select honing unit.
2. Assemble CR honing unit.
3. Insert honing unit into spindle chuck.
4. Set up connecting rod fixture.
5. Set stroke length.
6. Set stroke position.
7. Set spindle speed.
8. Set stroke speed.
9. Position rod torque support.
10. Set cutting pressure.
11. Position oil lines and adjust oil flow.

a. SELECT HONING UNIT

(1) Determine connecting rod diameter.

b. Select correct Type CR honing unit (refer to Page 32 lot Stone Selection Chart).

b. ASSEMBLY CR HONING UNIT

The mandrel, tension block, shoes, and wedge are assembled at the factory. The following instructions, however, cover the complete assembly procedure (Figure 7).

(1) To Assemble Guide Shoes.

Put guide shoes in place and fasten with screws in shoe clamps (Figure 8). Do not tighten until later, when shoes are adjusted to fit curvature of con rod to be honed.

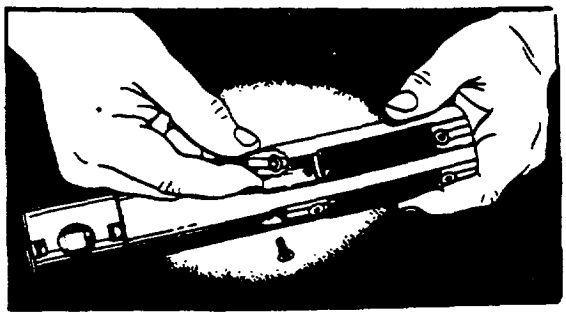


FIGURE 8

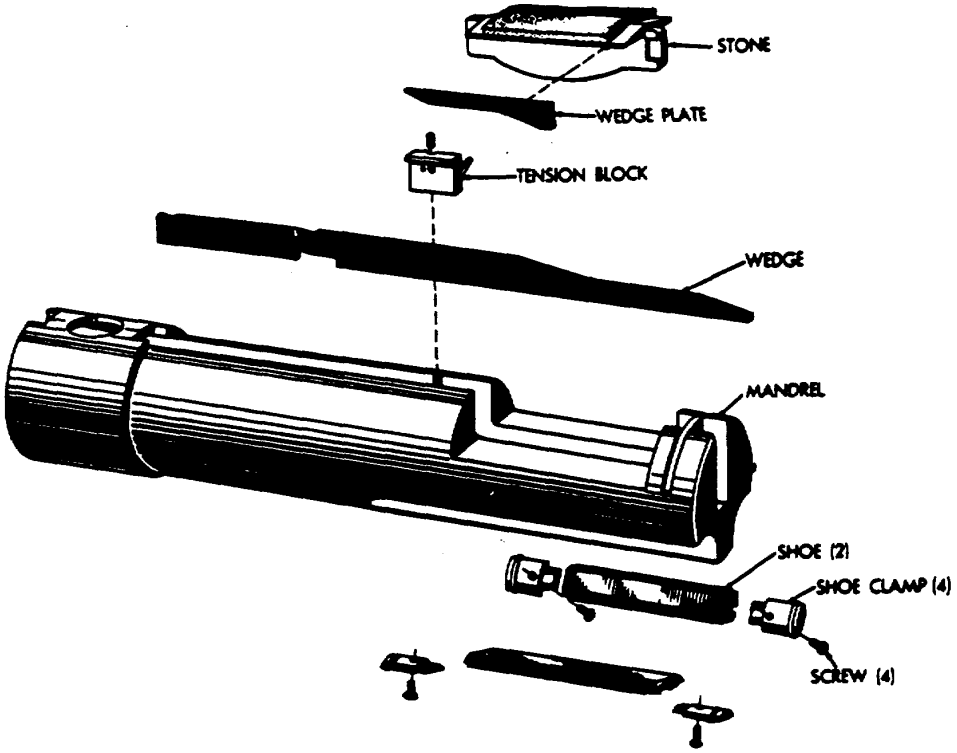


FIGURE 7

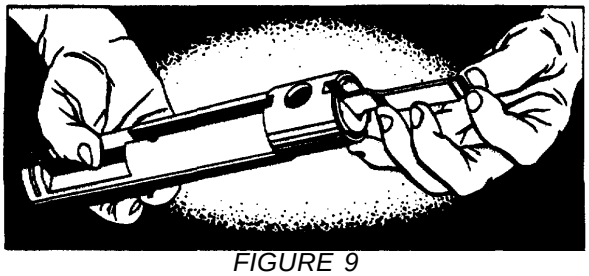


FIGURE 9

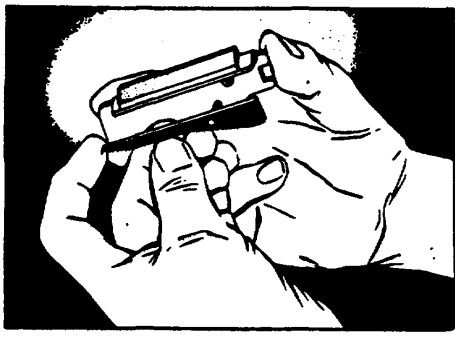


FIGURE 10

(2) To Install Wedge.
Insert wedge from end as shown (Figure 9), put tension block in place over wedge, and tighten set screw.

(3) To Insert Stone.

(a) Attach wedge plate to stone assembly by inserting pin into hole in stone holder as shown (Figure 10).

NOTE:

Large wedge plate is used when stone is worn and it is necessary to hone diameters in upper range of honing unit.

(b) Insert stone assembly and wedge plate into stone slot of mandrel, with wedge plate over wedge and with stone holder against tension block spring (Figure 11). Push against spring until entire assembly can be pressed down into mandrel slot.

c. INSERT HONING UNIT INTO SPINDLE

WARNING

Be sure power is off (amber light out).

(1) Back off feed dial (counterclockwise) all the way, then advance it clockwise about five turns (Figure 12).

(2) With stone in mandrel, pull wedge out as far as possible with wrench provided.

(3) Pull eccentric sleeve out until it is free to rotate, and set arrow on sleeve to the correct size range as indicated on sides of mandrel body (Figure 13). Push eccentric sleeve back onto mandrel shank, engaging locating pin with notch in sleeve.

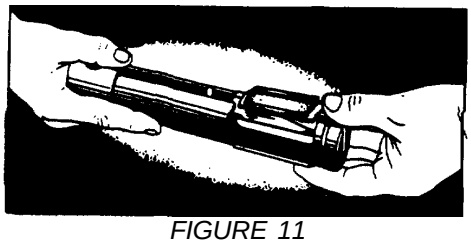


FIGURE 11

EXAMPLE: When honing a connecting rod crank pin hole with a diameter of 2.043", use CR-1900 honing unit and set arrow on eccentric sleeve to "over 2.000"."

(4) See Figure 14. Rotate spindle so that Large Set Screw is at 12 o'clock position. With stone of honing unit turned a quarter turn to right of large set screw, insert honing unit in spindle as far as it will go. Then rotate the honing unit a quarter turn clockwise and push unit in until it "bottoms". Tighten Large Set Screw:

WARNING

Make sure HONE START lamp is <u>not</u> on before performing next step.

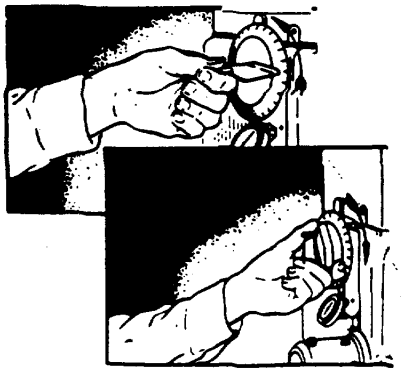


Figure 12

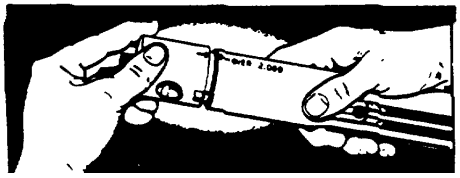


FIGURE 13

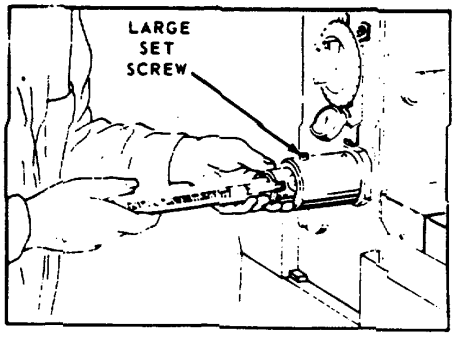


Figure 14

(5) Check the setup by depressing and releasing the Pedal or turning the Feed Dial in both directions. If wedge does not move forward and back, it did not engage with feed link. In that case, remove honing unit and repeat steps "b" and "d".

d. SETUP CONNECTING ROD FIXTURE

(1) Select and install Face Rings.

(a) Select proper Face Rings.

NOTE

Face Rings are stamped with part number and diameter range. Example: CRF-521*2.1-2.2**

(b) Install Face Rings.

(1) Remove Front Plate if previously installed.

(2) Remove Clamp Bars from both Front and Back Plates.

(3) Clean all surfaces thoroughly.

(4) Install Face Rings on Front and Back Plates. Tighten Clamp Rings evenly and securely.

(2) Set distance between Face Rings for proper rod width.

(a) See Figure 15. Install Brass Sleeves and Spacing Nuts.

(b) Place cap or rod between Spacing Nuts on Brass Sleeve.

NOTE

Brass Sleeve is used to protect threads on Spacing Studs.

(c) Adjust Nuts on each of the three Studs to just touch the rod or cap.

(d) Replace Front Plate.

(e) See Figure 16. Tighten Front Nuts and adjust Spacing Nuts so the rod or cap has a very slight drag between Spacing Nuts and Locking Nuts.

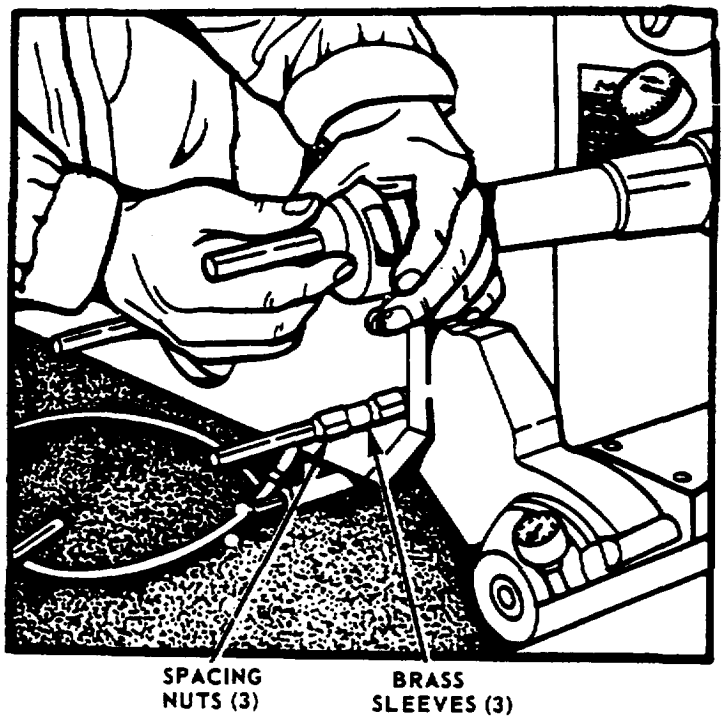


Figure 15

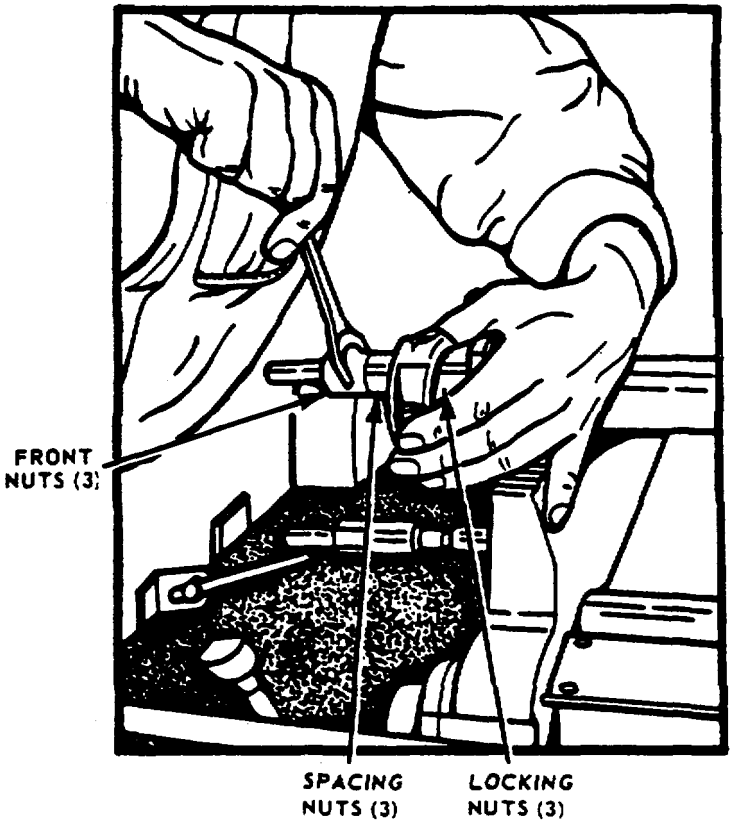


Figure 16

e. SET STROKE LENGTH

Set stroke length equal to CR stone length (2-11/16" or 68 mm).

a. See Figure 17. Loosen flat head Clamp Screw, move Notched Crank to Pin "A", and tighten Clamp Screw.

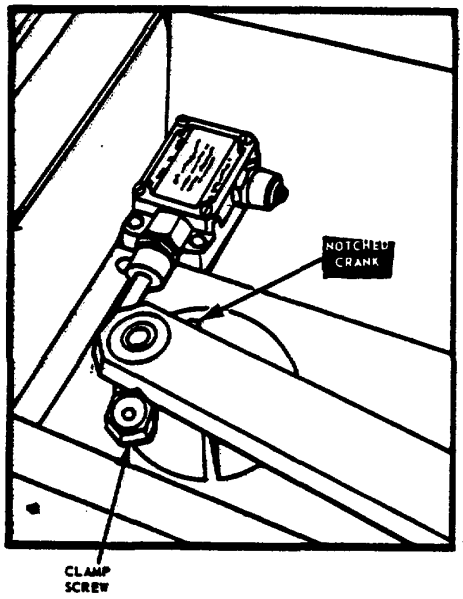


FIGURE 17

(2) See Figure 18. Loosen Clamp on Stroke Length Adjustment and rotate adjustment knob until Index Line coincides' with Red Line (1-11/32" on "B" Scale).

NOTE

If using other than CR-10, CR-12 or CR-14 stones for honing other than rods, make the stroke length equal to the stone or part, whichever is longer.

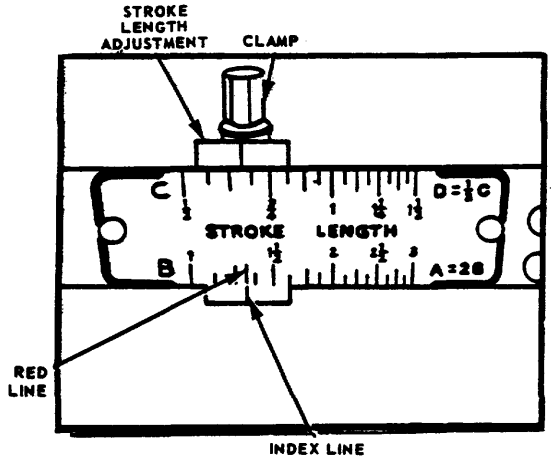


FIGURE 18

f. SET STROKE POSITION

(1) See Figure 19. Rotate Gear Box Pulley to put stroke at either extreme end.

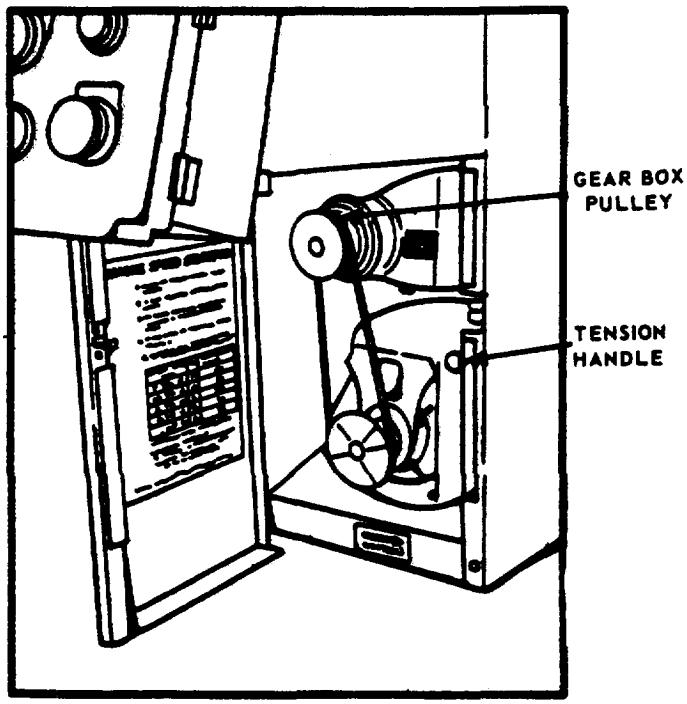


FIGURE 19

(2) See Figure 20. Rotate Arm Position Knob until the space between Face Rings is divided-half over the stone, half off the stone.

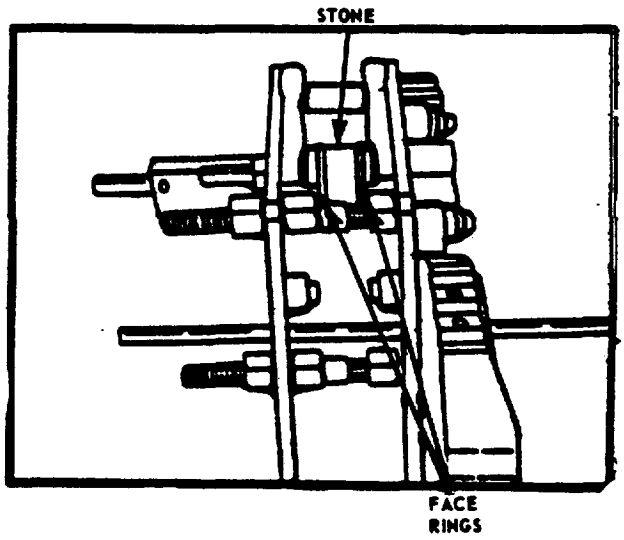


FIGURE 20

7. SET SPINDLE SPEED

(1) Use 320 RPM for most passenger car rods and light truck rods in 1.9" 2.6" (48-66 mm) diameter range.

(2) Use 250 RPM for large truck rods over 2.6" (66 mm) in diameter.

(3) To change speed, turn motor OFF and shift V-belt to groove providing desired speed (see Figure 21). For easiest belt shifting, always move belt to smaller diameter groove on either pulley first.

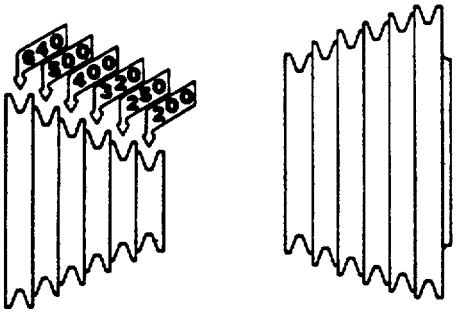


FIGURE 21

h. SET STROKE SPEED (see chart inside door)

(1) Use 80 strokes per minute (SPM) for most passenger car rods and light truck rods in 1.9" 2.6" (48-66 mm) diameter range. Use 55 SPM for large truck rods over 2.6" (66 mm) in diameter.

(2) Figure 19. Release tension on belt by lifting Tension Handle, and position belt in desired grooves. Release Tension Handle.

i. POSITION ROD TORQUE SUPPORT

See Figure 22. Position Rod Torque Support as close as possible to pinhole of rod without locating on curved portion of rod.

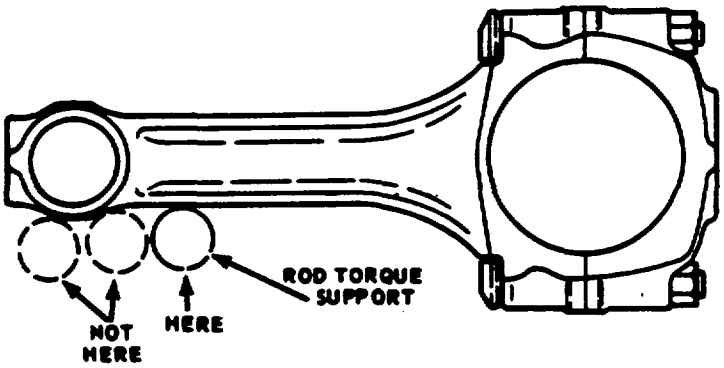


FIGURE 22

j. SET CUTTING PRESSURE

The Cutting Pressure Control is for setting the pressure of the stone against the work, and is numbered 1 to 8 (Figure 23). Turn dial to higher numbers to increase stone pressure against the work. Use lowest pressure that will give good cutting action and still stabilize the work on the honing unit. Generally, higher pressures re used for roughing operations, hard metals, and large holes. Until such time as experience dictates the best pressure settings, start out with position 2 or 2-1/2 for roughing and position 1-1/2 for finishing, and change as necessary to get proper cutting action.

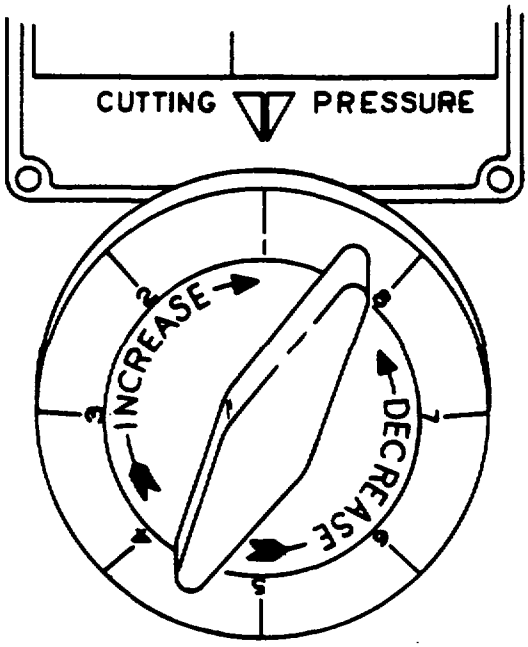


FIGURE 23

k. POSITION OIL LINES AND ADJUST OIL FLOW

(1) Make sure that you are using undiluted honing oil. This oil will ensure free cutting, reliable stone performance, and consistent surface finish.

(2) See Figure 24. Attach and adjust position of oil nozzles.

(a) Use rod extending from the machine and direct the oil flow so that it enters work-piece parallel to the mandrel. One jet should point forward toward the rear of the mandrel shoe and the other jet should point rearward toward the front of the mandrel shoe.

(b) If you prefer, clamp the oil rod to the stroking arm, again directing the oil flow parallel to the mandrel.

NOTE

Run stroke through one cycle manually to check if oil nozzles are in the way.

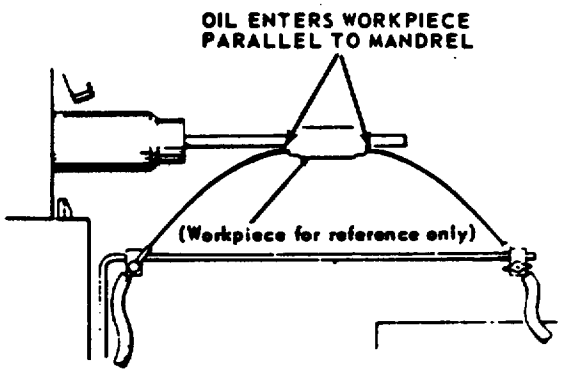


FIGURE 24

(3) Adjust oil flow control valves.

(a) Adjust individual Oil Jet Control Valves to get an even flow of oil from front and rear jets. This is necessary to hone straight parts.

(b) Adjust Total Volume Control Valve so that oil that floods mandrel shoe.

1-7 HOW TO POWER HONE CONNECTING RODS

a. Pull Release Handle toward you.

b. See Figure 25. Pull Arm and Connecting Rod Fixture away from the machine so fixture opening Clears end of Mandrel.

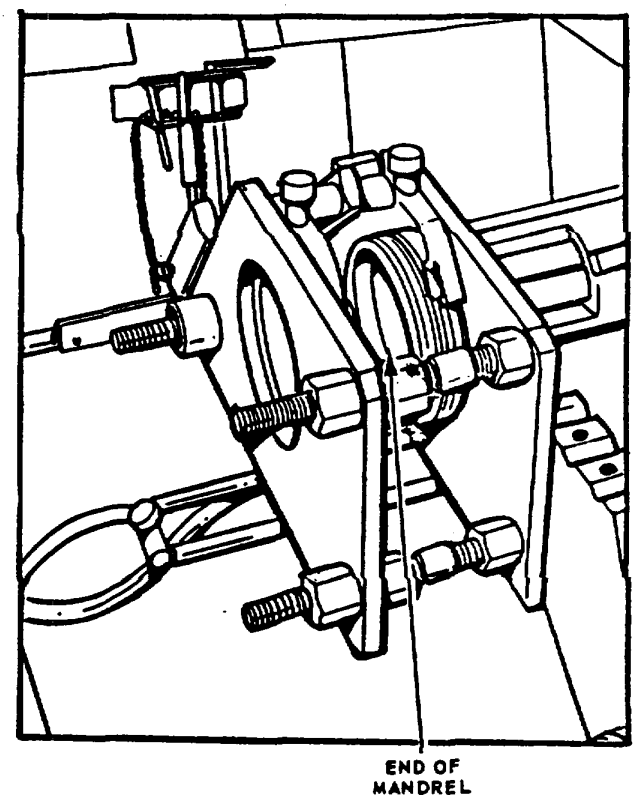


FIGURE 25

c. Push Release Handle back.

d. With motor Oil, rotate Mandrel so the shoes are up and retract the stone all the way.

e. See Figure 26. Slide a rod that has been ground and torqued into fixture opening with rod shank up.

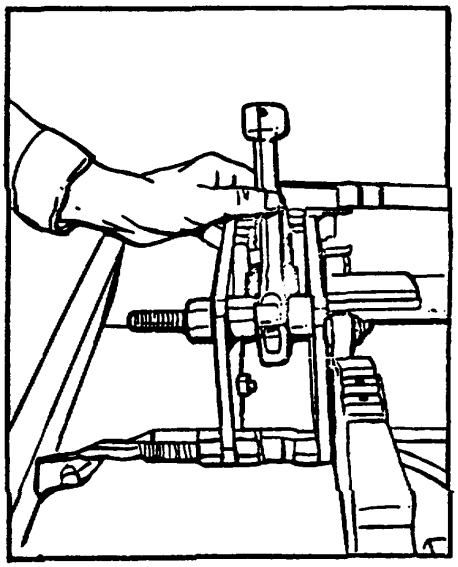


FIGURE 26

f. Push Fixture and Arm toward the machine so the rod will slide onto the mandrel. Push Arm toward machine until it locks in place.

g. With Rod Shank still up and HONE START lamp off, depress machine pedal and feed up stone until there is a reading (approximately 5) on the honing dial. Loosen shoe set screw and adjust mandrel shoes to the curvature of the rod by tapping rod shank lightly. Tighten shoe set screws (do not overtighten).

h. Adjust stone feedup until the honing dial indicates the amount of stock removal desired.

i. See Figure 27. With machine pedal still depressed, set Feed Marker at Index Line while holding Feed Dial.

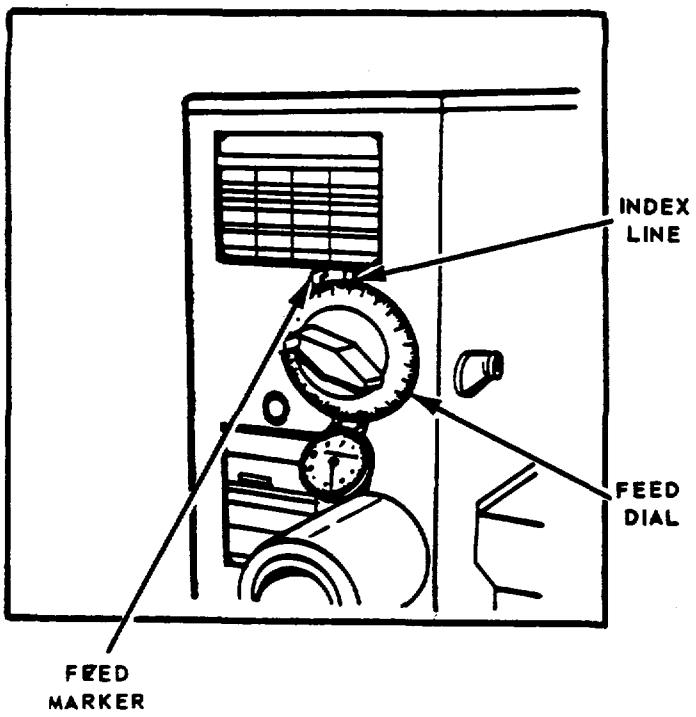


FIGURE 27

j. Release machine pedal.

k. See Figure 28. Back off Feed Dial until Feed Marker is at 8 o'clock position.

NOTE

Feed Marker will move with Feed Dial.

l. Push HONE START button and turn STROKE switch to POWER.

m. Depress machine pedal slowly all the way to the floor.

n. Slowly advance Feed Dial until Feed Marker reaches Index Line.

NOTE

The sound of honing and the pull on the honing machine motor will dictate how fast Dial can be advanced.

o. Stop honing when honing dial reaches "0".

NOTE

On the first rod, the honing dial needle may not leave the red line. If this happens, stop honing when Feed Marker reaches Index Line.

p. Pull Release Handle toward you.

q. Pull rod and Fixture toward you.

r. Push Release Handle toward machine.

s. Remove and gage the connecting rod.

t. Advance Feed Dial the amount needed to bring the rod to size.

NOTE

Feed Marker will stay at Index Line.

u. Back off Feed Dial until Feed Marker is at 8 o'clock position.

v. Place rod back into Fixture and push Arm into locked position.

w. Repeat Steps 13 through 19 until rod is to size.

x. Before honing the second rod, back Feed Dial off until Feed Marker is at 8 o'clock position.

y. Continue to hone according to the procedure in Steps 13 through 19 until the second rod is to size.

z. Use the same procedure to hone the remaining rods. If desired, stone breakdown can be added before honing a rod by advancing Feed Dial the amount required before backing Feed Marker off to the 8 o'clock position.

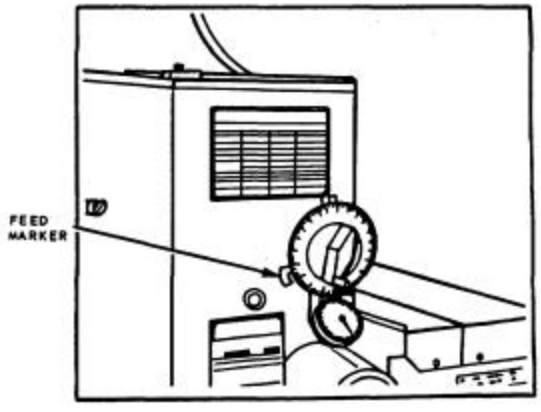


FIGURE 28

1-8 SET UP FOR MANUAL STROKING

a. Detailed instructions for setting up your Honing Machine for manual stroking are covered on the following pages. The sequence of steps is as follows:

(1) Select honing unit.
(2) Assemble honing unit if necessary.
(3) Insert honing unit into the spindle.
(4) Select and set spindle speed.
(5) Set cutting pressure.
(6) If necessary, center honing unit (reduce runout) using eccentric sleeve.
(7) Stroking procedure.
(8) True the stone and mandrel.
(9) Adjust the work support (if used).

b. SELECT HONING UNIT

(1) For best results, always use the honing unit that is designed for the job to be done.

(2)

TYPE OF HONING UNIT	TYPE OF WORK
RYY, SL, SYY, LH, LJ,	Pin fitting in pistons
3ML, 3PL	(both bushings at the same time)
KL, 1PL, RL	Pin fitting in con rods, and cylinder reconditioning in small bore engines.
3ML, 4ML, 5ML, 4PL, 5PL, UL	King pin fitting
HB, SC, RL, KL	Reconditioning hydraulic brake cylinders
CR	Con-rod reconditioning

(3) When fitting new piston pins in new standard bushings it is faster to use a roughing operation (with a coarse grit stone) to bring the bushings almost to size, then finish up with a finishing operation (with fine grit stone).

See Page 32 for Stone Selection Chart.

c. ASSEMBLE HONING UNIT

Be sure the mandrel, adapter (it any), shim (if any), wedge, and stone ace assembled correctly according to the instructions.

d. INSERT HONING UNIT INTO SPINDLE

WARNING

Be sure power is off (amber light out).

(1) Back off feed dial (counterclockwise) all the way, then advance it clockwise about turns. (Figure 29).
(2) With stone in mandrel, pull wedge out as far as possible with wrench provided.
(3) Install eccentric spindle sleeve if required.

NOTE

For Type CR honing units pull eccentric sleeve out until it is tree to rotate, and set arrow on sleeve to the correct size range as indicated on sides of mandrel body. (Figure 30). Push eccentric sleeve back onto mandrel shank, engaging locating pin with notch in sleeve.

EXAMPLE: When honing a connecting rod crank pin hole with a diameter of 2.043", use CR-1900 honing unit and set arrow on eccentric sleeve to "over 2.000".

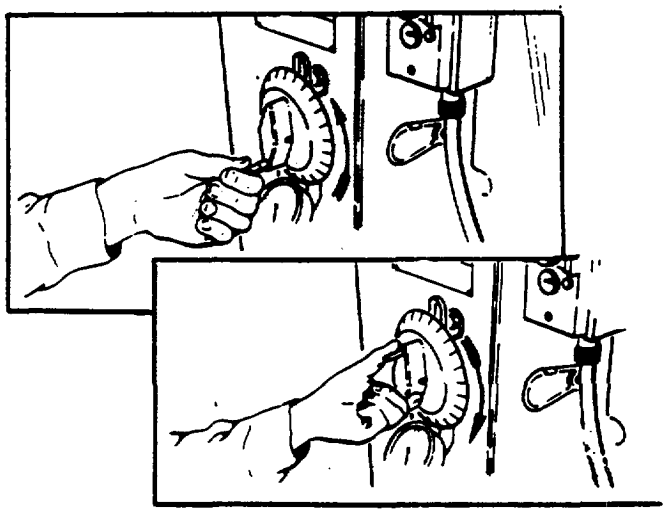


FIGURE 29

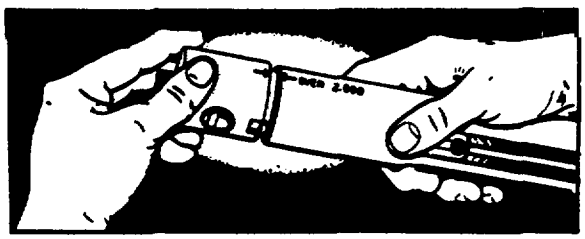


FIGURE 30

(4) With power shut off (?), spindle so that large set screw is at 11 o'clock position. With stone of honing unit turned a quarter turn to right of large set screw, insert honing unit in spindle as far as it will go (Figure 31). Then rotate the honing unit a quarter turn clockwise and push unit in until it "bottoms". Tighten large set screw.

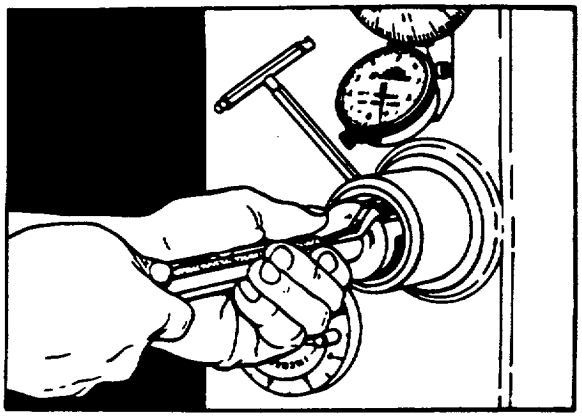


FIGURE 31

(5) Check the setup by depressing and releasing the Pedal or turning the Feed Dial in both directions. If wedge does not move forward and back, it did not engage with feed link. In that case, remove honing unit and repeat steps "b" and "d".

e. SELECT AND SET SPINDLE SPEED

(1) To change speed, turn motor OFF. Open belt cover and pull tension release handle to detent. Shift V-belt to groove providing desired speed (Figure 32). For easiest belt shifting always move belt to smaller diameter groove on either pulley first. Release belt tension, release handle, and close belt cover.

(2) The following chart is a guide to use in selecting the proper speed. Condition of the bore and other variables may require you to try a faster or slower speed than that indicated in the chart.

DIAMETER OF HOLE TO BE HONED		SPINDLE SPEED
2" and over	51 mm and over	200
1-1/2"	38 mm	250
1"	25 mm	320
7/8"	22 mm	400
3/4"	18 mm	500
1/2" and under	13 mm and under	640

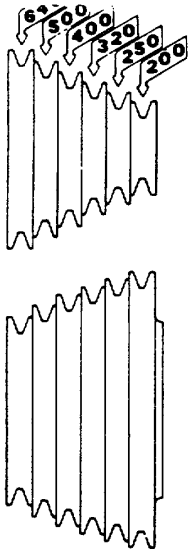


FIGURE 32

f. SET CUTTING PRESSURE

The Cutting Pressure Control is for setting the pressure of the stone against the work, and is numbered 1 to 8 (Figure 33). Turn dial to higher numbers to increase stone pressure against the work. Use lowest pressure that will give good cutting action and still stabilize the work on the honing unit. Generally, higher pressures are used for roughing operations, hard metals, and large holes. Until such time as experience dictates the best pressure settings, use position 2 or 2-1/2 for roughing and position 1-1/2 for finishing.

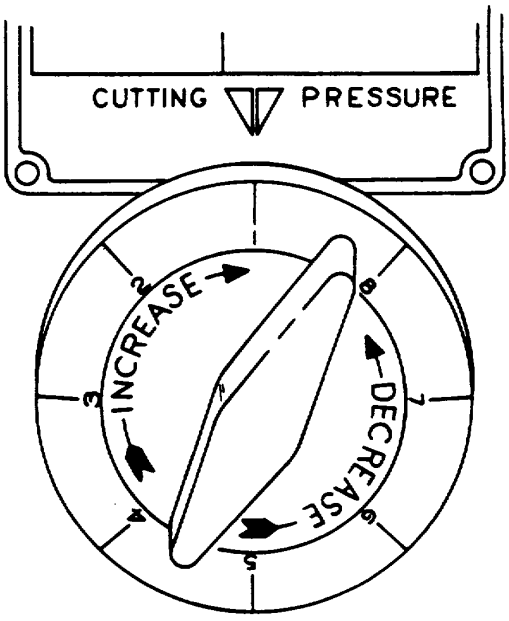


FIGURE 33

g. REDUCE RUNOUT OF HONING UNIT

(1) As mandrel shoes wear, and honing unit is used in upper end of its diameter range, the center of the honing unit may be offset with respect to the center of the spindle chuck. This will cause runout

(2) Although runout is not objectionable for most applications, certain honing units are designed to be used with an eccentric sleeve (furnished with the machine). Rotating this sleeve one-half turn will reduce the runout sufficiently (Figure 34).

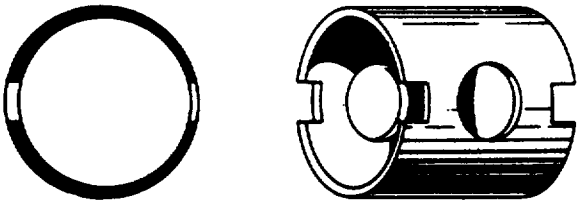


FIGURE 34

h. STROKING PROCEDURE

(1) Place the piston, rod, or other part on rear of honing unit as shown (Figure 35). Depressing Pedal slowly, stroke the part forward and back on honing unit, at a rate of about one complete stroke each second. Release Pedal before removing part.

WARNING

Do not remove part while mandrel is still rotating.

(2) Length of stroke should be such that the part is stroked over the ends of the stone, by 1/3 to 1/2 the length of the hole (or piston boss if the part is a piston).

(3) Proper stroking assures that the entire length of stone and guide shoes wears uniformly, keeps stone and shoes true, and assures accuracy.

(4) Reverse the work end for end frequently to help keep shoes and stone true.

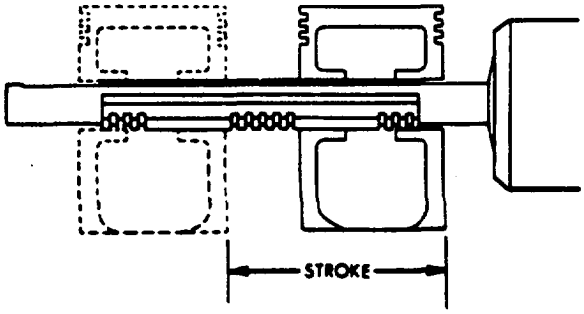


FIGURE 35

i. TRUE THE STONE AND MONDREL

WARNING

Do not attempt to rotate the mandrel by hand when the HONE START lamp is on. If pedal is depressed, the mandrel will rotate with full power. Push STOP switch and then depress pedal to release brake. Only then should you attempt to rotate the mandrel.

(1) For accurate work the surfaces of the honing stone and the two guide shoes must be parallel. Therefore, when starting with a new honing unit, with new guide shoes, or with a new stone in a used honing unit, it is necessary to "true in" the stone and mandrel. The truing procedure is as follows:

a. Set the Cutting Pressure Control according to the following table:

SIZE OF HONING UNIT		CUTTING PRESSURE FOR TRUING
3/8" - 1/2"	9- 13 mm	1
1/2" - 1"	13 - 25 mm	1-1/2
1" up	25 mm up	2

If a great deal of truing is needed, use a lower pressure than recommended at first. Increase pressure as stone and mandrel true in.

(2) Retract stone by turning Feed Dial counterclockwise to end of range. Adjust oil line to direct oil down into drain pan. Apply honing oil sparingly to the stone, using brush or finger. Slide truing sleeve onto honing unit and depress Pedal.

(3) Advance Feed Dial until Honing Dial needle reads 3 or 4 (Figure 36). Release Pedal. Start motor, and while stroking truing sleeve forward and back on the mandrel, depress Pedal slowly until crank arm hits stop pin. Overstroke each end of the stone by 1/3 to 1/2 the length of the truing sleeve. Stone surface must be overstroked by same amount on each end. Reverse truing sleeve frequently. Always release Pedal to stop rotation of honing unit before removing the truing sleeve.

(4) Whenever Honing Dial needle drops to zero, release Pedal and advance Feed Dial 3 or 4 numbers. If the Honing Dial needle does not move during the truing operation, increase the cutting pressure by one-half number. If the needle moves too fast, or if the honing torque is too great, decrease the cutting pressure by one-half number. Truing process is complete when stone and guide shoes are radiused and show contact over their full length. Shoes do not have to show contact across their full width.

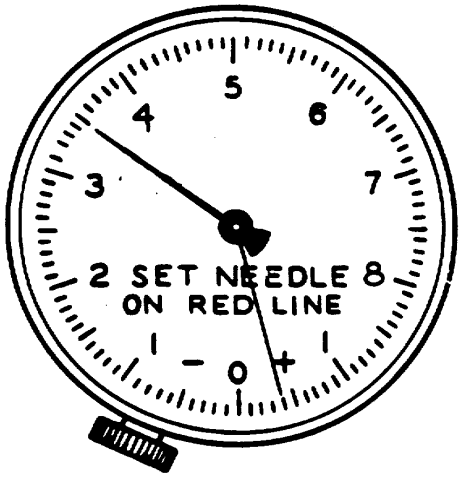


FIGURE 36

(3) Use the truing sleeve sparingly. Excessive use of the truing sleeve causes undue wear. After a few reversals of the sleeve, stop the machine and visually inspect the mandrels and stones. High spots on the stone will be "loaded" (Figure 37). Use an abrasive dressing stick to remove high spots. High spots on guide shoes will be bright and shiny. A few light strokes with a file will true most guide shoes. Truing sleeve thus is used as a straightedge and will last longer. Truing time is reduced. Truing sleeve should be as near as possible to size of hole to be honed, so that curvature of shoes fits the curvature of the hole.

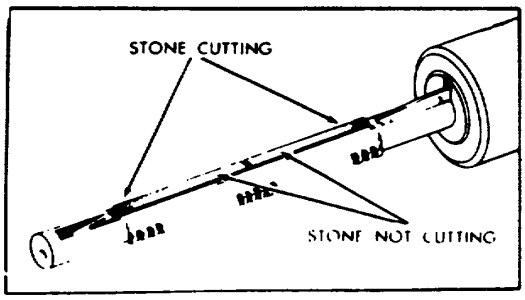


FIGURE 37

j. ADJUST WORK SUPPORT

The work support makes accurate work easier when honing long unbalanced parts such as connecting rods and spindle bodies. Bar should be placed approximately under center of gravity (balance point) of the work.

1-9 HOW TO HONE WITH MANUAL STROKING

WARNING

Do not attempt to rotate the mandrel by hand when the HONE START lamp is on. If pedal is depressed, the mandrel will rotate with full power. Push STOP switch and then depress pedal to release brake. Only then should you attempt to rotate the mandrel.

a. FITTING PINS IN POSITION

(1) This pin fitting method permits definite control of clearances and produces holes that are round and straight and have a very fine surface finish. This assures full bearing contact and unbroken oil film, and gives long life to the parts.

(2) Pins fitted by this method will feel absolutely free men though the clearance may be only a "tenth". With such a precise pin fit on a precision gage because a "feel" fit in a honed hole an only indicate clearance of Iens than .0001 (.003 mm). This clearance is insufficient to maintain a proper oil.

(3) Except when fitting oversize pins, there will usually be a considerable amount of stock to be removed from the bushings. It is generally faster to size the hole in two operations - rough honing for bringing the hole almost to size, followed by finish honing to remove the last two thousandths of stock and produce the proper surface finish.

(a) Rough Honing.

(1) Set the Precision Gage as instructed for piston pin fitting.

(2) Insert honing unit with roughing stones in honing machine and set cutting pressure dial between 2 and 2-1/2 (Figure 38).

(3) To gage the piston to see how much stock must be removed, hold piston lightly with thumb on edge of skirt and fingers under crown as shown in Figure 39. Slip the piston first over Adjustable Finger point, then slide it over the Size Indicating Finger point, as shown in Figure 40. Allow piston to hang from centralizer point, but do not contact face of gage with piston. Make certain that gaging and centralizer points clear oil holes or grooves in the bushing or pin boss. Hold piston level and rock it to right and left as shown in Figure 41 to obtain maximum gage indicator reading (maximum counterclockwise movement of indicator hand). IMPORTANT: Note that this rocking movement is from side to side in a horizontal plane, instead of a vertical plane as with the setting fixture.

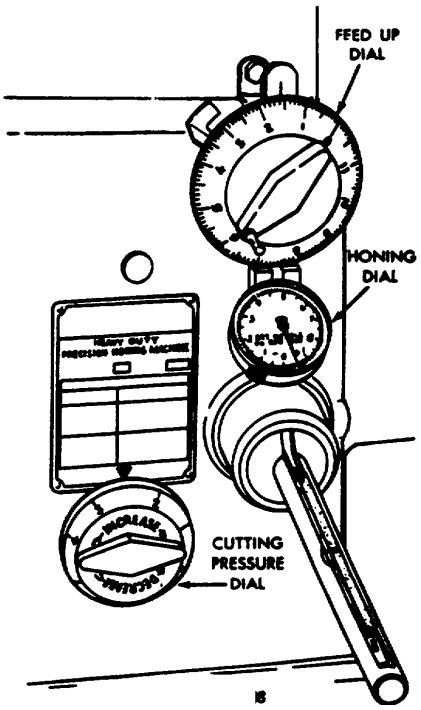


FIGURE 38

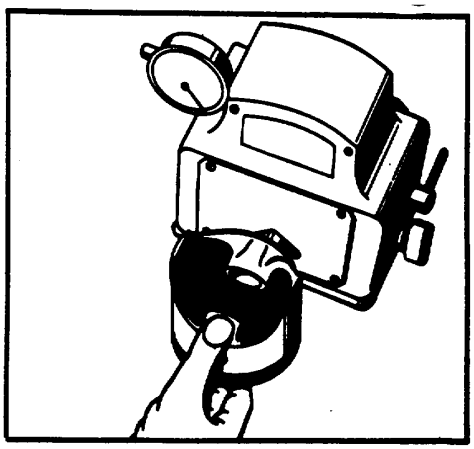


FIGURE 39

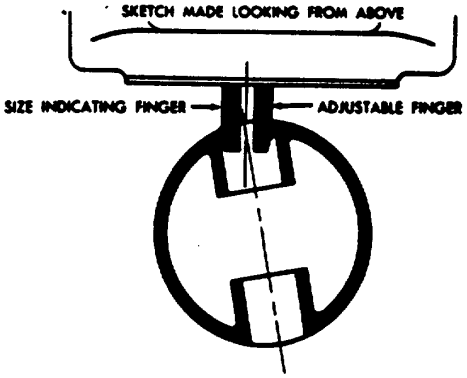


FIGURE 40

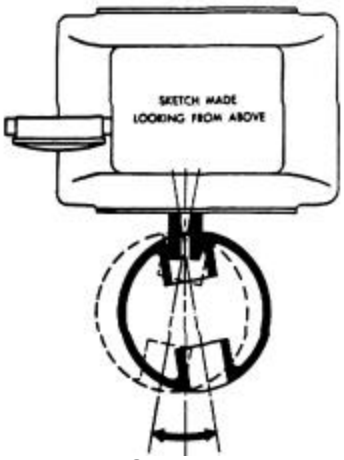


FIGURE 41

NOTE

Gage will show amount of stock under finished size, up to 7 thousandths (.18 mm). If bushing has more than 7 thousandths to be removed, do not force piston on gage, but hone out enough stock (as in Step 4) until piston will fit on gage.

(4) Fitting New Pins To New Bushings.

(a) Push STOP button. Fully depress Pedal and back off Feed Dial until piston will go on honing unit. Position piston over rear stone (stone nearest machine).

(b) With Pedal still fully depressed, advance Feed Dial until Honing Dial points to zero while rotating piston slightly in both directions to seat it on honing unit. From this position the Feed Dial should be advanced as needed for required stock removal.

(c) When fitting standard pins to new bushings with excessive stock, advance Feed Dial until Honing Dial reads approximately 7, or as indicated by AG-300 Gage (Pedal still fully depressed). (With the part to be honed on the honing unit and the stone expanded to contact the hole, further turning of the Feed Dial actuates the automatic stone feed mechanism which then ? the stone during honing, to the limit as set on the Feed Dial.)

(d) Release Pedal. Piston should now be free on honing unit. Do not remove piston.

(e) Push HONE START button and adjust oil flow.

(f) Place piston over rear stone, grasp it securely with both hands and slowly depress Pedal all the way, while stroking piston back and forth on honing unit. Reverse piston on mandrel occasionally to keep mandrel and stone true. Always start stroking from rear. Continue honing until Honing Dial reads zero. Never hone past zero.

(g) Release Pedal and remove piston from honing unit.

(h) Gage piston as in step a (3).

(i) Adjust Feed Dial by amount shown on the gage, less the 2 thousandths needed for the finishing operation.
EXAMPLE: It gage reads 5 thousandths undersize, advance Feed Dial 3 thousandths (three numbers when using piston type honing units - see machine nameplate).

(j) Continue honing until Honing Dial again reads zero, and gage for size.

(k) Gage will now show approximately 2 thousandths stock left for finishing operation.

NOTE

Because of stone wear, the amount of stock removed will always be less than the amount the Feed Dial was advanced.

(l) The machine now is properly set for roughing the remaining pistons, with no further adjustments necessary except to compensate for stone wear.

(b) Finish Honing.
After all pistons have been rough honed, proceed with finish honing as follows:

(1) Turn honing machine motor OFF, remove roughing mandrel and insert finishing mandrel. Set Cutting Pressure Dial to approximately 1-1/2.

(2) Adjust machine as in step a (4) (a).

(3) Adjust Feed Dial as in step a (4) (b).

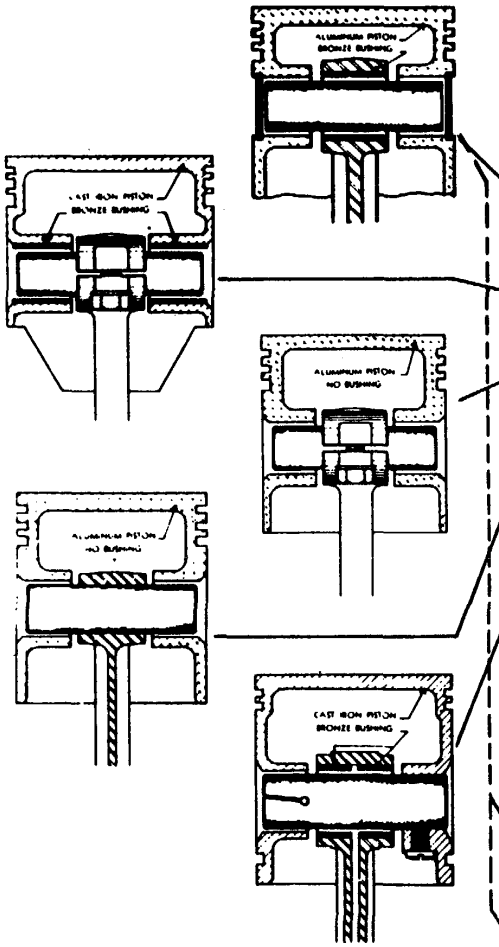
(4) Advance Feed Dial until needle of Honing Dial reads approximately the stock to be removed.

(5) Same as steps a (4) (d) through a (4) (g). Reverse piston on mandrel occasionally so the stones will wear evenly (be sure to stop mandrel by releasing Pedal before taking piston off mandrel).

(6) Now place piston on gage as in roughing operation. If gage shows hole to be within recommended pin clearance size, piston is finished. If hole is still undersize, advance Feed Dial the amount the hole is undersize. Replace piston on mandrel

Table 1

RECOMMENDED PIN CLEARANCES



PRECISION PIN FITS ON ENGINES WITH 3/4" TO 1-1/4" (19 TO 32mm) DIAMETER PINS

Description	Aluminum Piston	Cast Iron Piston	Connecting Rods
Full Floating	.0001" to .0003" (.003 to .008 mm) clearance	.0003" to .0005" (.008 to .013 mm) clearance	.0003" to .0005" clearance (.008 to .013 mm) (all pressure feed, .0005" to .0007" (.013 to .018 mm) clearance.)
Oscillating in bushed piston		.0003" to .0005" (.008 to .013 mm) clearance	clamped in Rod
Oscillating in piston (no bushing)	.0003" to .0005" (.008 to .013 mm) clearance	.0006" to .0008" (.015 to .020 mm) clearance	clamped in Rod
Oscillating in piston —press fit in Rod	.0003" to .0005" (.008 to .013 mm) clearance		.0008" to .0012" (.020 to .030 mm) press fit
Set Screw Type Piston	Screw Side, .0002" to .0003" (.005 to .008 mm) press fit	Screw Side, .0001" to .0002" (.003 to .005 mm) press fit	When locked in piston, and all pressure feed: .0007" to .0009" (.018 to .023 mm) clearance
	Free Side, 0 to .0001" (0 to .003 mm) clearance	Free Side, 0 to .0001" (0 to .003 mm) clearance	

PRECISION PIN FITS ON ENGINES WITH 1-1/4" (32mm) AND 1-1/2" (38 mm) DIAMETER PINS*

Description	Aluminum Piston	Cast Iron Piston	Connecting Rods
Full Floating 1¼" (32 mm) dia. pin holes	.0003" to .0005" (.008 to .013 mm) clearance		.0007" to .0009" (.018 to .023 mm) clearance (all pressure feed, .0009" to .0011" (.023 to .028 mm) clearance.)
Full Floating 1½" (38 mm) dia. pin holes	.0005" to .0007" (.013 to .018 mm) clearance		.0010" to .0012" (.025 to .020 mm) clearance (all pressure feed, .0013" to .0015" (.033 to .038 mm) clearance)

This chart is to be followed only when piston pin holes are honed by this company's method.

The clearances shown are not applicable when less accurate methods are used.

* On large diameter pins check Engine Manufacturers Manual for recommended clearances.

and hone until Honing Dial again reads zero. Gage should now show pin hole to be within the recommended clearance.

(7) Finish hone the remaining pistons. Gage each one and advance Feed Dial as necessary to compensate for stone wear.

b. HONING AND GAGING PIN END OF CON RODS

(1) Con rods are honed in the manner outlined for pistons, except always start and stop stroking in the middle of the stone. Also, use a con rod type of honing unit. Keep in mind that the stone in some honing units advances twice as fast as a stone in a piston type honing unit. Use same cutting pressure setting or 1/2 division higher setting than used for honing pistons.

NOTE

To remove .003" stock with a con rod honing unit, advance the Feed Dial only one and a half dial numbers instead of three as with a piston type honing unit. See nameplate on honing machine for stone advance for various type honing units.

(2) Gaging is similar to that of pistons. Hang the rod freely from the gage centralizer point as shown in Figure 42. Do not touch face of gage with rod. Rock the rod from side to side (Figure 43) to determine hole size as shown by minimum indicator reading.

c. HONING AND GAGING CON RODS WITH INTERFERENCE OR PRESS FITS

(1) Most engines require the pin to have a press fit in the rod, and the exact interference fit is necessary.

(2) Follow the same procedure outlined above. Set pin size to zero. Rotate front bezel of indicator to set limit marker to desired amount of interference in "INTERFERENCE" (Red) area of indicator dial. Stop honing when indicator hand reaches limit marker.

d. HONING AND GAGING CRANK PIN END OF CON RODS

NOTE

V-8 rods and rods with narrow bearings should be honed two at a time. (Figure 46).

(1) Select proper size CR honing unit and insert it in spindle chuck.

(2) Install correct extension points in AG-300 gage.

(3) Set the cutting pressure between 2-1/2 and 3-1/2.

(4) Push STOP button. Rotate machine spindle by hand until mandrel shoes are on top. Loosen the four shoe clamp screws about 1/2 revolution with wrench provided. Place con rod vertically on mandrel at center of shoes (Figure 44). Fully depress Pedal and keep it fully depressed until screws are tightened. Expand stone by turning Feed Dial clockwise until con rod is held firmly on honing unit.

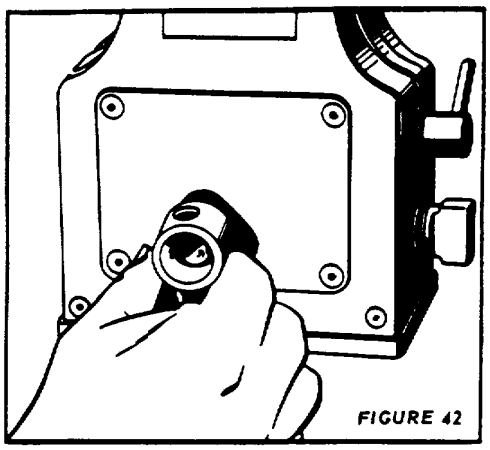


FIGURE 42

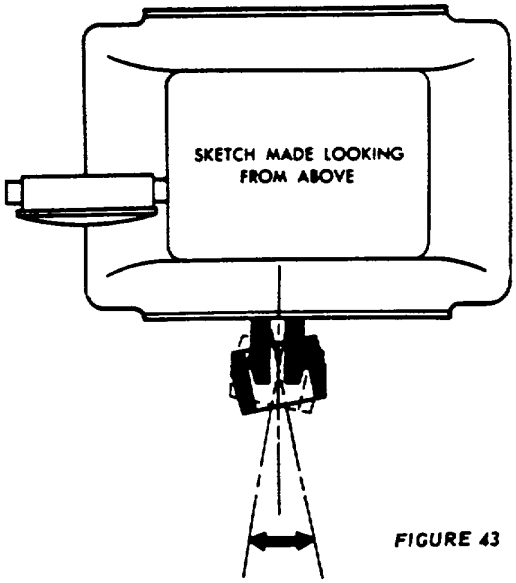


FIGURE 43

43

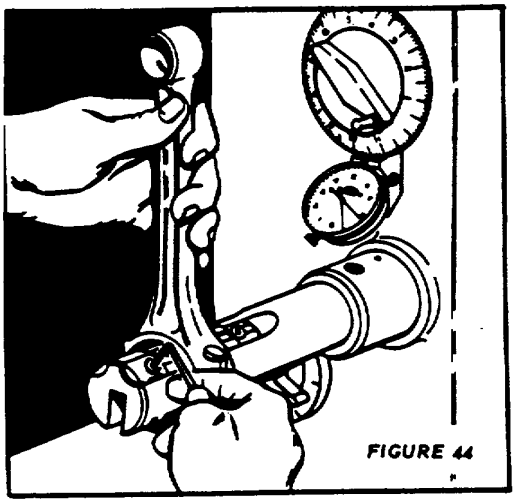


FIGURE 44

(5) Slight tapping on end of con rod will aid in seating shoes. Tighten all four shoe clamp screws firmly, making sure each shoe contacts inside surface of hole at two points, but do not overtighten screws. Back off Feed Dial until Honing Dial reads zero with Pedal still fully depressed.

(6) No truing is required. Type. CR honing units, stones and shoes are self-truing (no Truing Sleeve is furnished).

(7) Release Pedal. Set machine to proper speed.

(8) Check rod bore to determine stock to be removed. This is done by using the AG-300 Precision Gage (Figure 45). With side of con rod against face of gage, exert a very light pressure on the rod downward and toward the left to obtain accurate measurement.

(9) Push HONE START button. Be sure to use the Work Support (Figure 46). Start stroking and depress Pedal slowly until it is all the way down. While stroking the con rod over the stone, advance the Feed Dial to keep stone in contact with con rod.

(10) Because of the out-of-round condition of the rod at this stage, the Honing Dial may be inoperative. As the hole rounds up, however, the Honing Dial may be used as in fitting piston pins.

(11) After the first rod has been sized, note the setting of the Feed Dial. Now, put the next rod on the honing unit, and hone until the Honing Dial needle is on zero, with Feed Dial returned to its previous setting. Gage the con rod and advance Feed Dial if necessary to compensate for stone wear. Hone to zero again and note position of Feed Dial.

(12) Repeat the procedure for additional rods in same set.

e. EXPANDING BUSHINGS into RODS, PISTONS, SPINDLE BODIES

(1) Select proper size AL or ALH mandrel for the bushing to be expanded: Assemble according to instructions on Page 29, and insert expander unit in spindle chuck.

(2) ADJUSTING THE MACHINE. Set belt for 200 RPM spindle speed. Turn Cutting Pressure Control to Number 8. For con rods and spindle bodies, adjust Work Support to take the torque.

(3) Direct a stream of honing oil onto the mandrel. DO NOT USE DRY.

(4) EXPANDING THE BUSHING. After the bushing has been pressed into the bore, place the part on the polished Expander Bit (Figure 47). Push Stop button. Depress Pedal and turn the Feed Dial to the right until the mandrel has expanded to the inside diameter of the bushing. Release Pedal.

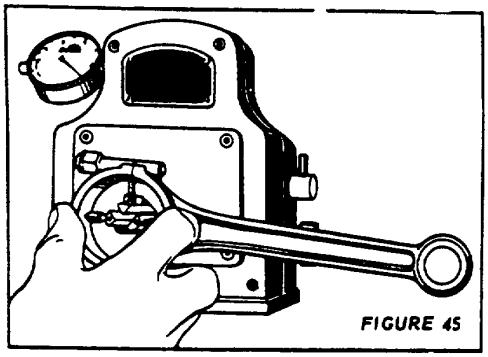


FIGURE 45

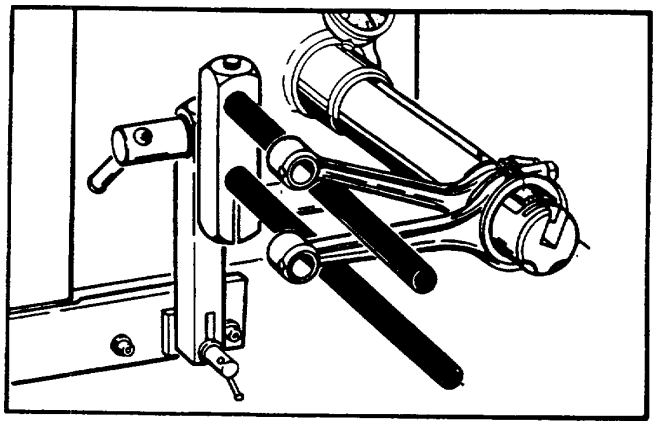


FIGURE 46

(5) Push HONE START button. Depress Pedal and stroke the part over the Expander Bit, advancing the Feed Dial until the Bit can be felt as the bushing passes over it.

(6) Advance the Feed Dial two to three numbers and slowly stroke the part across the Expander Bit several times to expand the bushing into the bore of the part.

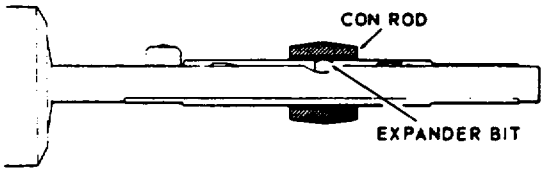


FIGURE 47

(7) When expanding bushings that have large grooves or oil holes, make sure Expander Bit doesn't drop into the grooves or holes.

(8) Examine inside of bushing; if properly expanded most of the inside surface will be burnished by the Expander Bit. Otherwise, advance the Feed Dial a few thousandths and repeat the operation.

(9) After the desired Expander setting has been found, all bushings of the same size may be expanded without further adjustments of the Feed Dial.

CAUTION

CARE MUST BE EXERCISED TO AVOID EXCESSIVE EXPANSION AS A SUFFICIENT AMOUNT OF MATERIAL MUST REMAIN FOR HONING TO FINISHED SIZE.

(10) FACING CUTTER. During the expanding operation, some of the bushing metal may have been squeezed out past the end of the bore. After expanding the bushing, slide the part to the rear of the mandrel and trim off the extruded portion of the bushing with the Facing Cutter. Reverse the part on the mandrel and trim opposite end (Figure 48).

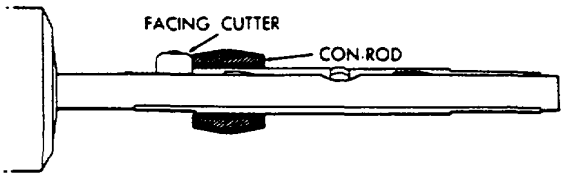


FIGURE 48

(11) The Facing Cutter is designed to trim soft bushing materials without cutting the rod. It is provided with a cutting edge on each end so that it can be turned around for additional service.

f. FITTING KING PINS

(1) Honing units for fitting king pins are extra long in order to get perfect alignment between bushings and to allow proper overstroking.

(2) Adjust the Work Support to absorb the honing torque (Figure 49). Use medium cutting pressure (2 or 3). See Page 14 for spindle speed selection. As with other new bushings, depress Pedal slowly until initial roughness is removed.

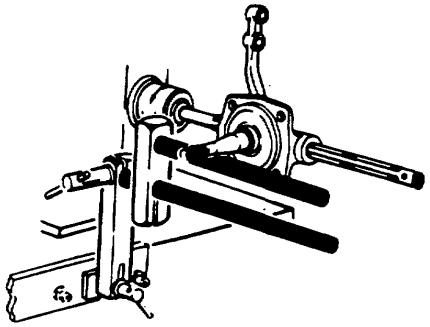


FIGURE 49

g. HONING HYDRAULIC BRAKE CYLINDERS

(1) Types SC and HB mandrels are used for hydraulic brake cylinder work.

(2) Keep the stone wet with a flow of honing oil. Start honing with light cutting pressure and stroke the full length of the hole. Type HB and SC stones are spring loaded and will wear rapidly if cutting pressure is heavy enough to collaps the spring.

(3) SIZING. To remove stock rapidly, use SC-7 HB-7, XSC-7, XHB-7, or KB-7 stone to remove deep scratches and true the bore.

(4) FINISHING. Use SC-13, HB-13, XSC-13, or XHB-13 stone to produce the finish needed for hydraulic brake cylinders.

(5) CLEANING. Cylinders must be cleaned thoroughly after honing to remove all traces of grease or oil.

h. HONING SMALL BORE ENGINES, ETC.

Small bore engines, air compressor cylinders, starter and generator bushings, and other jobs can be honed easily on the Honing Machine. Select a honing unit of the proper size, with a stone from 2/3 to 1-1/2 times as long as the hole to be honed, and follow the general honing procedure as outlined for piston pin fitting. Select proper spindle speed (Page 14).

CHAPTER 1

SECTION III HOW TO ASSEMBLE HONING UNITS

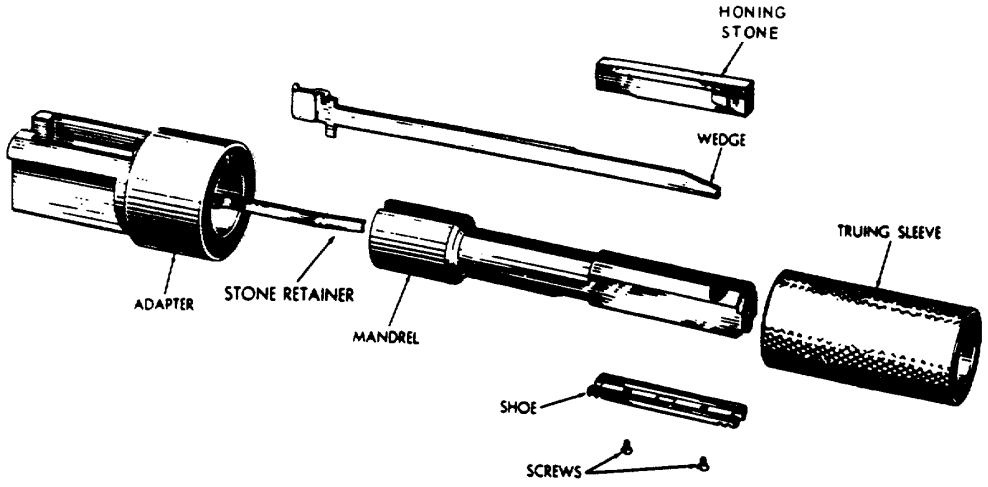


FIGURE 50

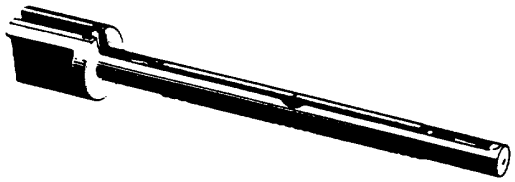


FIGURE 51

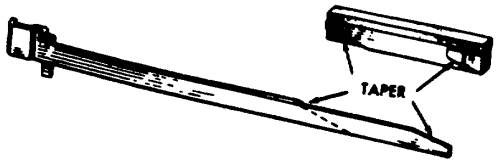


FIGURE 52

1-10 General

a. The principal components of a honing unit are the Adapter, Mandrel (including Shoes), Wedge, Honing Stone, and Truing Sleeve (Figure 50). The Adapter and Mandrel may be two separate parts (Type KL honing units, Figure 50) or they may be made together in one piece (Type SL mandrels, Figure 51).

b. The Stone has a lug at each end, on the side of the stone holder. The lugs are tapered on the bottom side (Figure 52). The Wedge has a matching Taper on the top edge. As the Wedge moves forward in the stone slot, the Stone is pushed upward. This expands the diameter of the honing unit and causes the Stone to contact the surface of the hole to be honed. The Truing Sleeve is used to make Stone and Shoe surfaces parallel.

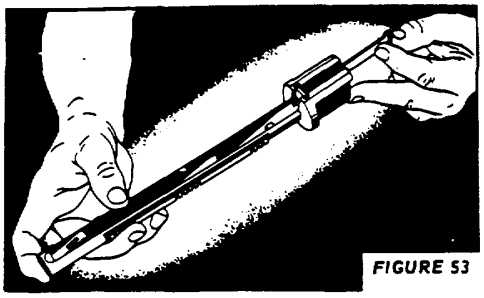


FIGURE 53

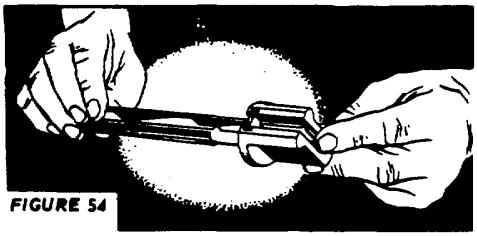


FIGURE 54

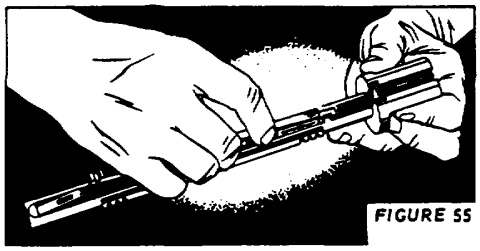


FIGURE 55

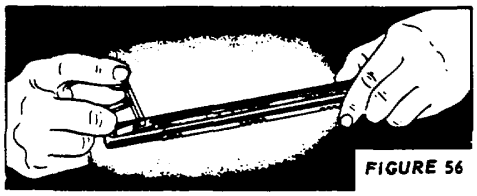


FIGURE 56

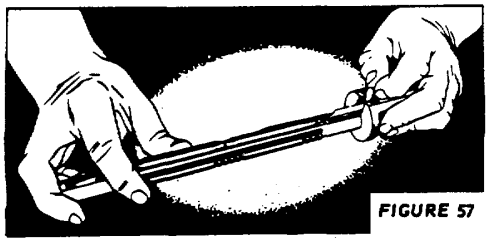


FIGURE 57

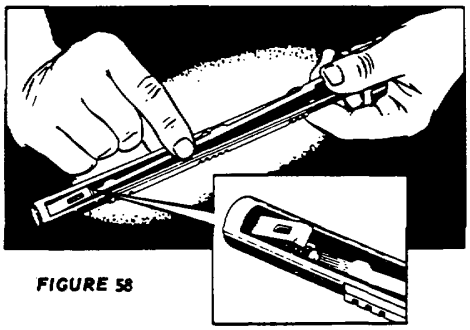


FIGURE 58

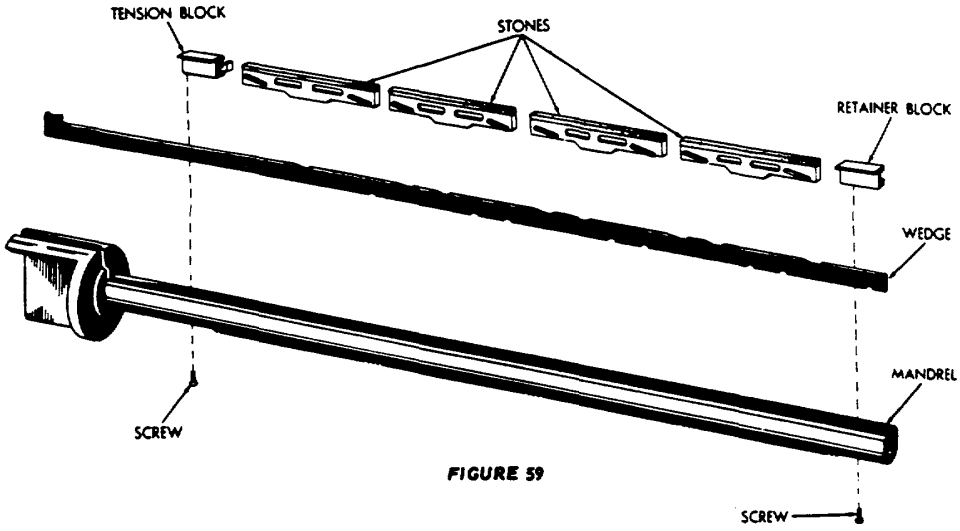


FIGURE 59

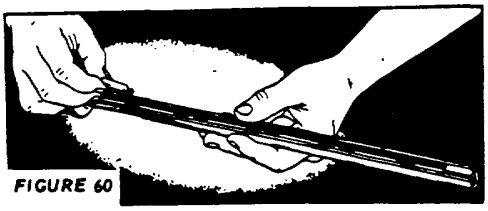


FIGURE 60

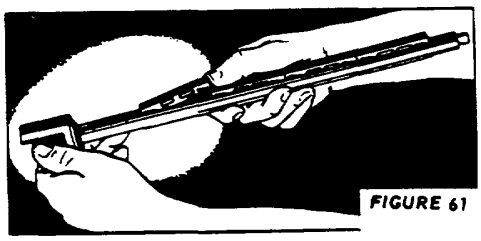


FIGURE 61

1-11 TYPE SL
RANGE .720" (18mm) UP

a. TO INSTALL WEDGE
Insert wedge into stone slot from rear, through hole provided (Figure 53). Position end of wedge flush with end of adapter (Figure 54).

b. TO INSERT STONE
Insert stone into stone slot of mandrel with groove of stone holder fitting over tongue in side of stone slot (Figure 55). Use chuck wrench to hook stone holder latch into notch in front end of stone assembly (Figure 56). Replace spring clip at rear as shown, to hold stone in slot (Figure 57).

c. TO INSTALL WEDGE SHIM

(1) When stone and shoes are worn it may be necessary to use a wedge shim (available for each SL mandrel above .720") to reach maximum range of the honing unit.

(2) To install shim, remove stone and wedge and clean stone slot in mandrel. With lugs of shim toward wedge side of stone slot, insert front end of shim (Figure 58) under rivet head in front end of mandrel. Push shim forward until it will lie flat in bottom of stone slot. Replace wedge and stone.

1-12 TYPE UL (Figure 59)

a. The mandrel, tension block, retainer block, and wedge are assembled at the factory. The following instructions, however, cover the complete assembly procedure.

b. TO INSTALL WEDGE
Place wedge against right hand side of stone slot of mandrel. Place retainer block in position over wedge in front end of mandrel, and tension block in position over wedge in rear of mandrel (Figure 60). Fasten with screws through bottom of mandrel.

c. TO INSERT STONES
Push wedge all the way forward. Place first stone in forward end of stone slot, with stone holder lugs facing wedge. Put intermediate stones in place. Insert rear stone against tension block spring and press rearward until stone can be pushed down into position (Figure 61). Press stones down firmly and pull wedge rearward to extreme position.

d. TO REMOVE STONES
To remove stones, remove honing unit from machine, push wedge all the way forward, and lift out stones.

NOTE

If the stones are removed from the honing unit after it has been trued and used, they should be marked so that reassembly can be made in the same order.

1-13 TYPE ML (Figure 62)

a. A three stone honing unit (Type 3ML) is used to illustrate the detailed assembly. However, these instructions are applicable also to four and five stone honing units (Types 4ML and 5ML). The mandrel, tension block, retainer block, shoes, and wedge are assembled at the factory. The following instructions, however, cover the complete assembly procedure.

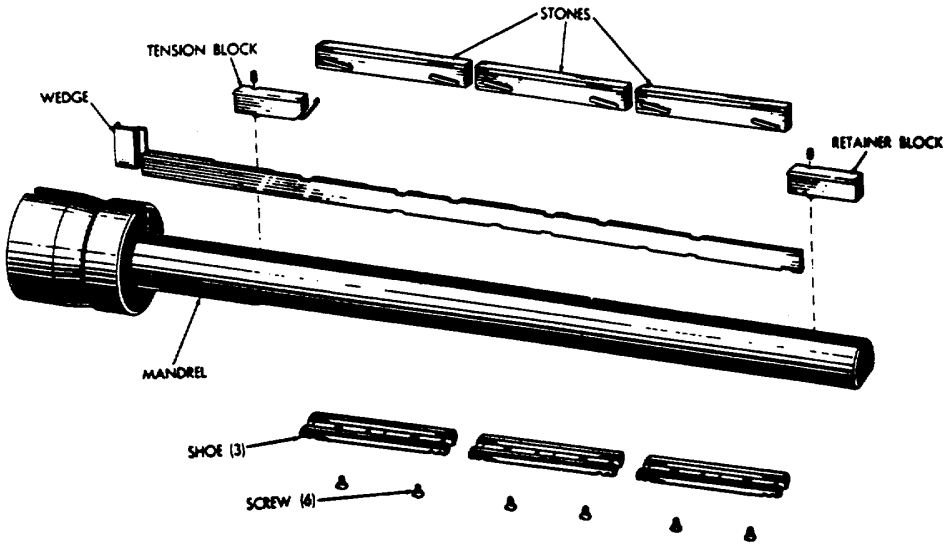


FIGURE 62

b. TO INSTALL GUIDE SHOES (Figure 63)

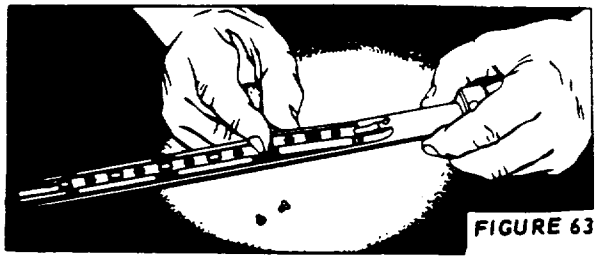


FIGURE 63

Install guide shoes on mandrel directly opposite the stone slot included between the retainer and tension blocks. Shims are furnished with these honing units in order to get full life from the guide shoes. Shoe retaining screws must not protrude into stone slot of mandrel. Be sure to use a shoe opposite each stone (use as many shoes as you have stones).

NOTE

Type ML mandrels below 3/4" (19mm) do not have replaceable shoes.

c. TO INSTALL WEDGE

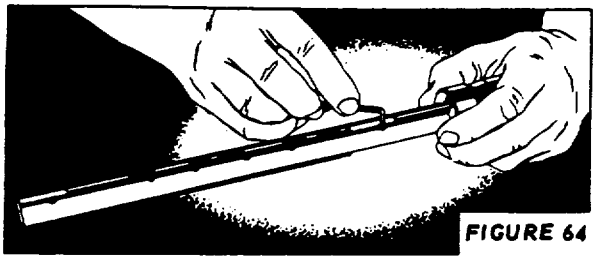


FIGURE 64

Insert wedge in stone slot of mandrel. Place retainer block in position flush with front end of mandrel and tension block in extreme rear position. Insert and tighten set screws (Figure 64).

d. TO INSERT STONES

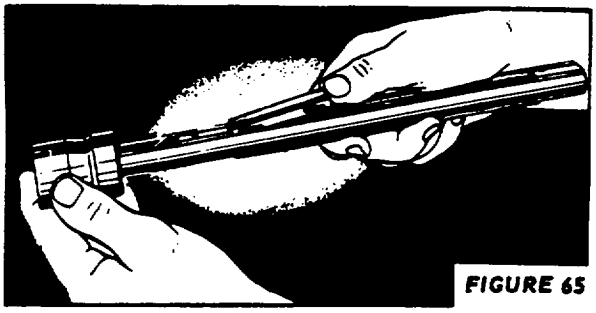


FIGURE 65

Push wedge all the way forward. Insert stones in mandrel by placing the first stone in forward end of stone slot, and intermediate stone(s) directly behind first stone. Place rear stone in slot against the tension block spring, and press against spring until stone can be pushed down into position (Figure 65). Press stones down firmly and pull wedge rearward to its extreme position.

e. TO REMOVE STONES

To remove stones, remove honing unit from machine, push wedge all the way forward, and lift out stones.

NOTE

If the stones or shoes are removed from the honing unit after it has been trued and used, they should be marked so that reassembly can be made in the same order.

1-14 TYPE PL (Figure 66)

a. A three stone honing unit (Type 3PL) is used to illustrate the detailed assembly. However, these instructions are applicable to four and five stone honing units (Types 4PL and 5PL), and to single stone units (Type 1PL). The mandrel, tension block, retainer block, shoes, and wedge are assembled at the factory. The following instructions, however, cover the complete assembly procedure.

b. TO INSTALL GUIDE SHOES (Figure 67)

Install guide shoes on mandrel directly opposite the stone slot included between the retainer and tension blocks. Shims are furnished with these honing units in order to get full life from the guide shoes. Longer screws are provided where necessary, for use when shims are used. Screws must not protrude into the stone slot (they will keep the wedge from moving). Be sure to use a shoe opposite each stone (use as many shoes as you have stones).

c. TO INSTALL WEDGE

Insert wedge in stone slot of mandrel. Place retainer block in position flush with front end of mandrel and place tension block in extreme rear position Insert and tighten set screws (Figure 68).

d. TO INSERT STONES

Push wedge all the way forward. Insert stones in mandrel by placing first stone in forward end of stone slot, and intermediate stone(s) directly behind, first stone. Place rear stone in slot against the tension block spring, and press against spring until stone can be pushed down into position (Figure 69). Press stones down firmly and pull wedge rearward to its extreme position.

e. TO REMOVE STONES

To remove stones, remove honing unit from machine, push wedge all the way forward, and lift stones out.

NOTE

If the stones or shoes are removed from the honing unit after it has been trued and used, they should be marked so that reassembly can be made in the same order.

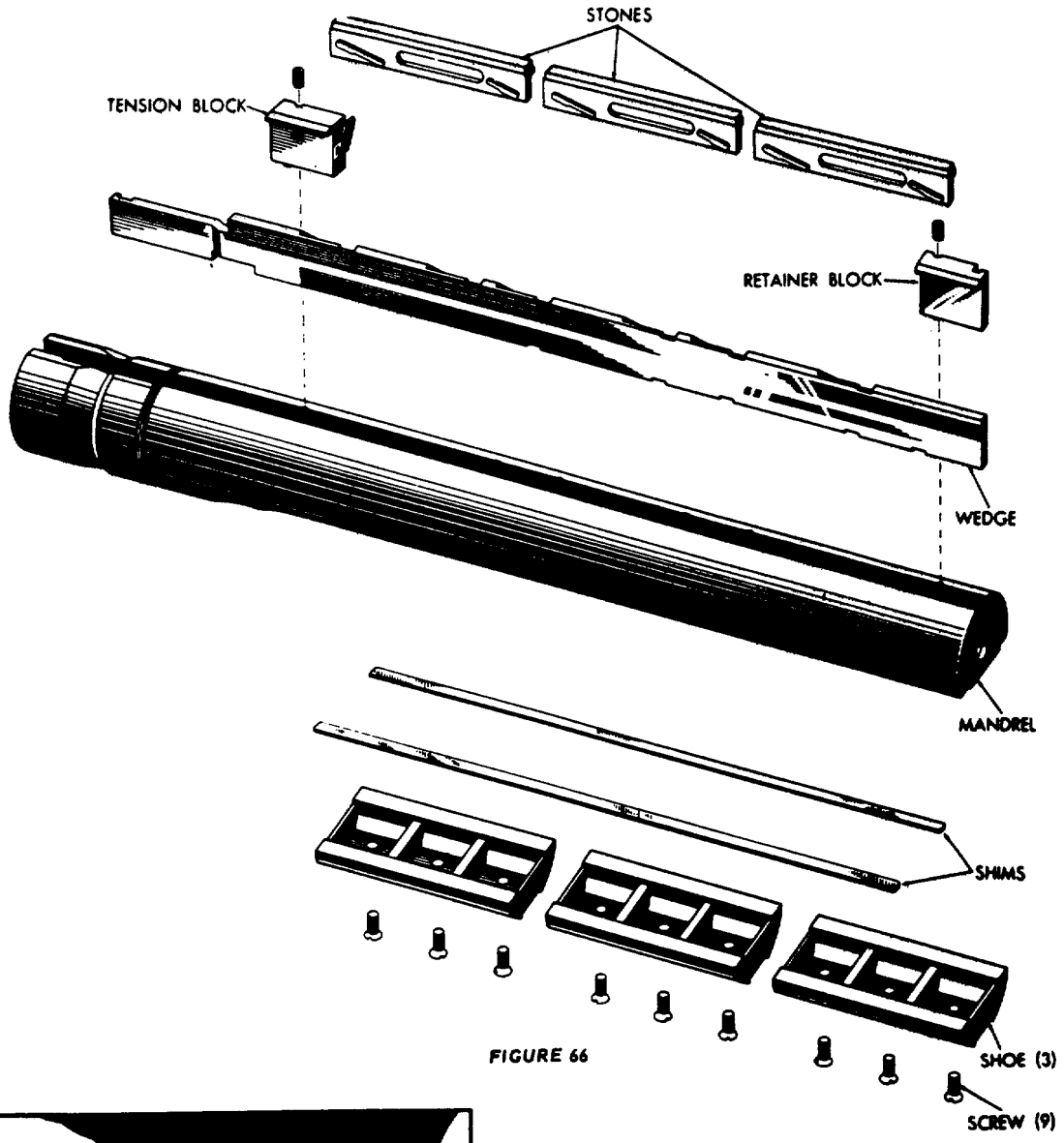


FIGURE 66

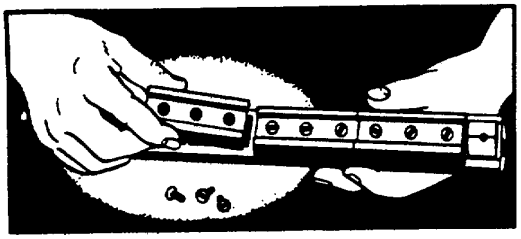


FIGURE 67

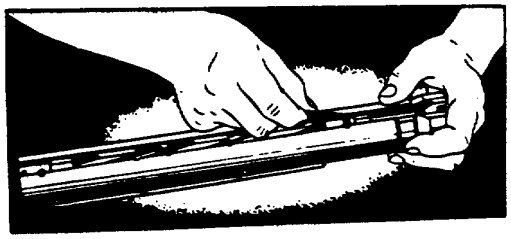


FIGURE 68

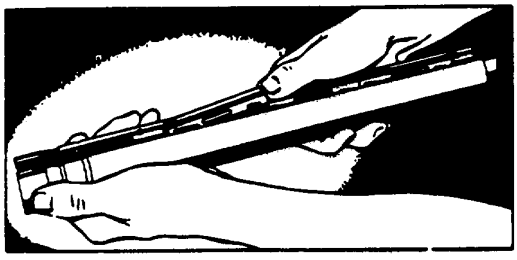


FIGURE 69

f. SPECIAL INSTRUCTIONS FOR 1PL HONING UNITS (single stone)

An additional tension block must be inserted in the stone slot, one stone length behind the retainer block, in position "B" (Figure 70). Insert stone in slot against the tension block spring and press against spring until stone can be pushed down in position. Otherwise, assembly instructions are same as those above for other Type PL honing units.

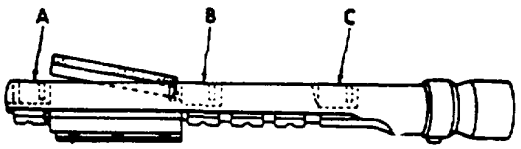


FIGURE 70

1-15 TYPES KL, LH, LJ, (Figure 71)

a. The mandrel, adapter, retainer, shoes, and wedge are assembled at the factory. The following instructions, however, cover the complete assembly procedure.

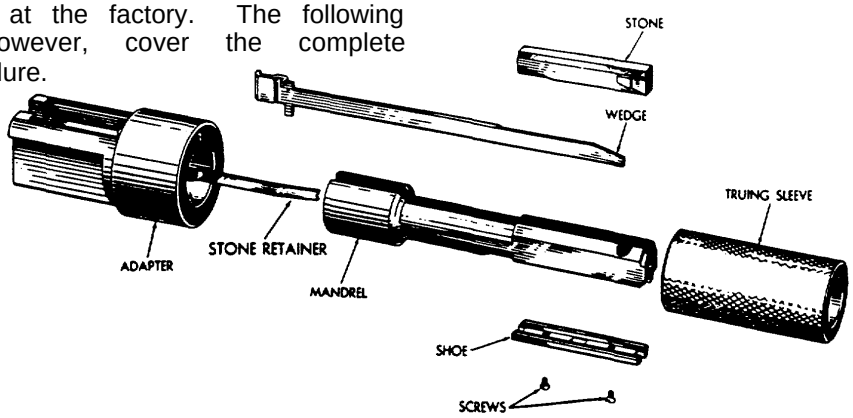


FIGURE 71

b. INSTALL MANDREL IN ADAPTER

Install mandrel in adapter so that mandrel stone slot is aligned with stone retainer spring in adapter (Figure 72). Make sure that end slot in mandrel shank engages the tongue in bore of adapter (in larger sizes, the set screw in the adapter engages a countersink in mandrel shank). When correctly assembled, end of mandrel shank will bottom in adapter. Tighten set screw.

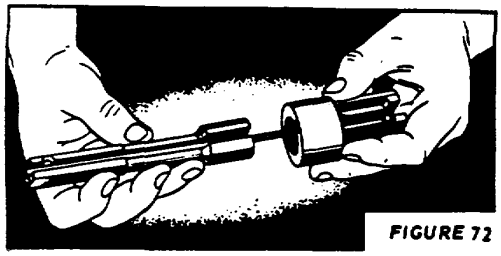


FIGURE 72

c. INSTALL WEDGE

Insert wedge into stone slot from adapter end, on right-hand side of stone retainer (Figure 73). Hold wedge down against bottom of stone slot in mandrel, and deflect wedge sidewise to clear the back stop lug in adapter while pushing wedge forward.

d. INSERT STONE IN MANDREL

Insert stone into stone slot of mandrel and push it back against stone retainer until lug on stone holder engages stone stop slot in mandrel (Figure 74).

Press stone down in stone slot. When correctly assembled, surface of stone will be parallel with mandrel. Make sure that stone retainer contacts back end of stone holder.

NOTE

KL-744 through KL-1187 honing units are furnished with replaceable guide shoes (Figure 75). Make sure that the screws do not protrude into stone slot.

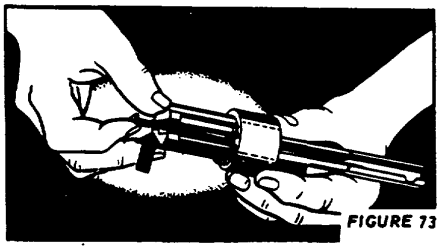


FIGURE 73

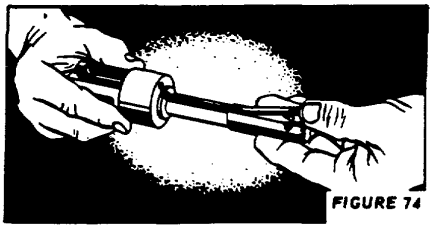


FIGURE 74

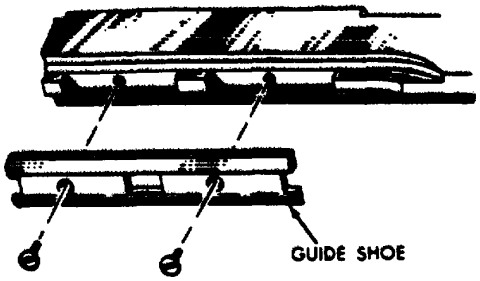


FIGURE 75

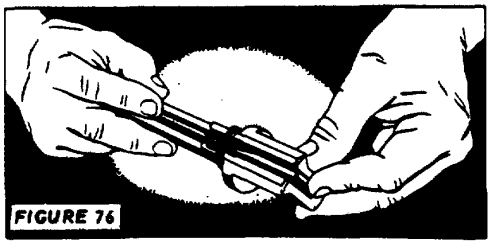


FIGURE 76

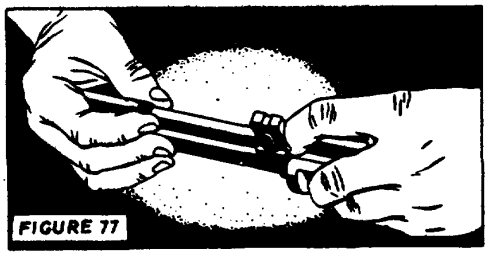


FIGURE 77

1-16 TYPES HB AND SC

a. TO INSTALL WEDGE

Position spring as shown (Figure 76). Insert wedge from rear and position it flush with adapter end of mandrel.

b. TO INSERT STONE

Hold spring back, insert stone into stone slot of mandrel with tongue on stone holder engaging groove in side of stone slot (Figure 77). Push stone down in slot and slip the spring into groove at rear of stone holder.

c. TO REMOVE STONE

To remove stone, push spring back and lift stone out of mandrel.

1-17 TYPE CR

See Page 6.

1-18 TYPES AL AND ALH (Figure 78)

NOTE

These mandrels are for bushing expansion only. They MUST NOT be used for honing, because the mandrel shoes are too short. Any attempt to use these mandrels for honing will result in inaccurate work.

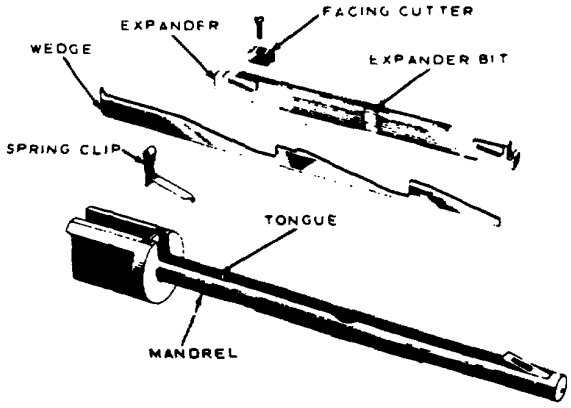


FIGURE 78

a. TO INSTALL WEDGE

Insert wedge into slot from rear, through hole provided (Figure 79). Position end of wedge flush with end of adapter.

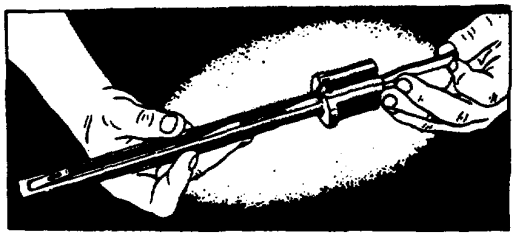


FIGURE 79

b. TO INSERT EXPANDER

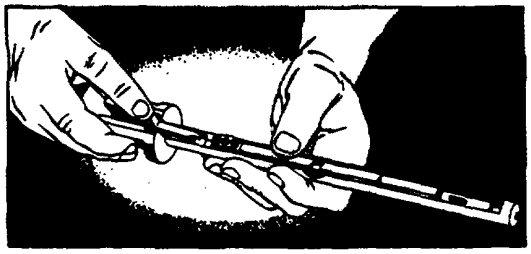


FIGURE 80

Insert expander into slot of mandrel with groove of expander fitting over tongue in side of mandrel slot. Use chuck wrench to hook stone holder latch into note on front end of expander. Replace spring clip at rear as shown, to hold expander in slot (Figure 80).

1-19 TYPES RYY AND SYY (Figure 81)

a. The mandrel, wedge, tension block, and honing stone are assembled at the factory. Place wedge in open slot of mandrel, put tension block in place over wedge, insert and tighten set screw. Push rear end of stone back against retainer spring, and snap stone down into slot (similar to type CR, Page 6).

b. It may be necessary to dress edges of a new stone to enter piston or new truing sleeve. Truing must be done with a sleeve that is smaller than the piston pin hole diameter so the stone, mandrel, and truing sleeve have the exact diameter of the finished piston pin hole when truing is completed.

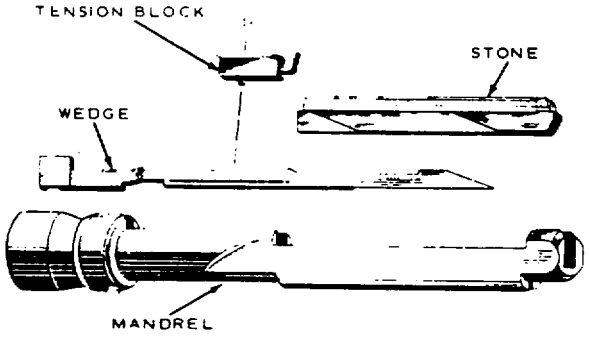


FIGURE 81

1-20 WHEN TO REPLACE MANDRELS, WEAR SHOES, OR TRUING SLEEVES (Figure 82)

a. It is essential that mandrels having integral shoes be replaced when the shoes are worn down to the mandrel body. Failure to replace a worn-out mandrel will result in inaccurate holes. Replace wear shoes on lifetime honing units when wear pads are worn and center of shoe is contacted.

b. Truing sleeves should be replaced when they are worn too large for the size indicated. Always start a new honing unit with a new truing sleeve.

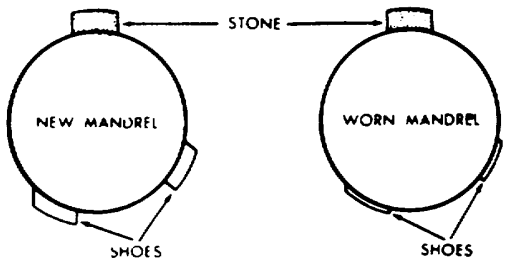


FIGURE 82

DIAMETER RANGES OF MANDRELS AND HONING UNITS

CAUTION: DO NOT ORDER FROM THIS PAGE.

Table 2

FITTING PINS IN PISTONS

Honing Unit	Size Range (inches)	Size Range (mm)
LH-370	.370 to .384	9.4 to 9.8
LH-432	.432 to .446	11.0 to 11.3
LJ-495	.495 to .525	12.6 to 13.3
LJ-526	.526 to .557	13.4 to 14.1
LJ-557	.557 to .587	14.1 to 14.9
LJ-619	.619 to .650	15.7 to 16.5
LJ-681	.681 to .713	17.3 to 18.1
SL-720	.720 to .780	18.3 to 19.8
SL-780	.780 to .840	19.8 to 21.3
SL-840	.840 to .900	21.3 to 22.9
SL-900	.900 to .960	22.9 to 24.4
SL-960	.960 to 1.020	24.4 to 25.9
SL-1020	1.020 to 1.080	25.9 to 27.4
SL-1080	1.080 to 1.140	27.4 to 29.0
SL-1140	1.140 to 1.200	29.0 to 30.5
SL-1200	1.200 to 1.300	30.5 to 33.0
SL-1300	1.300 to 1.400	33.0 to 35.6
SL-1400	1.400 to 1.500	35.6 to 38.1
SL-1500	1.500 to 1.600	38.1 to 40.6
SL-1600	1.600 to 1.700	40.6 to 43.2

Honing Unit	Size Range (inches)	Size Range (mm)
3ML-750	.744 to .781	18.9 to 19.8
3ML-781	.775 to .812	19.7 to 20.6
3ML-812	.806 to .843	20.5 to 21.4
3ML-843	.838 to .875	21.3 to 22.2
3ML-875	.869 to .906	22.1 to 23.0
3ML-906	.900 to .937	22.9 to 23.8
3ML-937	.931 to .968	23.6 to 24.6
3ML-968	.962 to 1.000	24.4 to 25.4
3PL-1000	.990 to 1.062	25.1 to 27.0
3PL-1062	1.052 to 1.125	26.7 to 28.6
3PL-1125	1.115 to 1.187	28.3 to 30.1
3PL-1187	1.177 to 1.250	29.9 to 31.7
3PL-1250	1.230 to 1.375	31.2 to 34.9
3PL-1375	1.355 to 1.500	34.4 to 38.1
3PL-1500	1.480 to 1.625	37.6 to 41.3
3PL-1625	1.605 to 1.750	40.8 to 44.4
3PL-1750	1.730 to 1.875	43.9 to 47.6
3PL-1875	1.855 to 2.000	47.1 to 50.8
3PL-2000	1.980 to 2.125	50.3 to 54.0
3PL-2125	2.105 to 2.250	53.5 to 57.1
3PL-2250	2.230 to 2.375	56.6 to 60.3
3PL-2375	2.355 to 2.500	59.8 to 63.5
3PL-2500	2.480 to 2.625	63.0 to 66.7

KING PIN FITTING

Honing Unit	Size Range (inches)	Size Range (mm)
3ML-625	.619 to .656	15.7 to 16.7
3ML-656	.650 to .687	16.5 to 17.4
3ML-687	.681 to .718	17.3 to 18.2
3ML-718	.713 to .750	18.1 to 19.0
4UL-781	.795 to .857	20.2 to 21.8
4UL-843	.858 to .920	21.8 to 23.4
4UL-906	.921 to .982	23.4 to 24.9
4UL-968	.983 to 1.070	25.0 to 27.2

Honing Unit	Size Range (inches)	Size Range (mm)
4ML-718	.713 to .750	18.1 to 19.0
4ML-750	.744 to .781	18.9 to 19.8
4ML-781	.775 to .815	19.7 to 20.7
4ML-812	.806 to .843	20.5 to 21.4
4ML-843	.838 to .875	21.3 to 22.2
5ML-875	.869 to .906	22.1 to 23.0
5ML-906	.900 to .942	22.9 to 23.9
5ML-937	.931 to .968	23.6 to 24.6
5ML-968	.962 to 1.003	24.4 to 25.5
4PL-1031	1.021 to 1.094	25.9 to 27.8
4PL-1094	1.084 to 1.156	27.5 to 29.4
4PL-1125	1.115 to 1.187	28.3 to 30.1
4PL-1219	1.209 to 1.281	30.7 to 32.5
5PL-1312	1.292 to 1.375	32.8 to 34.9
5PL-1375	1.355 to 1.500	34.4 to 38.1
5PL-1562	1.542 to 1.625	39.2 to 41.3
5PL-1625	1.605 to 1.750	40.8 to 44.4
5PL-1750	1.730 to 1.875	43.9 to 47.6
5PL-1875	1.855 to 2.000	47.1 to 50.8
5PL-2000	1.980 to 2.125	50.3 to 54.0
5PL-2125	2.105 to 2.250	53.5 to 57.1
5PL-2250	2.230 to 2.375	56.6 to 60.3
5PL-2375	2.355 to 2.500	59.8 to 63.5
5PL-2500	2.480 to 2.625	63.0 to 66.7

FITTING PINS IN CON-RODS

Honing Unit	Size Range (inches)	Size Range (mm)
KL-650	.650 to .680	16.5 to 17.3
KL-681	.681 to .712	17.3 to 18.1
KL-713	.713 to .743	18.1 to 18.9
KL-744	.744 to .774	18.9 to 19.7
KL-775	.775 to .805	19.7 to 20.4
KL-806	.806 to .837	20.5 to 21.3
KL-838	.838 to .868	21.3 to 22.0
KL-869	.869 to .899	22.1 to 22.8
KL-900	.900 to .930	22.9 to 23.6
KL-931	.931 to .961	23.6 to 24.4
KL-962	.962 to .993	24.4 to 25.2
KL-1000	.994 to 1.062	25.2 to 27.0
KL-1062	1.056 to 1.125	26.8 to 28.6
KL-1125	1.119 to 1.187	28.4 to 30.1
KL-1187	1.181 to 1.250	30.0 to 31.7
1PL-1000	.990 to 1.062	25.1 to 27.0
1PL-1062	1.052 to 1.125	26.7 to 28.6
1PL-1125	1.115 to 1.187	28.3 to 30.1
1PL-1187	1.177 to 1.250	29.9 to 31.7
1PL-1250	1.230 to 1.375	31.2 to 34.9
1PL-1375	1.355 to 1.500	34.4 to 38.1
1PL-1500	1.480 to 1.625	37.6 to 41.3
1PL-1625	1.605 to 1.750	40.8 to 44.4
1PL-1750	1.730 to 1.875	43.9 to 47.6
1PL-1875	1.855 to 2.000	47.1 to 50.8
1PL-2000	1.980 to 2.125	50.3 to 54.0
1PL-2125	2.105 to 2.250	53.5 to 57.1
1PL-2250	2.230 to 2.375	56.6 to 60.3
1PL-2375	2.355 to 2.500	59.8 to 63.5
1PL-2500	2.480 to 2.625	63.0 to 66.7

MANDRELS FOR PISTONS WITH WIDE SLOTS

Mandrel No.	Pin Diameter (inches)	Pin Diameter (mm)
RYY-875	.875 to .885	22.2 to 22.5
RYY-912	.912 to .922	23.2 to 23.4
SYY-927	.927 to .940	23.5 to 23.9
SYY-973	.975 to .980	24.8 to 24.9
SYY-989	.990 to 1.000	25.1 to 25.4
SYY-1040	1.040 to 1.050	26.4 to 26.7
SYY-1094	1.094 to 1.104	27.8 to 28.0

RECONDITIONING CON-RODS

Honing Unit	Diameter Range (inches)	Diameter Range (mm)
CR-1450	1.450 to 1.600	38.6 to 40.6
CR-1600	1.600 to 1.750	40.6 to 44.4
CR-1750	1.750 to 1.900	44.4 to 48.3
CR-1900	1.900 to 2.100	48.3 to 53.3
CR-2100	2.100 to 2.300	53.3 to 58.4
CR-2300	2.300 to 2.500	58.4 to 63.5
CR-2500	2.500 to 2.700	63.5 to 68.6
CR-2700	2.700 to 2.900	68.6 to 73.7
CR-2900	2.900 to 3.100	73.7 to 78.7
CR-3100	3.100 to 3.300	78.7 to 83.8
CR-3300	3.300 to 3.500	83.8 to 88.9
CR-3500	3.500 to 3.700	88.9 to 94.0
CR-3700	3.700 to 3.900	94.0 to 99.1
CR-3900	3.900 to 4.100	99.1 to 104.1
CR-4100	4.100 to 4.300	104.1 to 109.2
CR-4300	4.300 to 4.500	109.2 to 114.3
CR-4500	4.500 to 4.700	114.3 to 119.4

BUSHING EXPANDERS

Expander Mandrel	Diameter Range (inches)	Diameter Range (mm)
AL-720	.720 to .840	18.3 to 21.3
ALH-720	.720 to .840	18.3 to 21.3
AL-840	.840 to .900	21.3 to 22.9
ALH-840	.840 to .900	21.3 to 22.9
AL-900	.900 to .960	22.9 to 24.4
ALH-900	.900 to .960	22.9 to 24.4
AL-960	.960 to 1.080	24.4 to 27.4
ALH-960	.960 to 1.080	24.4 to 27.4
AL-1080	1.080 to 1.200	27.4 to 30.5
AL-1200	1.200 to 1.300	30.5 to 33.0
AL-1300	1.300 to 1.400	33.0 to 35.6
AL-1400	1.400 to 1.500	35.6 to 38.1
AL-1600	1.600 to 1.700	40.6 to 43.2

STONE SELECTION CHART

For Use With Mandrels		For Use With Flow of		Honing Oil	Std. Pkg.
		Roughing	Finishing	Medium Finish	
SL-720 thru SL-1600		SL-5 SL-8	SL-13 SL-17	SL7	6
CR Series	1450 thru 1750		CR-4	CR-2	2
	1900 and up		CR-14	CR-12	
HB-1000 thru HB-1375		HB-7	HB-13		6
Extension Stone for HB Mandrels		XHB-7	XHB-13		6
SC-1000 thru SC-1375		SC-7	SC-13		6
Extension Stone for SC Mandrels		XSC-7	XSC-13		6
KL Series		KL-5	KL-13	KL-7 KL-14*	12
LG Series			LG-13		6
LH Series		LH-7	LH-13		6
LJ Series		LJ-7	LJ-13		6
LM Series			LM-13		6
ML Series		ML-5 ML-8*	ML-13 ML-17**	ML-7 ML-14*	12 12
PL Series		PL-5 PL--8*	PL-13 PL-17**	PL-7 PL-14*	6 6
UL Series		UL-5		UL-7	4
CR-1450 thru CR-1750			CR-4	CR2	2
CR-1900 and up		CR-10	CR-14	CR-12	2
RYY Series			RYY-13		1
SYY Series			SYY-13		1

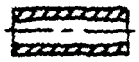
* For enlarging pin hole in con-rod and spindle body forgings.

** For extra-fine finishing, if desired, after PL-8 or ML-8 roughing operation.

Table 3

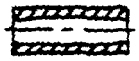
CHAPTER 1
SECTION IV - OPERATION TROUBLESHOOTING

1-21 BELLMOUTHING



a. Work is not being stroked back and forth the full length of the stone. This causes the stone and mandrel shoes to become large at the ends, which causes bellmouthing (holes larger at the ends than at the middle). An untrue condition is easily determined by the "feel" of the work as it passes over the honing unit. Any high spots will feel tighter. Use the Truing Sleeve (Page 15).
b. Wedge may have become bent.
c. Mandrel may be worn out. (See "WHEN TO REPLACE MANDRELS", Page 30).
d. Bellmouthing in rods may be from using too light stone cutting pressure.
e. Shorten stone from each end until bellmouth disappears.

1-22 BARREL SHAPE



a. If stone has been shortened, use longer stone.
b. If stone is full length, shorten shoes by altering them.

1-23 TAPERED HOLE

a. Operator is not reversing work often enough.
b. Use Truing Sleeve.
c. Make sure honing oil is distributed evenly on mandrel.
d. Part is overstroked mote at one end than at the other.
e. Operator is pulling workpiece off mandrel before spindle stops rotating.

f. If power stroking, move the stroke position toward the big end of the taper.

1-24 STONE NOT CUTTING

a. Stone may have become loaded or glazed. Break glaze by using stone dresser lightly, or sometimes glaze can be broken by a few very rapid strokes of the work across the stones. The most common cause of stone loading or gla? is the use of improper honing oil. Use only Honing Oil.
b. Improper stone being used. See Stone Selection Chart, (Page 32).
c. Too light cutting pressure.

1-25 EXCESSIVE STONE WEAR

a. Improper honing oil being used.
b. Too heavy cutting pressure.
c. Feed Dial advanced too much at a time.
d. Work may contain heavy burrs.
e. When honing out-of-round or very rough parts depress Pedal slowly to reduce stone wear.
f. Spindle speed too slow.
g. Power stroking rate too fast.

CHAPTER 1
SECTION V - MAINTENANCE INSTRUCTIONS

1-26 LUBRICATION

CAUTION

Do not get oil on drive belts, brake strap, or pulleys.

a. SPINDLE DRIVE

(1) Use SAE 20 or MIL-L-2104 an brake linkage every 100 operating hours..

(2) Spindle bearings are sealed and require no lubrication.

b. FEED SYSTEM

Every 100 operating hours, put a few drops of S.A.E. 10 or 20 oil on feed screw, on feed rod, and on pressure control fork.

c. PEDAL LINKAGE

Use S.A.E. 10 or 20 oil every 100 operating hours.

d. POWER STROKER

(1) Gear box.

(a) See figure 83 Grease upper bearing every 6 months with MIL-G-25013D.

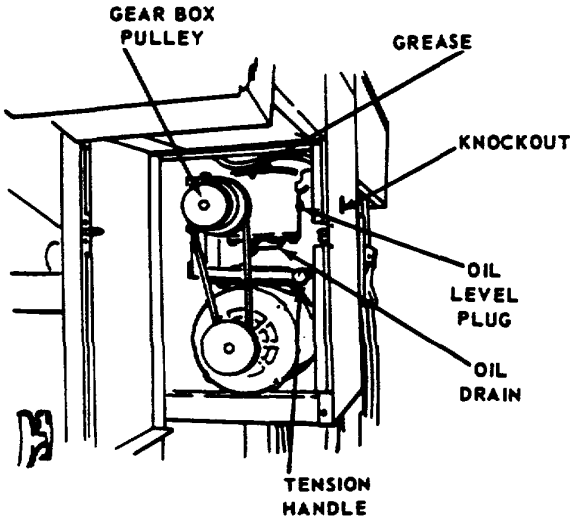


FIGURE 83

(b) See Figures 83 and 84. Change oil every year with MIL-L-2105C. Fill reservoir through oil filter hole to level of oil level plug (see Figure 83) so oil is even with bottom of gear box pulley shaft.

CAUTION

Do not fill above oil level plug (see figure 83); oil will leak around the shaft of the gear box pulley.

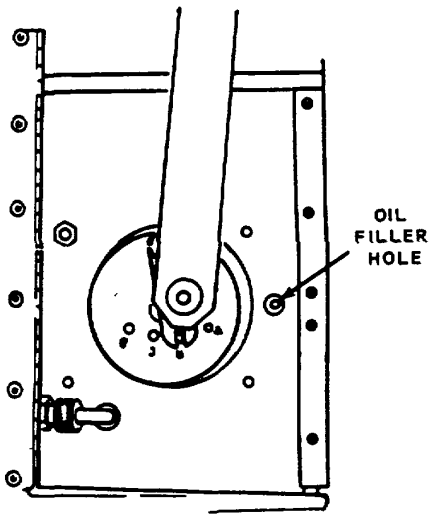


FIGURE 84

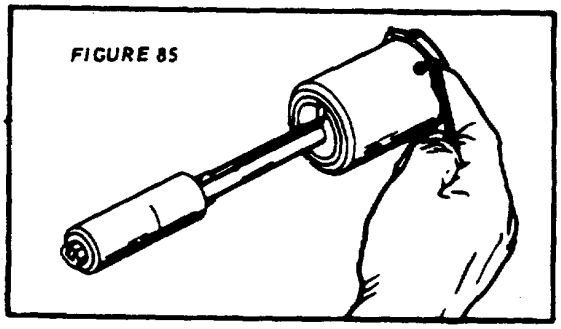
(**2**) Bearing Tube.

(**a**) Periodically rotate Arm to storage position and stroke back and forth. Repeat several times to redistribute lubricant over internal bearing surfaces.

(b) See Figure 85. Lubricate annually by adding 1 or 2 ounces of MIL-23549 through the vent hole in top of bearing tube (line up hole in Shaft Cover with vent hole).

NOTE

Excess lubricant might pass through the front seal and into the stationary honing oil drip tray. Sufficient lubricant, however, will be retained for effective lubrication.



e. MOTORS

See instructions on the three individual motors.

1-27 HONING OIL SYSTEM

a. CLEANING SEDIMENT TRAY

(1) Open door on front of machine base to gain access to Sediment Tray (2, Figure 86) and Oil Reservoir (3). Push Drain Pipe (4) to the left, which lifts it out of the way.

(2) Tip Tray to allow oil to drain from sludge into reservoir.

(3) Remove Tray and dispose of sludge. If not cleaning Reservoir, reinstall Tray. Pull Drain Pipe to the right (down).

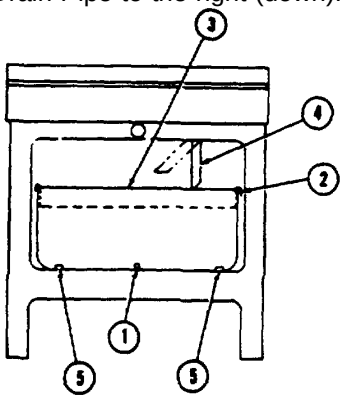


FIGURE 86

b. CLEANING RESERVOIR

NOTE

Always clean Sediment Tray before cleaning Reservoir.

(**1**) Use one or more oil jets to pump oil from. Reservoir into a separate container. (Oil line may be uncoupled from oil manifold and used to pump oil from Reservoir to container.) When oil level has been lowered to pump intake, oil will stop pumping. Turn motor off.

(**2**) See Figure 87. Unscrew Relief Hose from Relief Valve.

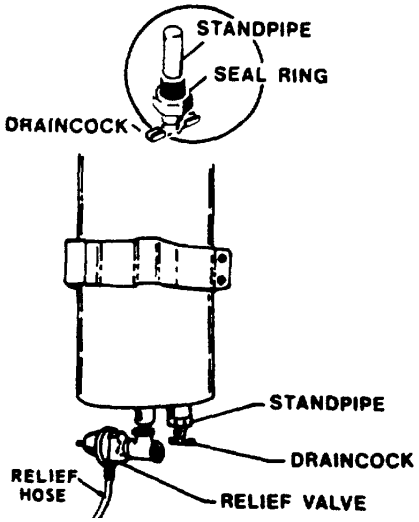


FIGURE 87

(3) Remove the two Reservoir Retainers (5) and slide Reservoir out 4 to 6 inches (Drain Pipe must be up). Remove Drain Plug (1) from front of Reservoir and drain oil. Remove Reservoir from machine base.

NOTE

Drain hole may be clogged with sludge if honing oil system has not been cleaned for a year or more. Open hole with a 3/8 inch rod to unclog it and drain the oil.

(4) Dip or pour out any oil remaining with sludge in Reservoir.

(5) Dispose of sludge and clean Reservoir.

(6) Push Reservoir all the way into the machine base and replace the Retainers. Install Tray. Replace Drain Plug and Relief Hose.

(7) Pull Drain Pipe to the right (down).

(8) The intake screen is held in place by friction. Remove screen from intake hose for cleaning.

(9) Make sure sealing ring is seated properly in its groove in the filter cover, then replace cover.

c. REPLACING FILTER ELEMENT

(1) Push STOP switch to turn off oil pump motor.

(2) See Figure 88. Open Air Vent in Cover of filter container.

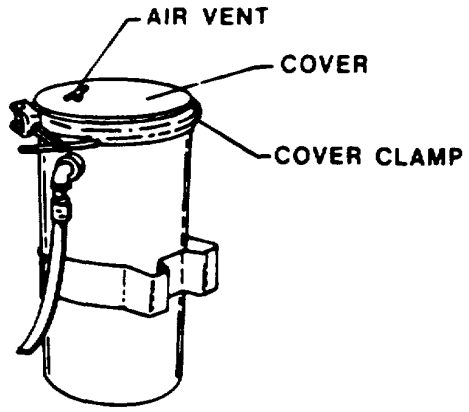


FIGURE 88

(3) See Figure 87. Open Draincock on bottom of filter container and drain about a quart of oil from the container to prevent spillage when removing element. Close Draincock.

(4) Remove replacement filter element from protective bag.

WARNING

In Step (5) the wire bale may fall out due to the weight of the clogged filter element. To prevent injury, protect hands and remove filter element by grasping its sides and turning and lifting simultaneously until element is clear of canister.

(5) Remove Cover Clamp and Cover, and slowly pull out ditty filter element. Dispose of dirty element in protective bag from Step d.

(6) Clean sludge from canister.

(7) Insert element into filter container. Rotate element slightly while inserting to make it slide down center post more easily.

(8) Make sure sealing ring is seated properly in its groove in the Cover, then replace Cover.

(9) Replace Clamp and tighten.

(10) Push HONE START switch. As the oil fills the container, air will escape through the Air Vent.

(11) When oil appears in Air Vent, close it. THE FILTER UNIT is NOW READY FOR USE.

d. CLEANING FILTER CONTAINER

(1) See Figure 88. Open Air Vent.

(2) See Figure 87. Open Draincock.

(3) Remove Cover while oil is draining.

(4) Several minutes after oil has drained from filter container, remove filter element.

(5) Dump oil from sediment tray into reservoir.

(6) Remove Standpipe.

(7) See Figure 89. Use a long piece of wood to scrape sludge from filter container into sediment tray.

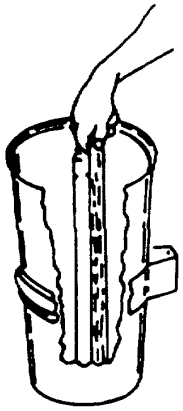


FIGURE 89

CAUTION

Take care not to contaminate honing oil in reservoir with solvent in Step h.

(8) Flush out remaining sludge with solvent.

(9) Remove sediment tray to discard sludge and solvent. Clean sediment tray and replace in reservoir.

(10) Clean Standpipe thread in filter container and reinstall Standpipe, making sure the Seal Ring is in its proper place.

(11) Close Draincock.

(12) Install new filter element(refer to "3. Replacing Filter Element").

e. REPLACING OIL PUMP SEAL

(1) See Figure 90. Remove Pump Body from Mounting Bracket by removing Set Screws.

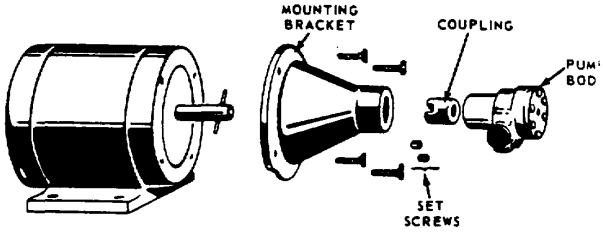


FIGURE 90

(2) Remove Coupling.

(3) See Figure 91. Remove Snap Ring.

(4) Remove Seal Seat, Rotary Member, O-Ring, Spring, and Spring Washer.

(5) Clean Rotor Shaft.

(6) Coat Shaft and inside of rubber Bellows of the Rotary Member with light oil.

(7) Place O-Ring into O-Ring groove inside pump housing.

(8) Place Spring Washer and Spring on Shaft.

(9) Slide Rotary Member part way down Shaft.

NOTE

The lapped carbon face of Wear Ring must face toward Seal Seat. Be sure notches on edge of Wear Ring mate with Retainer Lugs on Rotary Member.

(10) Oil lapped faces of Rotary Member and Seal Seat.

NOTE

Two Seal Seats are furnished in replacement kit . . . use the Seal Seat applicable to your pump.

(11) Slide Seal Seat onto Shaft to contact Rotary Member, then push the complete Seal into Body.

(12) See Figure 91. Replace Snap Ring.

(13) Your pump is now completely assembled. Turn Shaft by hand to be sure it turns freely.

(14) Reinstall Coupling.

(15) Reinstall Pump Body on Mounting Bracket and tighten Set Screws.

(16) Start Pump with a supply of oil in the suction line, since pump should not be run dry.

(17) See page 50 for replacing oil pump seal hypro pump

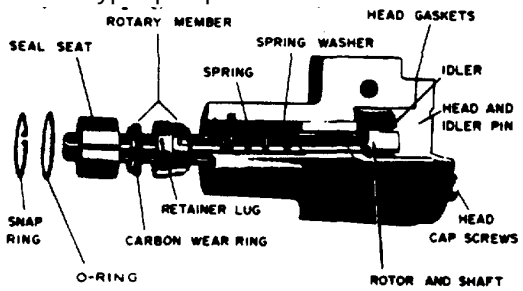


FIGURE 91

f. SETTING RELIEF VALVE IN BYPASS SYSTEM

See Figure 92. Adjust for more or less coolant pressure by turning the Adjusting Screw in the end of the valve. Tighten to increase pressure; loosen to decrease pressure.

CAUTION

Pump Relief Valve is preset at factory ... do not readjust ... too much pressure can cause the filter element to collapse.

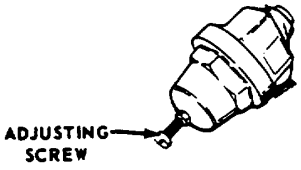


FIGURE 92

g. ADDING OIL

If the machine is low on oil, order more MILC-46149. DO NOT ADD KEROSENE, CUTTING FLUIDS, OR ANY OTHER FLUID TO THE OIL THAT'S LEFT-IT WILL BE RUINED. If you must operate the machine before you receive your new oil, place a large chunk of metal in the reservoir to raise the oil level above the pump inlet-but remember this is a temporary expedient, and remove the chunk of metal when you refill the reservoir.

1-28 CHECK POINTS FOR PROPER OPERATION

a. FEED DIAL END PLAY

(1) CHECK: Set Cutting Pressure Control to 3 and check Feed Dial for end play. If Honing Dial needle moves more than one or two tenths during this check, there is too much end play.

(2) TO ADJUST: Loosen set screw in Set Collar at rear of housing (Figure 93). While lightly pushing in on Feed Dial, hold Collar against rear of bushing in housing with light finger pressure. Rotate Collar slightly on shaft to give set screw a new contact point and tighten set screw. Feed screw must rotate freely in bushing. If any binding occurs or bushing rotates with feed screw, reset Collar.

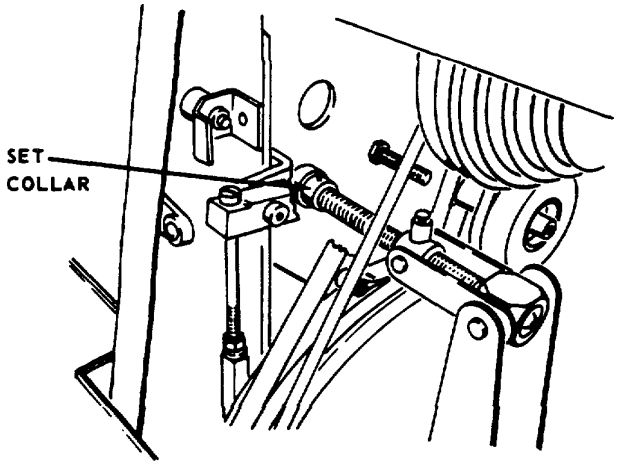


FIGURE 93

b. HONING DIAL

1. CHECK: Set the Cutting Pressure Control to 3. With "0" on the Honing Dial at the 6 o'clock position, the Honing Dial needle should be on the red line.

2. TO ADJUST:

(a) If needle is not on the red line, loosen set screw in side of Honing Dial bracket and move Dial up or down as needed to set needle on red line (Figure 94). Tighten set screw.

(b) Now push the Feed Dial in. Needle should return to red line when pressure is released.

(c) Now set the Cutting Pressure Control to 1. Repeat the pressure against the Feed Dial and watch the Honing Dial needle. It should return to the red line. In some cases it will be necessary to advance the Cutting Pressure Dial to about 1-1/2 before the needle will return to the red line. (However, this condition need not affect the operation of the machine. Simply determine the lowest setting of the Cutting Pressure Control at which the Honing Dial needle returns to the red line. Use that setting as the "zero" reference point for making adjustments in the cutting pressure.)

(d) If it is desired to adjust the machine internally to correct the above condition, refer to Paragraph 3.

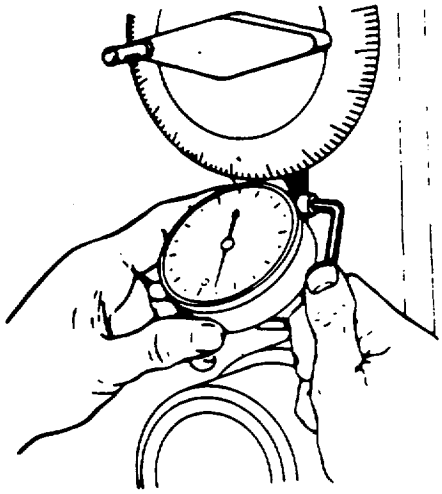


FIGURE 94

C. CUTTING PRESSURE CONTROL

1. CHECK: If honing unit is in spindle chuck, remove it. With cutting pressure set at 1, push in on Feed Dial and see if Honing Dial needle returns to red line when Feed Dial is released.

2. TO ADJUST:

(a) Make sure Feed Dial is not at extreme end of travel.

(b) Make sure that Feed Screw (Figure 95) moves freely in bushings and collar. Apply penetrating oil at front and back of housing and work it in and out a few times to clean out gum or dirt.

(c) Make sure the Honing Dial plunger is clean and works freely.

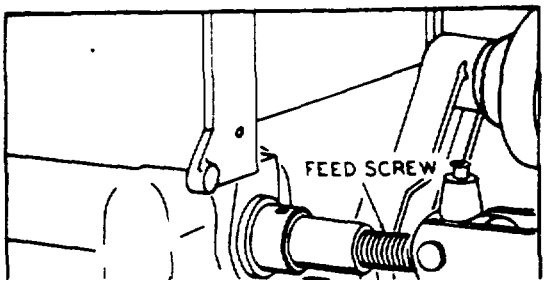


FIGURE 95

If these checks do not remedy the problem:

(1) Turn Cutting Pressure Control counterclockwise against stop.

(2) Loosen Locknut "D" (Figure 96).

(3) Watching the Honing Dial, turn threaded Sleeve "C" counterclockwise (as viewed from rear of machine) slowly until the needle returns to "0".

(4) Lock Nut "D" against threaded Sleeve "C".

(5) To check the adjustment, turn Cutting Pressure Control all the way counterclockwise. Press the Feed Dial all the way in and release it slowly. Needle should not return all the way to red line.

(6) Set the Cutting Pressure Control on 1 and the needle should move to red line.

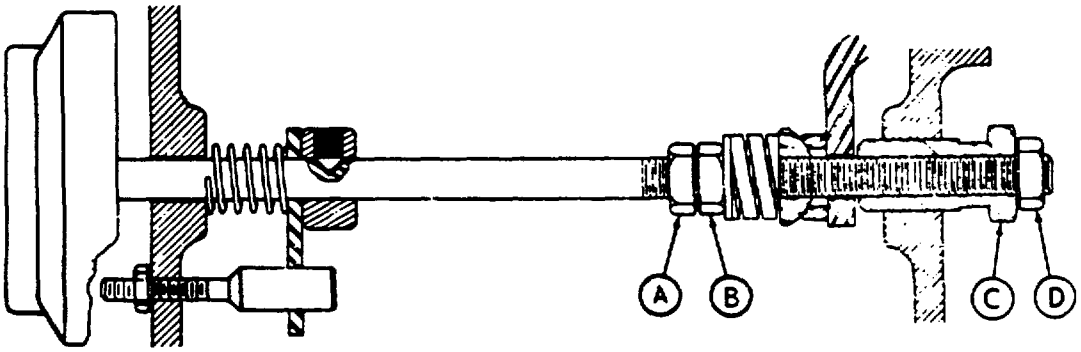


FIGURE 96

d. PEDAL ADJUSTMENT (Figure 97)

1. CHECK: Crank Arm (1) must hit Lower Stop Pin (2) when Pedal (3) is between 1/4" and 1/2" from floor. When Pedal is released, Crank Arm should just hit Upper Stop Pin (4).
2. TO ADJUST: Depress Pedal to gain easiest access to Pedal Clamp Screws (5) (one on each side) from front of machine. Using T-Wrench furnished with machine, loosen the Screws. Adjust Pedal Bar (6) in or out to a convenient position, making sure Pedal Bar extends equally on both sides to prevent binding. Retighten Clamp Screws.
3. Using T-Wrench, adjust Screw (7) to make sure Crank Arm hits Lower Stop Pin when Pedal is 1/4" to 1/2" above the floor.
4. Rotate Pedal Bar Tension Control (8) clockwise until Crank Arm will just hit Upper Stop Pin (4).
   (If Pedal Bar is readjusted in or out, the preceding two settings may have to be changed.)

NOTE

Use T-Wrench to loosen Screw (10) to invert Pedal for easier operation from a sitting position. Adjust Nut (9) to raise or lower Pedal. Both sides must be adjusted equally to keep sides parallel.

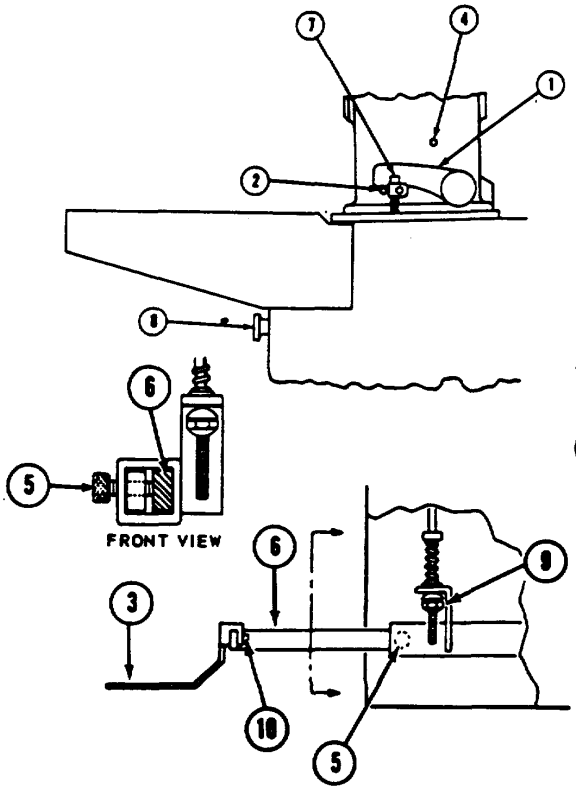


FIGURE 97

e. OIL SYSTEM

If oil flow is insufficient:

(1) Check first to be sure oil level covers the pump intake screen. If not, add honing oil (refer to "7, Adding Oil", Page 37).

(2) Check that Bypass Valve is dumping oil into reservoir. 11 not, replace filter element (refer to "3. Replacing Filter Element", Page 36).

NOTE

If the machine is low on oil, order more Honing Oil. DO NOT ADD KEROSENE, CUTTING FLUIDS, OR ANY OTHER FLUID TO THE OIL THAT'S LEFT-IT WILL BE RUINED. If you must operate the machine before you receive your new oil, place a large chunk of metal in the reservoir to raise the oil level above the pump inlet-but remember this is a temporary expedient, and remove the chunk of metal when you refill the reservoir.

f. BRAKE OPERATION

NOTE

If Brake Strap shows signs of aluminum pickup, replace it immediately to prevent damage to the pulley (refer to Paragraph 6b).

(1) Adjustment

CHECK: When pedal is released, the honing machine spindle should stop quickly.

TO ADJUST: There are two adjustments necessary:

(a) Open right side (facing front of machine) belt guard.

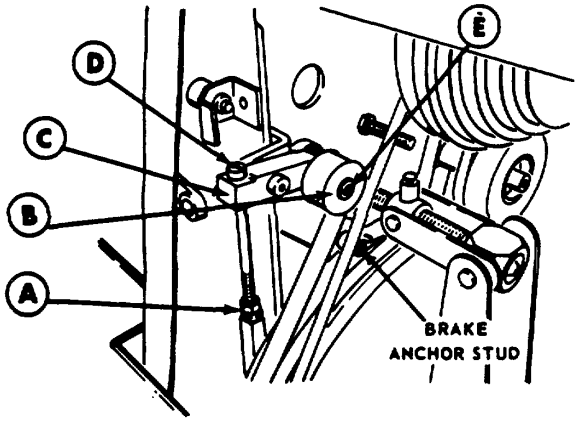


FIGURE 98

(b) See Figure 98. Push STOP switch (amber light out), loosen Screw E, and rotate Brake Cam B until brake strap is loose.

(c) See Figures 99 and 100. Loosen locknut A.

(d) With pedal up, lift Brake Cam B (Figure 99) as far as possible; adjust Screw D so that screw head just contacts ridge on Lever C and tighten Locknut A. (This should be a one-time adjustment.)

(e) Now rotate Brake Cam B counterclockwise (left) to take up slack in brake strap, until Lever C is horizontal or 1/8" above horizontal (see Figure 100).Tighten Screw E.

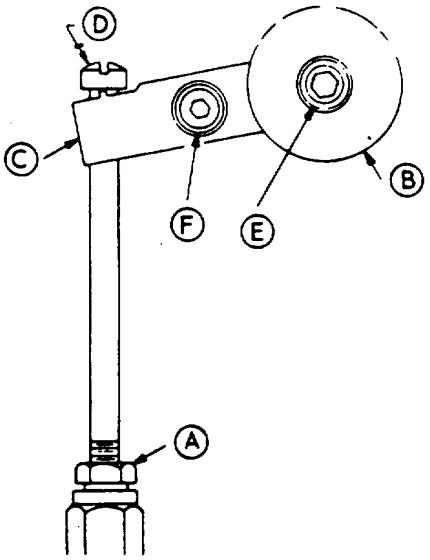


FIGURE 99

(2) Replacing Brake Strap (Part No MBB-1828A)

(a) See Figure 100 Open belt guard, loosen Screw E, and remove brake strap from anchor stud.

(b) Remove Screw G and Washer H and discard worn strap.

(c) Clean pulley.

(d) Fasten new strap in place with washer and screw and install strap loop onto brake anchor stud.

(e) Adjust brake as instructed above.

(f) Recheck after 10 hours of operation; readjust if required.

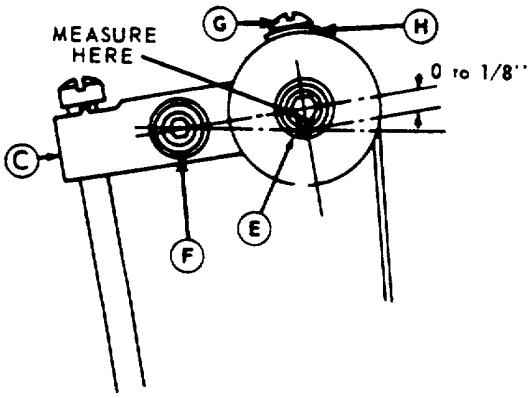


FIGURE 100

(g) SPINDLE ROTATION

1. CHECK: Push HONE START button. Depress pedal; machine spindle should rotate counterclockwise, as indicated by arrow (Figure 101).
(This check is usually required only on original installation or if motor has been replaced.)

2. TO ADJUST: To reverse rotation of motor reverse any two power line connections.

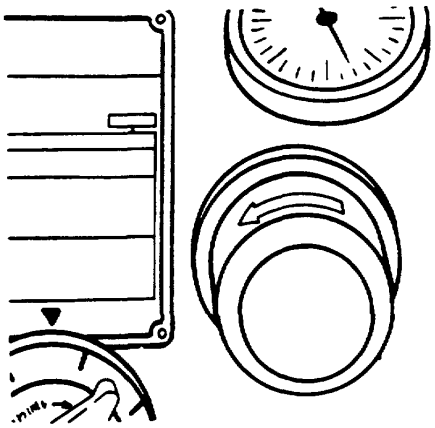


FIGURE 101

h. TIMING OF SPINDLE ROTATION AND STROKING

This covers the timing of spindle rotation and stroking with brake release and feed rod travel. Spindle rotation and stroking arm motion are started with one switch operated by the pedal. For longest brake belt life, and to have spindle rotation and stroker arm motion start before stone cutting pressure is applied, the switch must be properly set.

CHECK:

a. Turn STROKE switch to MANUAL and push HONE START switch.
b. Slowly depress pedal, observing movement of Cam B (Figure 98). Brake must release well before motor starts. If brake does not release, adjust as instructed in Paragraph 6.
c. Turn machine off.
d. See Figure 102. Loosen Screw. This will enable you to slide Switch Plate, which is slotted around Screw.

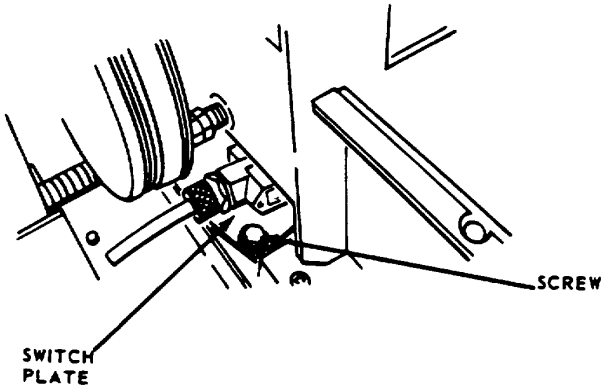


FIGURE 102

e. While standing on left side of machine, depress pedal bar one inch. Slide Switch Plate until you hear a faint click. Tighten Screw.
f. With STROKE switch at MANUAL, push HONE START switch. Depress pedal one inch; spindle should start turning. If it doesn't, repeat Steps *c, d,* and *e*.

i. SAFETY SWITCH ADJUSTMENT

A Safety Switch has been provided to prevent operation of Stroker when Arm is up .in storage position. This Switch is located under the right-hand top cover and is operated by a lever that touches the lower edge of Shaft Cover. The Switch is set at the factory, but can be adjusted easily should the need arise.

a. Push STOP button.
b. Lower Arm to operating position.
c. Check Shaft Cover freedom by rocking it slightly. You should be able to move Cover no more than 1/64-inch. Reposition Cover if it moves too far or not far enough, as follows:
   (1) See Figure 103. Use 3/16-inch hex wrench to loosen screw in Shaft Collar.

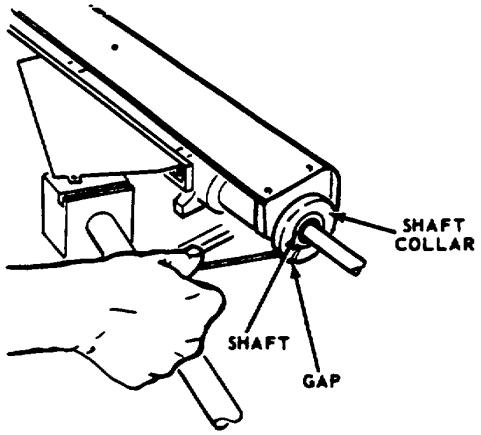


FIGURE 103

   (2) Rotate Collar:
      (a) Counterclockwise to increase Cover movement.
      (b) Clockwise to decrease Cover movement.
   (3) Tighten Collar, making sure it exerts forward pressure on Cover to keep it from rattling.
d. Push HONE START button.
e. Turn STROKE switch to POWER.
f. Push Release Handle (Callout 3, Figure 6) to engage Arm to power stroke.
g. Depress Pedal - spindle should rotate and Arm should stroke. If Arm does not stroke:
   (1) See Figure 104. Push STOP switch.
   (2) Use 1/8-inch (3 mm) hex wrench to loosen Block holding Switch Lever.
   (3) Move Block toward Switch until Switch clicks lock Block in this position.

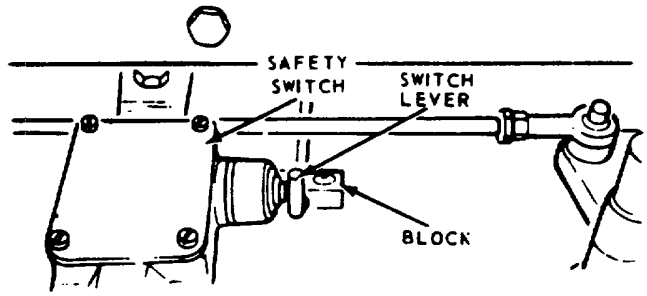


FIGURE 104

j. STROKER ALIGNMENT. Perform Steps 10A, 10B, and 10C in order.

j-1 STROKER HORIZONTAL ALIGNMENT

a. See Figure 105. Insert Torque Support Bar or Oil Support Bar (whichever fits your Dial Indicator) into clamp groove.

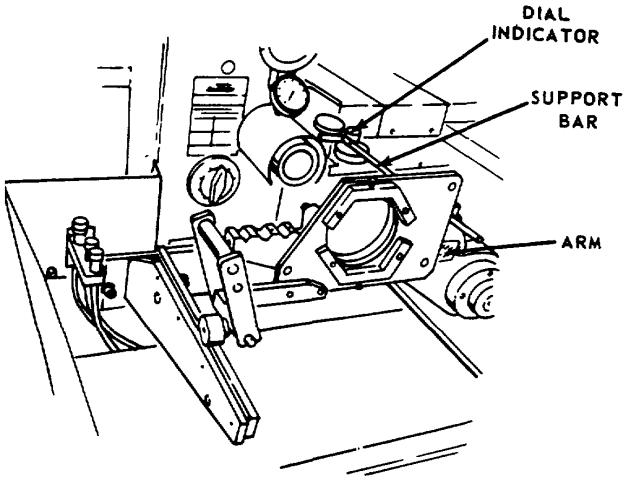


FIGURE 105

b. Clamp Dial indicator to Support Bar and stroke Arm to check that side of spindle nose and line of motion of Arm are parallel within .003" (0.08mm) over the length of the spindle nose.

c. It out of Tolerance:

(1) See Figure 106. Slightly loosen the four stroker Mounting Bolts.

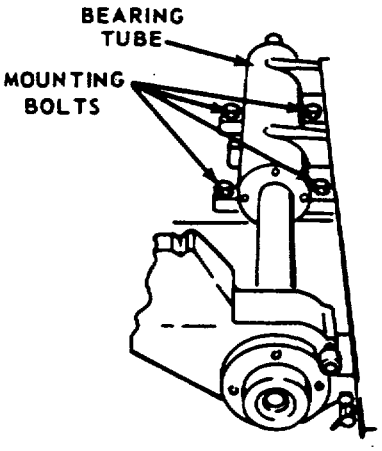


FIGURE 106

(COVER REMOVED FOR CLARITY)

(2) Move Bearing Tube under snug Mounting Bolts until this parallelism requirement is met.

(3) Tighten Mounting Bolts, and recheck alignment..

j-2 STROKING ARM CENTERING

a. Install Indicator Support Bar in spindle nose.

b. Rotate spindle nose to check that runout or Indicator Support Bar is within .005" (. 13 mm T.I.R. If it is not within .005" T.I.R., looser the set screw on spindle nose on the side that shows the highest reading and tighter set screw on the opposite side. Continue adjusting until runout does not exceed .005" T.I.R.

CAUTION

Make sure all set screws art tightened securely after adjusting.

c. Install Setup Disk.

d. See Figure 107. Loosen the four bolts in Hub End of Arm.

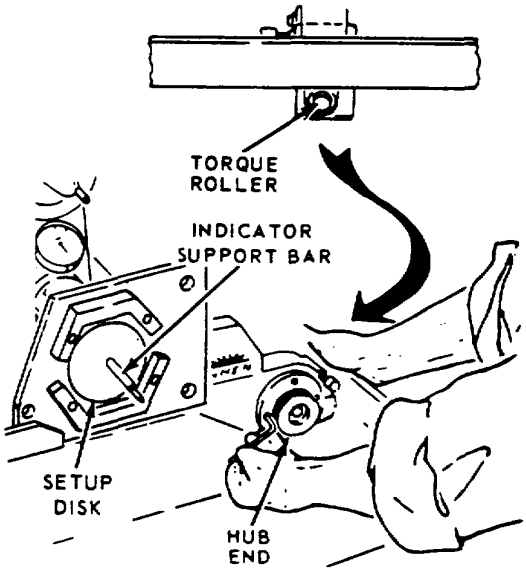


FIGURE 107

e. Move Arm toward machine until largest diameter of Indicator Support Bar goes through hole in Setup Disk.

f. With Setup Disk around Support Bar, raise Hub End of Arm and bold Torque Roller in contact with underside of Rectangular Torque Bar while evenly tightening the four bolts in Hub.

g. Pull Arm and Setup Disk off Indicator Support Bar.

j3 KNEE SUPPORT RAIL ALIGNMENT

a. Use a 5 32-inch hex wrench to remove Honing Dial.

b. Relocate Dial Indicator to sweep top of Spindle Nose. Stroke Arm to check that top of the Spindle Nose and the line of motion of Arm are parallel within .003 " (.08mm) over the length of the Spindle Nose.

c. If out of Tolerance:
(1) See Figure 108. Loosen Roller Locking Screw. Rotate Roller Cam Sleeve to position Roller at midpoint of its travel. Tighten Locking Screw.

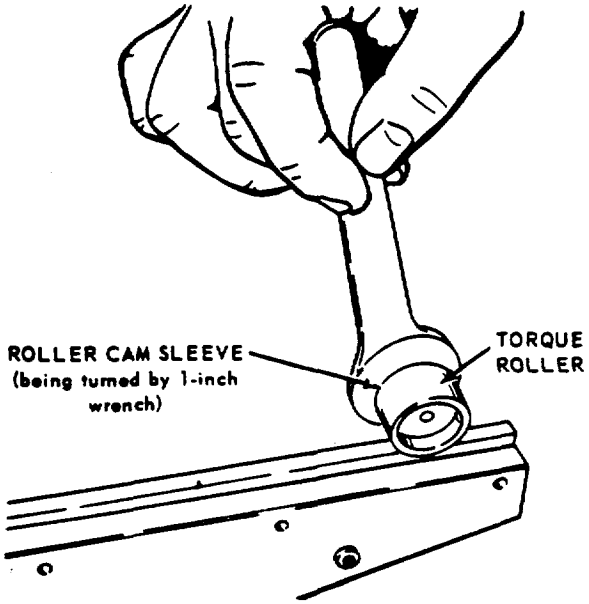


FIGURE 108

(2) See Figure 109. Use a 5/32-inch hex wrench to loosen the four Screws that attach Rail to Knee Support. Also loosen the two Cam Buttons, and lower the Rail.

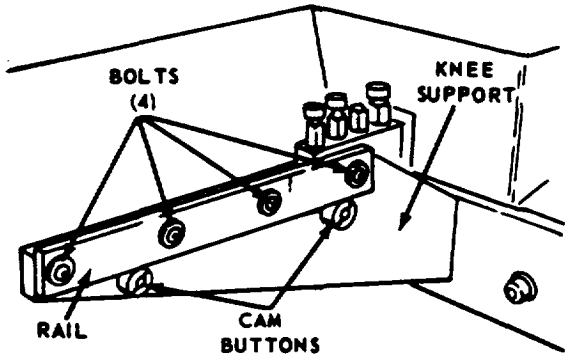


FIGURE 109

(3) See Figure 107. With Setup Disk over largest diameter of Indicator Support Bar, set Torque Roller shown in Figure 108 so that it is directly over the rear Rail Cam. Rotate rear Rail Cam until Rail touches Torque Roller. Position Indicator so its point is at the end of the Spindle Nose closest to the machine. Set Indicator at zero.
(4) Sweep top of Spindle Nose and stop with Indicator point at the front of the Spindle Nose. Rotate front Cam until Indicator reads zero. Recheck, and Repeat steps (3) and (4) if necessary to make sure that Rail and top of Spindle Nose are parallel within .003 over the length of Spindle Nose.
(5) Tighten the four Screws that attach Rail to Knee Support.
(6) Tighten the two Cam Buttons.
(7) Replace Honing Dial.

h. SQUARING THE CONNECTING ROD FIXTURE

When squareness accuracy needs to be improved, correct as follows:
CHECK:
a. Install the 3 Spacing Studs.
b. Install Indicator Support Bar in spindle nose.
c. Attach the largest Face Ring you have to Back Plate as follows:

(1) See Figure 110. Clean surfaces of Face Ring and Back Plate very thoroughly.

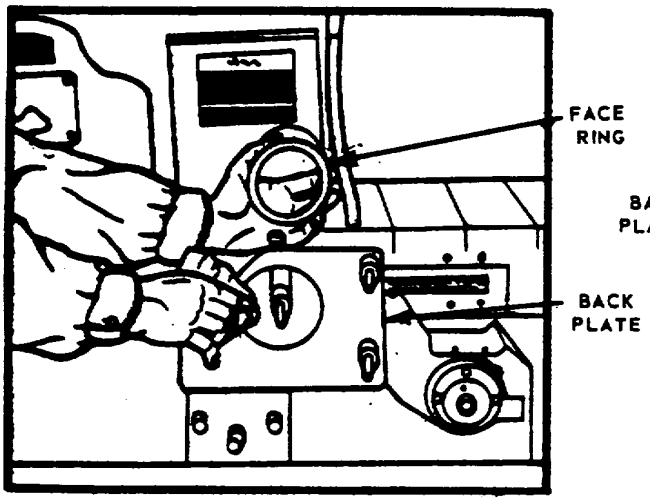


FIGURE 110

(2) See Figure 111. Install Face Ring. DO NOT OVERTIGHTEN Locking Screw Face Ring may distort.

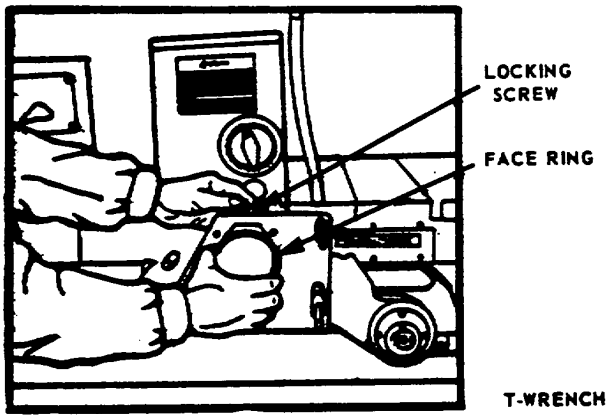


FIGURE 111

d. Push Release Handle back and move arm back until it locks in position.

e. Rotate gear box pulley by hand to position Back Plate as close as possible to Spindle Nose (see Figure 112).

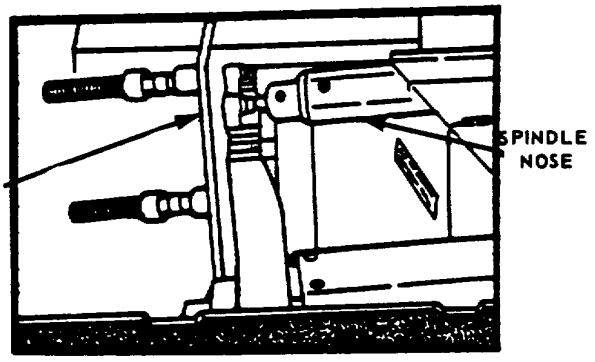


FIGURE 112

f. See Figure 113. Rotate arm position knob clockwise with T-Wrench until Back Plate is as far back as it will go.

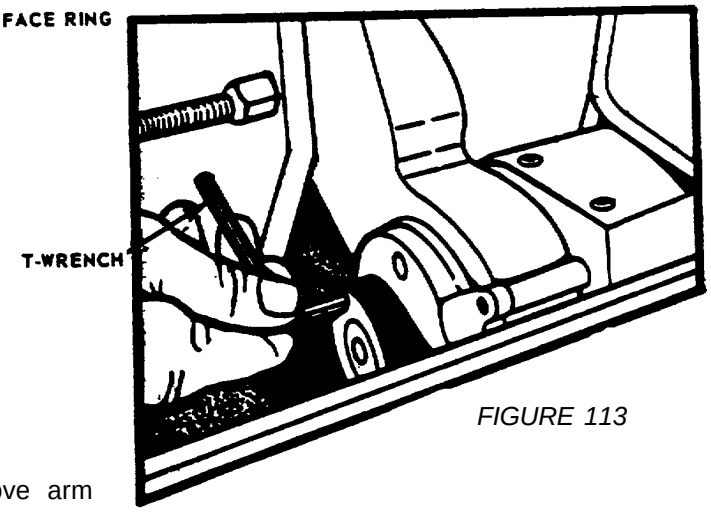


FIGURE 113

g. See Figure 114. Attach Dial Indicator to Indicator Support Bar position arm and Indicator so Indicator will sweep Face Ring Working Surface. Lock arm in this position by clamping to Rectangular Torque Bar with a C-clamp and Block of Wood (see Figure 115) so it will not move during the following steps.

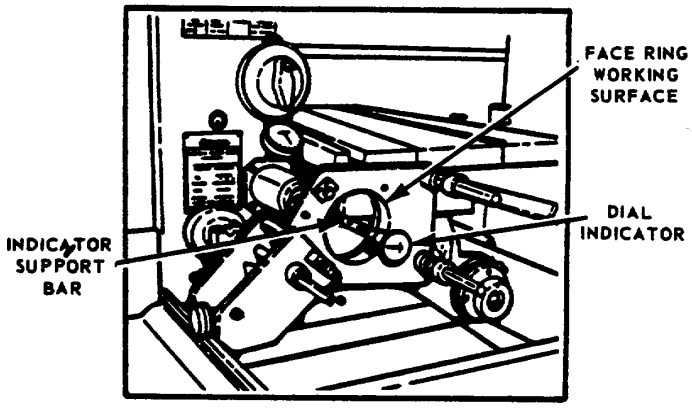


FIGURE 114

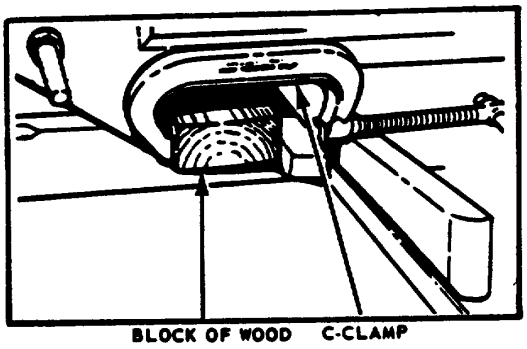


FIGURE 115

TO CORRECT OUT-OF-SQUARENESS:

1. See Figures 116 and 117. Slightly loosen the two Attaching Nuts on Adjustable Support Bushings. Leave the Attaching Nut at Solid Support Bushing tight.

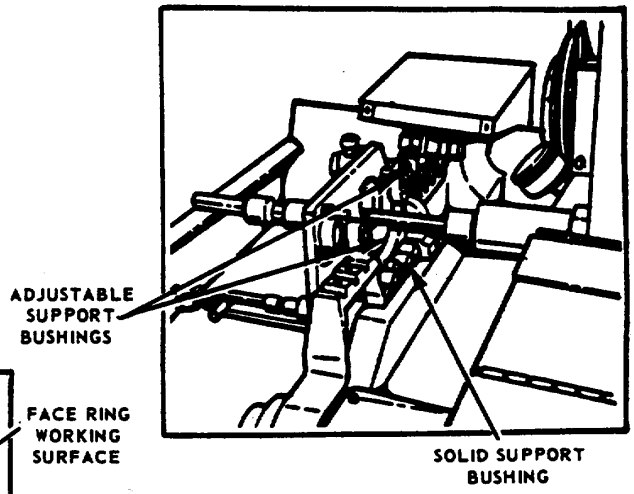


FIGURE 116

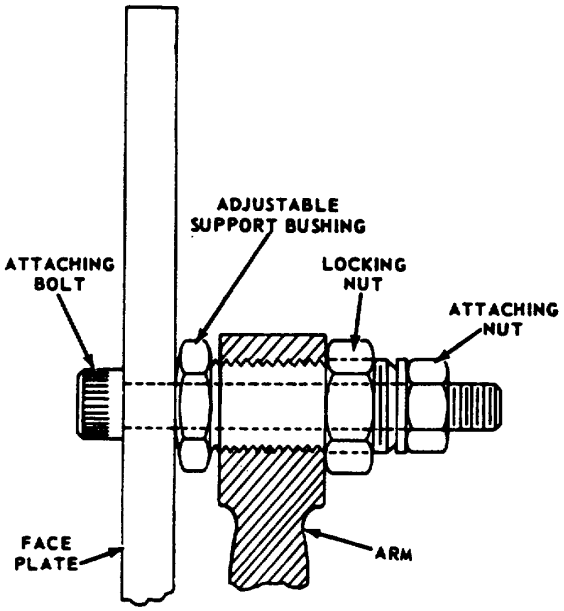


FIGURE 117

2. Rotate spindle nose to position Dial Indicator finger near Solid Support Bushing Attaching Bolt and zero Indicator.
3. Rotate spindle nose until Dial Indicator finger is next to one of the other two Attaching Bolts.
4. See Figures 116 and 117. If Dial Indicator does not read zero, loosen Locking Nut on rear of appropriate Adjustable Support Bushing.

NOTE

The Adjustable Bushings have a hex wrenching surface between the rear of Back Plate and arm. A special thin wrench is provided for adjusting the Bushing.

5. Turn Bushing clockwise to move Face Ring away from Indicator or counterclockwise to move it toward Indicator until Indicator reads zero. Snug up Locking Nut and Attaching Nut to get reliable reading.
6. When Indicator reads zero with Locking Nut snug, rotate spindle nose until Indicator finger is next to the other Adjustable Bushing Attaching Bolt and repeat Steps d and e.
7. Repeat Steps a through f as required to achieve the squareness accuracy desired.
8. Remove Dial Indicator, Indicator Support Bar, and Face Ring.
9. Remove C-clamp and Block of Wood.

l. STROKER BELT REPLACEMENT

For replacement belt, specify Part No. KKN-444A.

m. STROKER ARM POSITION ADJUSTMENT DRAG SETTING

See Figure 118. If stroker arm position seems to drift, tighten Set Screw (clockwise).

1-29 REPAIR

a. TO REPLACE ADJUSTING NUT ASSEMBLY

See Figure 119. Facing back of machine, remove Bolt and Nut from top right side of Feed Arm Assembly. Spring sides apart and disconnect feed arm from Adjusting Nut Assembly. Now hold Nut to keep it from turning and wind Feed Dial counterclockwise until Nut comes off shaft. Reverse this procedure to install new Adjusting Nut Assembly. Make sure Projection on Adjusting Nut Assembly extends upward as shown in Figure 120.

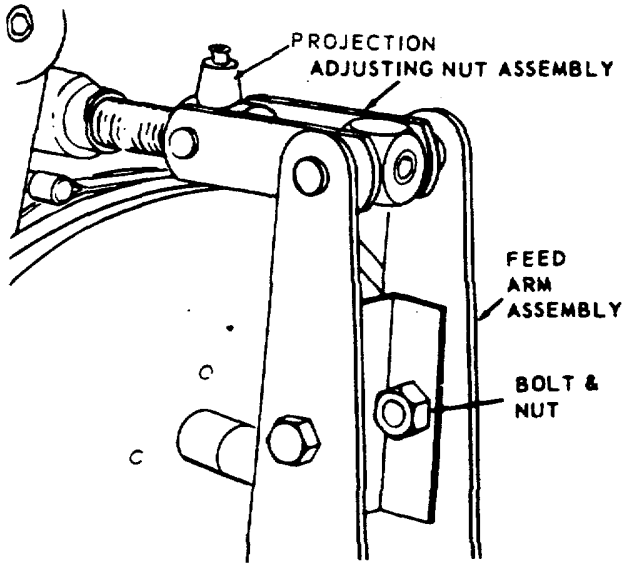


FIGURE 119

b. TO REPLACE SPINDLE BEARINGS

(Order Part No. PBR-56A for front bearing; PBR-57A for rear bearing.)

1. Disassembly.
   (a) See Figure 120. Stick a 3/8" (9.5mm) diameter rod into Hole in side of housing and turn spindle until rod engages hole in center of spindle shaft.

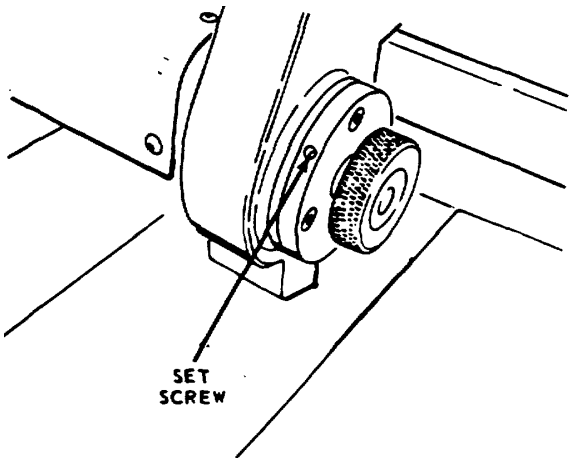


FIGURE 118

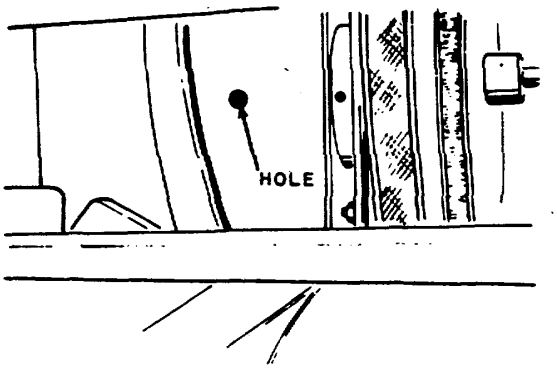


FIGURE 120

(b) See Figure 121. Using 5?" hex wrench, remove Screw and Washer from back end of feed rod.

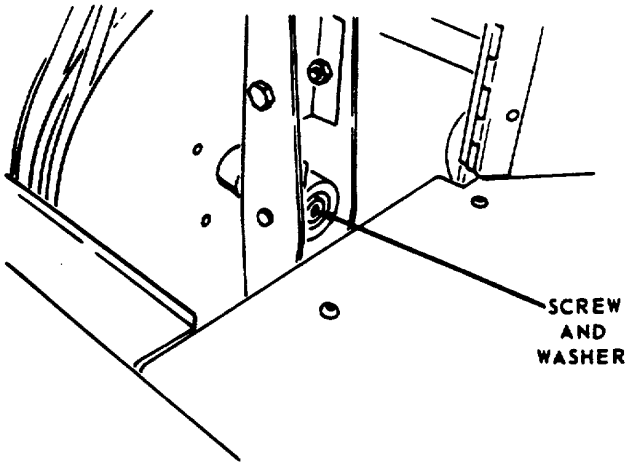


FIGURE 121

(c) Remove belts and brake strap.
(d) Turn feed dial to back adjusting nut all the way out.
(e) Lay feed arm assembly and adjusting nut back and out of the way.
(f) A special spanner wrench is required for the next step. A suggestion for constructing one is shown in Figure 122.

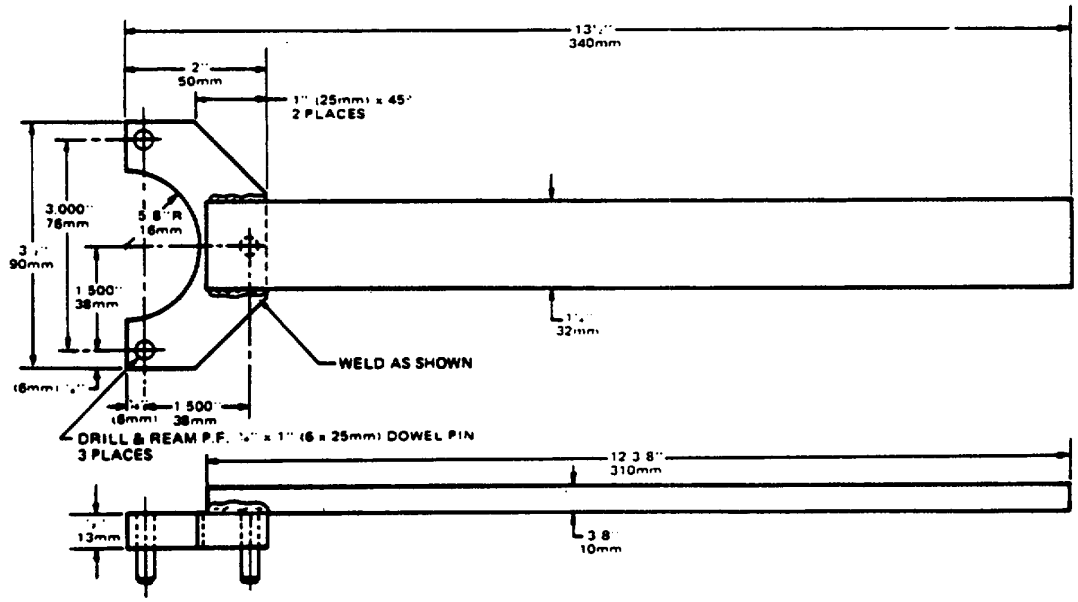


FIGURE 122

(g) See Figure 123. Insert Spanner Wrench into holes provided in Pulley and hammer the Wrench as shown to loosen Pulley. Unscrew Pulley completely.

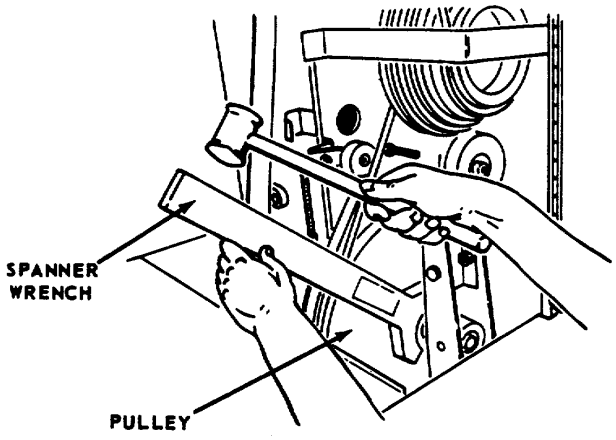


FIGURE 123

(h) See Figure 124. Loosen Set Screw with 3/32-inch hex wrench.

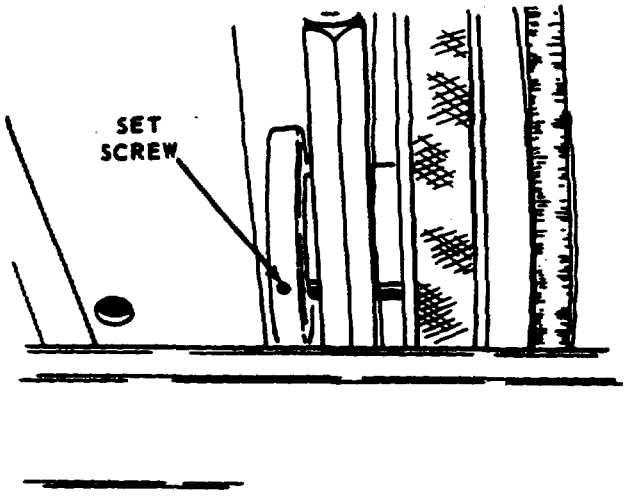


FIGURE 124

(i) See Figure 125. Using a 3/16-inch) hex wrench, remove the four Screws holding Bearing Retainer to housing.

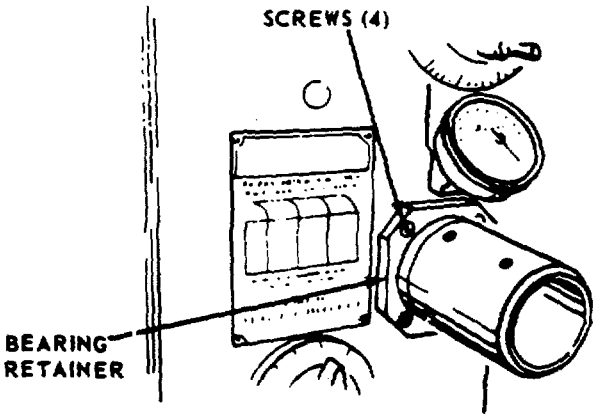


FIGURE 125

(j) Withdraw spindle through front of Machine Housing. Save Spacer and Ground Washer (see Figure 126).

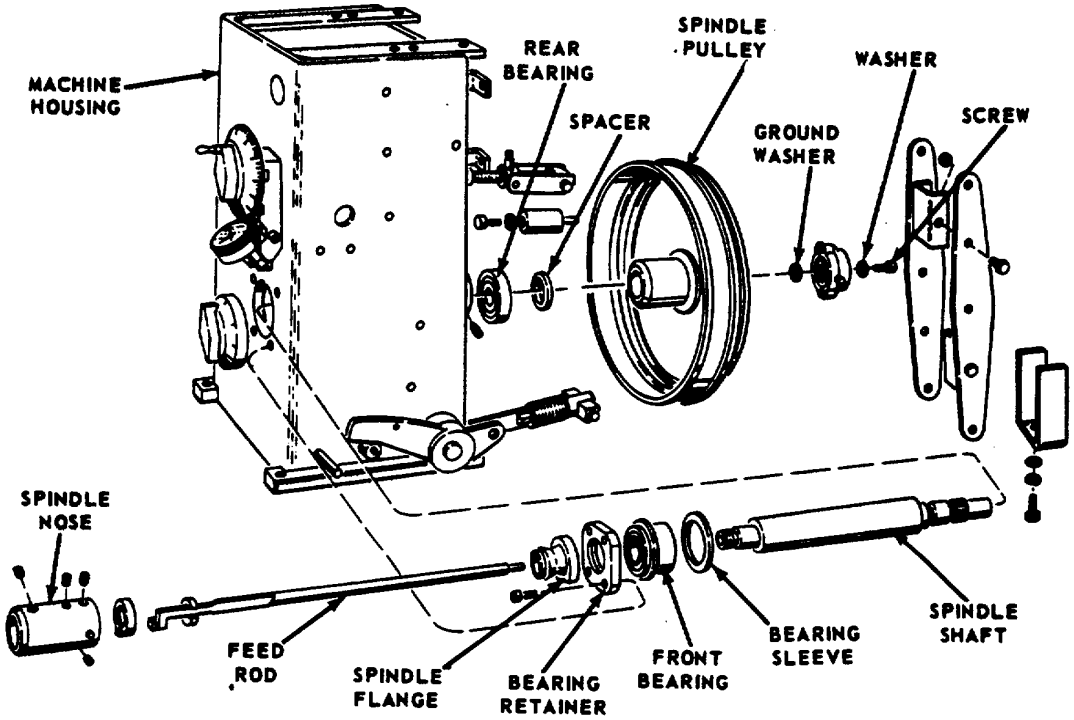


FIGURE 126

(k) Clamp Spindle Nose in a vise. Using 3/8" (9.5 mm) diameter rod of Step (1), unscrew and remove Spindle Shaft.

(l) Press Front and Rear Bearings off Shaft. If arbor press is not available, place Spindle Shaft with Bearing extending over open jaws of vise, hold block of wood over end of Spindle Shaft, and hit with hammer to force Shaft out of Bearing (see Figure 127).

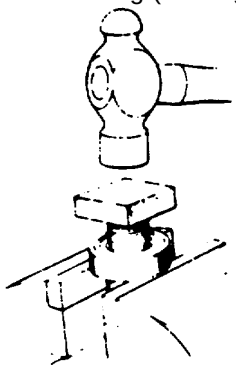


FIGURE 127

2. Reassembly

(a) Put new Front Bearing, Bearing Retainer, and Bearing Sleeve on Spindle Shaft and force into position by screwing Spindle Flange onto Shaft.

(b) Insert spindle assembly through front of Housing.

(c) Secure Bearing Retainer to Housing with the four Screws (see Figure 125).

(d) Put Spacer on Spindle Shaft.

(e) Use bar to keep Spindle Shaft from turning while threading Spindle Pulley onto Shaft, thus drawing Rear Bearing into Housing. Be careful not to damage Spindle Pulley.

(f) Put Ground Washer on Feed Rod.

(g) Reinstall adjusting nut and feed arm assembly, and turn feed dial to bring it to normal position.

(l) Reinstall Screw and Washer in end of Feed Rod and tighten.

(i) Reinstall belts and brake strap.

(j) See Figure 124. Tighten Set Screw (just snugly, please).

(k) Run spindle at top spindle speed and listen to bearing noise. It should "hiss" slightly. If you hear a hum, turn machine off and loosen Set Screw slightly. Recheck.

1-30 REPLACING OIL PUMP SEAL - HYPRO PUMP

Identify the manufacturer of the oil pump installed on your LBB-1810 (the Hypro name is cast in the pump cover). This replacement procedure applies to the Hypro pump only, for Viking pump seal replacement see Section 5.

a. With 3/16 hex wrench, remove four screws that hold Cover to Pump Body (see Figure 91A). Remove Cover.

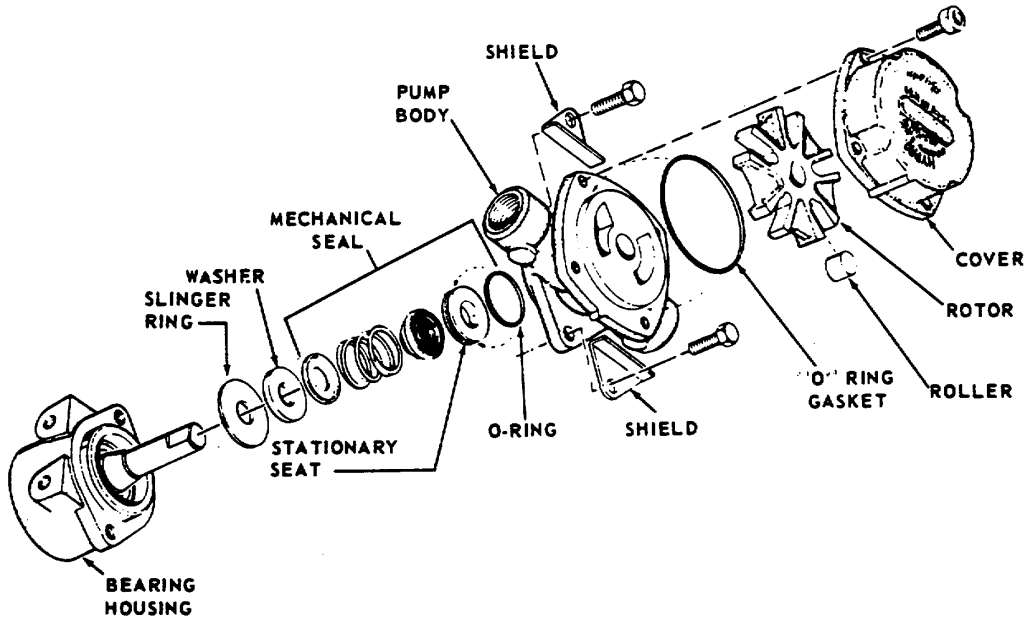


Figure 91A. HYPRO PUMP

b. Remove Rollers and "O" Ring Gasket.

c. Remove Rotor from shaft by prying with two screw drivers. Apply even pressure under webs of Rotor.

d. Remove two hex cap screws that hold Pump Body to Bearing Housing. Two Shields also come off with the capscrews. Pull Pump Body off, leave hoses attached to Pump Body.

e. Pull Mechanical Seal. Washer, and Slinger Ring from shaft. Remove Stationary Seat of Mechanical Seal from Pump Body.

f. To reassemble, assemble Slinger Ring and Washer on shaft against shoulder.

g. Place spring retainer, spring, and rotating seat of Mechanical Seal on shaft in order as indicated in Figure 91A. Insert Stationary Seal of Mechanical Seal with O-ring into counterbore on motor side of Pump Body. The polished side of the Stationary Seat must face the motor. Lightly oil O-ring on Stationary Seat to avoid tearing O-ring during insertion.

h. Put Shields back in place and install Pump Body to Bearing Housing.

i. Put "O" Ring Gasket on Pump Body. Rotor on shaft, and Rollers into rotor slots.

j. Replace Cover and secure to Pump Body with four screws. Note that the Cover is installed upside down as far as the print on the casting is concerned.

CHAPTER 1
SECTION VI - PARTS LIST

PARTS LIST FOR HONING MACHINE, MODEL LBB-1810

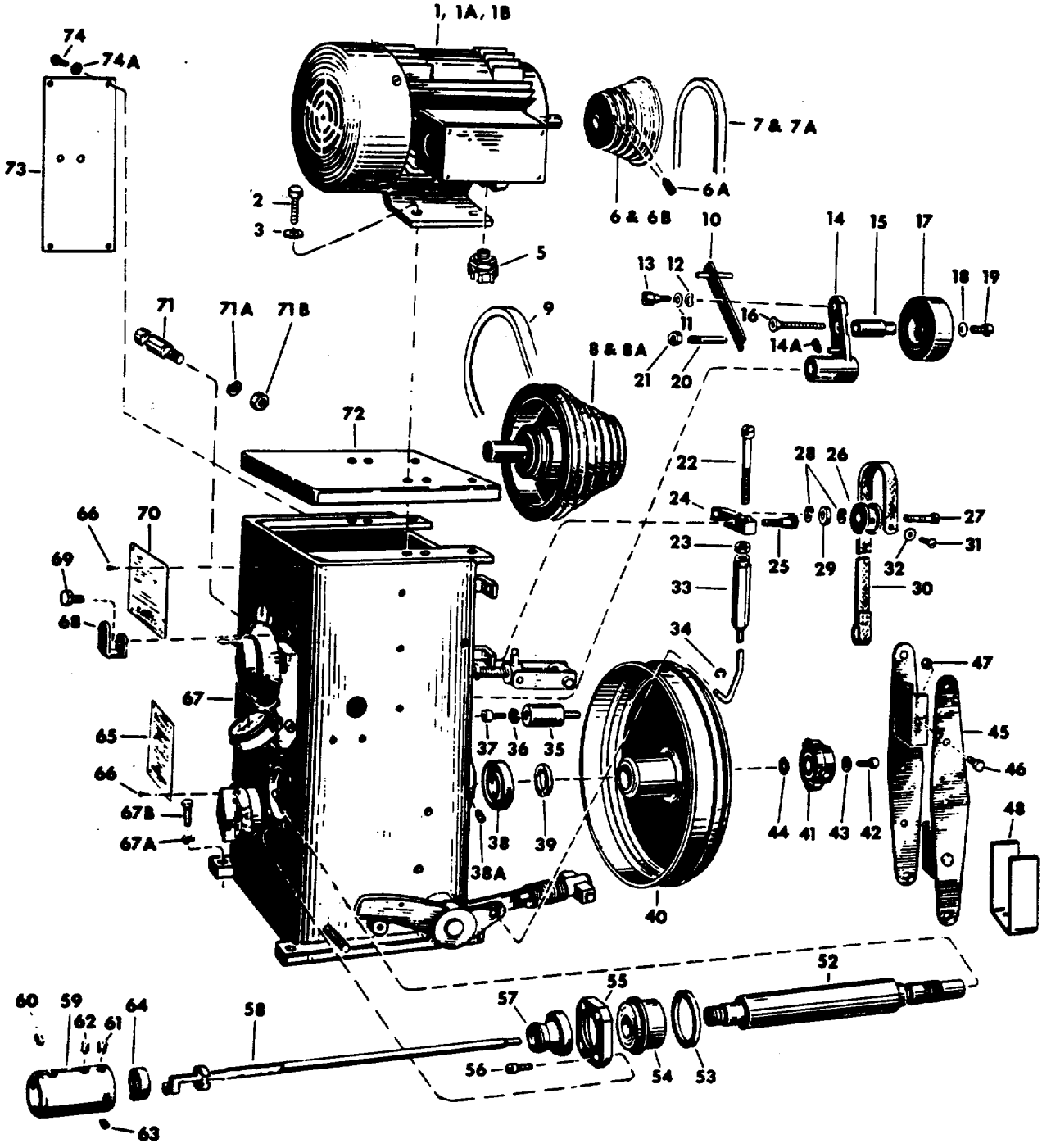


Figure 128. HONING MACHINE HEAD ASSEMBLY

PARTS LIST COVERING FIGURE 128 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	PMO-571B-A	1	.....*Motor (1 H.P., Nema 143T Frame, T.E.F.C., 230/460 Volt, 60 Hz, 3 Ph., 1725 RPM, 7/8 Dia. Shaft)
1A	PMO-572B-A	1	.....*Motor (1 H.P., Nema 143T Frame, T.E.F.C., 220/380 Volt, 50 Hz, 3 Ph., 1425 RPM, 7/8 Dia. Shaft)
1B	PMO-573B-A	1	.....*Motor (1 H.P., Norma 143T Frame, T.E.F.C., 220/4.40 Volt, 50 Hz, 3 Ph., 1425 RPM, 7/8 Dia. Shaft)
2		4	.....Screws (5/16.18 x 1" Hex Hd. Cap)
3		4	.....Washers (5/16 Plain)
5		1	.....Connector
6	MBB-1826A	1	.....Motor Pulley for 60 Hz Machines *with*
6A		2	.....Set Screws (1/4-20 x 1/2 Soc. Full Dog Pt.)
6B	MBB-1846A	1	.....Motor Pulley for 50 Hz Machines *with*
6A		2	.....Set Screws (1/4-20 x 1/2 Soc. Full Dog Pt.)
7	MBB-1830A	1	....."V" Belt for 60 Hz Machines (Mfg. No. 7M690)
7A	MBB-1833A	1	.....“V" Belt for 50 Hz Machines (Mfg. No. 7M670)
8	MBB-1815A	1	.....Countershaft Pulley *with* Bearing for 60 Hz Machines
8A	MBB-1835A	1	.....Countershaft Pulley *with* Bearing for 50 Hz Machines
9	MBB-1840A	1	....."V" Belt (Mfg. No. 7M1120)
	MBB-1850A	1	.....Idler Assembly consists of
10	MBB-1870A	1	.....Idler Release Assembly *with*
12		1	.....Spring Washer (Shakeproof Style 6)
11		1	.....Washer (5/16 Fibre)
13		1	.....Shoulder Screw (5/16 x 3/8 with 1/4-20 x 7/16 thread)
14	MBB-1855A	1	.....Idler Arm *with*
14A		2	.....Set Screws (5/16-18 x 1/2 Soc. Plain Cup Pt.)
		1	.....Groov-Pin (GP 4-156X625-14)
15	MBB-1867A	1	.....Shoulder Bushing *with*
16		1	.....Screw (5/16-18 x 1-1/4 Soc. Flat Hd. Cap)
17	MBB-1860A	1	.....Idler Pulley Assembly *with*
18		1	.....Washer (5/16 Plain)
19		1	.....Screw (5/16-18 x 3/4 Soc. Hd. Cap)
Not Shown		1	.....Washer (5/16 Lock)

(Parts continued on next page)

*Specify Brand name of motor and if other than Voltage and Hertz as listed.

PARTS LIST COVERING FIGURE 128 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
20	MBB-1874A	1	.....Stud *with*
21		1	.....Nut (3/8-16 Hex)
22	MBB-968A	1	.....Brake Adjusting Screw *with*
23		1	.....Nut (1/4-20 Hex)
24	MBB-978A	1	.....Brake Lever *with*
25		1	.....Shoulder Screw (5/16 x 5/8 with 1/4 - 20 x 7/16 thread)
Not Shown		1	.....Locknut (1/4-20 Hex)
26	MBB-973C	1	.....Brake Cam *with*
27		1	.....Screw (5/16-18 x 1-1/4 Soc. Hd. Cap)
28		2	.....Washers (5/16 Serrated Lock)
29		1	.....Spacer
30	MBB-1823A	1	.....Brake Strap *with*
31		1	.....Screw (10-32 x 3/8 Rd. Hd.)
32		1	.....Washer (Bent)
33	MBB-985A	1	.....Brake Rod Assembly *with*
34	MBB-976A	1	.....Retaining Ring (Truarc No. 5133-25)
35	MBB-2441A	1	.....Brake Anchor *with*
36		1	.....Washer (3/8 Lock)
37		1	.....Screw (3/8-16 x 1" Soc. Hd. Cap)
38	PBR-57A	1	.....Bearing (MRC #206SZZ)
38A		1	.....Set Screw (10-32 x 1/4 Soc. Nylon Tip)
39	MBB-2529A	1	.....Spacer
40	LBB-1107A	1	.....Spindle Pulley
41	MBB-365A	1	.....Thrust Assembly *with*
42		1	.....Screw (3/8-16 x 3/4 Soc. Hd. Cap)
43		1	.....Washer (3/8 Special)
44		1	.....Washer (.555 Special)
45	LBN-385A	2	.....Feed Arm Assemblies *with*
46		4	.....Screws (5/16-18 x 1/2 Hex Hd. Cap)
47		4	.....Nuts (5/16-18 Hex)
48	MB-3089A	1	.....Feed Arm Stabilizer *with* Attaching Hardware
52	MBB-2491A	1	.....Spindle

(Parts continued on next page)

PARTS LIST COVERING FIGURE 128 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
53	MBB-2498A	1	.....Bearing Sleeve
54	PBR-56A	1	.....Bearing (MRC #5206-SBKZZG) *with* Snap Ring
55	MBB-2497A	1	.....Bearing Retainer *with*
56		4	.....Screws (1/4-20 x 3/4 Soc. Hd. Cap)
57	MBB-352C	1	.....Spindle Flange *with*
63	PHS-127A	1	.....Set Screw (5/16-24 x 7/16 Soc. Half Dog Pt.)
58	MBH-648A	1	.....Feed Rod Assembly *with*
42		1	.....Screw (3/8-16 x 3/4 Soc. Hd. Cap)
43		1	.....Washer (3/8 Special)
44		1	.....Washer (.555 Special)
59	LBB-343A	1	.....Spindle Nose *with*
60	LBN-346A	1	.....Set Screw (1/2-13 x 7/16 Soc. Flat Pt.)
61	MBB-339A	3	.....Set Screws (5/16-24 x 7/16 Soc. Oval Pt.)
62	MBB-332A	1	.....Set Screw (1/4-20 x 3/8 Soc. Full Dog Pt.)
63	PHS-127A	1	.....Set Screw (5/16-24 x 7/16 Soc. Half Dog Pt.)
64	MBB-642A	1	.....Drive Plate *with*
62		1	.....Set Screw (1/4-20 x 3/8 Soc. Full Dog Pt.)
65	LBB-989A	1	.....Clearance Chart *with*
66		4	.....Screws (#0 x 3/16 Drive)
67		1	.....Housing
67A		4	.....Washers (3/8 Plain)
67B		4	.....Screws (3/8-16 x 1-1/4 Hex Hd. Cap)
68	MBB-2563A	1	.....Dial Pointer *with*
69		1	.....Screw (1/4-20 x 3/8 Hex Hd. Cap)
70		1	.....Nameplate *with*
66		4	.....Screws (#0 x 3/16 Drive)
71	MBB-1844A	1	.....Belt Cover Latch Pin with
71A		1	.....Washer (5/16 Lock)
71B		1	.....Nut (5/16-18 Hex)
72	MBB-2538B-A	1	Top Cover
73	MBB-2528B-A	1	Cover *with*
74		4	.....Screws (10-32 x 1/4 But. Hd. Cap)
74A		4	.....Washers

HONING MACHINE HEAD ASSEMBLY

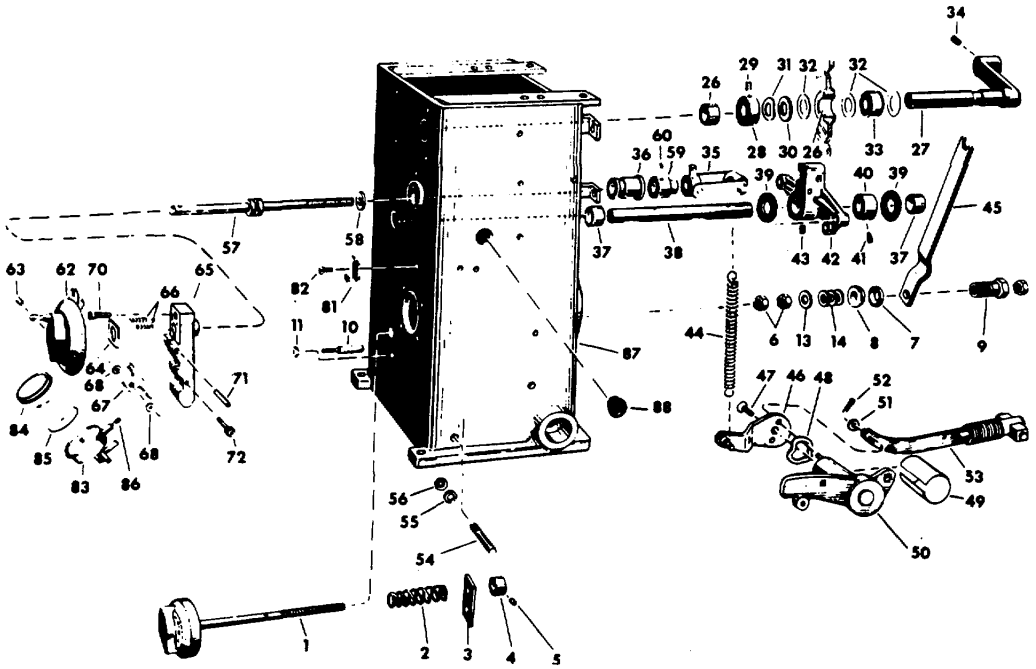


Figure 129. HONING MACHINE HEAD ASSEMBLY

PARTS LIST COVERING FIGURE 129

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	LBB-2475A	1	.....Pressure Dial Assembly *with*
2		1	.....Spring
3		1	.....Plate
4	LBN-450C	1	.....Set Collar *with*
5		1	.....Set Screw (1/4-20 x 1/4 Soc. Cup Pt.)
6		2	.....Nuts (3/8-24 Hex)
13		1	.....Washer (3/8 Hardened)
14	LBA-453A	1	.....Spring
7	LBA-445A	1	.....Spherical Socket *with*
8		1	.....Spherical Washer
9	LBA-456A	1	.....Thread Nut & Jam Nut
10	LBA-438C	1	.....Pin *with*
11		1	.....Nut (10-32 Hex)
26	PBR-34A	2	.....Bearings (Garlock #12 DU10) Pkg. of 2
27	MBB-2920A	1	.....Arm & Shaft Assembly *with*
28	MBB-866A	1	.....Set Collar *with*
29		1	.....Set Screw (1/4-28 x 5/16 Soc. Cup Pt.)
30		1	.....Washer (Special)
31		1	.....Spring Washer
32	MBB-867A	3	.....Thrust Bearings-Nylon
33	MBB-1897A	1	.....Spacer
34		1	.....Set Screw (3/8-16 x 1/2 Soc. Cup Pt.)
35	LBA-381A	1	.....Adjusting Nut Assembly

(Parts continued on next page)

HONING MACHINE HEAD ASSEMBLY

PARTS LIST COVERING FIGURE 129 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
36	LBA-367C	1	.....Sleeve
37	PBR-53A	2	.....Bearings (Garlock #10DU08) Pkg. of 2
38	MBB-1859A	1	.....Idler Shaft
39	MBB-1858A	2	.....Thrust Bearing (Pkg. of 1)
40	LBN-337A	1	.....Set Collar *with*
41		1	.....Set Screw (1/4-20 x 3/8 Soc. Cup Pt.)
42	MBB-2912A	1	.....Idler Tension Arm *with*
43		1	.....Set Screw (3/8-16 x 5/8 Soc. Cup Pt.)
44	PSP-303A	1	.....Spring
45	LBA-446A	1	.....Lever
46	MBB-2915A	1	.....Crank Arm Lever *with*
47		1	.....Screw (1/4-28 x 3/4 Soc. Flat Hd. Cap)
48	PHW-145A	1	.....Washer (Spring)
49	MBB-2464A	1	.....Bearing Insert
50	MBB-2460A	I	.....Stub Crank Arm Assembly *with*
51		1	.....Washer (1/4 Plain)
52		1	.....Cotter Pin (1/16 x 1/2 Long)
53	LBA-395A	1	.....Feed Arm Link Assembly
54	LBN-406A	2	.....Stop Pin (Pkg. of 1) *with*
55		2	.....Washer (5/16 Plain)
56		2	.....Nut (5/16-18 Hex)
57	MBB-2405A	1	.....Feed Screw *with*
59	MBB-986A	1	.....Set Collar *and*
60		1	.....Set Screw (1/4-20 x 1/4 Soc. Cup Pt.)
58		1	.....Fiber Washer
62	LBN-375A	1	.....Dial Assembly *with*
63		1	.....Set Screw (1/4-20 x 1/4 Soc. Cup Pt.)
64	MBB-719A	1	.....Plate
65	MBB-2395A	1	.....Body Assembly *with*
66	MBB-718A	2	.....Springs
67		1	.....Rocker
68		2	.....Washers
70		1	.....Screw (1/4-20 x 1" Soc. Hd. Cap)
71		1	.....Pin
72		1	.....Screw (10-32 x 1" Soc. Hd. Cap)
81	KKN-1139A	1	.....Spindle Nose Cover Clip *with*
82		1	.....Screw (10-32 x 3.8 Rd. Hd.)
83	MBB-707A	1	.....Dial Indicator & Pin Assembly *Complete with*
84	MBB-708A	1	.....Dial Indicator Bezel & Crystal
85	MBB-709A	1	.....Dial Indicator Face
86	MBB-705A	1	.....Cushion Indicator Tip
87		1	.....Housing
88	PHM-734A	1	.....Plug

PRECISION GAGE

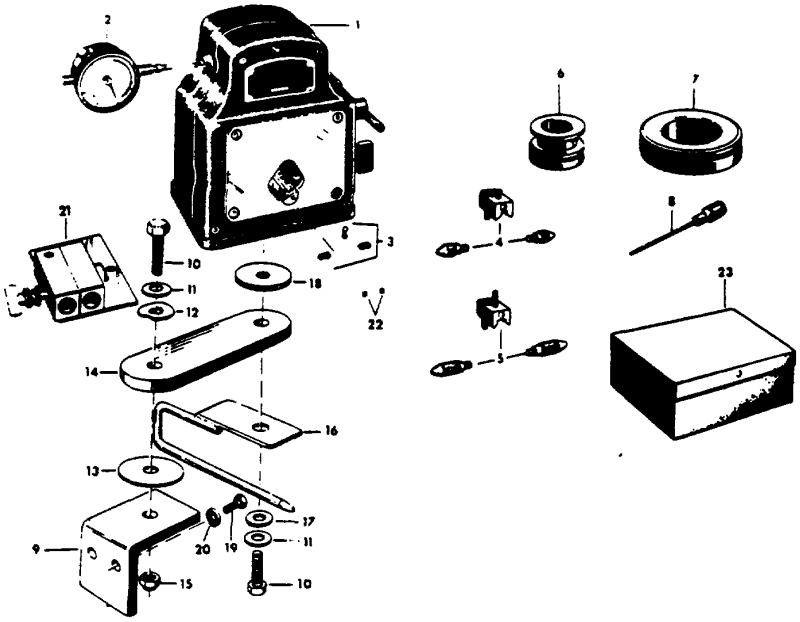


Figure 130. PRECISION GAGE
PARTS LIST COVERING FIGURE 130

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	†AG-300	1	.....Precision Gage *complete with*
2	AG-50A	1	.....Indicator Assembly
3	AG-210	1	.....Standard Point Set
4	AG-420	1	.....Medium Extension Point Set
5	AG-430	1	.....Large Extension Point Set
6	AG-456A	1	.....Small Range Calibrator Ring
7	AG-465A	1	.....Medium & Large Range Calibrator Ring
8	AG-450A	1	.....Wrench Assembly
	AG-295A	1	.....Gage Mount *complete with*
9	AG-306A	1	.....Bracket
10		2	.....Screws
11		2	.....Washers (3/8 Plain)
12		1	.....Washer (3/8 Spring)
13	MB-1228A	1	.....Washer (3/8 Fiber)
14	MB-1229A	1	.....Link
15		1	.....Nut (3/8-16 Self-Lock)
16	AG-315A	1	.....Rod Assembly
17	AG-291A	1	.....Cushion Washer (Neoprene)
18	AG-292A	1	.....Cushion Washer (Neoprene)
19		2	.....Screws (5/16-18 x 3/4 Hex Hd. Cop)
20		2	.....Washers (5/16 Plain)
21	AG-299A	1	.....Setting Fixture Assembly
22	AG-438A	1	.....Package of 10 Replacement Gage Balls
23	AG-445A	1	.....Storage Box
Not	AG-475-L	1	.....Boxed Accessory Kit - *consists of*
Shown			.....Items 4, 5, 6, 7, 8, 22 & 23

† This is a precision instrument and cannot be repaired in the field.

CAUTION - USE THIS PAGE FOR MOTOR, PUMP & OIL CONTROL SERIAL NUMBERS BEFORE NO. 21400. (SEE PAGE **60&61** FOR LARGER SERIAL NUMBERS) All other Honing Machine Base Parts the same as listed on Page **60**.

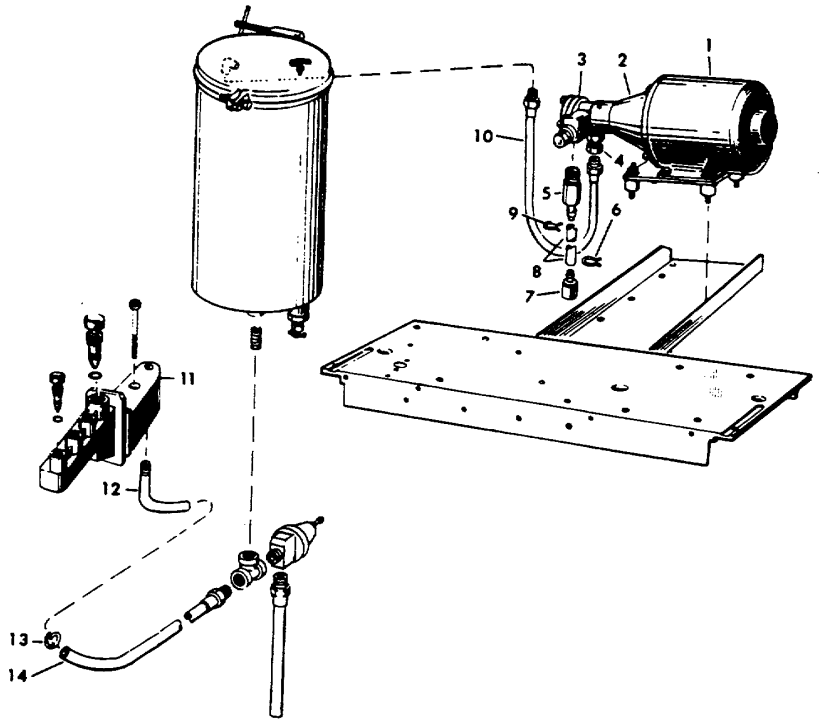


Figure 131. MOTOR, PUMP & OIL CONTROL

PARTS LIST COVERING FIGURE 131

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	PMO-360A	1	.....Motor (1/2 H.P., 230/460 Volt, 60 HZ, 3 Ph.)
1	PMO-360A	1	.....Motor (1/2 H.P., 230/460 Volt, 60 Hz, 3 Ph.)
1	PMO-372A	1	.....Motor (1/2 H.P., 220/380 Volt, 50 Hz, 3 Ph.)
1	PMO-373A	1	.....Motor (1/2 H.P., 220/440 Volt, 50 Hz, 3 Ph.)
2	PF-183A	1	.....Mounting Bracket
3	PF-179A	1	.....Pump *with*
Not Shown		1	.....Reducer-Bushing (1/2 - 3/8 NPT)
4	PPP-146A	1	.....Adapter
5	MBB-1635A	1	.....Check Valve *with*
6		1	.....Clomp
7	PF-317A	1	.....Intake Strainer
8	MBB-1632A	1	.....Hose *with*
9		1	.....Clamp
10	PPP-22A	1	.....Hose Assembly
11	MB-2180A		.....Valve Body Assembly
12	MB-2189A	1	.....Pipe
14	PPP-28A	1	.....Hose Assembly *with*
13		1	.....Clamp

HONING MACHINE BASE

CAUTION - USE THIS PAGE FOR MOTOR, PUMP & OIL CONTROL SERIAL NUMBER 21400 & UP. (SEE PAGE **59** FOR NUMBERS UNDER 21400.

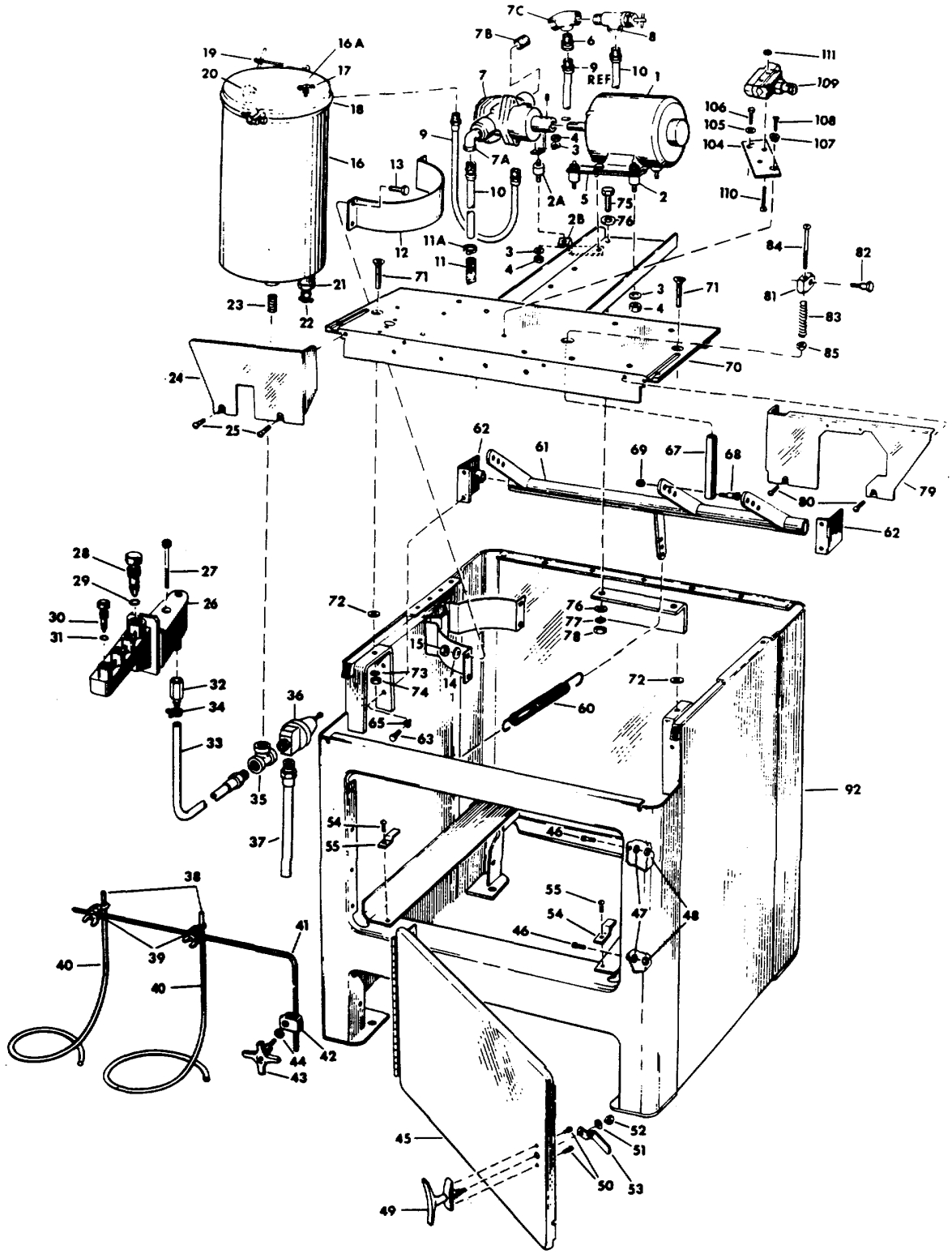


Figure 132. BASE, FILTER, PUMP & OIL CONTROL ASSEMBLY

PARTS LIST COVERING FIGURE 132 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	PMO-345A	1	.....Motor (1/2 H.P., 230/460 Volt, 60 Hz, 3 Ph.)
1	PMO-347A	1	.....Motor (1/2 H.P., 220/380 Volt, 50 Hz, 3 Ph.)
1	PMO-346A	1	.....Motor (1/2 H.P., 220/440 Volt, 50 Hz, 3 Ph.)
2	PF-224A	4	.....Flex Bolt Mounting Set *with*
3		8	.....Washers (5/16 Plain)
4		8	.....Nuts (5/16-18 Hex)
2A	PF-224C	1	.....Flex Bolt Mounting
3		2	.....Washers (5/16 Plain)
4		2	.....Nuts (5/16-18 Hex)
2B	CH-371A	1	.....Pump Bracket
5	MB-3297A	2	.....Motor Base
		4	.....Washers (5/16 Plain)
		2	.....Nuts (5/16-18 Hex)
6	PPP-146A	1	.....Adapter
7	PF-175A	1	.....Pump
7A		1	.....Street Elbow (1/2 NPT 90°)
7B		1	.....Close Nipple (1/2 NPT)
7C		1	.....Side Outlet Elbow (1/2 NPT 90°)
8	PF-171A	1	.....Relief Valve
9	PPP-22A	1	.....Hose Assembly
10	PPP-29A	2	.....Hose Assembly (Pkg. of 1)
11	PF-317A	1	.....Intake Strainer *with*
11A		1	.....Clamp
12	PF-162C	1	.....Mounting Bracket *with*
13		4	.....Screws (1/4-20 x 3/4 Hex Hd. Cap)
14		4	.....Washers
15		4	.....Nuts
16	PF-240A	1	.....Filter Container Assembly *with*
16A	PF-243A	1	.....Cover
	PF-244A	1	.....Gasket
	PF-247A	1	.....Spring
17	PF-246A	1	.....Air Vent
18	PF-260A	1	.....Clamp Assembly *with*
19	PF-270A	1	.....Tee Handle Assembly
20	PPP-116A	1	.....Adapter
21	PF-257A	1	.....Standpipe *with*
	PF-258A	1	.....Washer (Fiber) (Pkg. of 2)
22	PF-259A	1	.....Draincock
23	PPP-147A	1	.....Close Nipple (1/2 NPT Block Iron)

(Parts continued on next page)

PARTS LIST COVERING FIGURE 132 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
24	MB-2267B-A	1	.....Rear Splash Guard - Left *with*
25		2	.....Screws (1/4-20 x 3/8 Rd. Hd.)
26	MB-2164A	1	.....Valve Body Assembly *with*
27		1	.....Screw (1/4-20 x 2" Soc. Hd. Cap)
28	MB-2177A	1	.....Inlet Stem *with*
29	MB-2184A	1	....."O" Ring
30	MB-2176A	2	.....Outlet Stem (Pkg. of 1) *with*
31	MB-2182A	2	....."O" Ring (Pkg. of 3)
Not Shown	MB-2174A	1	.....Blank Outlet Stem & Tip Seal *with*
31	MB-2182A	1	....."O" Ring (Pkg. of 3)
32	MBB-1630A	1	.....Check Valve *with*
34		1	.....Clamp
33	PPP-29A	1	.....Hose Assembly
35	PPP-148A	1	.....Tee (1/2 x 1/2 x 1/2)
36	PPP-136A	1	.....Relief Valve
37	PPP-27A	1	.....Hose Assembly
38	MB-2185A	2	.....Jet Assembly (Pkg. of 1) *with*
39	MB-2194A	2	.....Jet Clamp (Pkg. of 1)
		2	.....Wing Nut
40	MB-2193A	2	.....Flexible Tube Feeder with Clamp (Pkg. of 1)
41	MB-2202A	1	.....Support Rod
42	MB-2203A	1	.....Support Rod Clamp
43	MB-2205A	1	.....Wing Hand Screw Assembly *with*
44		1	.....Washer (1/2 Plain)
45	MB-2210B-A	1	.....Door & Hinge *with*
		4	.....Screws (10-32 x 1/2 Flat Head)
		4	.....Washers (#10 Shakeproof)
		4	.....Nuts (10-32 Hex)
46		2	.....Screws (10-32 x 1/2 Soc. Hd. Cap)
47		2	.....Washers (#10 Shakeproof)
48		2	.....Nuts (10-32 Hex)
49	PF-288A	1	.....Handle *with*
50		2	.....Screws (8-32 x 1/4 Rd. Hd.)
51		1	.....Washer (3/8 Shakeproof)
52		1	.....Nut (3/8-24 Hex Jam)
53	MB-2214A	1	.....Cam
54	MB-2299A	2	.....Reservoir Retainer (Pkg. of 1) *with*
55		2	.....Screw (1/4-20 x 3/8 Rd. Hd.)

(Parts continued on next page)

PARTS LIST COVERING FIGURE 132 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
60	MB-2143A	1	.....Clutch Return Spring
61	MB-2135A	1	.....Clutch Tube
62	MB-2140A	2	.....Bearing & Bracket Assembly (Pkg. of 1) *with*
63		4	.....Screws (1/4-20 x 3/4 Hex Hd. Cap)
65		4	.....Washers (1/4 Lock)
67	MB-2146A	1	.....Clutch Nut *with*
68		1	.....Shoulder Screw (5/16 x 5/8 with 1/4-20 x 7/16 Thread)
69		1	.....Nut (1/4-20 Hex Lock)
70	MB-3095B-A	1	.....Top Plate *with*
71		2	.....Screws (3/8-16 x 1-1/2 Flat Hd. Soc. Cap)
72		2	.....Washers (3/8 Plain)
73		2	.....Washers (3/8 Lock)
74		2	.....Nuts (3/8-16 Hex)
75		2	.....Screws (5/16-18 x 1" Hex Hd. Cap)
76		4	.....Washers (5/16 Plain)
77		2	.....Washers (5/16 Lock)
78		2	.....Nuts (5/16-18 Hex)
79	KKN-169B-A	1	.....Rear Splash Guard - Right *with*
80		2	.....Screws (1/4-20 x 3/8 Rd. Hd.)
81	MB-2148A	1	.....Pivot Block *with*
82		1	.....Shoulder Screw (5/16 x 5/8 with 1/4-20 x 7/16 Thread)
83	MB-2147A	1	.....Spring
84	PHS-595A	1	.....Screw (5/16-24 x 3-1/2 Soc. Hd. Cap) *with*
85		1	.....Nut (5/16-24 Hex Jam)
92		1	.....Base Shell
104	MBB-3132A	1	.....Switch Plate *with*
105		1	.....Washer (1/4 Plain)
106		1	.....Screw (1/4-20 x 3/4 Hex Hd. Cap)
107	MBB-3138A	1	.....Pivot Bushing *with*
108		1	.....Screw (1/4-20 x 7/8 Flat Hd. Soc. Cap)
109	PES-155A	A	.....Switch *with*
110		2	.....Screws (6-32 x 1-1/2 Flat Hd.)
111		2	.....Nuts (6-32)

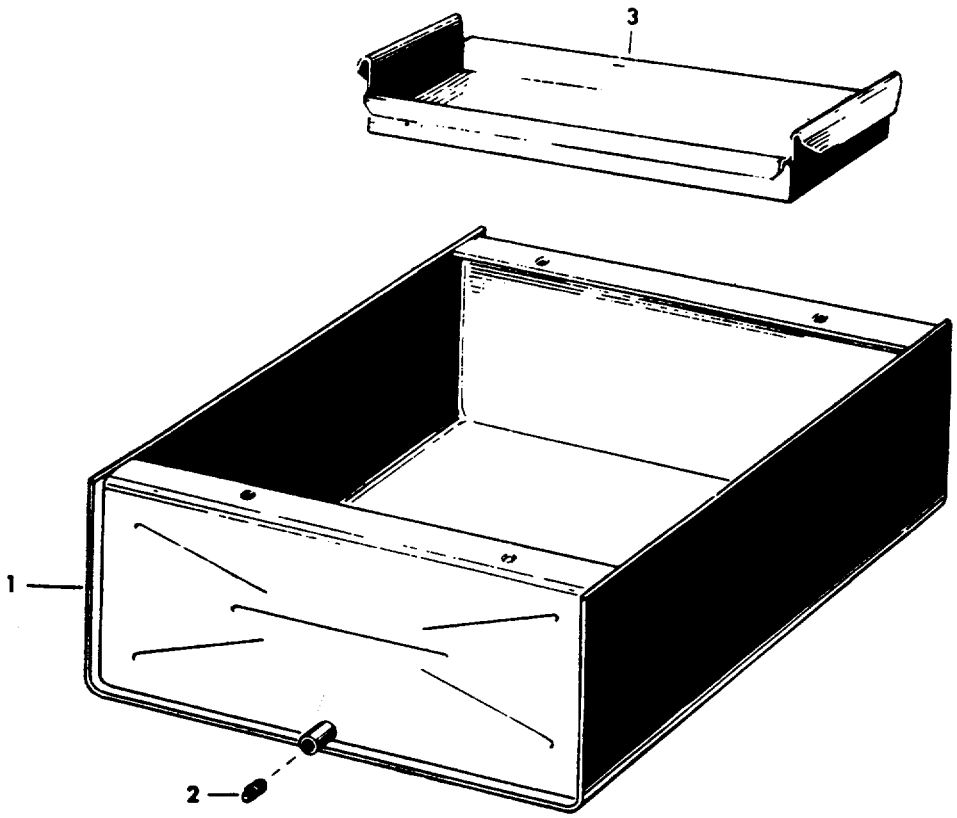


Figure 133. OIL RESERVOIR UNIT

PARTS LIST COVERING FIGURE 133

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	MB-3275A	1	.....Oil Reservoir *with*
2	MB-2281A	1	.....Pipe Plug (3/8 NPT)
3	MB-3262A	1	.....Settlement Tray

FOOT PEDAL UNIT

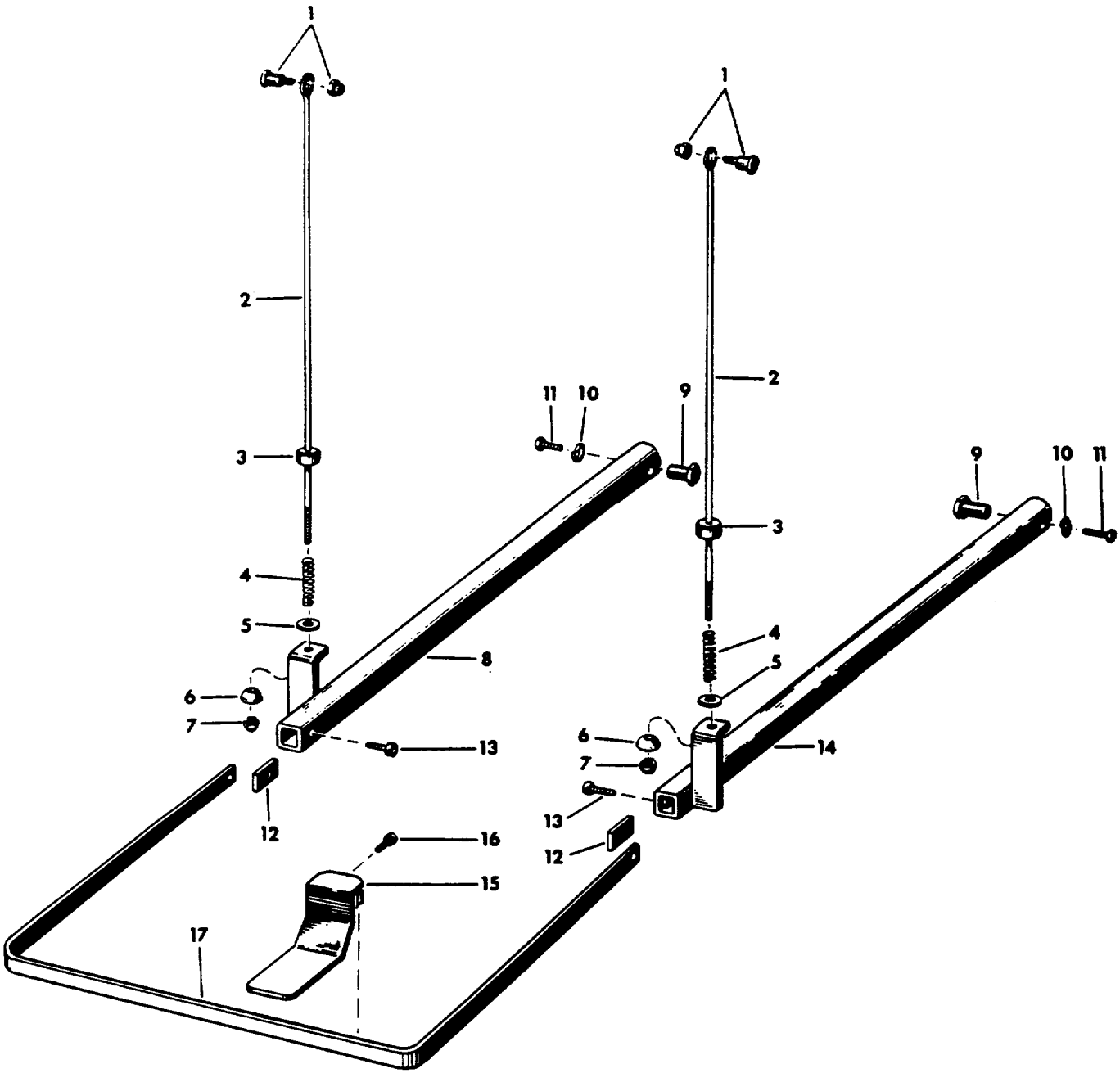


Figure 134. FOOT PEDAL UNIT

PARTS LIST COVERING FIGURE 134 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	PHS-594A	2	.....Shoulder Screw (5/16 x 1/4 with 1/4.20 x 7/16 Thread) Pkg. of 1 *with*
		2	.....Nut (1/4-20 Hex)
2	MB-2123A	2	.....Pedal Link Assembly (Pkg. of 1) *with*
3	LBN-450C	2	.....Set Collar (Pkg. of 1) *and*
		2	.....Set Screw (1/4-20 x 1/4 Soc. Cup Pt.)
4		2	.....Spring
5		2	.....Washer (3/8 Plain)
6		2	.....Spherical Washer
7		2	.....Nut (3/8-16 Hex Self Locking)
8	MB-3115A	1	.....Foot Pedal Assembly - Left *with*
9		1	.....Pedal Bushing
10		1	.....Washer (3/8 Lock)
11		1	.....Screw (3/8-16 x 3/4 Hex Hd. Cap)
12		1	.....Clamp Nut
13		1	.....Screw (5/16-18 x 1" Soc. Hd. Cap)
14	MB-3110A	1	.....Foot Pedal Assembly - Right *with*
9		1	.....Pedal Bushing
10		1	.....Washer (3/8 Lock)
11		1	.....Screw (3/8-16 x 3/4 Hex Hd. Cap)
12		1	.....Clamp Nut
13		1	.....Screw (5/16-18 x 1" Soc. Hd. Cop)
15	MB-2295B-A	1	.....Tread Assembly *with*
16		1	.....Screw (5/16-18 x 1/2 Soc. Hd. Cap)
17	MB-2122A	1	....."U" Bar

DRIP TRAY & ACCESSORIES

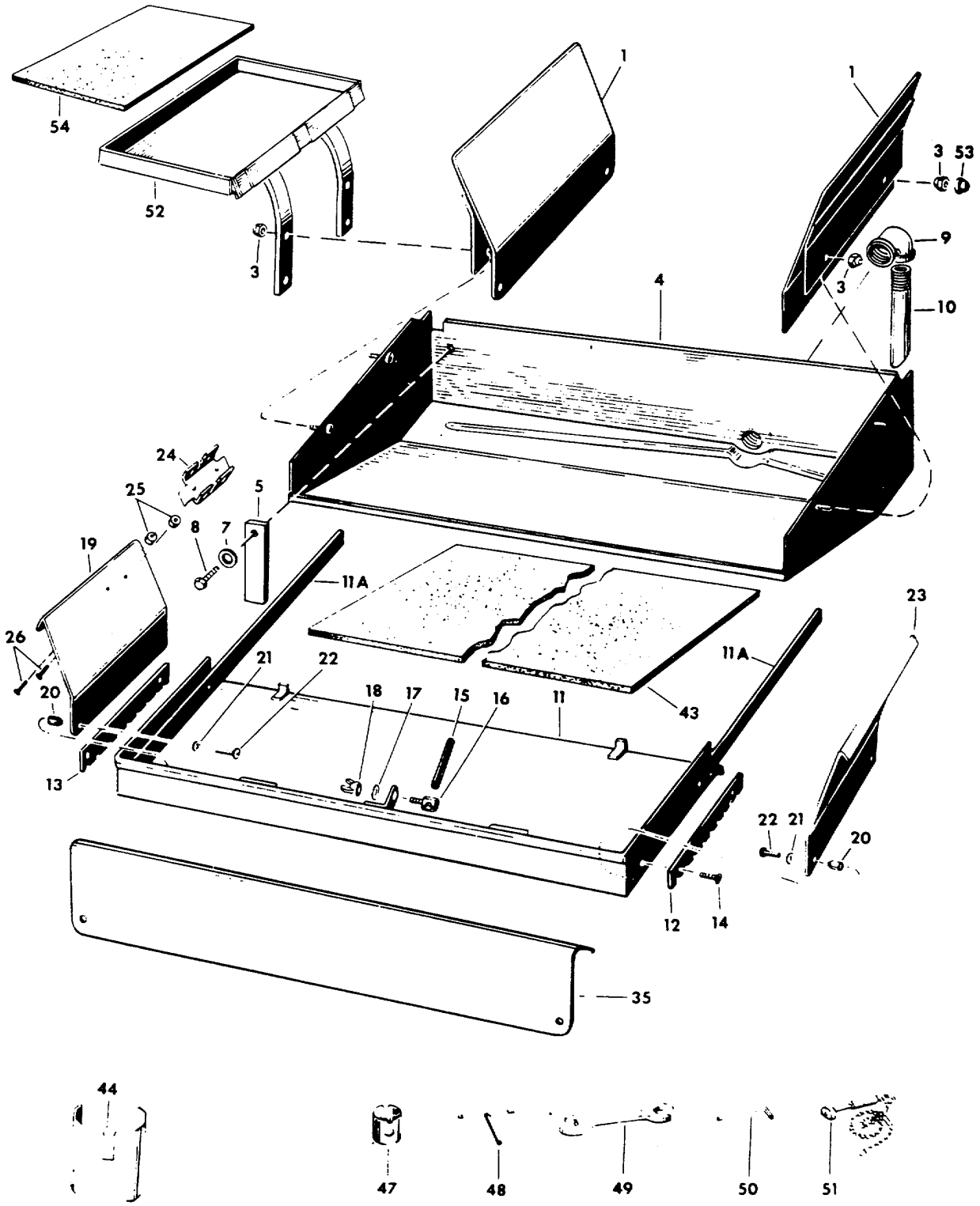


Figure 135. DRIP TRAY & ACCESSORIES

PARTS LIST COVERING FIGURE 135 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	MB-2230B-A	2	.....Stationary Splash Guard (Pkg. of 1) *with*
3		4	.....Nuts (1 4-20 Hex Acorn)
4	MB-2220B-A	1	.....Stationary Drip Troy *with*
5		2	.....Reinforcing Blocks
7		2	.....Washers (3/8 Plain)
8		2	.....Screws (3/8-16 x 1" Hex Hd. Cap)
Not Shown		1	.....Caplug (Installed in right side panel of Drip Tray)
9	MAN-1079A	1	.....Elbow
10	MB-2228A	1	.....Pipe Extension
11	MB-2235B-A	1	.....Movable Tray Assembly *with*
11A	MB-2248A	2	.....Guide Rods
12		1	.....Detent Rail - Right
13		1	.....Detent Rail - Left
14		4	.....Screws (10-24 x 3/8 Flat Hd. I.M.S.)
15	MB-220A	1	.....Rear Support Rod *with*
16		1	.....Rear Support Clamp
17		1	.....Washer (5/16 Plain)
18		1	.....Wing Nut (5/16-24)
19	MB-2258B-A	1	.....Movable Splash Guard *with*
20		1	.....Spacer
21		1	.....Washer (3/16 Plain)
22		1	.....Screw (10-24 x 5/8 But. Hd. Cap)
23	MB-2249B-A	1	.....Movable Splash Guard *with*
20		1	.....Spacer
21		1	.....Washer (3/16 Plain)
22		1	.....Screw (10-24 x 5/8 But. Hd. Cap)
24	MB-2256A	1	.....Accessory Holder *with*
25		2	.....Spacers
26		2	.....Screws (10-32 x 3/4 Flat Hd. Soc. Cap)
35	MB-2252B-A	1	.....Front Splash Guard
43	MB-2328C	2	.....Anti-Splash Pads (Upper & Lower) (Pkg. of 2)
44	MBB-989B-A	I	.....Spindle Nose Cover
47	LN-0116A	1	.....Eccentric Sleeve
48	LBN-62A	1	.....Mandrel Wrench
49	KKN-196A	1	.....Wrench with 1/2" & 5/8" Openings
50	LN-1546A*	1	.....Hex Key Wrench (5/64 Across Flats)
50	KN-574A*	1	.....Hex Key Wrench (1/8 Across Flats)
50	KN-229A*	1	.....Hex Key Wrench (3/16 Across Flats)
50	PHS-14A*	1	.....Hex Key Wrench (7/32 Across Flats)
51	MAN-700	1	.....Diamond Dresser
52	MB-2405B-A**	1	.....Work Tray *with*
3		2	.....Nuts (1/4-20 Hex Acorn)
53	MBB-856A	1	.....Neoprene Bumper
54	MB-2418A**	1	.....Tray Pad

*PHS-50A Hex Key Kit supplied with 50 Hertz machines.

POWER STROKER

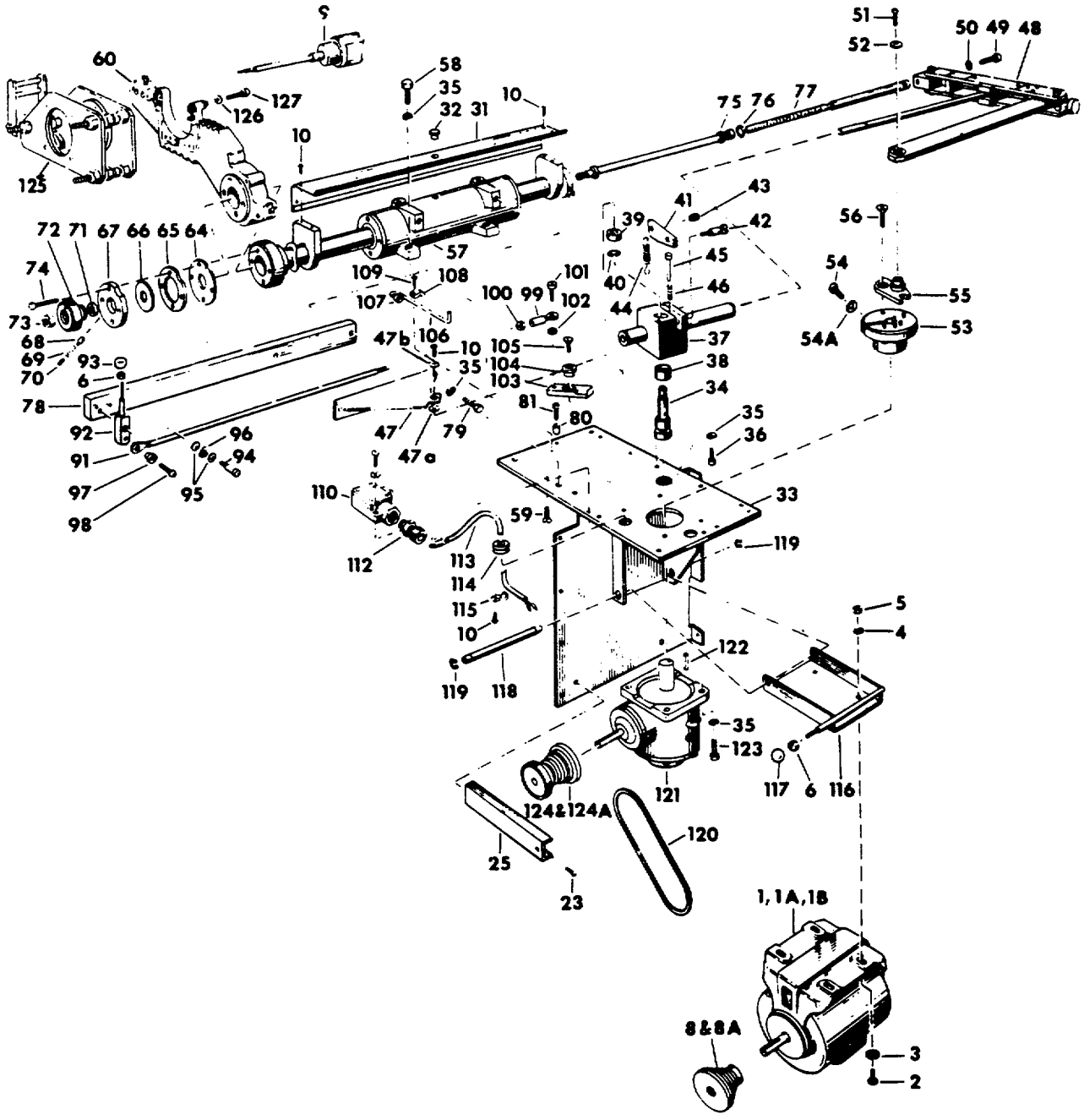


Figure 136. POWER STROKING ATTACHMENT

PARTS LIST COVERING FIGURE 136 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	PMO-345A	1	.....Motor (1/2 H.P. Nema H56 Frame T.E.N.V., 230/460 Volt, 60 Hz, 3 Phase, 1725 RPM & 5/8 Dia. Shaft)
1A	PMO-347A	1	.....Motor (1/2 H.P. Nema J56 Frame T.E.N.V., 220/380 Volt, 50 Hz, 3 Phase, 1425 RPM & 5/8 Dia. Shaft)
1B	PMO-301A	1	.....Motor (1/2 H.P. Nema H56 Frame T.E.N.V., 220/440 Volt, 50 Hz, 3 Phase, 1425 RPM & 5/8 Dia. Shaft)
2		4	.....Screws (5/16-18 x 3/4 Hex Hd. Cap)
3		4	.....Washers (5/16 Plain)
4		4	.....Washers (5/16 Lock)
5		4	.....Nuts (5/16-18 Hex)
8	KKN-338A	1	.....Motor Pulley for 60 Hz Machines *with* .....Set Screw (1/4-20 x 1/2 Soc. Full Dog Pt.)
8A	KKN-438A	1	.....Motor Pulley for 50 Hz Machines *with* .....Set Screw (1/4-20 x 1/2 Soc. Full Dog Pt.)
9	KKN-260A	1	.....Indicator Support Assembly
25	KKN-454B-A	1	.....Lower Brace *with*
23		1	.....Screw (10-32 x 1/4 But. Hd. Cap)
31	KKN-168B-A	1	.....Shaft Cover *with*
32		1	.....Caplug
10		6	.....Screws (10-32 x 3/8 But. Hd. Cap)
33	KKN-1655A	1	.....Frame Assembly
34	KKN-328A	1	.....Pivot Stud *with*
35		1	.....Washer (3/8 Lock)
36		1	.....Screw (3/8-16 x 1" Soc. Hd. Cap)
37	KKN-370A	1	.....Pivot Assembly *with*
38		1	.....Bearing (Torrington #B-1212-OH)
39		1	.....Bearing (Nice #1606-DS) *with*
40		1	.....Retaining Ring (Truarc #5008-93-S)
10		2	.....Screws (10-32 x 3/8 But. Hd. Cap)
41	KKN-373A	1	.....Wedge *with*
42		1	.....Shoulder Screw (1/4 x 3/4 with 10-24 x 3/8 Thread)
43		1	.....Set Screw (3/8-24 x 3/8 Soc. Flat Pt.)
44	KKN-374A	1	.....Spring
45	KKN-371A	1	.....Lift Pin
46	KKN-372A	1	.....Spring
47	KKN-378A	1	.....Pivot Support *with*
47A		1	.....Washer (3/8 Plain)
47B		1	.....Washer (3/16 Plain)
10		1	.....Screw (10-32 x 3/8 But. Hd. Cap)
48		1	.....Cross Arm Assembly (See Fig. K)

(Parts continued on next page)

PARTS LIST COVERING FIGURE 136 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
49	PHS-589A	1	.....Screw (1/2-20 x 2-1/2 Soc. Hd. Cap) *with*
50		1	.....Washer (1/2 Plain)
51	PHS-572A	1	.....Screw (1/4-20 x 5/8 Nylok But. Hd. Cap) *with*
52		1	.....Washer (1/4 Plain)
Not Shown		1	.....Washer (#10 Shakeproof)
53	KKN-335A	1	.....Drive Head Assembly *with key and*
54		1	.....Screw (5/16-24 x 1" Soc. Hd. Cap)
54A		1	.....Washer
55	KKN-340A	1	.....Lever Assembly *with*
56		1	.....Screw (3/8-16 x 1" Flat Hd. Cap)
57		1	.....Tube & Shaft Assembly (See Fig. J)
58		4	.....Screws (3/8-16 x 1-3/4 Hex Hd. Cap)
35		4	.....Washers (3/8 Lock)
59		2	.....Screws (3/8-16 x 3/4 Flat Hd.)
60		1	.....Arm Assembly (See Fig. I)
64	KKN-364A	1	.....End Washer
65	KKN-363A	1	.....Thrust Spacer
66	KKN-362A	1	.....Thrust Disk
67	KKN-366A	1	.....Bearing Retainer *with*
68	KKN-368A	1	.....Nylon Rod
69	KKN-369A	1	.....Spring
70		1	.....Set Screw (10-32 x 3/16 Soc. Flat Pt.)
71	KKN-361A	1	.....Spacer
72	KKN-367A	1	.....Knob *with*
73		1	.....Nut (3/8-16 Hex Jam)
74	PHS-584A	4	.....Screws (1/4-20 x 1-1/2 Soc. Hd. Cap) (Pkg. of 4)
75	KKN-355A	1	.....Adjustment Tube *with*
76		1	....."O" Ring (Trostel -622713)
77	KKN-354A	1	.....Adjustment Rod
78	KKN-1665A	1	.....Torque Bar Assembly *with*
35		2	.....Washers (3/8 Lock)
79		2	.....Screws (3/8-16 x 1-1/4 Hex Hd. Cap)
80	KKN-108A	1	.....Guide Cover *with*
81		1	.....Screw (1/4-20 x 1" Soc. Hd. Cop)
91	KKN-382A	1	.....Link Rod
92	KKN-346A	1	.....Handle *with*
93	KKN-440A	1	.....Clutch Knob
6		1	.....Nut (1/4-20 Hex Acorn)
94		1	.....Shoulder Screw
95		2	.....Washers (5/16 Plain)
96		1	.....Spring Washer (5/16 Shakeproof)

(Parts continued on next page)

PARTS LIST COVERING FIGURE 136 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
97	KKN-348A	1	.....Cam Rod Bushing *with*
98		1	.....Screw (10-32 x 1/2 But. Hd. Cap)
Not Shown		1	.....Washer (#10 Shakeproof)
99	KKN-383A	1	.....Rod End *with*
100		1	.....Nut (1/4-28 Hex Jam)
101		1	.....Screw (1/4-28 x 3/4 Soc. Hd. Cap)
102		1	.....Spacer
103	KKN-331A	1	.....Cam *with*
104	KKN-332A	1	.....Bushing
105		1	.....Screw (1/4-28 x 3/4 Flat Hd. Cap)
106	KKN-315A	1	.....Switch Rod Assembly *with*
107		1	.....Sleeve
108	KKN-318A	2	.....Switch Rod Bearing (Pkg. of 1) *with*
109		2	.....Screw (10-32 x 3/4 But. Hd. Cap)
Not Shown		2	.....Washers (#10 Shakeproof)
110	PES-102A	1	.....Switch with Attaching Hardware
112	PEC-112A	1	.....Cable Connector
113	MBB-1311A	1	.....Cable Assembly *with*
114		1	.....Grommet
115	PEM-331A	2	.....Cable Clamps (Pkg. of 2) *with*
10			.....Screws (10-32 x 3/8 But. Hd. Cap)
116	KKN-325A	1	.....Motor Base Assembly *with*
117	KKN-445A	1	.....Tension Knob
6		1	.....Nut (1/4-20 Hex Acorn)
118		1	.....Motor Pivot
119		2	.....Retaining Rings (Truarc #5100-25-S)
120	KKN-444A	1	.....Belt (Gates Polyflex 5M600)
121	CRF-433A	1	.....Gear Reducer *with*
122		1	.....Key
123		4	.....Screws (3/8-16 x 1" Hex Hd. Cap)
35		4	.....Washers (3/8 Lock)
Not Shown	CK-438A	1	.....Bearing Set For CRF-433A Gear Reducer - (5/8" Shaft) (Consists of two Timken Bearing Cups No. 05185, type TS and two Timken Bearing Cones No. 05062, type TS)
Not Shown	CK-453A	1	.....Gasket For CRF-433A
Not Shown	CK-454A	1	.....Grease Seal (Victor No. 64098) For CRF-433A
124	KKN-337A	1	.....Gear Box Pulley for 60 Hz Machines *with* Set Screw (1/4-20 x 1/2 Soc. Full Dog Pt.)
124A	KKN-437A	1	.....Gear Box Pulley for 50 Hz Machines *with* Set Screw (1/4-20 x 1/2 Soc. Full Dog Pt.)
125		1	.....Front & Back Plate Assembly (See Fig. I)
126		3	.....Washers (1/4 Plain)
127		3	.....Screws (1/4-28 x 1-5/8 Soc. Hd. Cap)

ARM ASSEMBLY

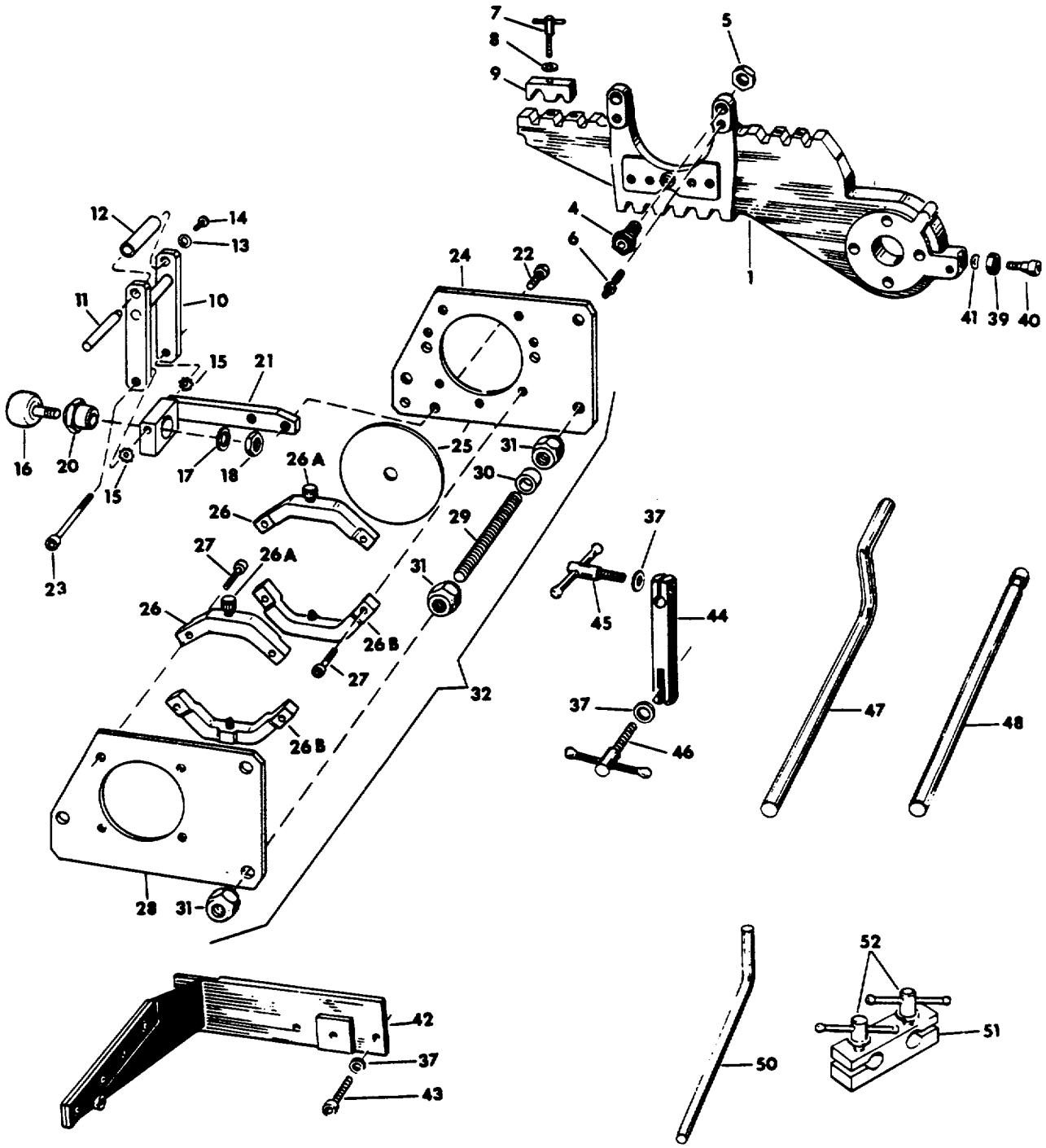


Figure 137. ARM ASSEMBLY

PARTS LIST COVERING FIGURE 137 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	KKN-141A	1	.....Arm Assembly *with*
4	KKN-157A	2	.....Leveling Bushings (Pkg. of 2) *with*
5		2	.....Lock Nuts
6	KKN-159A	2	.....Locating Studs (Pkg. of 2)
7	KKN-155A	1	.....Clamp Screw Assembly *with*
8		1	.....Washer (1/4 Plain)
9	KKN-154A	1	.....Clamp
10	CRF-470A	1	.....Rod Support Assembly *with*
11		1	.....Torque Pin
12	CRF-477A	1	.....Sleeve
13		1	.....Washer (3/16 Plain)
14		1	.....Screw (10-32 x 3/8 But. Hd. Cap)
15		2	.....Washers (Shakeproof #1118-00)
16	PBR-33A	1	.....Bearing *with*
17		1	.....Washer (1/2 Plain)
18		1	.....Nut
20	CRF-464A	1	.....Eccentric
Not Shown	CRF-546A*	1	.....Wrench (1" Open End, 1/4 Thick)
21	CRF-455A	1	.....Roller Bracket *with*
22		2	.....Screws (3/8-16 x 7/8 But. Hd. Cap)
23		1	.....Screw (5/16-24 x 3-3/4 Soc. Hd. Cap)
15		2	.....Washers (5/16 Shakeproof)
24	CRF-451A	1	.....Back Plate with attaching screws & washers
25	CRF-541A	1	.....Setup Disk
	CRF-410	1	.....Clamp Set Kit *consists of*
26	CRF-413A	2	.....Clamp Bar (Pkg. of 1)
26A	CRF-414A	2	.....Locking Screw (Pkg. of 1)
26B	CRF-411A	2	.....Support Bar (Pkg. of 1) *with*
		2	.....Spring Plunger
27		8	.....Screws (1/4-28 x 3/4 Soc. Hd. Cap) (Pkg. of 2)
28	CRF-441A	1	.....Front Plate

(Parts continued on next page)

*Used to adjust items #20 & #31

PARTS LIST COVERING FIGURE 137 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
29	CRF-543A	3	.....Stud (Pkg. of 1)
30	CRF-542A	3	.....Sleeve (Pkg. of 3)
31	CRF-544A	9	.....Nut (Pkg. of 3)
32	CRF-543C	3	.....Stud, Nut & Sleeve Set (1 Set per Pkg.)
39	LBA-535D	1	.....Bearing (Nice #1606-DS)
40	PHS-606A	1	.....Shoulder Screw (3/8 x 1/2 with 5/16-18 x 1/2 thread) *with*
41		1	.....Spring Washer (Shakeproof Style 3)
42	CRF-420A	1	.....Heavy Work Support *with*
	CRF-432A	1	.....Support Rail *with* Screws & Washers
	CRF-431A	2	.....Cams *with* Screws
37		3	.....Washers (1/2 Plain)
43		3	.....Screws (1/2-13 x 1-3/4 Soc. Hd. Cap)
44	LBN-738A	1	.....Arm with
45	*MB-2325A	1	.....Handle Screw (1/2-20 Thread) *with*
37		1	.....Washer (1/2 Plain)
46	AAN-37A	1	.....Clamping Screw *with*
37		1	.....Washer (1/2 Plain)
47	MB-2331A	1	.....Offset Bar (13")
48	LBN-721A	1	.....Bar (13")
50	KKN-198A	1	.....Oiler Bar (3/8 Diameter)
51	LBN-736A	1	.....Arm *with*
52	MB-2325A	2	.....Handle Screws *with*
		2	.....Washers (1/2 Plain)

*For machines sold prior to January, 1974 order
LBN-733A Handle and Screw which have a 1/2-13 thread.

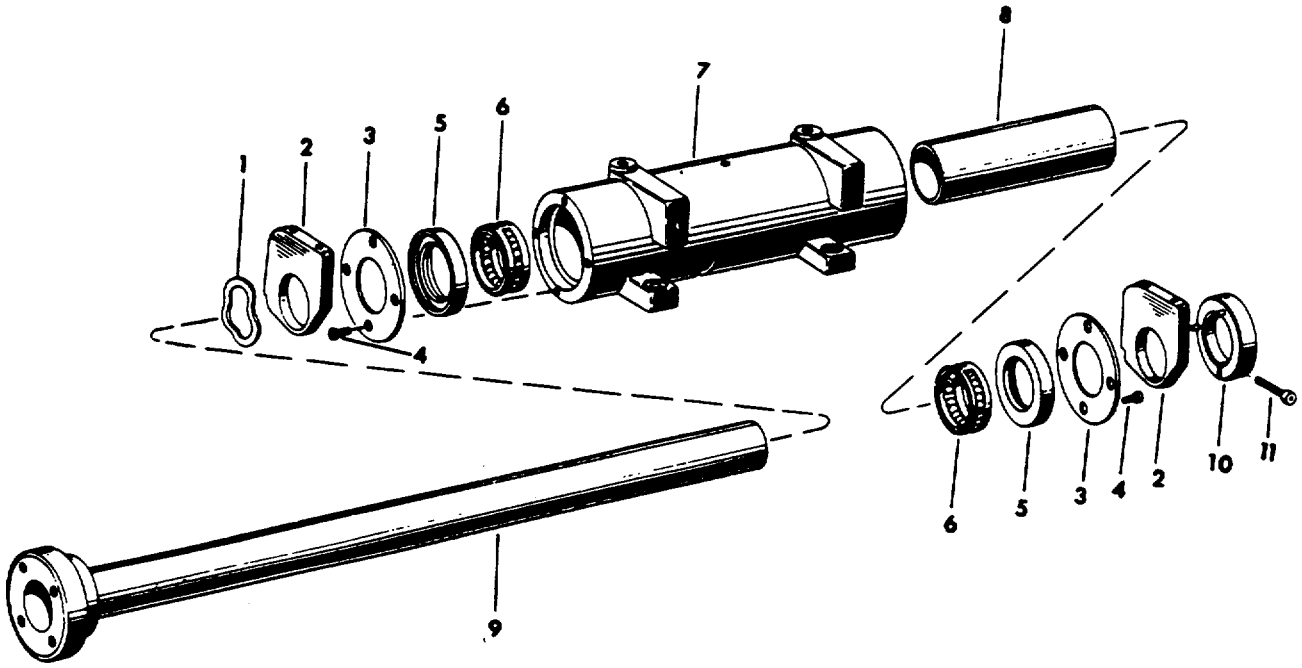


Figure 138. Tube & Shaft Assembly

PARTS LIST COVERING FIGURE 138

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	MBB-355A	1	.....Spring Washer
2	KKN-133A	2	.....Cover Support (Pkg. of 1)
3	KKN-124A	2	.....Seal Retainer (Pkg. of 1) *with*
4		8	.....Screws (10-32 x 3/8 But. Hd. Cap)
5	PHM-701A	2	.....Seals (Pkg. of 2)
6	KKN-120A	2	.....Ball & Cage Assemblies (Pkg. of 2)
7	KKN-115A	1	.....Bearing Tube Assembly
8	KKN-119A	1	.....Bearing Spacer
9	KKN-130A	1	.....Hub & Shaft Assembly
10	KKN-135A	1	.....Collar Assembly *with*
11		1	.....Screw (1/4-20 x 1-1/4 Soc. Hd. Cap)

CROSS ARM ASSEMBLY

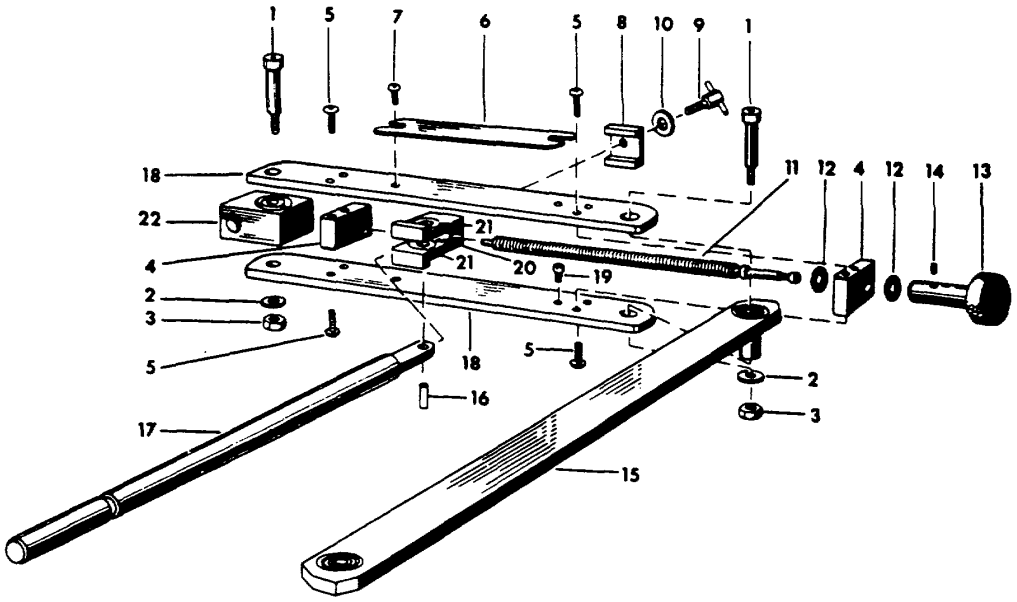


Figure 139. CROSS ARM ASSEMBLY

PARTS LIST COVERING FIGURE 139

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	PHS-610A	2	.....Shoulder Screw (3/8 x 1-1/2 with 5/16-18 x 1/2 thread) Pkg. of 1 *with*
2		2	.....Washer (5/16 Plain)
3		2	.....Nut (5/16-18 Hex)
4	KKN-412A	2	.....Spacer (Pkg. of 1) *with*
5			.....Screws (1/4-20 x 5/8 But. Hd. Cap)
6	KKN-436A	1	.....Stroke Length Scale with (specify when metric is required)
7		2	.....Screws (10-32 x 1/4 But. Hd. Cap)
8	KKN-424A	1	.....Clamp Block
9	KKN-425A	1	.....Clamp Screw Assembly *with*
10		1	.....Washer (3/8 Plain)
11	KKN-413A	1	.....Adjusting Screw *with*
12		2	.....Washers (9/32 Plain)
13	KKN-414A	1	.....Adjusting Knob *with*
14		2	.....Set Screws (10-32 x 3/16 Soc. Cone Pt.)
15	KKN-385A	1	.....Input Bar Assembly *with*, Bearings & Spacer Bushing
16	KKN-422A	1	.....Pin
17	KKN-379A	1	.....Pivot Rod
18	KKN-411A	2	.....Cross Bars (Pkg. of 2) *with*
19		2	.....Screws (10-32 x 1/4 Fil. Hd.)
20	KKN-420A	1	.....Moving Block Assembly *with*
21	LBA-535A	2	.....Bearings (Nice #1606-DS) (Pkg. of 2-2 recommended when replacing)
22	KKN-430A	1	.....Driving Block Assembly *with* Bearing

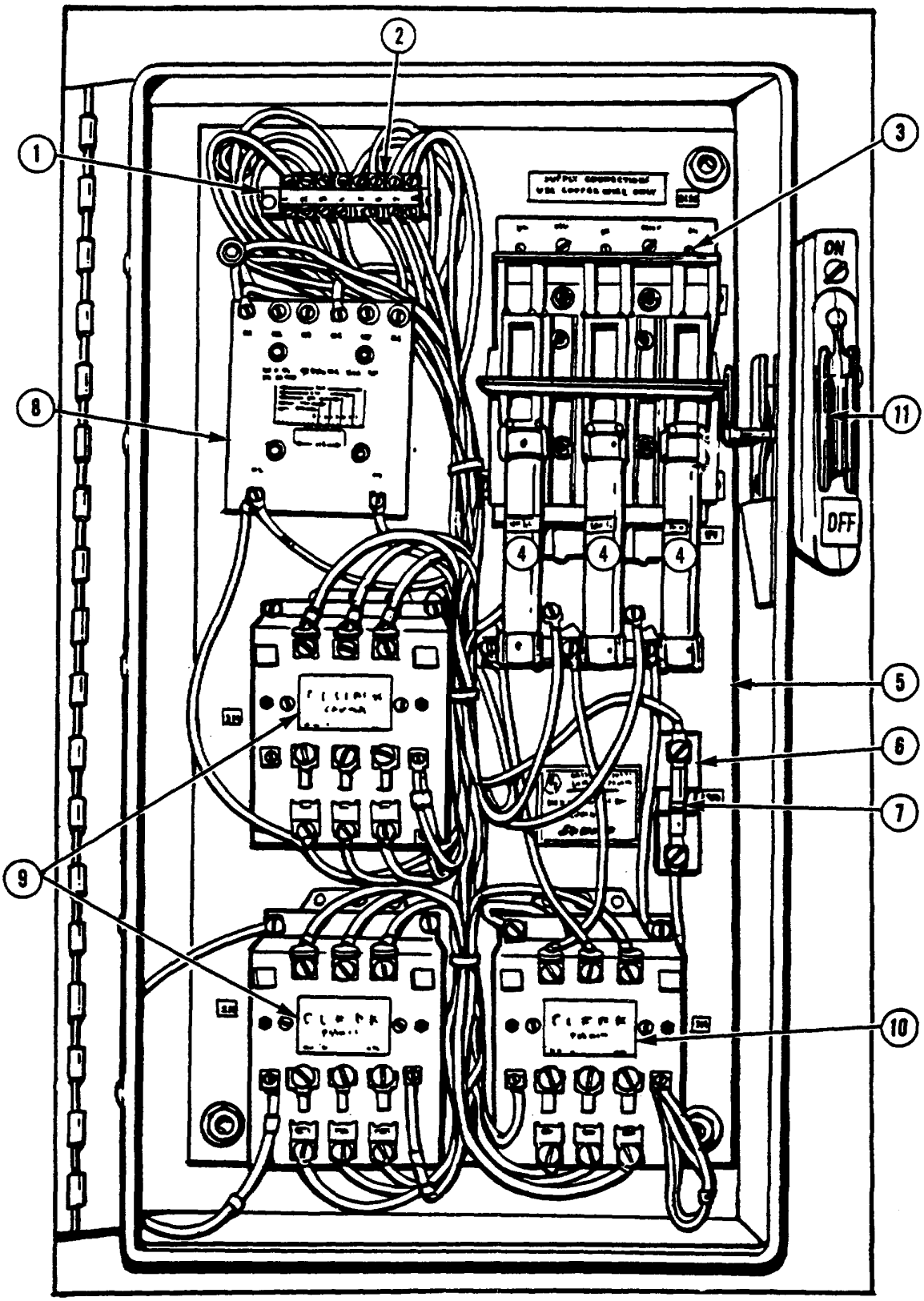


Figure 140. Control Panel

PARTS LIST COVERING FIGURE 140 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	PEM-392A	1	.....Terminal Block End Section
2	PEM-391A	8	.....Terminal Block Section (Pkg. of 1)
3	PES-147A	1	.....Disconnect Switch *with*
		4	.....Screws (10-32 x 1/2 Self Topping Binding Hd.)
4	PEM-351A	3	.....Fuse (Buss Fusetron #FRS-15) (Pkg. of 1) For 208/220/230 Volt
*4A	PEM-367A	3	.....Fuse (Buss Fusetron #FRS-7) (Pkg. of 1) For 380/440/460 Volt
5	MBB-1953A	1	.....Panel
6	PEM-388A	1	.....Fuse Block with
		2	.....Screws (8/32 x 3/8 Fillister Hd.)
7	PEM-362A	1	.....Fuse (Buss Fusetron #FNM-1)
8	PEM-511A	1	.....Transformer (For 230/460 Volt, 60 Hz or 220/380/440 Volt, 50 Hz) wit
		4	.....Screws (10-32 x 1/2 Sel; Tapping Binding Hd.)
*8A	PEM-512A	1	.....Transformer (For 208 Volt, 60 Hz) *with*
		4	.....Screws (10-32 x 1/2 Self Tapping Binding Hd.)
9	PES-142A	2	.....* Magnetic Starter (Pkg. of 1) *with*
		6	.....Screws (10-32 x 1/2 Self Tapping Binding Hd.)
10	PES-142C	1	.....* Magnetic Starter *with*
		3	.....Screws (10-32 x 1/2 Self Tapping Binding Hd.)
11	PEM-390A	1	.....Lever Operator Mechanism

*** not shown**

**** NOTE:**

Item 9 (Upper) is for Spindle
Item 9 (Lower) is for Stroker
Item 10 is for Pump

HEATER ELEMENTS & FUSES

Since heater elements and fuses may change with different models of motors and controls, replacements must be ordered by supplying the number appearing on the heater elements or fuses in your control box.

CONTROL BOX

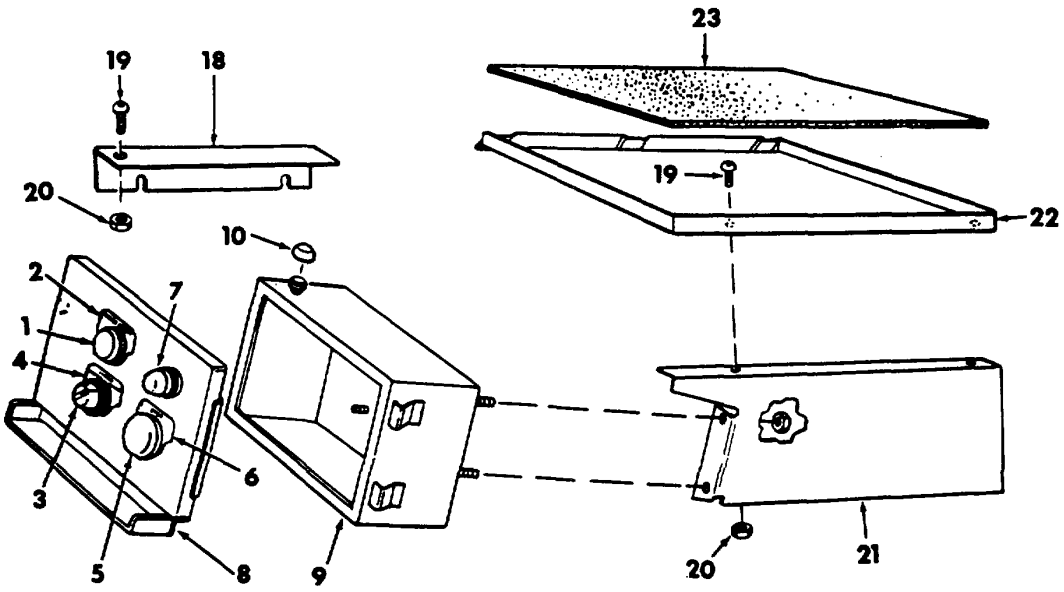


Figure 141. Control Box

PARTS LIST COVERING FIGURE 141

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	PES-156A	1	.....Hone Switch
2	MBB-1336A	1	.....Hone Start Nameplate
3	PES-119A	1	.....Stroke Switch
4	MBB-1337A	1	.....Stroke Nameplate
5	PES-123A	1	.....Stop Switch
6	MBB-1338A	1	.....Stop Nameplate
7	CK-1443A	1	.....Indicator Light (Dialco #103-3227-1333-403) with
Not Shown	CK-1444A	1	.....Incandescent Lamp (Dialco #10C7DC)
8	MBB-3160A	1	.....Cover
9	LBB-3145A	1	.....Switch Box
10	MBB-856A	1	.....Neoprene Bumper
18	MBB-3172B-A	1	.....Switch Box Angle
19			.....Screws (10-32 x 3/8 But. Hd. Cap)
20			.....Nuts (10-32 Hex)
21	MBB-3169B-A	1	.....Side Cover
22	MBB-3205B-A	1	.....Work Tray
23	MBB-3218A	1	.....Tray Pad

COVERS & GUARDS

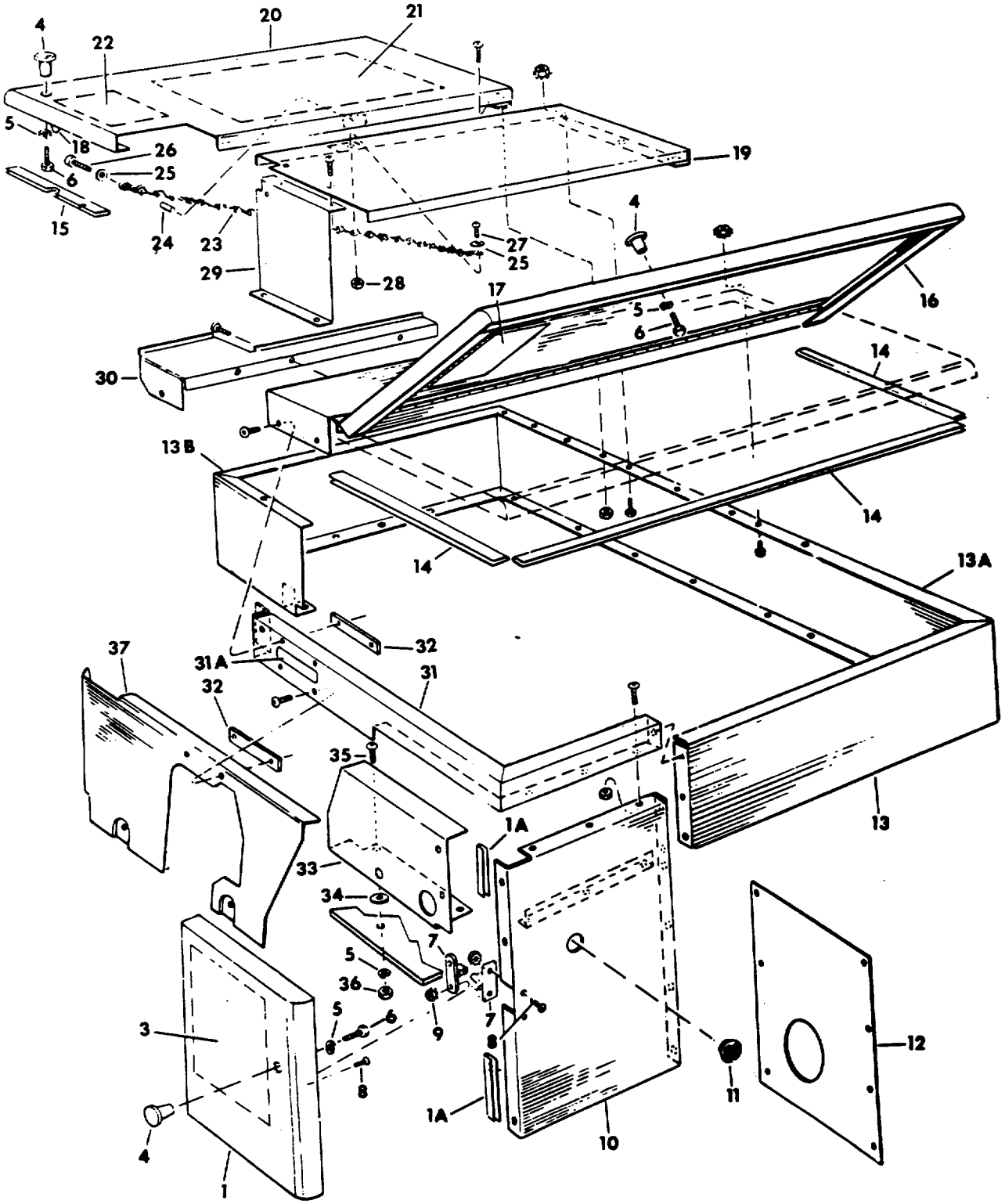


Figure 142. Sheet Metal Coven & Related Hardware

PARTS LIST COVERING FIGURE 142 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	KKN-455B-A	1	.....Lower Door *with*
1A	KKN-1643A	1	.....Bumper Set
		4	.....Screws (10-32 x 1/4 But. Hd. Cap)
3	CRF-489A	1	.....Stroke Speed Chart
4	KKN-458A	1	.....Knob *with*
5		1	.....Washer (1/4 Lock)
6		1	.....Screw (1/4-20 x 1/2 Hex Hd. Cap)
7	KKN-462C	1	.....Catch, Set *with*
8		4	.....Screws (6-32 x 1/4 But. Hd. Cap)
9		4	.....Nuts & Lockwashers (6-32 Hex)
10	KKN-1615B-A	1	.....Side Panel Assembly & Catch Set *with*
1A	KKN-1643A	1	.....Bumper Set
11		1	.....Caplug
12	KKN-1658B-A	1	.....Rear Plate
	KKN-1622B-A	1	.....Wrap Around *consists of*
13	KKN-1619B-A	1	.....Right Panel
13A	KKN-1618B-A	1	.....Rear Panel
13B	KKN-1620B-A	1	.....Left Panel
14	KKN-1648A	1	.....Bumper Set-Right Side
15	KKN-1647A	1	.....Bumper Set-Left Side
16	KKN-1515B-A	1	.....Door Assembly *with*
17	KKN-468A	1	.....Stroke Length Chart (Specify when Metric is req'd.)
4	KKN-458A	1	.....Knob (Pkg. of 1) *with*
5		1	.....Washer (1/4 Lock)
6		1	.....Screw (1/4-20 x 1/2 Hex Hd. Cap)
19	KKN-1625B-A	1	.....Intermediate Cover
20	KKN-1630B-A	1	.....Filter Door Assembly *with*
21	PNP-204A	1	.....Filter Instruction
22	PNP-203A	1	.....Oil Flow Diagram
18	KKN-1519A	1	.....Pilot with Washer & Screw
4	KKN-458A	1	.....Knob (Pkg. of 1) *with*
5		1	.....Washer (1/4 Lock)
6		1	.....Screw (1/4-20 x 1/2 Hex Hd. Cap)

(Parts continued on next page)

PARTS LIST COVERING FIGURE 142 (Continued)

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
23	KKN-1638A	1	.....Chain *with*
24		1	.....Bushing
25		2	.....Washers (Special)
26		1	.....Screw (8-32 x 5/8 Soc: Hd. Cop)
27		1	.....Screw (8-32 x 3/8 But. Hd. Cap)
28		1	.....Nut (8-32 Hex)
29	KKN-1624A	1	.....Cover Support
30	KKN-2077B-A	1	.....Filler Strip
31	KKN-1612B-A	1	.....Front Strip *with*
31A		1	.....Warning Label
32	KKN-1512A	2	.....Tap Strip (Pkg. of 1)
33	KKN-2066B-A	1	.....Front Cover *with*
34		1	.....Washer
35		1	.....Screw (1/4-20 x 1" But. Hd. Cap)
5		1	.....Washer (1/4 Lock)
36		1	.....Nut (1/4-20 Hex)
Not Shown	PBR-58A	1	.....Snap Bushing
37		1	.....Rear Splash Guard (See Fig. D)

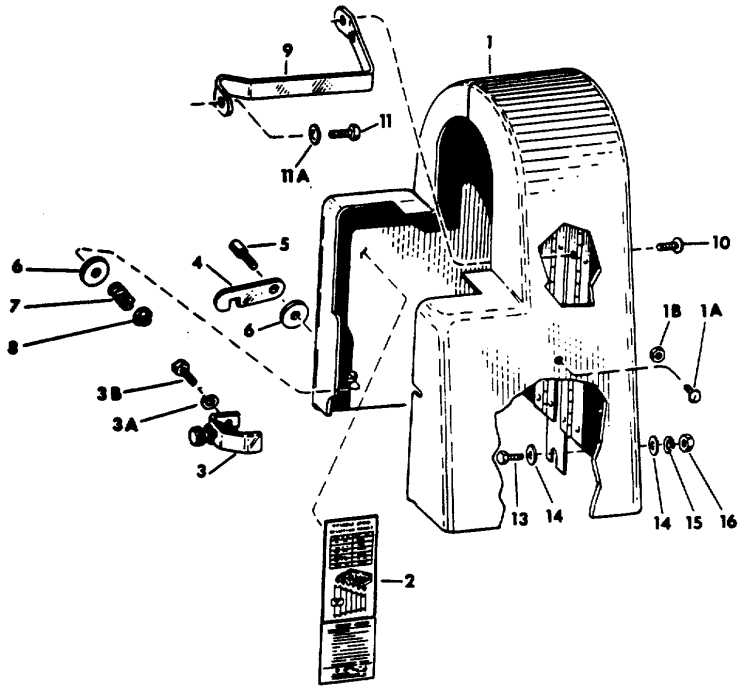


Figure 143. BELT GUARD ASSEMBLY

PARTS LIST COVERING FIGURE 143

ITEM NO.	ORDER BY PART NUMBER	QUANTITY PER MACHINE	DESCRIPTION
1	MBB-3010B-A	1	.....Belt Guard Assembly *complete with*
1A		1	.....Stud Bumper
1B		1	.....Nut (1/4-20 Lock)
2	PNP-209A	1	.....Speed Change Chart
3	MBB2545A	1	.....Bracket & Knob Assembly *with*
3A		1	.....Washer (1/4 Lock)
3B		1	.....Screw (1/4-20 x 1/2 Hex Hd. Cap)
4	MBB-807A	1	.....Latch *with*
5		1	.....Latch Pivot
6		2	.....Washers (1/4 Special)
7		1	.....Spring
8		1	.....Nut (1/4.20 Hex Self Locking)
9	MBB-1019A	1	.....Upper Support
10		1	.....Screw (10-32 x 3/8 Button Hd. Soc. Cap)
11		1	.....Screw (1/4-20 x 3/4 Hex Hd. Cap)
11A		1	.....Washer (1/4 Plain)
13		1	.....Screw (5/16-18 x 3/4 Hex Hd. Cap)
14		2	.....Washers.(5/16 Plain)
15		1	.....Washer (5/16 Lock)
16		1	.....Nut (5/16 Hex)

CHAPTER 2
Section I - Introduction

CRG-750 HEAVY DUTY CAP AND ROD GRINDER
FOR
HONING MACHINE - MODEL LBB-1810

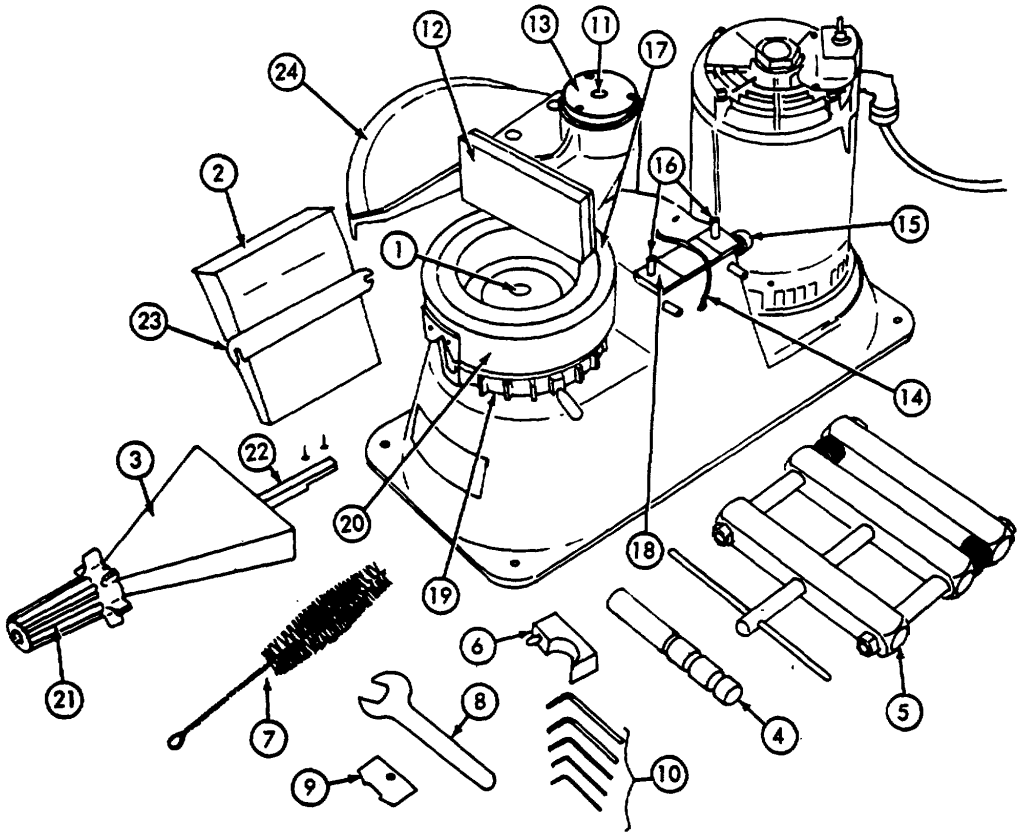


Figure 144. LOCATION OF COMPONENTS AND TOOLS

1. Wheel Flange
2. Grit Collector
3. Clamp Assembly and Screws
4. Gage Rod
5. Rod Clamping Fixture*
6. Diamond Dresser & Dressing Block
7. Cleaning Brush*
8. Spindle Wrench
9. Grinding Wheel Flange Wrench
10. Set of Allen Wrenches* - 5/64, 3/32, 1/8, 5/32 & 3/16
11. Pivot Post Screw
12. Clamp Table
13. Pivot Post Cap
14. Retainer Spring
15. Locator Button
16. Upper Positioning Pins
17. Wheel Guard Cover
18. Support Block
19. Feed Wheel
20. Wheel Guard
21. Clamp Handle
22. Clamp Shaft
23. Hanger Bar
24. Wheel Cover

* Reference - - not called out in text.

Chapter 2

Section II. Installation

2-1 TO PREPARE MACHINE FOR OPERATION

a. INSTALLING CLAMP ASSEMBLY (3, Fig 144)
   (1) Remove Wheel Cover (24).
   (2) Loosen Pivot Post Screw (11) approximately 4 turns (do not remove).
   (3) Rotate Clamp Table (12) clockwise until it almost touches the motor. It will be necessary to raise the table slightly to clear the grinding stop.
   (4) Position Clamp Shaft (22) into Notch under face of Camp Table. Countersink side of the screw holes in Clamp Shaft must extend downward.
   (5) Insert the two screws and tighten firmly, alternately tightening one and then the other.
   (6) Rotate Clamp Table, with Clamp Shaft assembled, back to the normal position. Replace Wheel Cover and retighten Pivot Post Screw.

b. ATTACHING GRIT COLLECTOR (2, Fig 144) left side of machine:
   (1) 'With front end of Hanger Bar (23) slightly elevated, slide horizontal slot of Hanger Bar between head of rear spring-loaded detent button and housing.
   (2) When horizontal slot is fully engaged, snap vertical slot of Hanger Bar down between head of the forward spring-loaded detent button and housings.

c. INSTALLING GAGE ROD (4, Fig 144)
   (1) Stretch Retainer Spring enough to slip the Gage Rod under it. Position Gage Rod shown in fig 144. Large groove should be over Location Button (15, fig 144) with spring in small groove in Center of Gage Rod.

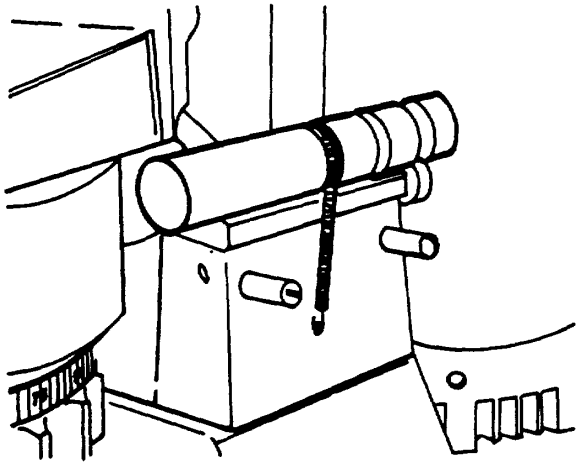


Figure 145. Gage Rod in Setup Position

   (2) Spring should retain Rod against Upper Positioning Pins (16) and hardened pads of Support Block (fig 145). Gap Rod must be free to move completely off hardened pads to rest against lower positioning pins (fig 146) without removing spring from control groove.

d. Make sure grinding wheel is tight on spindIe.

e. Connect machine to proper electrical power source.

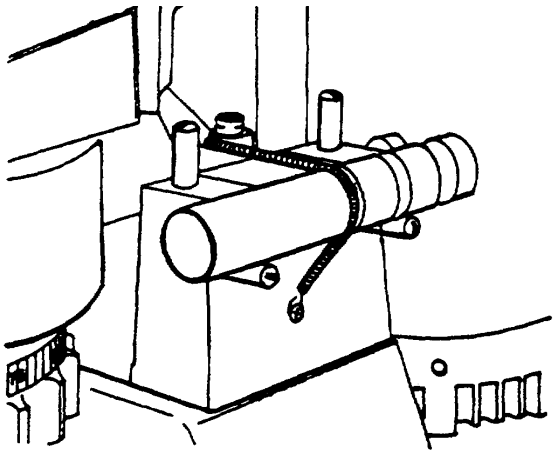


Figure 146. Gage Rod in Retracted Position

2-2 TO DRESS GRINDING WHEEL

The wheel should be dressed when stalled, or whenever the wheel locking nut has been loosened or tightened for any reason. Additional dressing is necessary unless the wheel face becomes glazed or chipped. Excessive dressing reduces wheel life.

a. Adjust diamond dresser to tip extends from Dressing Block (6, fig. 144) about 1/12 inch.

b. With motor off, turn Feed Wheel (19) until face of grinding wheel is about 1/16 inch above top edge of Wheel Guard (20).

c. Spin grinding wheel by hand and swing the Clamp Table across face of wheel to check for interference.

d. Position Clamp Table so left edge overhangs face of grinding wheel. Place Dressing Block over Clamp Shaft so diamond tip rests on grinding wheel face, then clamp firmly.

e. Move Gap Rod to retracted position on lower positioning pins (fig. 146) and swing clamp table to setup position (fig. 147).

f. Turn motor on and make several passes across face of wheel, advancing Feed Wheel about 2 thousandths between each pass. (Each graduation is one thousandth inch.) Wheel dressing should be done moderately fast, about 1/2 second for one complete pass across wheel face - a slower rate will glaze the wheel and wear the diamond excessively; too fast a rate will cut grooves across the face of the wheel with the possibility of jarring the diamond out of is mounting.

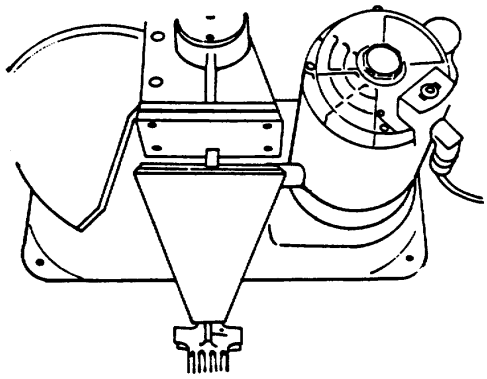


Figure 147. Clamp Table in Setup Position

CHAPTER 2
SECTION III. OPERATING INSTRUCTIONS

2-3 TO USE ROD CLAMPING FIXTURE (Fig 148)
(Fixture may be mounted on CRF-600 Storage Bench Cabinet, or on workbench; clamped in standard machinist's vice.)

a. DISASSEMBLY OF ROD: Use rod Clamping fixture to hold rod while removing nut.
b. ASSEMBLY OF ROD: After cap and rod are ground and assembled, position their parting line between the jaws of the Rod Clamping Fixture and clamp snugly to assure alignment while nuts are torqued to manufacturer's specifications.

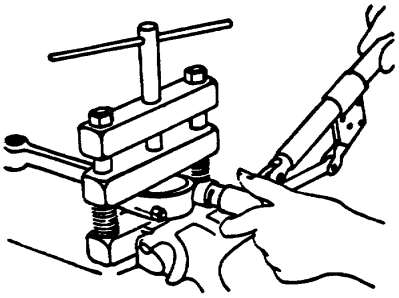


Figure 148. Clamping Fixture

2-4 TO GRIND CONNECTING ROD PARTING FACES

a. GRINDING STANDARD CONNECTING RODS.
(1) Disassemble connecting rod and cap and remove any burrs from sides and parting faces.
(2) Clean Gage Rod and hardened pads of Support Block (18, Fig 144).
(3) Place Clamp Table in setup position (Fig 147).
(4) Place parting faces of cap on Gage rod with one face on either side of Clamp Shaft.
(5) Clamp tightly by turning Clamp Handle (21, Fig. 144) clockwise.

NOTE

If cap is not clamped tight enough, the grinding wheel will push it up and less stock will be removed than desired.

(6) Swing Clamp Table to position one parting face of cap over first edge of wheel.
(7) Start motor and advance Feed Wheel until light sparking occurs.
(8) Return cap to original setup position over Gage Rod, and advance Feed Wheel according to amount of stock removal desired.
EXAMPLE: If .004" is the desired reduction in rod diameter, advance the Feed Wheel 1/2 this amount to remove .002" from the cap. Remove the remaining .002" from the con-rod, to assure perfectly matched surfaces when re-assembled. If more than .004" is the desired reduction in rod diameter, remove 1/2 from the - but use more than one cut, never removing more than .002" on any one cut. On rods with cast-in bolts, total desired stock removal must be taken from cap...again, do not remove more than .002" on any one cut.
(9) Swing Clamp Table across the grinding wheel with a slow, smooth, steady motion, grinding both faces of the cap. For best combination of grinding wheel life and finish, swing work across the wheel at a moderate speed. (A one-inch wide face should cross the wheel face in about two seconds.) Continue operation until a reduction in sparking shows that the desired stock has been removed.
(10) Return to setup position and remove cap.
(11) Place connecting rod in the same position and clamp firmly.
(12) Repeat grinding cycle without further grinding wheel adjustments.

NOTE

Since the grinding wheel wears very slowly, it is possible to grind an entire set of rods (or more) with one wheel height setting. To change the amount of cut, retract the grinding wheel and repeat steps (2) through (8).

b. GRINDING TONGUE AND GROOVE RODS, ALTERNATE TYPE (tongue on one side, groove on other):
   (1) With Clamp Table in setup position (Fig. 147), plate cap on Gage Rod with groove face of caps toward the wheel, and with the tongue resting in one of the grooves Gage Rod.
   (2) Clamp firmly.
   (3) Slide Gage Rod from under part and into retracted position.
   (4) Proceed to grind as outlined in steps (5) through (10) in a. above. Grind only the first face. Do not permit the second face (side with tongue) to contact the grinding wheel - note that total amount of stock is removed from one parting face of cap and other part face of red.
   (5) Repeat above process with the con-rod.

c. GRINDING TONGUE AND GROOVE RODS, OPPOSED TYPE (BOTH tongues on the same part).
   (1) Grind only part containing grooves, following same procedure as outlined for standard connecting rods (steps (1) through (10) in above).

NOTE

The manufacturers of tongue and groove rods provide clearance between tongue and bottom groove. If an amount exceeding this clearance is removed from the grooved face through excessive or repeated reconditioning, it will be necessary to grind the tongue to re-establish clearance.
To accomplish this on con-rods with both tongues on the same part, place the tongue on the Gage Rod, taking particular care that neither tongue engages a groove. Grind as outlined in steps (1) through (10) on page 2-3.
To grind a part with a tongue on one side, groove on other, place the tongue on the surface of Gage Rod and a shim approximately equal to tongue thickness under grooved face. Clamp firmly, remove shim and grind as outlined in steps, (5) through (10) on page 2-3.

d. GRINDING UNUSUALLY SMALL CONNECTING RODS (lawn mowers, chain saws, etc.). Both rod and cap can be ground at the same time:
   (1) With Clamp Table in setup position (Fig. 147) place cap on side of Clamp Shaft and con-rod on other side, so parting faces of each are resting on Gap Rod.
   (2) Clamp firmly and proceed as outlined in steps (5) through (10) on page 2-3.

CHAPTER 2
SECTION IV -MAINTENANCE

2-5 TO REPLACE GRINDING WHEEL WARNING

Disconnect Grinder from electrical power source to prevent accidents.

a. Loosen Pivot Post Screw (11, Fig. 144) approximately four turns (do not remove). Rotate Clamp Table (12) clockwise until Wheel Cover (24) almost touches the motor. It will be necessary to raise the table slightly to clear the grinding step.
b. Lower grinding wheel by turning Feed Wheel (19) clockwise as far as possible.
c. Insert Spindle Wrench (8) between grinding wheel and top of Feed Wheel and engage flats on spindle collar.
   d. To remove threaded Wheel Flange (1), grasp edge of grinding wheel, or use Wheel Flange Wrench (9) and rotate counterclockwise.
e. Lift the grinding wheel and slide it out.
f. Install new wheel in reverse order.
g. Dress new wheel as described under Installation, para 2-2.

2-6 TO CLEAN THE CRG-750

a. After every set of rods, or whenever grinding wheel height is adjusted:
   (1) Wipe grit from Gage Rod (4, Fig 144), Support Block (18) and Locator Button (15).
   (2) Wipe grit from face of Clamp Assembly and Clamp Table.
b. After each day of use or at frequent intervals;
   (1) Remove and empty Grit Collector (2).
   (2) Blow or brush the grit from inside of grinding wheel and Grit Collector spout.
   (3) Wipe or brush the grit from Clamp Table, Wheel Cover and motor.
   (4) Wipe or brush the grit from machine housing, especially areas next to Clamp Table pivot and Feed Wheel.
   (5) Unscrew Clamp Handle and remove completely from Clamp Shaft. Blow or brush grit from Clamp Handle and cover-tube which runs through Clamp Assembly. Wipe Clamp shaft and threads free of grit. Reassemble Clamp Handle. A dry film lubricant (graphite, SS-G-659A) may be used on any sliding surfaces, as well as on threads. Do not use oil or grease of any sort, as this will collect grit at the points which need the lubricant.

2-7 TO ADJUST GRINDING WHEEL ELEVATING MECHANISM

(If Feed Wheel tends to move during grinding operation or if Feed Wheel becomes difficult to move, tension on Quarter Nut (G Figure 149) is incorrect.

a. Turn grinder on its side and remove bottom cover (Fig. 149).
b. Remove the two screws holding Quarter Nut in place and remove Quarter Nut.
c. Brush all dirt and grit from Quill threads (E).
d. Lubricate with several drops of good quality SAE 10 oil.
e. Replace Quarter Nut. Tighten the two fastening screws while holding a light pressure against the nut to force it into the threads. Try the Hand Wheel; if it is hard to turn, loosen the two screws and retighten with less pressure against the nut. Adjust until the wheel turns freely but without backlash.
f. Replace bottom cover.

2-8 TO LUBRICATE THE CRG-750

(Sealed, prelubricated ball bearings requiring no lubrication are used on the spindle and on all other high speed rotating parts.)

a. PIVOT POST MONTHLY LUBRICATION.
   (1) Thoroughly clean Pivot Post Cap (13, Fig. 144)
   (2) Carefully remove Pivot Post Screw to prevent any grit from falling into the hole.
   (3) Wipe the hole carefully and pour in about one teaspoonful of a good quality SAE 10 oil.
   (4) Clean Pivot Post Screw, rubber “O” ring, and groove; and then replace.

b. PIVOT POST ANNUAL LUBRICATION & CLEANING
   (1) Thoroughly clean Pivot Post Cap.
   (2) Carefully remove Pivot Post Screw to prevent any grit from falling into the hole. Lift entire Clamp Table from the pivot post.
   (3) Remove rubber “O” ring seal from Clamp Table bore.
   (4) Wipe pivot post and Clamp Table bore with a clean cloth. Common solvents, such as fuel oil, may be used.

Figure 149 Bottom View of Cap & Rod Grinder
A. Drive Belt
B. Idler Arm Shaft
C. Idler Crank Arm
D. Oil Retainer
E. Quill Threads
F. Spindle Pulley
G. Quarter Nut
H. Spindle
J. Spindle Bushing

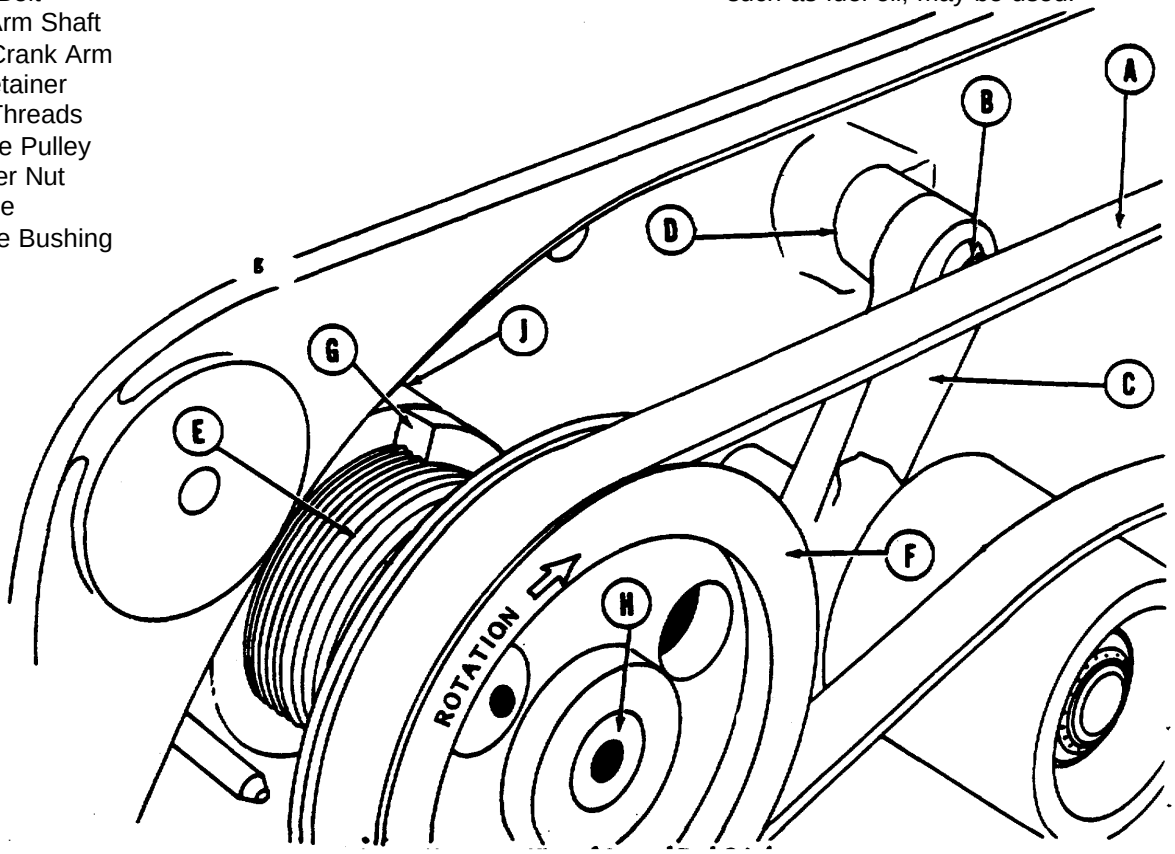


Figure 149. Bottom View of Cap and Rod Grinder

NOTE

Extreme care must be taken to avoid nicks and scratches and to remove all solid particles from the pivot post and from the Clamp Table bore, as well as from adjacent areas which might introduce grit during reassembly.

(5) Lubricate both pivot post and Clamp Table bore liberally with Lubriplate Lo-Temp or equivalent.
(6) Install rubber "O" ring; replace if worn or nicked.
(7) Carefully guide Clamp Table bore down onto pivot post. Do not force as permanent damage may result.
(8) Pour approximately one teaspoonful of good quality SAE 10 oil into Pivot Post Screw hole.
(9) Clean Pivot Post Screw and rubber "O" ring and re-install.

c. IDLER SHAFT ANNUAL LUBRICATION AND CLEANING
(1) Turn grinder on its side and remove bottom cover (Fig. 149).
(2) Remove Drive Belt (A, Fig. 149)
(3) Remove snap ring from Idler Arm Shaft (B), and remove Idler Crank Arm (C).
(4) Clean Idler Arm Shaft and bore.
(5) Lubricate Idler Arm Shaft and bore. Saturate felt Oil retainer (D).
(6) Replace Idler Crank Arm and replace snap ring.

d. GRINDING WHEEL ELEVATING MECHANISM LUBRICATION
(1) With machine on its side, remove bottom cover.
(2) Brush all dirt and grit from Quill threads.
(3) Lubricate with several drops of good quality SAE 10 oil.

2-9 TO DISASSEMBLE SPINDLE

Entire spindle may be removed for cleaning and lubrication as follows:

a. Swing Clamp Table until it touches the motor (see INSTALLATION, Section II, para 2-1.
b. Remove Wheel Guard Cover (17, Fig. 144) from Wheel Guard (20).
c. Place unit on its front, with Clamp Table still resting against motor.
d. Remove bottom cover.
e. Remove Spindle Pulley (F, Fig. 149) and Spring Washer.
f. Remove the two screws holding Quarter Nut (6) in place and remove Quarter Nut.
g. Slide Spindle (H), Feed Wheel, and grinding wheel as a unit from spindle bushing (J).
h. Clean all parts thoroughly, including nylon dust seal. A solvent cleaner such as fuel oil may be helpful.

2-10 TO ASSEMBLE SPINDLE

a. Apply light grease to nylon dust seal.
b. Apply Lubriplate Lo-Temp, or equivalent liberally to outside of Quill Tube and inside of Spindle Bushing.
c. Insert Quill Tube into Spindle Bushing, being careful to void introducing any foreign matter, or nicking or scratching either surface.
d. Replace Quarter Nut as outlined in Section III, step 5, page 5.
e. Replace the spring washer with the raised side against the bearing.
f. Replace spindle pulley, compressing spring washer to about half its thickness.
g. Replace bottom cover and set grinder upright.
h. Replace Wheel Guard Cover on Wheel Guard.
i. Position Clamp Table, tighten Pivot Post Screw, and replace Wheel Cover.

CRG-750 HEAVY DUTY CAP AND RCD GRINDER

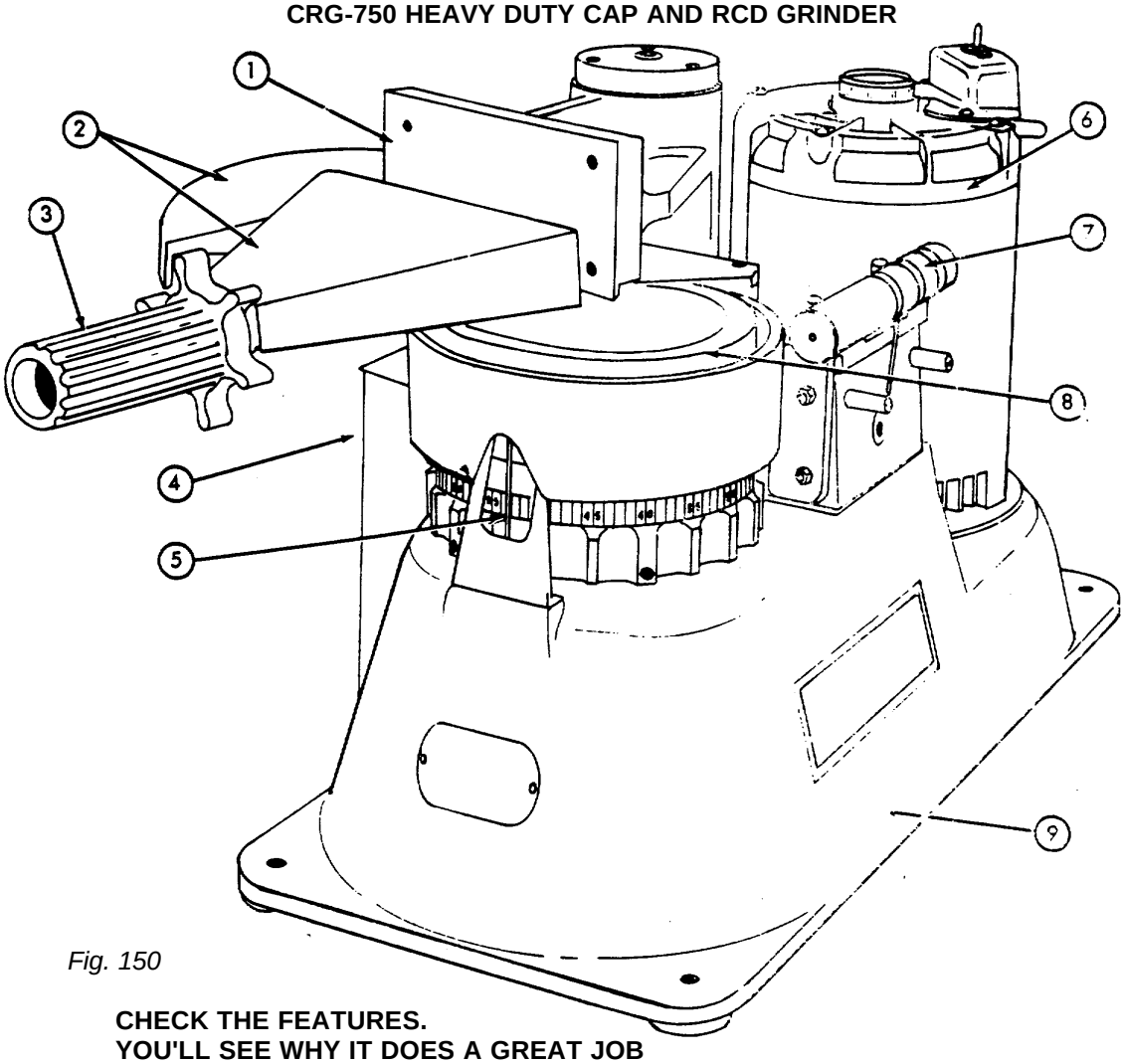


Fig. 150

CHECK THE FEATURES.
YOU'LL SEE WHY IT DOES A GREAT JOB

1. HARDENED STEEL FACE PLATE. Assures permanent accuracy.
2. SAFETY GUARDS. Completely cover grinding wheel and trap the cuttings and sparks.
3. FAST ACTION CLAMP. Just a twist of the wrist assures positive set-up.
4. GRIT COLLECTOR. Removable tray catches metal cuttings and grit.
5. EASY-TO-READ MICROMETER FEED. Positive setting. Will not “creep” or back off.
6. TOTALLY ENCLOSED, DUST FREE MOTOR. 115V, single phase, 60 cycle.
7. PRECISION-GROUND, HARDENED STEEL LOCATING PIN. Accommodates all types of rods, including step-type and tongue-and-groove.
8. LONG-LIFE, FAST-CUTTING 6” GRINDING WHEEL.
9. HEAVY, STRESS-RELIEVED HOUSING. Can’t warp. Encloses vibration-free belt drive. Does not require fastening to bench.

CHAPTER 2

SECTION V - PARTS LIST FOR MODEL CRG-750

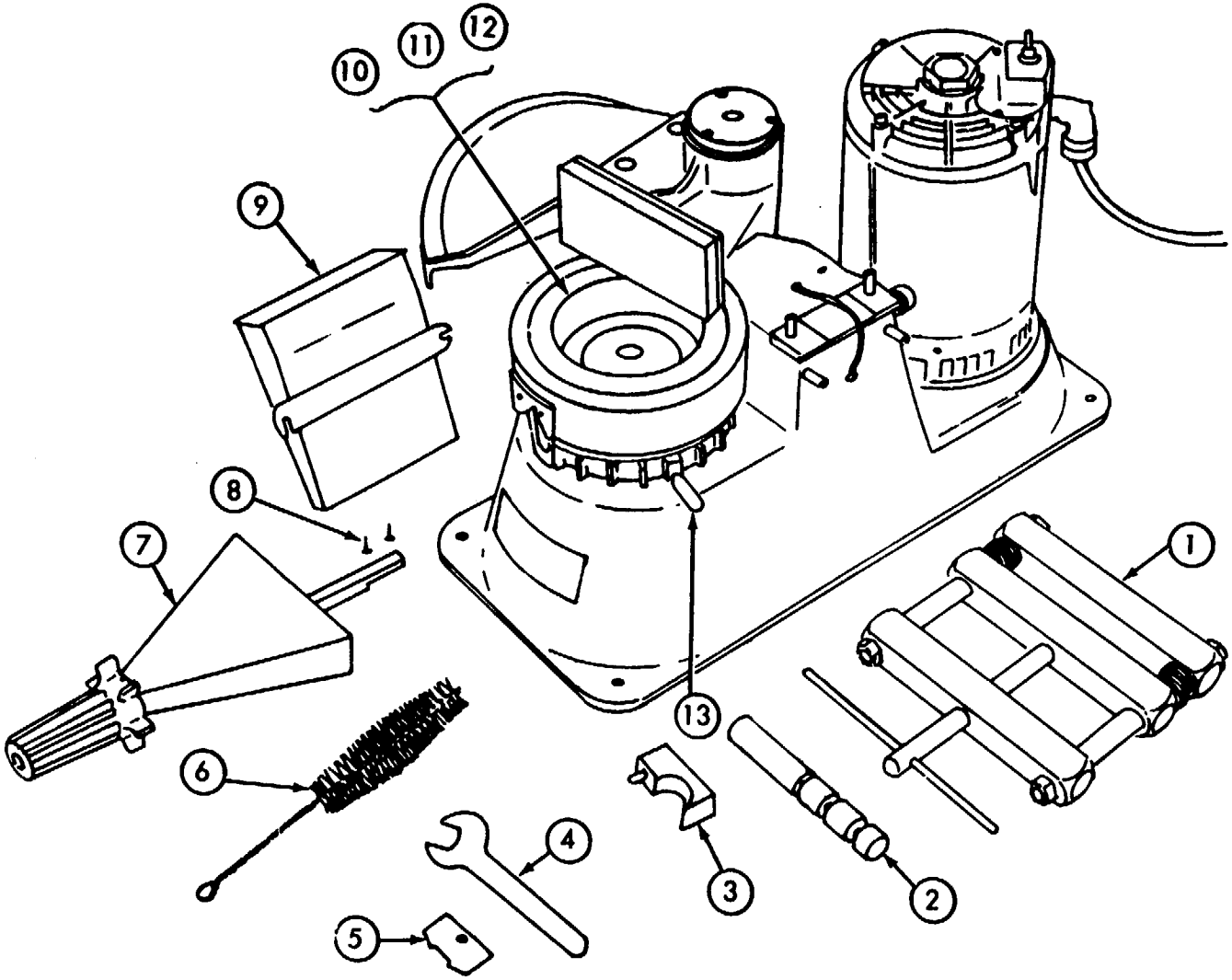


Fig 151. - Accessories

Parts List Covering Figure 151 - Accessories

ITEM NO.	ORDER PART NUMBER	DESCRIPTION
1	CRG-960A	.....Rod Clamping Fixture
2	CRG-903A	.....Gage Rod
3	CRG-330A	.....Diamond Dresser
4	CRG-496A	.....Wrench (Special 7/8" Open End)
5	CRG-996A	.....Wrench (Special)
6	LBN-427A	.....Brush
7	CRG-930A	.....Clamp Rod Assembly *with*
8		.....Screws (8-32 x 3/4 Flat Hd. Soc. Cap)
9	CRG-915A	.....Dust Pan
10	CRG-803	.....Grinding Wheel (Soft)
11	CRG-805	.....Grinding Wheel (Standard)
12	CRG-807	.....Grinding Wheel (Hard)
13	CRG-908A	.....Hand Wheel Stud

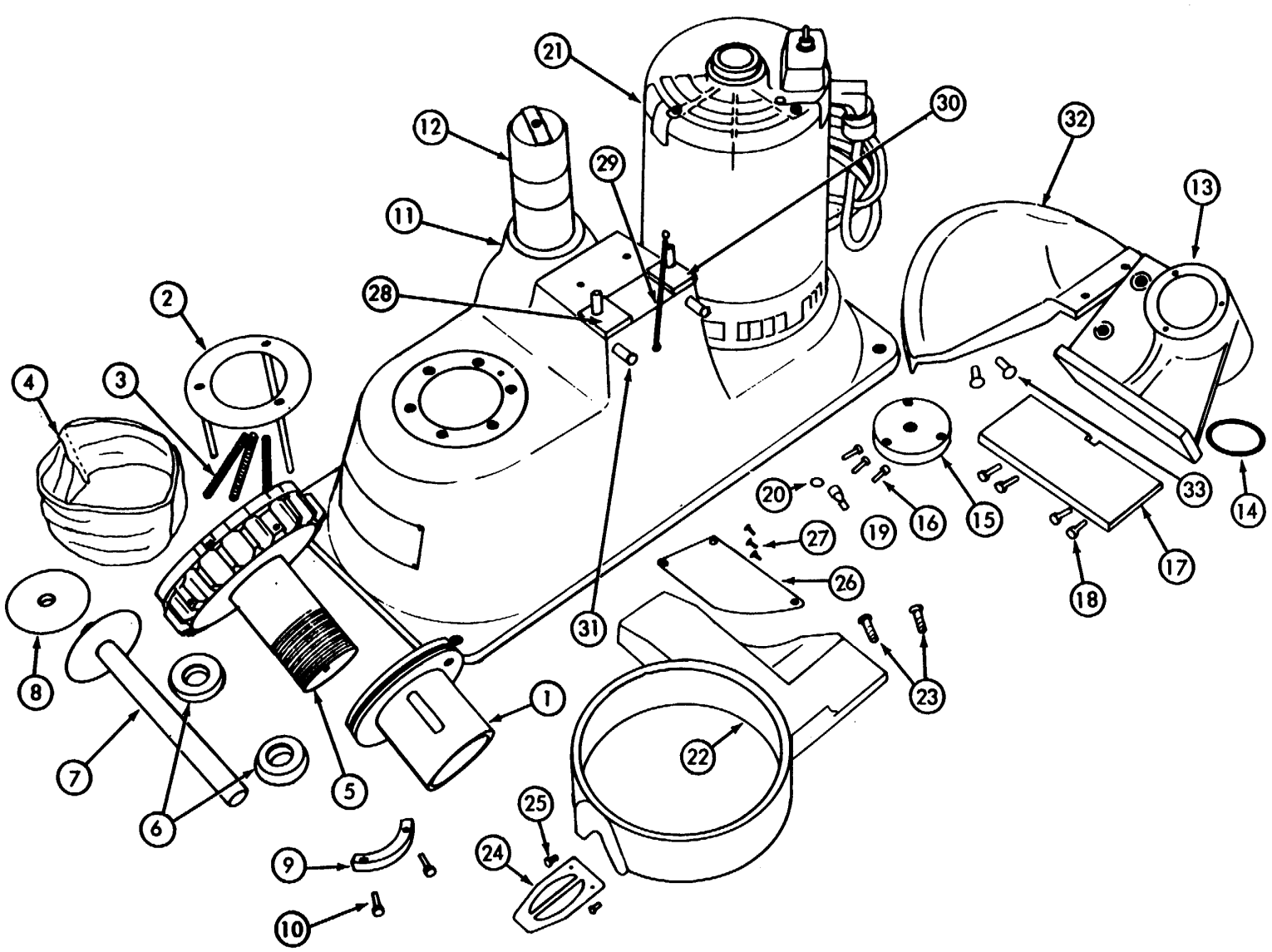


Figure 152. CRG-750 Heavy Duty Cap & Rod Grinder

Parts List for CRG-750 Heavy Duty Cap & Rod FIGURE "B" Grinder

ITEM NO.	ORDER PART NUMBER	DESCRIPTION
1	CRG-768A	.....Spindle Bushing *with* (Sold only with Item 5) Screws (5/16-18 x 1-3/4 Soc. Hd. Cap)
2	CRG-865A	.....Dust Seal Assembly
3	CRG-873A	.....Springs (3 per pkg.)
4	CRG-870A	.....Dust Sleeve
5	CRG-785A	.....Quill Assembly (Sold only with Item 1)
6	PBR-12A	.....Bearing (N.D. #4993LO4X1C) (1 per pkg.)
7	CRG-790A	.....Spindle Shaft
8	CRG-877A	.....Grinding Wheel Nut
9	CRG-796A	.....Half Nut *with*
10		.....Screws (10-32 x 3/4 Soc. Hd. Cap)
11	CRG-816A	.....Stop Cam Button *with* Screw (10-32 x 1/2 Soc. Hd. Cap)
12	CRG-814A	.....Pivot Post *with*
		.....Washer (5/8 AM. Std. Medium Sec. Lock)
		.....Screw (5/8-11 x 1-1/2 Hex. Hd. Cap)
13	CRG-691A	.....Table (SEE NOTE at bottom of page) *with*
14	CRG-896A	....."O" Ring (Houghton 8226)
15	CRG-894A	.....Cam Cap *with*
		.....Washers
16		.....Screws (10-32 x 5/8 Soc. Hd. Cap)
17	CRG-898A	.....Clamp Table Face (SEE NOTE at bottom of page) *with*
18		.....Screws (1/4-20 x 5/8 Soc. Hd. Cap)
19	CRG-899A	.....Screw *with*
20	CRG-97A	....."O" Ring (Houghton #011)
21	CRG-850	.....Motor Assembly (Specify Voltage *and* frequency if other than 115/230 Volt, 60 Cycle) includes key, switch cover, switch, cord and plug.
22	CRG-882A	.....Grinding Wheel Guard *with*
23		.....Screws (5/16-18 x 7/8 Button Hd. Soc. Cap)
24	CRG-83A	.....Index Plate *with*
25		.....Screws (8-32 x 3/8 Button Hd. Soc. Cap)
26	CRG-884A	.....Guard Plate *with*
27		.....Screws (6-32 x 3/8 Flat Hd. Soc. Cap)
28	CRG-811A	.....Gage Surface Plate (SEE NOTE at bottom of page) *with*
		.....Screws (Special 1/4-20 Shoulder)
29	CRG-812A	.....Gage Rod Spring *with*
		.....Screws (10-32 x 1/4 Button Hd. Soc. Cap)
30	CRG-813A	.....Gage Rod Guide *with*
		.....Screw (6-32 x 5/8 Button Hd. Soc. Cap)
31	CRG-817A	.....Shoulder Screws (2 per pkg.)
32	CRG-907A	.....Wheel Cover *with*
33		.....Screws (5/16-18 x 7/8 Button Hd. Sc. Cap)

NOTE: Items 13, 17 & 28 require shimming at time of installation to assure proper alignment. See Operating and Maintenance Instructions supplied with your machine.

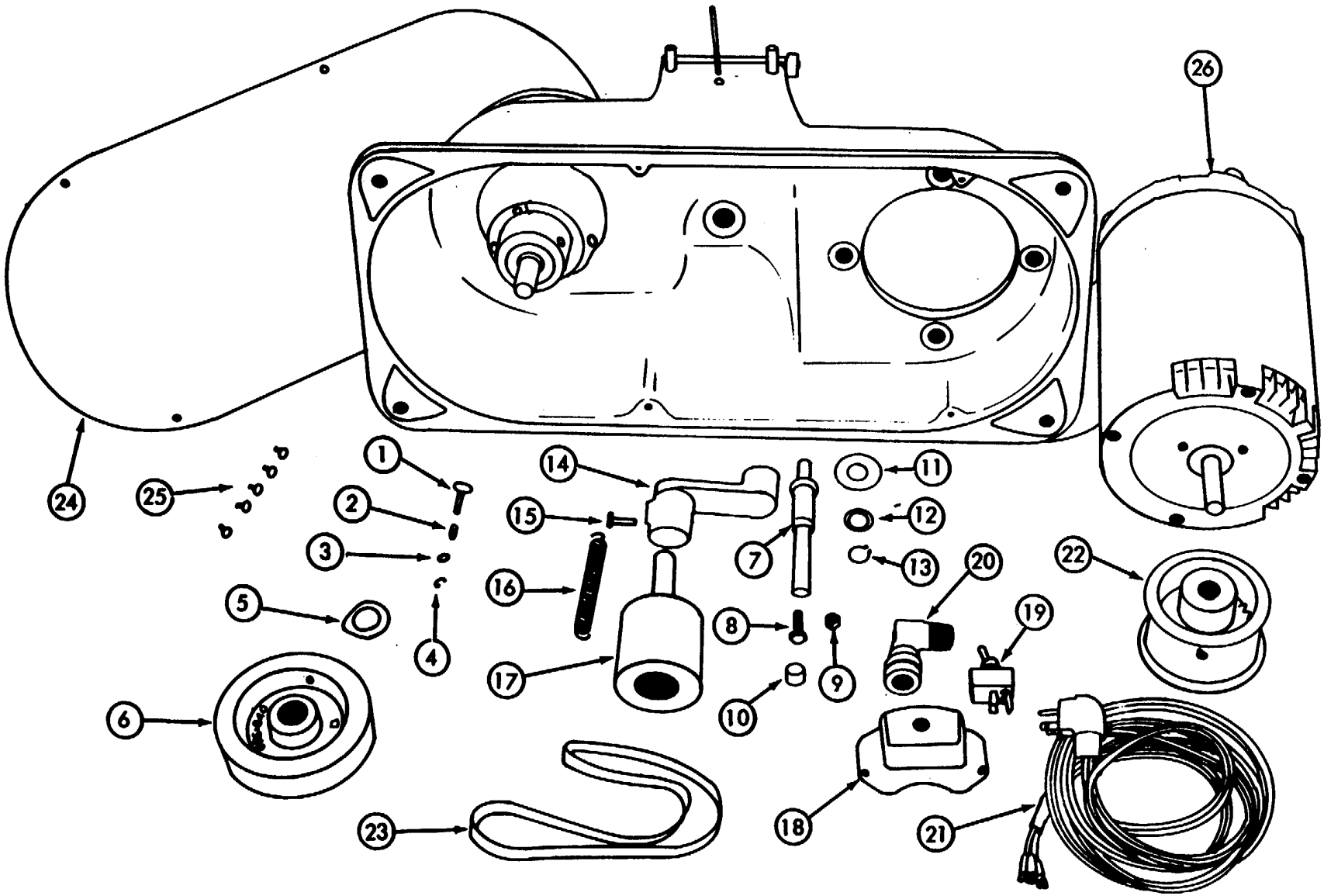


Figure 153. CRG-750 Heavy Duty Cap & Rod Grinder

CRG-750 Heavy Duty Cap & Rod Grinder FIGURE 153

ITEM NO.	ORDER PART NUMBER	DESCRIPTION
1	CRG-772A	.....Detent Button *with*
2		.....Spring
3		.....Washer
4		.....Retaining Ring
5	CRG-844A	.....Spring Washer
6	CRG-842A	.....Spindle Pulley *with*
		.....Set Screw (1/4-20 x 3/8 Soc. Hd. Cup Pt.)
7	CRG-827A	.....Idler Stud *with*
8		.....Screw (1/4-20 x 1-1/4 Hex. Hd. Cap)
9		.....Nut (1/4-20 Hex.)
10		.....Neoprene Bumper
11	CRG-828A	.....Felt Washer
12	PG-932A	.....Spring Washer *with*
13		.....Retaining Ring (Truarc #5100-62-S)
14	CRG-831A	.....Idler Arm *with*
15		.....Screw (1/4-20 x 3/4 Hex. Hd. Cap)
11	CRG-828A	.....Felt Washer
16	CRG-838A	.....Spring
17	CRG-835A	.....Idler Pulley *with* Bearing
18	CRG-861A	.....Switch Housing
19	CRG-299D	.....Switch *with*
		.....Leads
		.....Insulator
		.....Indicator Plate
		.....Screw (6-32 x 3/16 P.K. type "F")
20	PEC-110A	.....Angle Connector with Cord Grip
21	LBN-305D	.....Cord Set
22	CRG-847A	.....Motor Pulley *with*
		.....Set Screw (1/4-20 x 3/8 Soc. Hd. Cup Pt.)
		.....Key
23	MBB-910	.....Flat Belt (37-1/4 Long)
24	CRG-853A	.....Bottom Cover *with*
25		.....Screws (10-24 x 3/8 Button Hd. Soc. Cap)
		.....Gasket (53" Length of Vinyl Foam Tape)
26		.....Motor (SEE ITEM 21, Figure 150)

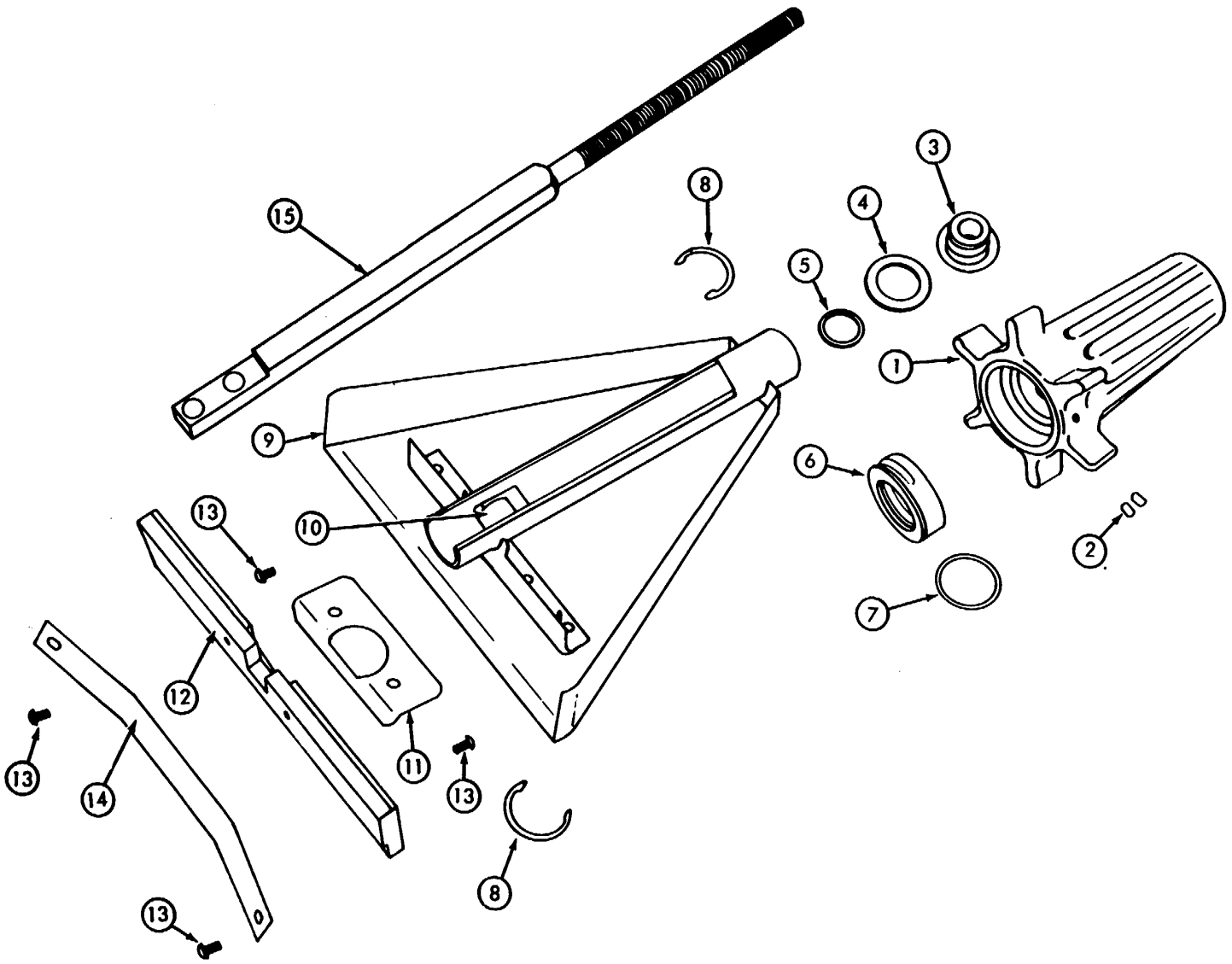


Figure 154. CRG-750 Heavy Duty Cap & Rod Grinder

CRG-750 Heavy Duty Cap & Rod Grinder FIGURE 154

ITEM NO.	ORDER PART NUMBER	DESCRIPTION
1	CRG-932A	.....Clamp Handle *with*
2		.....Set Screws (8-32 x 1/4 Soc. Hd. Cup Pt.)
3	CRG-944A	.....Thrust Bushing *with*
4		.....Thrust Washer
5		....."O" Ring (#ARP 568-016)
6	CRG-933A	.....Handle Insert *with*
7		....."O" Ring (#ARP 568-020)
8	PHR-316A	.....Retaining Ring (Truarc #5103-87-S) (2 per pkg.)
9	CRG-935A	.....Clamp Rod Cover *with*
10	CRG-938A	.....Spring *with*
		.....Screw (6-32 x 1/4 Button Hd. Soc. Cap)
		.....Nut & Lockwasher
11	CRG-943A	.....Cover Retainer
12	CRG-942A	.....Clamp Face *with*
13		.....Screws (6-32 x 1/4 Button Hd. Soc. Cap)
14	CRG-947A	.....Clamp Face Spring *with*
13		.....Screws (6-32 x 1/4 Button Hd. Soc. Cap)
15	CRG-931A	.....Clamp Rod *with*
		.....Screws (8-32 x 3/4 Flat Hd. Soc. Cap)

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

WEIGHTS

1 Gram = 0 001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 Lb
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

CUBIC MEASURE

1 Cu Centimeter = 1000 Cu Millimeters = 0 06 Cu Inches
1 Cu Meter= 1,000,000 Cu Centimeters = 35 31 Cu. Feet

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

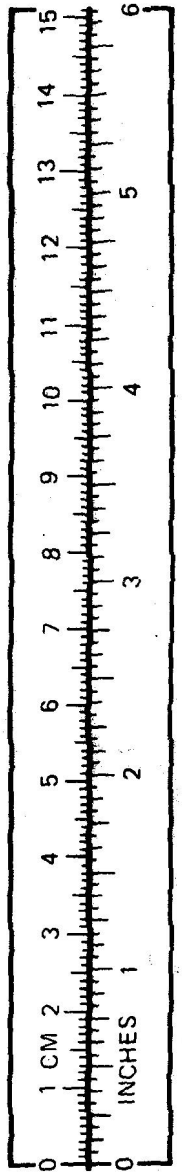
TEMPERATURE

5/9 (°F - 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32 2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 (°C + 32) = °F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid	Ounces Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.45
Short Tons	Metric Tons	0.0907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0 155
Square Meters	Square Feet .	10.764
Square Meters	Square Yards	1.195
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters Fluid	Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2 205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621



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