

659-TYPE TOOLS

PIECE-PART DATA AND REPLACEMENT PROCEDURES

1. GENERAL

1.01 This section covers the information necessary for ordering parts to be used in the maintenance of the 659-type tools. These tools are used for enlarging rectangular holes and clipping tabs of blanks to obtain coded cards for use in the 1-type translator in the 4A and 4M toll switching systems.

1.02 This section is reissued to add piece-part data and replacement procedures covering the 660B hole-enlarging punch and die assembly and the 659D, 659E, and 659F tools. It is also reissued to omit piece-part data covering the 660A punch and die assembly. Detailed reasons for reissue will be found at the end of the section. Since this reissue covers a general revision, the arrows ordinarily used to indicate changes have been omitted.

1.03 Initially, all 659-type tools were equipped with the 660A hole-enlarging punch and die assembly. More recently, the 660B hole-enlarging punch and die assembly has been furnished as the replacement for the 660A. The 660B punch and die assembly has no punch pilot but has four cutting edges in the die. If the hole-enlarging punch and die assembly is to be replaced, a 660B punch and die assembly should be installed. When replacing a 660A by a 660B, change the wiring and coding on the 659-type tool as covered in 3.15.

1.04 The following table covers the codes of 659-type tools equipped with the 660A punch and die assembly and equivalent codes of 659-type tools equipped with the 660B punch and die assembly.

CODES OF 659-TYPE TOOLS EQUIPPED WITH 660A PUNCH AND DIE ASSEMBLY	EQUIVALENT CODES OF 659-TYPE TOOLS EQUIPPED WITH 660B PUNCH AND DIE ASSEMBLY
659A	659D
659B	659E
659C	659F

1.05 The 659E tool is similar to the 659B tool except that it is equipped with a 660B punch and die assembly and with suitable wiring to insure full penetration of the punch through the card. The 659D tool is a modified 659A tool which has been provided with a 660B punch and die assembly and appropriate wiring. On the 659A and 659D tools, a foot pedal is used to control the action of the punch and die assembly. On the 659B, 659C, 659E, and 659F tools, the punch action is hand controlled. Section 076-143-802 covers the method for converting the 659A and 659D tools to the equivalent of the 659B and 659E tools, respectively; the converted tools are identified by codes 659C and 659F.

1.06 Part 2 of this section covers the piece-part numbers and the corresponding names of the parts which it is practicable to replace in the field in the maintenance of the 659-type tool. No attempt should be made to replace parts not designated except as covered in 2.04. Part 2 also contains explanatory figures showing the different parts. This information is called Piece-Part Data.

1.07 Part 3 of this section covers the approved procedures for the replacement of the parts covered in Part 2. This information is called Replacement Procedures.

1.08 Unless otherwise specified, parts are replaced with the tool in its normal locked position.

1.09 The replacement of certain parts of the hydraulic shelf assembly requires the draining of oil from the tank prior to replacement of the part. In such cases, drain the oil as covered in 3.06. After replacement of parts which necessitate draining the tank, refill the tank as covered in 3.07. Then check the hydraulic system for leaks as covered in Section 076-143-701.

1.10 After replacement of parts which necessitate breaking pipe connections in the foot-pedal hydraulic system, fill and bleed this

SECTION 076-143-801

system and check for leaks as covered in Section 076-143-701.

2. PIECE-PART DATA

2.01 The figures included in this part show the various piece parts in their proper relation to other parts of the 659-type tool. The piece-part numbers of the various parts are given together with the name of the parts as listed by Western Electric Company Merchandise Department. When these names differ from those in general use in the field, the latter names, in some cases, are shown in parentheses.

2.02 When ordering parts for replacement purposes, give both the piece-part number and the name of the part, for example, "P-19A219 Can." If a part identified by other than a piece-part number is required, order the part by the drawing and detail number and include the manufacturer's name if given. For example, QFP3-160-OIT, 115-volt, 60-cycle, solenoid-operated pilot valve less subplate but with subplate "O" rings, Double A Products Co. If the part required is used in one of the components of the tool as in the solenoid-operated pilot valve referred to above, include this information when ordering the part. For example, DECCO 20-51 solenoid for QFP3-160-OIT, 115-volt, 60-cycle, solenoid-operated pilot valve, Double A Products Co. Do not refer to the BSP number or to any information shown in parentheses following the piece-part number.

2.03 Information enclosed by parentheses () is not ordering information. This information may be references to notes, parts referred to in other portions of the section and not considered replaceable, or the part names in general use in the field if these names differ from those assigned by the manufacturer.

2.04 When a part which is not included in these procedures requires replacement and is part of a replaceable subassembly, the latter shall be replaced. Where a part which is not included in these procedures requires replacement and is part of a nonreplaceable subassembly, refer the matter to the supervisor.

2.05 The following index lists the figures on which ordering information for all replaceable parts is shown. References are also

given to the replacement procedures of parts covered in Part 3 of this section.

INDEX

PART	ORDERING INFORMATION FIG. NO.	REPLACEMENT PROCEDURES (covered in Part 3)
Covers, Punch Guard, and Chaff Bin		
Front, Rear, and Top Covers	1	3.09
Under Table Cover	1	3.10
Foot-Pedal Assembly Drip Pan (659A and 659D tools only)	1	3.11
Foot-Pedal Assembly Cover (659A and 659D tools only)	1	3.12
Punch Guard	1	3.13
Chaff Bin	3 & 4	3.14
660B and 661A Punch and Die Assemblies		
659A, 659B, and 659C Tools Only	1	3.15
All 659-Type Tools	1	3.16
Parts of Hydraulic Shelf Assembly (power-driven hydraulic system)		
Punch Coupling and Locknut	1	3.17
Punch Cylinders	5	3.18
Punch-Cylinder Chevron Packing and Associated Parts	6	3.19
Micro-Switch Operating Arm	8	3.20
Micro-Switch Operating Arm Mounting	8	3.21
Punch-Guard Micro Switch (D3)	8	3.22

PART	ORDERING INFORMATION FIG. NO.	REPLACEMENT PROCEDURES (covered in Part 3)	PART	ORDERING INFORMATION FIG. NO.	REPLACEMENT PROCEDURES (covered in Part 3)
Hole-Enlarging Punch Micro Switch (D6)	8	3.23	Pilot Pin	9	3.41
Tab-Clipping Punch Micro Switch (D8)	8	3.24	Pilot Pin Cylinder "O" Rings (659A and 659D tools only)	9	3.42
Bypass Valve	5	3.25	Tab-Clipping Control Unit		
Pressure Gauge	5	3.26	Cylinder "O" Rings (659A and 659D tools only)	10	3.43
Pressure-Gauge Valve	5	3.27	Selector Valve (659A and 659D tools only)	10	3.44
Double-Solenoid Valve	7	3.28	Selector Valve Spool "O" Rings (659A tool only)	10	3.45
Solenoid of Double-Solenoid Valve	7	3.29	Stylus	11	3.46
"O" Rings in Mount- ing Surface of Double-Solenoid Valve	7	3.30	Tab-Clipping Control Micro Switch (D7)	3 & 4	3.47
"O" Rings in Interior of Double-Solenoid Valve	7	3.31	Foot-Pedal Assembly (659A and 659D tools only)		
Nosepiece	7	3.32	Hydraulic Cylinder	12	3.48
Motor	5	3.33	Hydraulic-Cylinder "O" Rings	12	3.49
Flexible Coupling	5	3.34	Nosepiece	12	3.50
Pump	5	3.35	Flexible Hose	12	3.51
Flexible Hoses	5	3.36	Solenoid Cut-Off Valve	3	3.52
Tubing	5	3.37	Tubing Between Pilot-Pin Cylinder and Selector Valve	3 & 9	3.53
Drain Cock	5	3.38	Tubing Entirely Below Table	3	3.54
Terminal Strip (TS2)	7	3.39	Fittings	3 & 9	3.55
Punch Control System			Other Parts		
Hole-Enlarging Control Unit			Parts of Carriage		
Hole-Enlarging Control Micro Switch (D5)	9	3.40	Front Carriage Stops	13	3.56

SECTION 076-143-801

PART	ORDERING INFORMATION FIG. NO.	REPLACEMENT PROCEDURES (covered in Part 3)	PART	ORDERING INFORMATION FIG. NO.	REPLACEMENT PROCEDURES (covered in Part 3)
Rear Carriage Stops	13	3.57	Parts on Control Panel		
Ball Retainer Stops and Carriage Bumper	13	3.58	Hole-Enlarging Punch Relay (S1) and Tab-Clipping Punch Relay (S2)	17	3.65
Card Jaws	14	3.59	TEST-OPERATE Switch (D1) and OFF-ON Switch (D2)	17	3.66
Card-Jaw Discs	14	3.60	Terminal Strip (TS1)	17	3.67
Carriage and Power Switch Lock			Miscellaneous Parts		
Lock Cylinder	15	3.61	Plug-On Power Cord	1	3.68
Lock Micro Switch (D4)	15	3.62	Chain	3 & 4	3.69
Parts of Selector- Handle Assembly			Micro-Switch Covers	3, 4, & 7	3.70
Selector-Handle Micro-Switch (D9)	3 & 4	3.63	Counter	2	3.71
Selector-Handle Micro Switch (D10)	3 & 4	3.64			

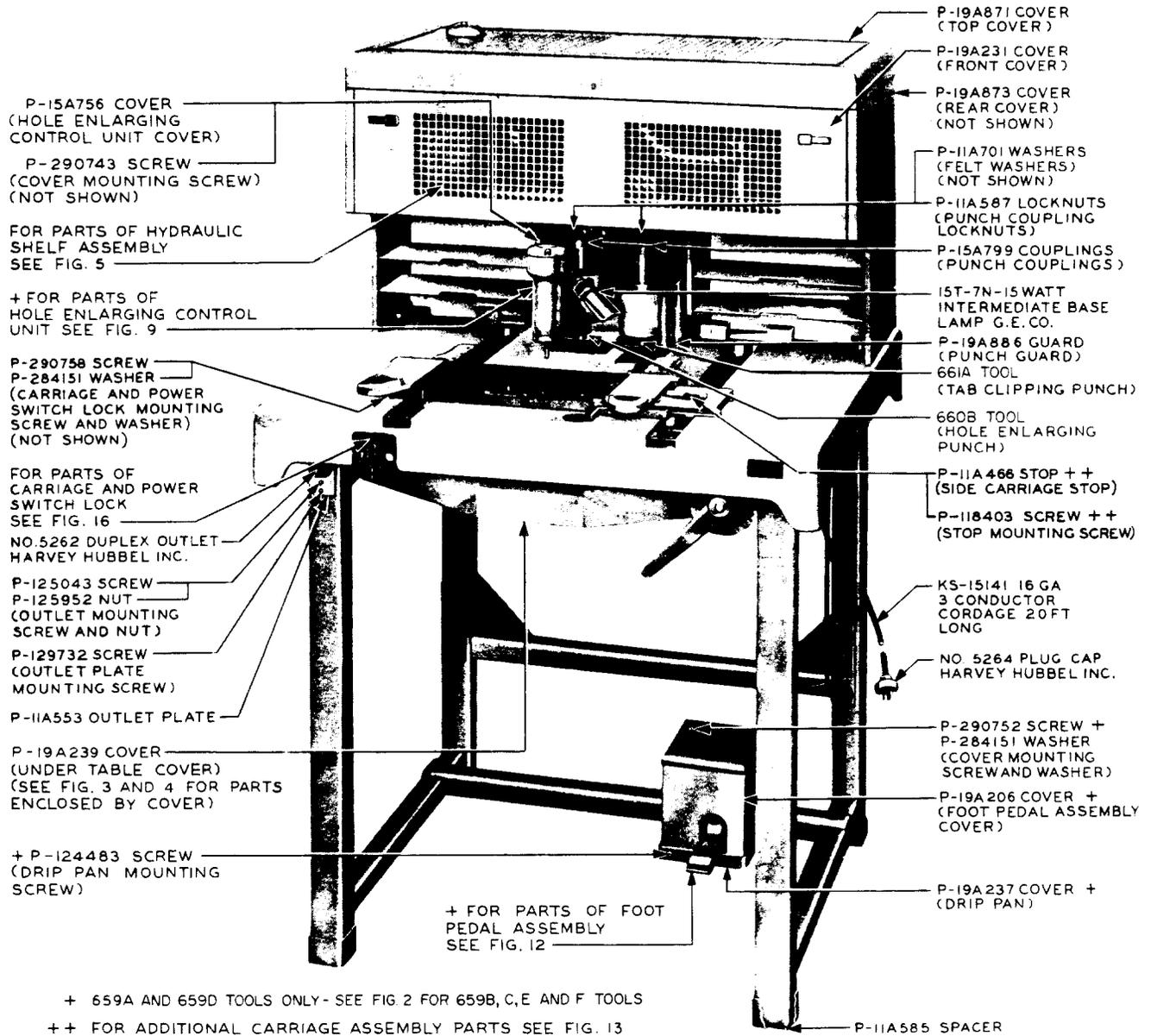


Fig. 1 - 659-Type Tool — 659D Tool Shown

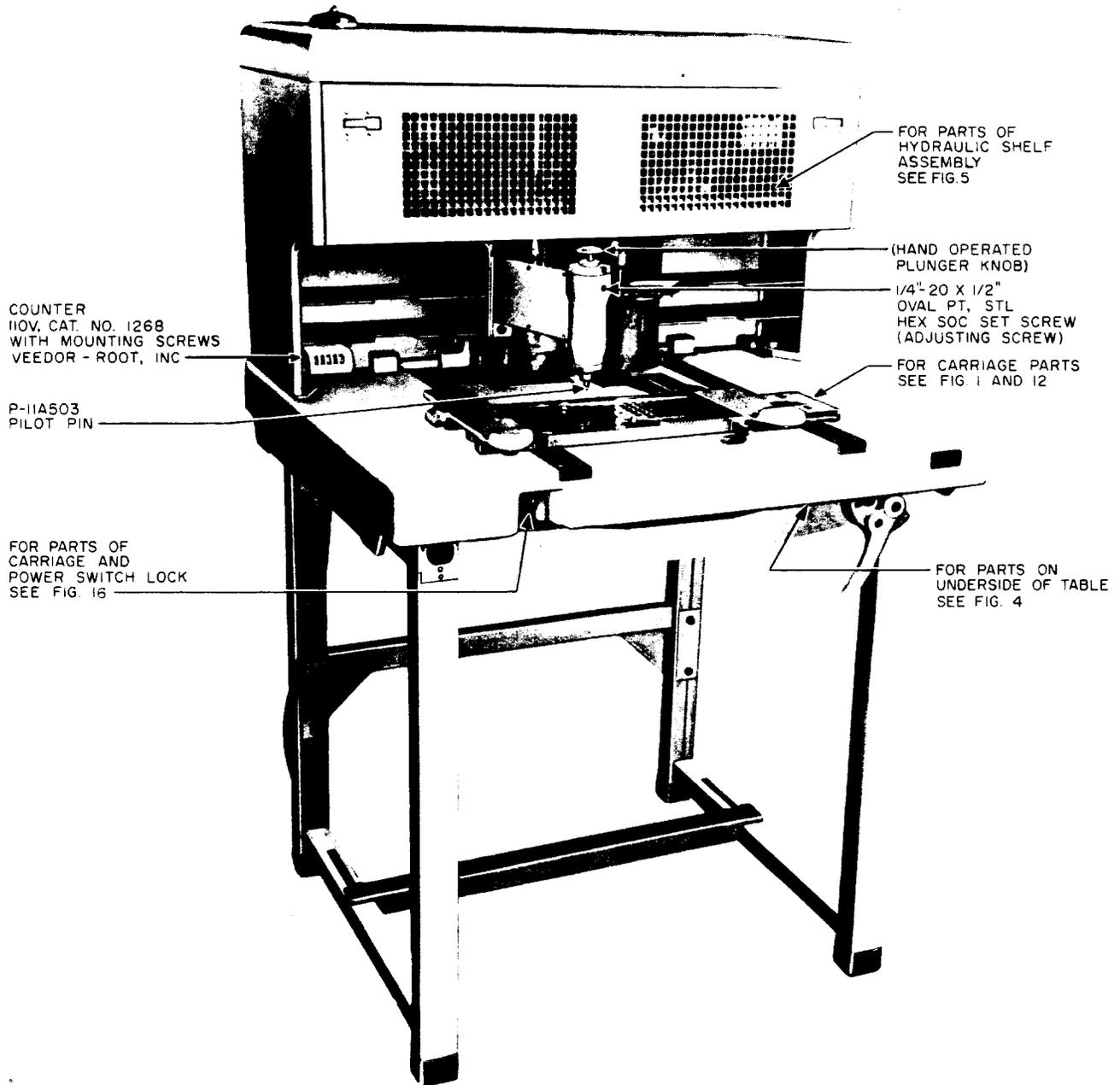
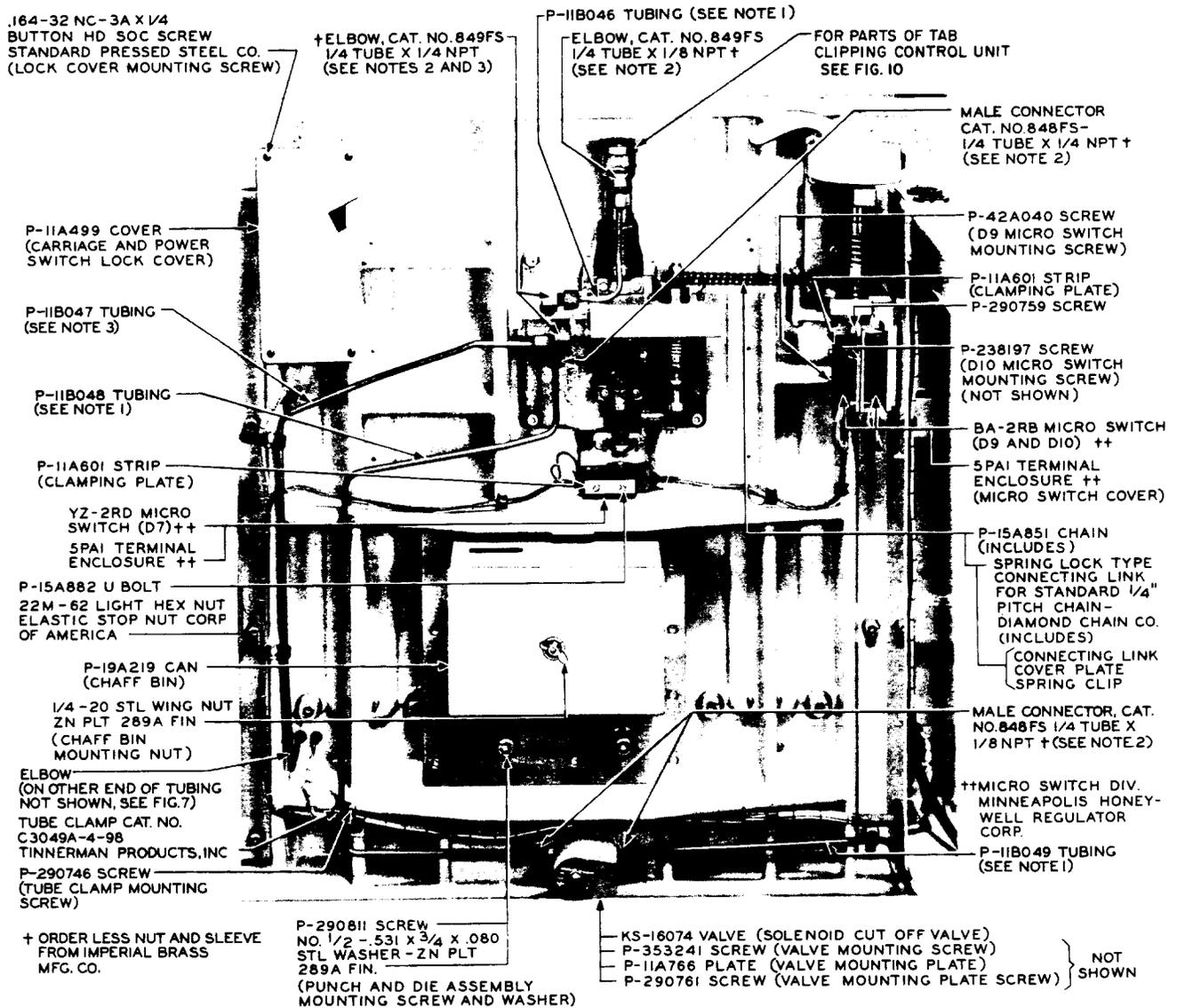


Fig. 2 - 659-Type Tool — 659B, 659C, 659E, and 659F Tools Shown



NOTE 1-IF TUBING TO BE REPLACED IS CONNECTED BY BLACK FITTINGS ALSO ORDER FITTINGS TO WHICH EACH END OF TUBING IS CONNECTED.

2-IF FITTING TO BE REPLACED IS BLACK, ORDER TUBING CONNECTED TO FITTING AND ALSO FITTING TO WHICH OTHER END OF TUBING IS CONNECTED.

3-IF ANY TUBING OR FITTING BETWEEN SELECTOR VALVE AND PILOT PIN CYLINDER IS TO BE REPLACED, REPLACE ALL TUBING AND FITTINGS BETWEEN THESE POINTS IF TUBING IS CONNECTED BY BLACK FITTINGS, IF TUBING TO BE REPLACED HAS OTHER THAN BLACK FITTINGS ORDER IN ADDITION TO TUBING, NUT FOR ELBOW CAT. NO. 849 FS 1/4 TUBE X 1/4 NPT TO BE USED ON FLARED END OF TUBING, ALSO ORDER NUT AND SLEEVE FOR ELBOW CAT. NO. 65F 1/4 TUBE X 1/4 TUBE TO BE USED TO CONNECT COMPRESSION TYPE FITTING AT OTHER END OF TUBING. ORDER THESE PARTS FROM IMPERIAL BRASS MFG. CO.

Fig. 3 - 659A and 659D Tools - Underside of Table

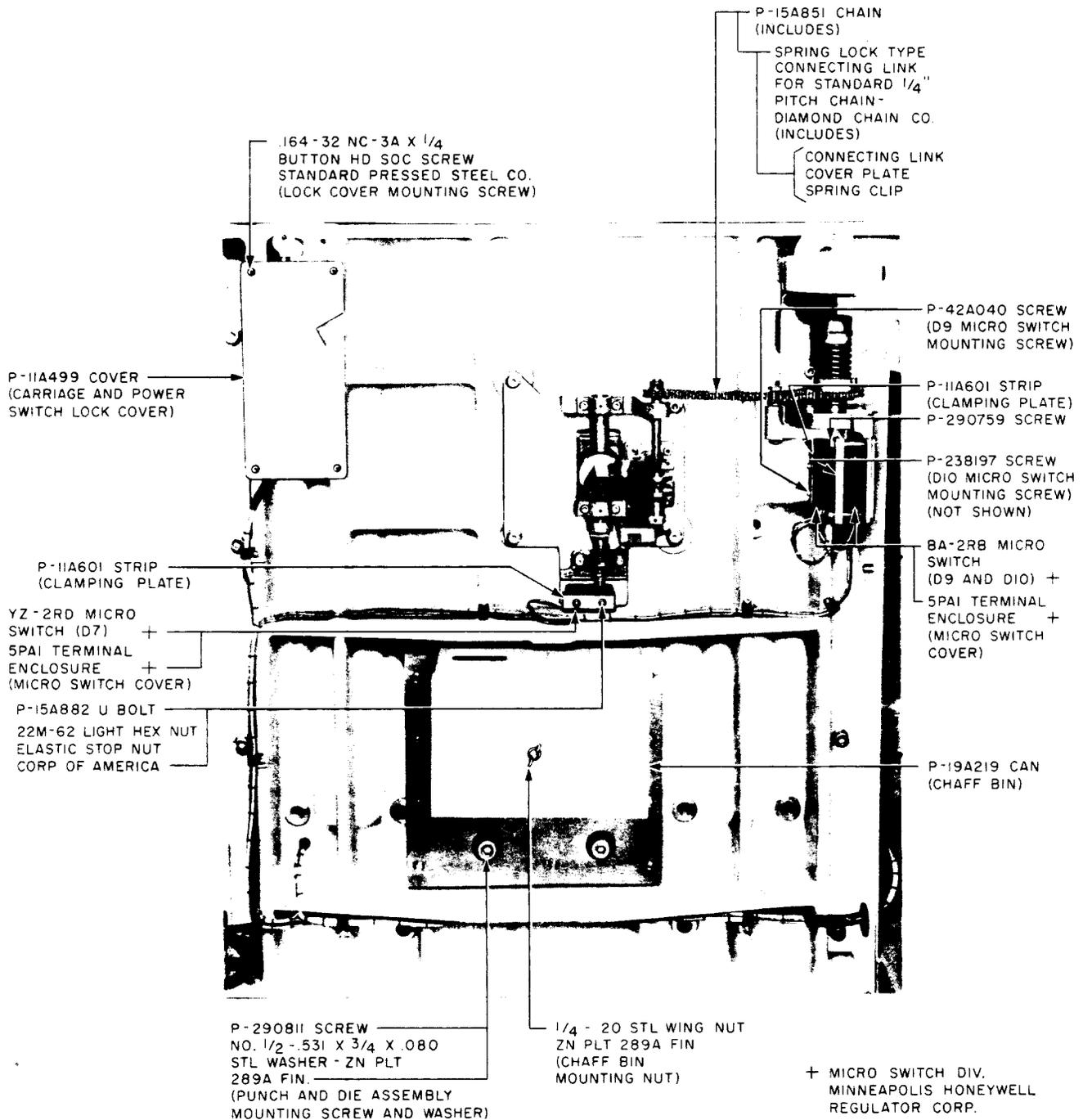


Fig. 4 - 659B, 659C, 659E, and 659F Tools — Underside of Table

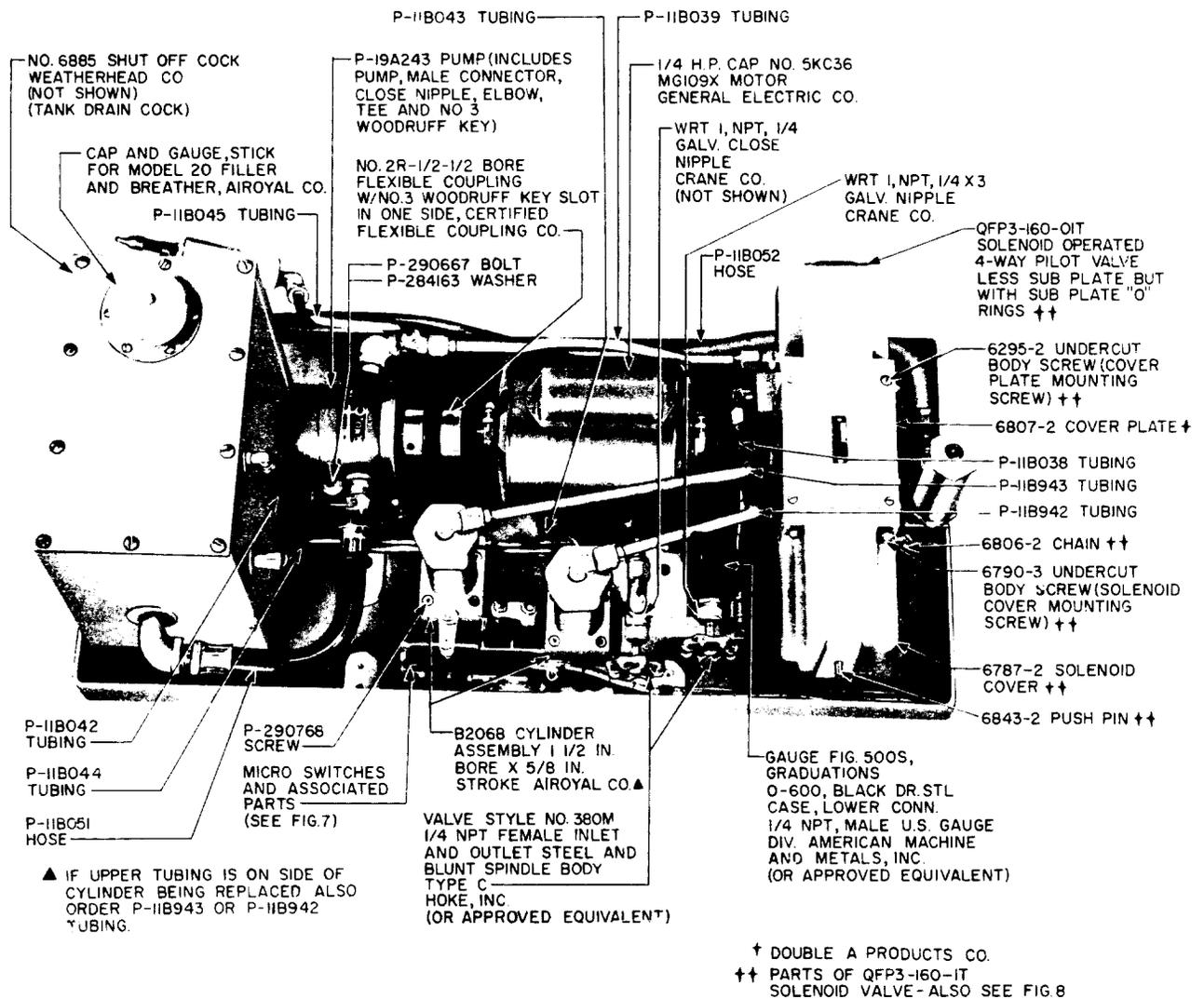


Fig. 5 - Hydraulic Shelf Assembly

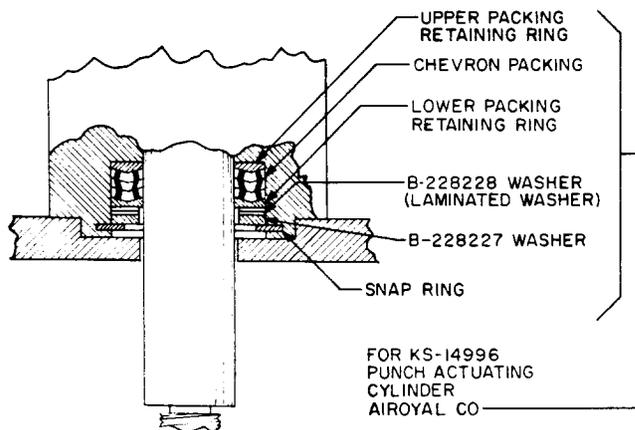


FIG. 6A - CYLINDER FURNISHED INITIALLY - UPPER TUBING ON SIDE OF CYLINDER

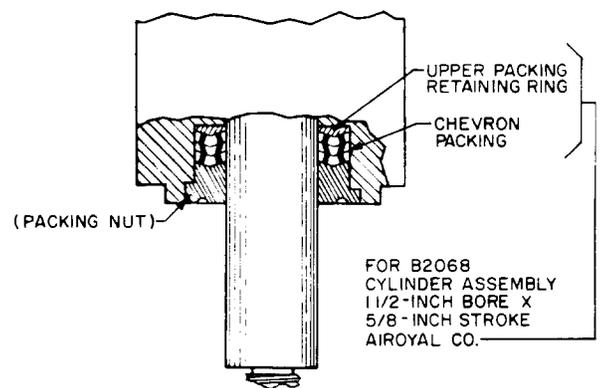
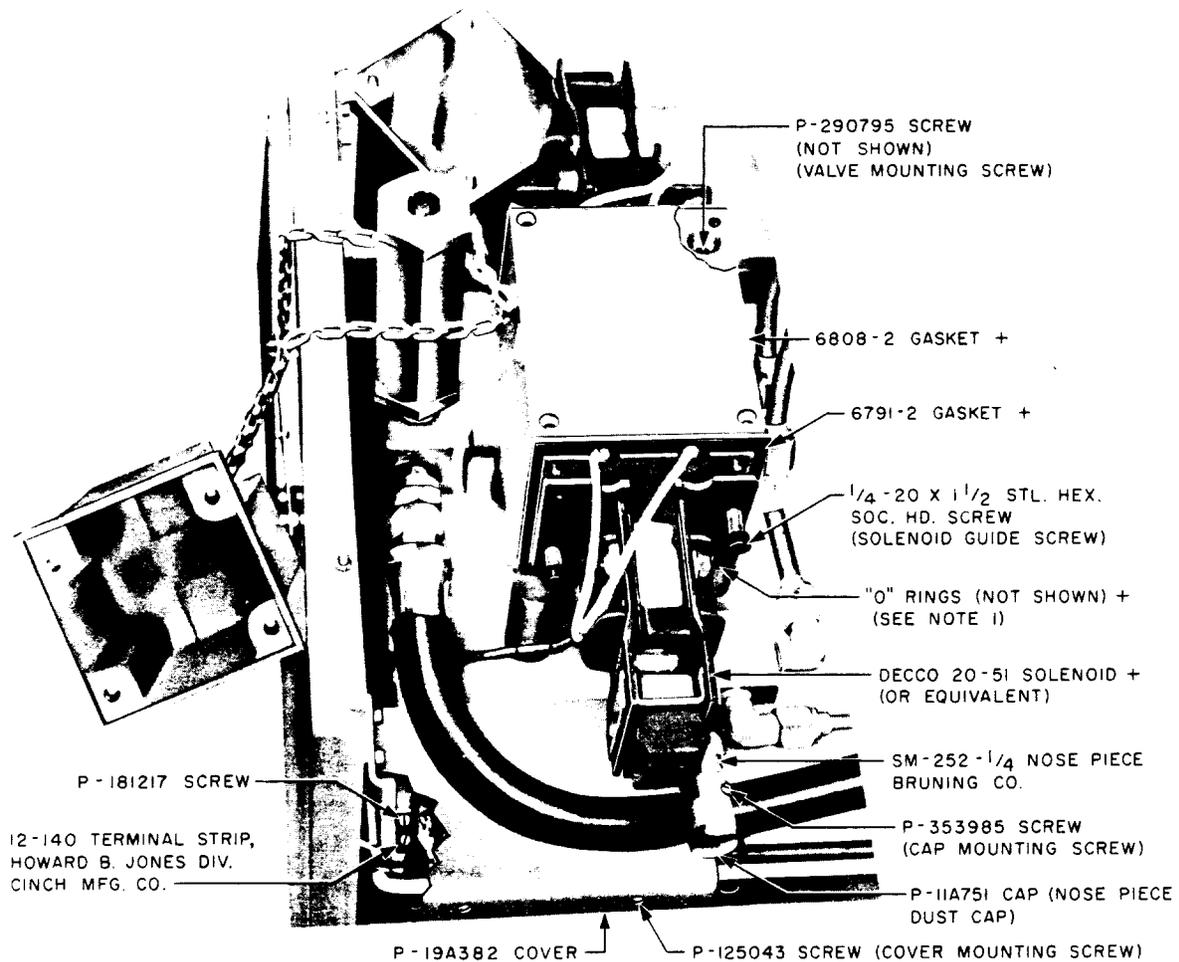


FIG. 6B - CYLINDER FURNISHED ON LATER TOOLS AND AS REPLACEMENT UPPER TUBING ON TOP OF CYLINDER

Fig. 6 - Punch Cylinders Showing Oil Seals



NOTE 1: SOLENOID OPERATED VALVE "O" RINGS +
 (A) "O" RINGS IN VALVE BASE (SUB PLATE "O" RINGS) + DOUBLE A PRODUCTS CO.
 SP 3113 "O" RING, $\frac{3}{32} \times \frac{11}{16} \times \frac{7}{8}$, (2 REQUIRED)
 SP 3111 "O" RING, $\frac{3}{32} \times \frac{9}{16} \times \frac{3}{4}$, (3 REQUIRED)
 (B) "O" RINGS IN INTERIOR OF VALVE
 SP 3103 AN "O" RING, $\frac{1}{16} \times \frac{3}{16} \times \frac{5}{16}$, (2 REQUIRED)
 SP 3123 "O" RING, $\frac{1}{8} \times \frac{1}{4} \times \frac{1}{2}$, (2 REQUIRED)

Fig. 7 – Hydraulic Shelf Assembly (partial view from rear with double-solenoid valve cover removed)

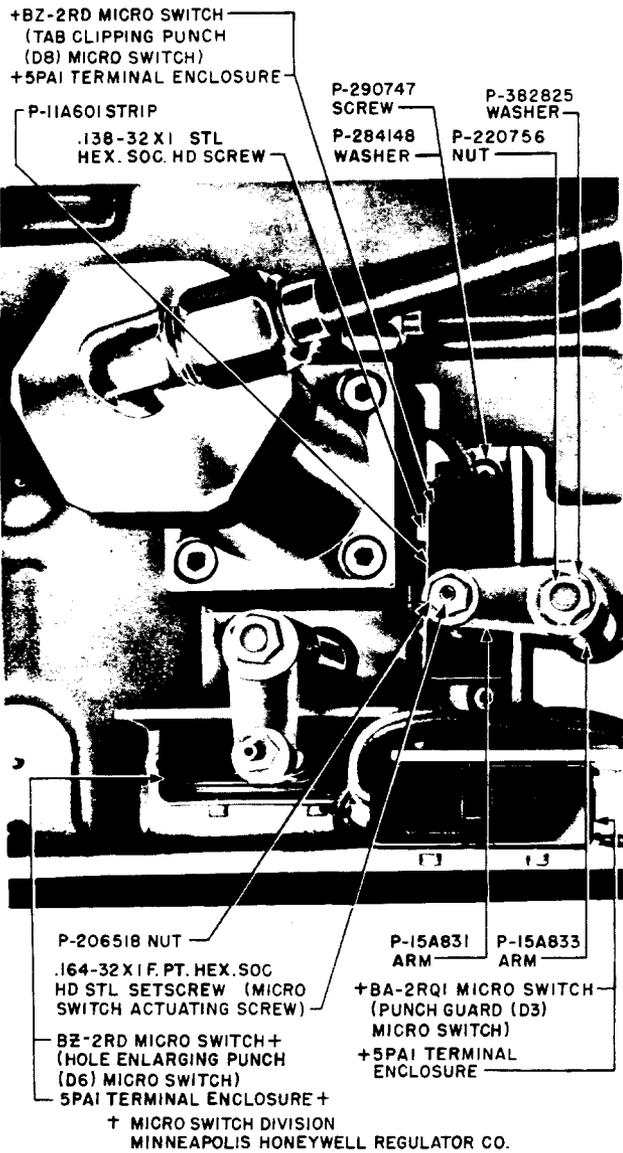
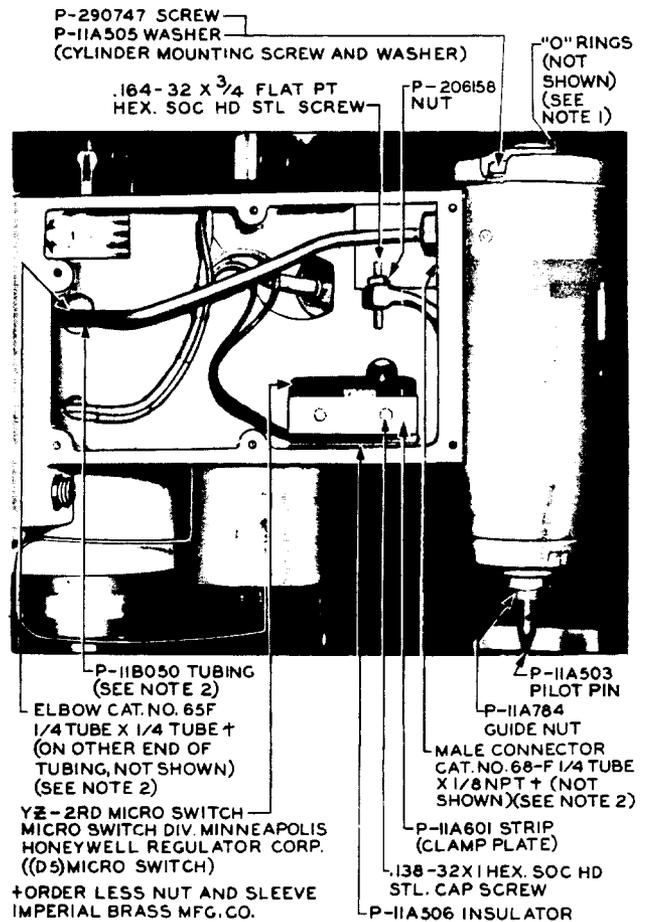


Fig. 8 - Hydraulic Shelf Micro Switches and Associated Parts (viewed from top)



NOTE: 1- GRC 27-15 "O" RING (PLUG "O" RING) } BELL INDUSTRIES
 GRC 27-6 "O" RING (SHAFT "O" RING) }

2- IF ANY TUBING OR FITTINGS BETWEEN SELECTOR VALVE AND PILOT PIN CYLINDER ARE TO BE REPLACED, REPLACE ALL TUBING AND FITTINGS BETWEEN THESE POINTS IF TUBING IS CONNECTED BY BLACK FITTINGS (ALSO SEE FIG. 2). IF TUBING HAS OTHER THAN BLACK FITTINGS ORDER IN ADDITION TO TUBING NUT AND SLEEVE FOR MALE CONNECTOR, CAT. NO. 68F-1/4 TUBE X 1/8NPT TO BE USED AT CYLINDER END OF TUBING AND NUT AND SLEEVE FOR ELBOW CAT. NO. 65F-1/4 TUBE X 1/4 TUBE TO BE USED AT OTHER END OF TUBING. ORDER THESE PARTS FROM IMPERIAL BRASS MFG. CO.

Fig. 9 - Hole-Enlarging Control Unit (cover removed) - 659A and 659D Tools Only

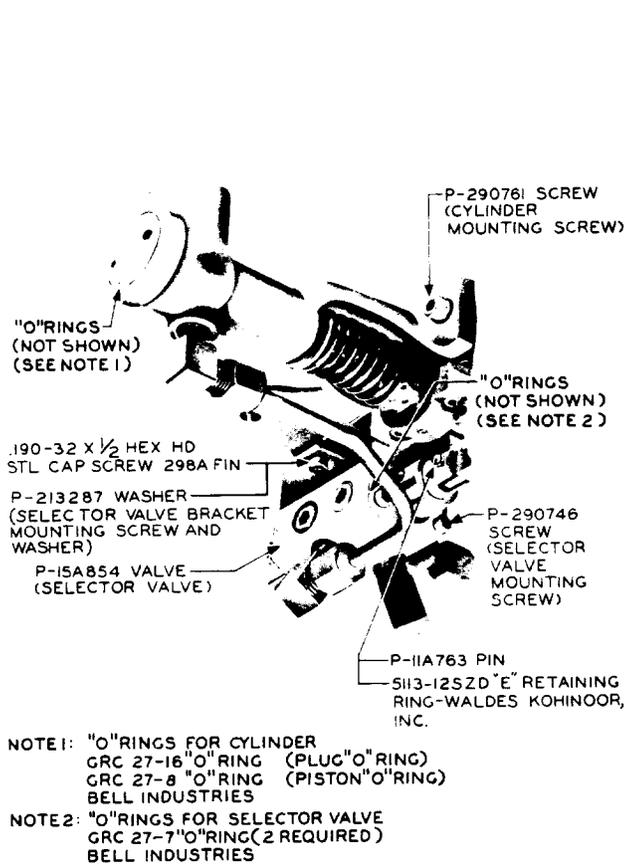


Fig. 10 - Tab-Clipping Control Unit (partial view from below right front of table) — 659A and 659D Tools Only

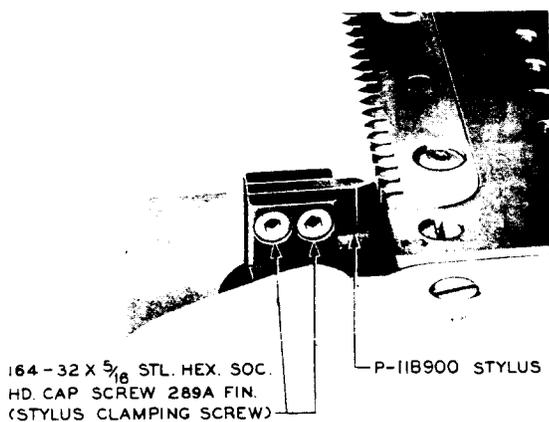


Fig. 11 - Tab-Clipping Control Stylus (elevated position viewed from side)

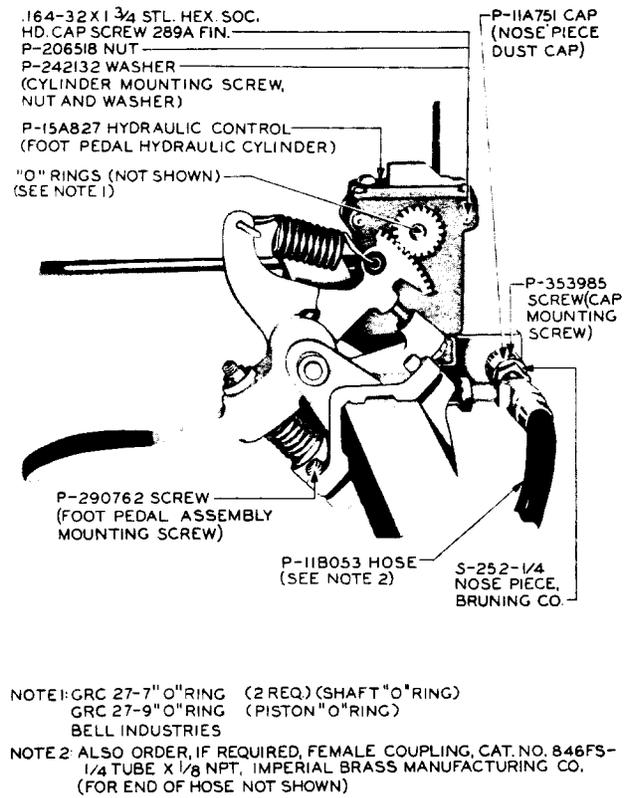


Fig. 12 - Foot-Pedal Assembly (cover and drip pan removed) — 659A and 659D Tools Only

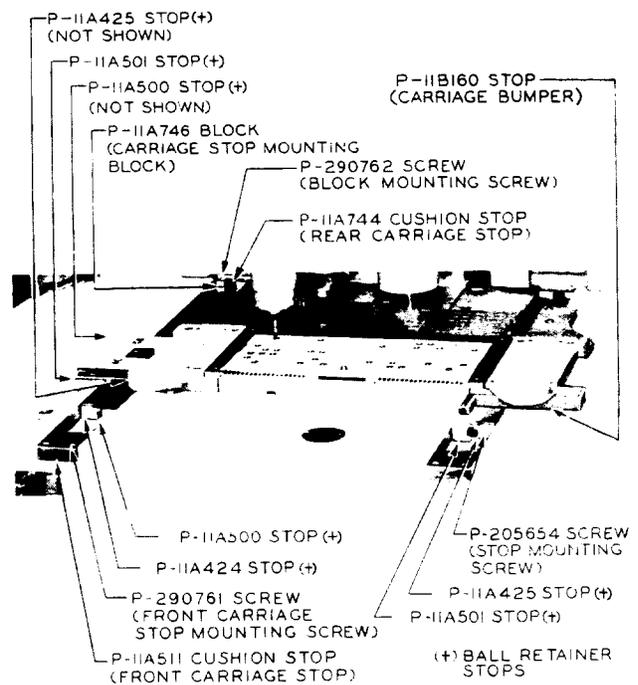


Fig. 13 - Carriage and Ball Retainer Stops and Carriage Bumper

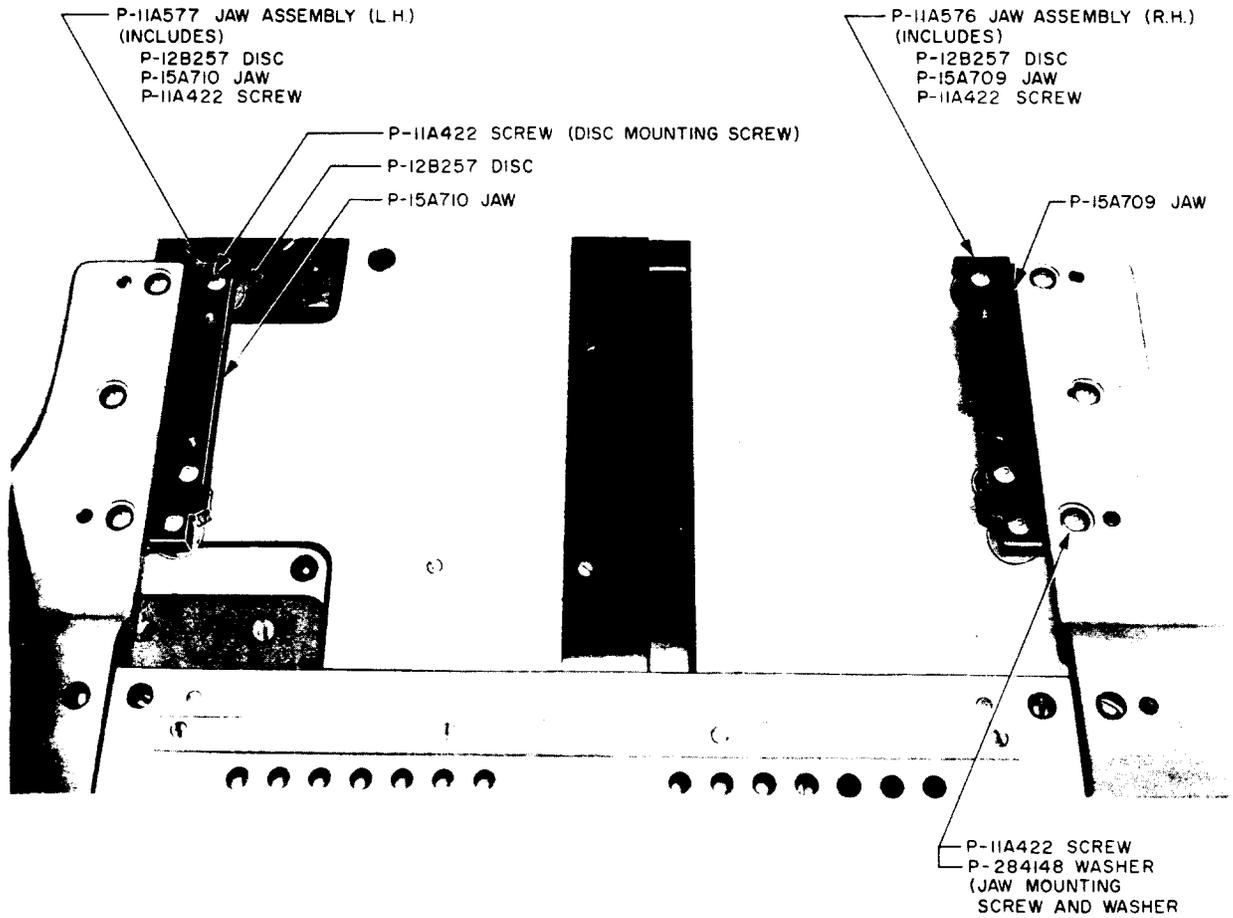


Fig. 14 – Card Nest Jaws With Discs for Supporting Cards

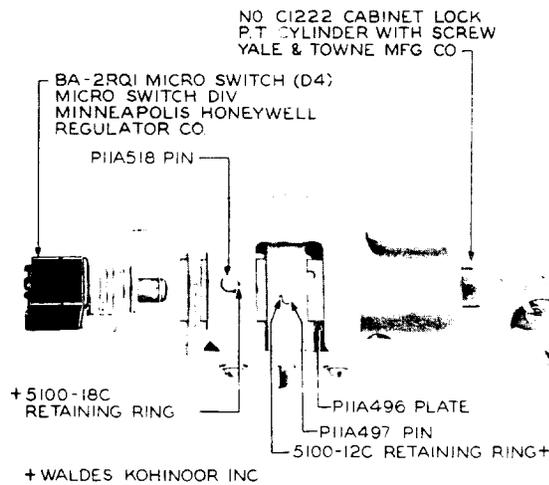


Fig. 15 – Carriage and Power Switch Lock
(underside of table)

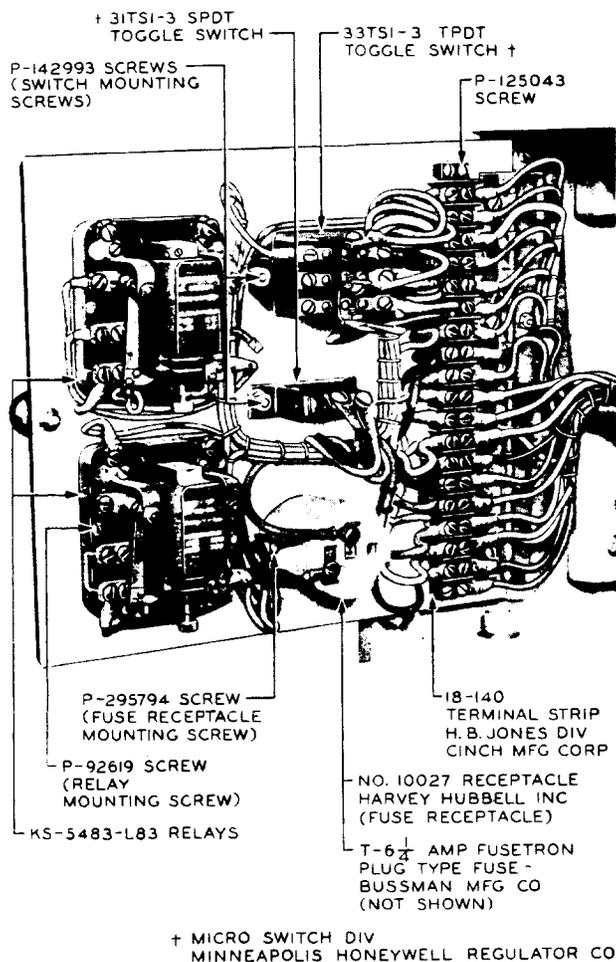


Fig. 16 - Control Panel (open position) —
Wiring Shown for 659D, 659E, and
659F Tools

3. REPLACEMENT PROCEDURES

3.01 List of Tools, Gauges, and Materials

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
33	11/32-Inch Hex. Single-End Socket Wrench
245 (2 reqd)	3/8- and 7/16-Inch Hex. Open Double-End Flat Wrench
347	Spanner Wrench
418A	5/16- and 7/32-Inch Hex. Open Double-End Flat Wrench
565A	Offset Screwdriver
KS-6320	Orange Stick
KS-7139	Pliers
KS-14164	Artists Show Card Brush
KS-16075	Filling and Bleeding Hose
L4 (for 659A and 659D tools)	
R-1102	Spudger
R-1482	Flat Combination File
R-1538	10-Inch Pipe Wrench
R-1542 (2 reqd)	3/4-Inch Adjustable Single-End Wrench
R-1619	C Clamp
R-1640	Center Punch
R-1770 (2 reqd)	1/2- and 9/16-Inch Open Double-End Wrench.
R-2291	Short Nose Skinning Pliers
R-2485	5/32-Inch Allen Socket Screw Wrench
R-2485	5/32-Inch Allen Socket Screw Wrench (modified, see 3.45)
R-2486	5/16-Inch Allen Socket Screw Wrench
R-2593	7/8- and 1-1/16 Inch Open Double-End Wrench
R-2670	3/32-Inch Allen Socket Screw Wrench
R-2670	3/32-Inch Allen Socket Screw Wrench (modified, see 3.22)
R-2671	1/8-Inch Allen Socket Screw Wrench
R-2673	3/8-Inch Allen Socket Screw Wrench
R-2812	3/16-Inch Allen Socket Screw Wrench
R-2896 (2 reqd)	3/4- to 2-Inch Adjustable Spanner Wrench
R-2958	5/64-Inch Allen Socket Screw Wrench
R-2975	Adjustable Snap Ring Pliers
R-3193	9/32- and 11/32-Inch Open Double-End Flat Wrench
R-3415	7/64-Inch Allen Socket Screw Wrench

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
R-3416	9/64-Inch Allen Socket Screw Wrench
TP-75503	Push Spring Hook
—	3-Inch C Screwdriver
—	4-Inch E Screwdriver
—	5-Inch E Screwdriver
—	P-Long-Nose Pliers
—	4-Ounce Riveting Hammer
—	13/16- and 1-Inch Open Double-End Wrench No. 33C, J. H. Williams & Co
—	Combination Pliers
—	5/32-Inch Twist Drill
—	No. 30 (.129-inch) Twist Drill
—	Hacksaw
—	Coping Saw
—	No. 9 Model G, Adjustable Wrench, Billings and Spencer
—	Adjustable Spanner Wrench 482, J. H. Williams & Co (or equivalent)
—	All-Angle Drill, Albertson & Co No. 1495-WE
GAUGES	
110B	0.016- and 0.250-Inch Double-End Thickness Gauge
MATERIALS	
KS-2423	Cloth
KS-6824	Sealing Compound
KS-7470	Oil
KS-7860	Petroleum Spirits
KS-14666	Cloth
—	Plumbers Fine Lampwick
—	1/2-Inch Inside Diameter Rubber Tubing 24 Inches Long
—	Cellophane Tape (Scotch brand or equivalent) (obtain locally)
—	Gem Clip
—	No. 8 Machine Screw, 3 Inches Long

3.02 Before removing any covers to gain access to the mechanism or making any replacement of parts, unless otherwise stated in the procedure, make sure that the carriage and power switch lock is in its locked position by depressing the lock cylinder. Remove the punch guard and covers only when necessary to gain access to parts to be replaced.

3.03 No replacement procedures are specified for screws or other parts when the replacement procedure consists of a simple operation.

3.04 After making any replacement of parts of the tool, the part or parts replaced shall meet the readjust requirements involved as specified in Section 076-143-701. Other parts whose adjustments may have been disturbed by the replacing operations shall be checked to the readjust requirements and an over-all operation check shall be made of the tool before restoring it to service.

3.05 *Precaution to Be Observed During Tightening of Fittings That Screw Into Cylinders or Other Parts:* When tightening a fitting, avoid backing it off since this may result in oil leakage. It is recommended that the fitting be turned manually until it is fingertight and then turned with the wrench to securely tighten the fitting in its required angular position.

3.06 *Removing Oil From Tank*

(1) **General:** The oil may be removed from the tank to the level of the connection to the pump by pumping the oil as covered in (2). Removal of this amount of oil is sufficient for replacing all parts except the return line (flexible hose) to the tank, nosepiece, the drain cock, and bypass valve. To completely drain the tank after the pumping operation, proceed as covered in (3). The oil removed from the tank may be re-used in the hydraulic system if clean. Wipe off any oil that may drip onto the tool or floor.

(2) **Pumping Oil From Tank:** Remove the dust cap from the nosepiece (Fig. 18) just below the double-solenoid valve using the 3-inch C screwdriver. Remove the nosepiece from the coupler of the KS-16075 L4 filling and bleeding hose by pulling back the movable sleeve of the coupler toward the hose as far as possible to break the connection. Push the

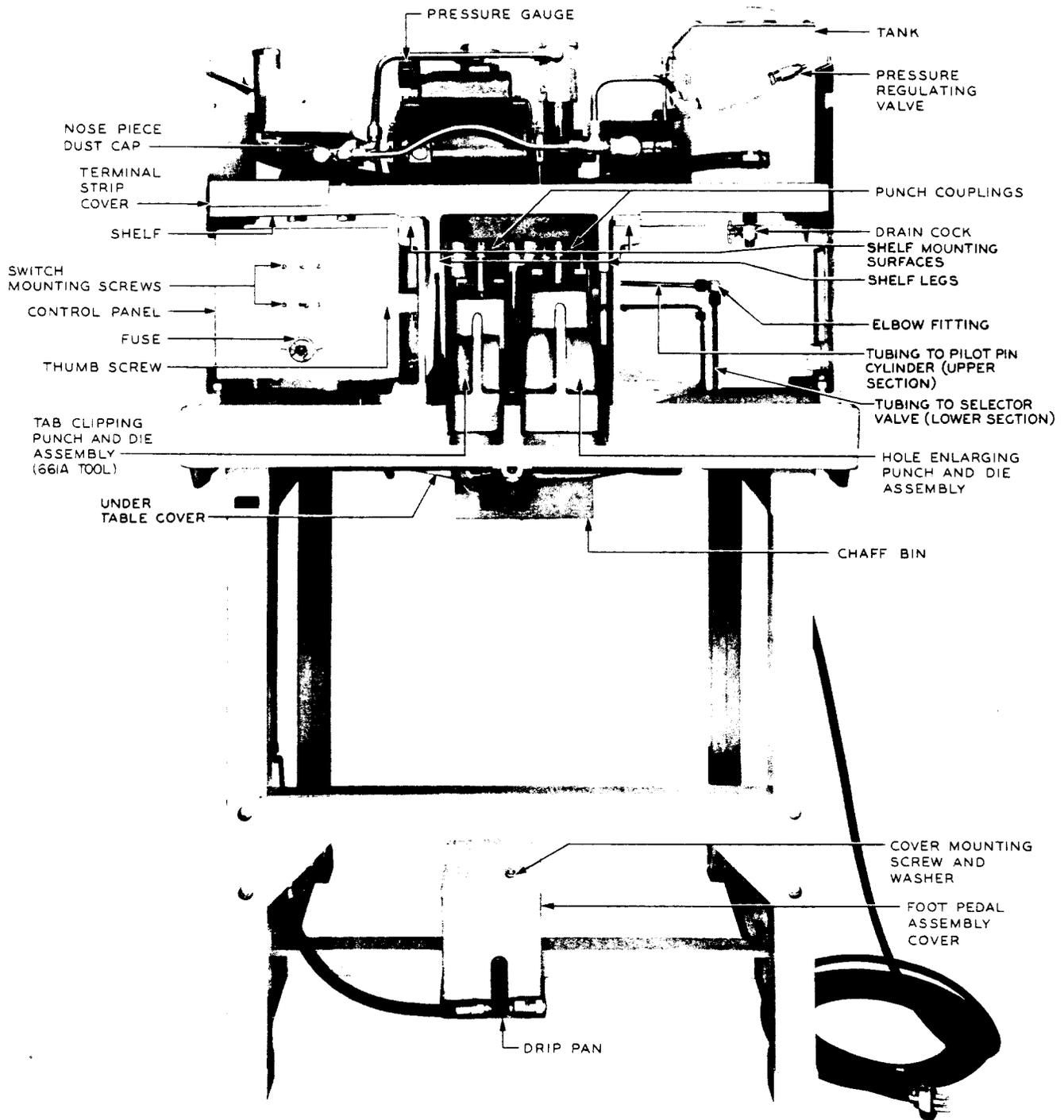


Fig. 17 - 659A and 659D Tools (rear view — covers removed)

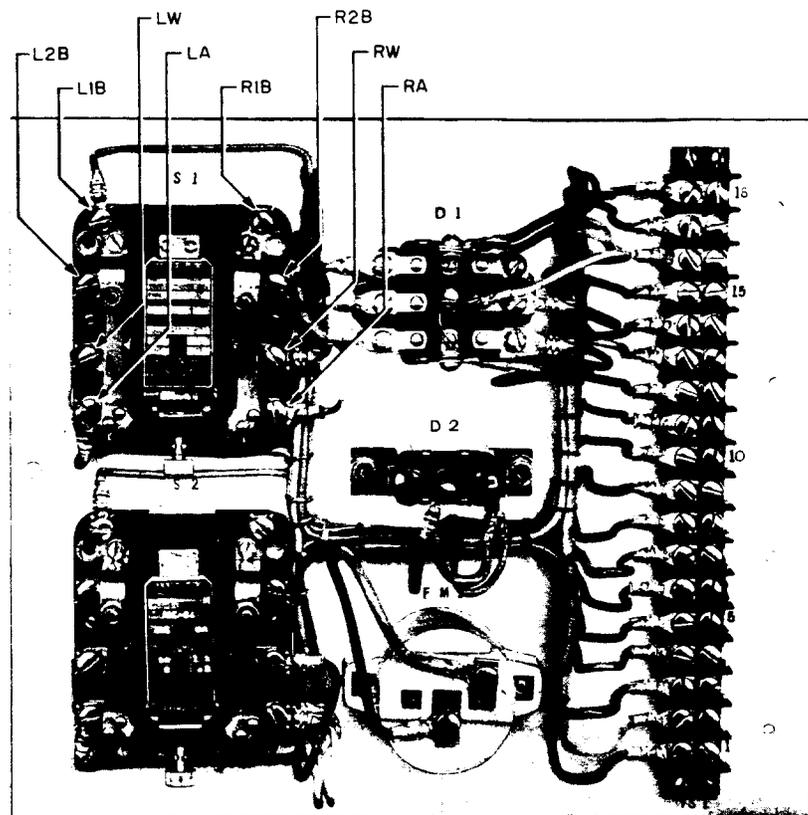


Fig. 18 - Control Panel — S1 Relay Terminal Designations —
659A, 659B, and 659C Wiring Shown

coupler over the nosepiece on the hydraulic shelf as far as possible and release the sleeve of the coupler to complete the connection. Place the other end of the hose in a clean container placed on the floor adjacent to the tool. Start the motor and pump the oil out of the tank. When sucking of air is heard, depress the lock on the tool to remove power to stop the motor. Disconnect the hose and remount the hose nosepiece. Remount the dust cap on the nosepiece on the hydraulic shelf.

(3) **Removing Oil Through Drain Cock:** Connect one end of a 24-inch length of 1/2-inch inside diameter rubber tubing to the drain cock (Fig. 18) located at the rear of the tank below the hydraulic shelf. Place the other end of the tubing in a clean container placed on the floor adjacent to the tool. Fully open the drain cock and allow the oil to drain out of the reservoir into the container. After all oil is drained, fully close the drain cock. Disconnect the tubing.

3.07 Filling the Tank: Before filling the tank, make sure that the drain cock is closed. Remove the filler cap from the tank and add the approved oil until the gauge stick attached to the filler cap touches the oil but the oil level is not above the hole in the stick. Oil previously drained from the system may be re-used if clean. Remount the filler cap.

3.08 If, after reconnecting tubing, leakage occurs at the nut of a fitting, tighten the nut. If a leak occurs at the portion of a fitting which screws into a cylinder or other part, proceed as follows.

(1) Completely drain the oil from the tank as covered in 3.06. On the 659A tool, if the fitting is in the foot-pedal hydraulic system, draining this system is not necessary. However, in both cases, place a folded KS-14666 cloth below the fitting to catch any oil which may drip when the fitting is disengaged as covered in (2) through (8).

(2) While holding the body of the fitting with one wrench, unscrew the nut with a second wrench. Use R-1542 and R-1770 wrenches as required.

(3) Disengage the tubing from the fitting, tapping the tubing lightly with the 4-ounce riveting hammer at an adjacent bend if necessary.

(4) Remove the body of the fitting.

(5) With the KS-14164 brush, apply a small amount of KS-6824 sealing compound to the threads of the fitting that screw into the cylinder or other part, exercising care to keep the compound from the ends of the threaded portion to avoid getting it into the hydraulic system. Do not apply the compound to the threads on which the nut is mounted.

(6) Remount the body of the fitting. Reconnect the tubing and securely tighten the nut.

Caution: To prevent leakage at fittings, it is essential that the body of the elbow or tee fitting be tightened as securely as practicable in its required angular position without backing it off.

(7) If the fitting which has been worked on is on the hydraulic shelf, fill the tank as covered in 3.07. On 659A and 659D tools, if the fitting is in the foot-pedal hydraulic system, fill and bleed this system as covered in Section 076-143-701.

(8) After completing the above procedures, check for leaks as covered in Section 076-143-701.

Covers, Punch Guard, and Chaff Bin

3.09 Front, Rear, and Top Covers: To replace the front and rear covers, depress the snap catches and lift the covers off the locating pins. Remove the top cover by lifting it off its locating pins. Mount the new covers so that the locating pins engage the corresponding mounting holes in the covers and engage the snap catches where provided.

Note: The TEST-OPERATE and OFF-ON switches should be in the OPERATE and ON positions, respectively, before mounting the rear cover.

3.10 Under Table Cover: To replace the under table cover, pull out on the latch pin located on each side near the front of the table. Allow the cover to swing downward and pull the cover forward to disengage the slots at the rear of each side of the cover from the locating pins in the table. To mount the new cover, engage the locating pins in the slots at the rear of the cover and push the cover up against the underside of the table so that the latch pins engage the mounting holes in the cover.

3.11 Foot-Pedal Assembly Drip Pan (659A and 659D tools only): Fig. 17 — To replace the foot-pedal assembly drip pan, remove the mounting screws using the 3-inch C screwdriver. Mount the new drip pan and securely tighten all screws.

3.12 Foot-Pedal Assembly Cover (659A and 659D tools only): Fig. 17 — To replace the foot-pedal assembly cover, remove the drip pan using the 3-inch C screwdriver. Then, remove the mounting screw and washer at the top of the cover using the proper size Allen wrench. Remove the cover. Mount the new cover and securely tighten the mounting screw making sure the washer is in place. Mount the drip pan and securely tighten all screws.

3.13 Punch Guard: To replace the punch guard, unlock the carriage. Approximately center the carriage on the table against the front stops so that the card nest is clear of the punch guard. Manually turn the guard thumbscrew counterclockwise and remove the guard. Mount the new guard with the carriage in the same position and securely tighten the thumbscrew. Relock the carriage.

3.14 Chaff Bin: Fig. 17 — To replace the chaff bin, remove the wing nut at the bottom of the bin and remove the bin. Mount the new bin with the opening in the long side of the bin facing the front of the tool. Remount and securely tighten the wing nut.

660B and 661A Punch and Die Assemblies

3.15 659A, 659B, and 659C Tools Only: Before substituting a 660B hole-enlarging punch and die assembly in place of a 660A hole-enlarging punch and die assembly as covered in 3.16, change the wiring as covered in (a) and (b) and the coding on the nameplate as covered in (c). If the card jaws have plates soldered

to the jaws as described in 3.60, replace the jaws as covered in 3.59.

Wiring (see Fig. 18)

(a) On the S1 relay of control panel:

- (1) Remove the strap lead between terminals RW and R2B.
- (2) Disconnect the lead at terminal RA (cut off and tape the end).
- (3) Disconnect the lead at terminal L1B and connect this lead to terminal R2B.
- (4) Strap terminal R2B to terminal LW.
- (5) Strap terminal L2B to terminal RA.
- (6) Connect a lead between RA and the upper right terminal on switch D1.

(b) On the D6 Micro Switch (hole-enlarging punch Micro Switch shown in Fig. 22), disconnect the lead at the normally open terminal and connect this lead to the normally closed terminal.

Coding

(c) To change the code on the nameplate, proceed as follows.

- (1) Observe the code on the nameplate and determine the code of the equivalent 659-type tool according to the table in 1.04.
- (2) Using the 46WE quick-drying white ink, entirely obliterate any existing code on the nameplate.
- (3) Using the R-2315 lettering and numbering set and quick-drying white ink, stamp the equivalent code as determined in (1) immediately to the right of the obliterated code.
- (4) After the ink has dried, apply clear lacquer over the white ink using the KS-14164 brush.

3.16 On all 659-type tools, the 660A or 660B hole-enlarging punch and die assembly and the 661A tab-clipping punch and die assembly are each replaced as a unit. The punch and die in each assembly constitute a matched pair and are never replaced individually. However, either assembly may be replaced separately as required. To replace either of these assemblies or when substituting a 660B punch and die assem-

bly in place of a 660A punch and die assembly as covered in 3.15, proceed as covered in (1) through (8).

(1) Remove the punch guard and chaff bin as covered in 3.13 and 3.14. Then lock the tool. Loosen the locknut above the punch coupling (Fig. 17) with the R-2895 wrench while holding the coupling stationary with a second R-2895 wrench. Turn the punch coupling so that the open end of the slot in the coupling faces the rear of the tool.

(2) Working from the underside of the table, remove the punch and die assembly mounting screws and washers (Fig. 19) using the proper size Allen wrench. Manually lower the movable dowel pin until it is clear of the punch and die assembly by turning it counterclockwise three full turns. Use the R-2895 wrench to start the dowel pin if necessary.

Caution: When replacing a punch and die assembly, take care not to damage the cutting edges of the punch and die. Never invert or make any attempt to dismantle a punch and die assembly except as covered in the section.

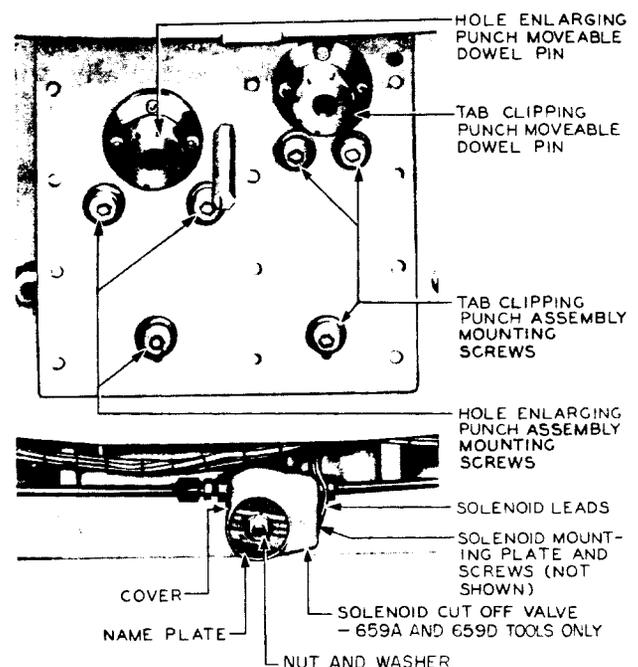


Fig. 19 - Punch and Die Assembly Mounting Details (underside of table)

(3) Working from the rear of the table, grasp the curved portion of the punch and die assembly casting with the left hand and slide the assembly toward the rear of the table, carefully disengaging the punch from its coupling. When the rear end of the assembly is flush with the edge of the table, tilt the assembly forward, lifting the rear end sufficiently to place the right hand under the bottom of the casting. Then, using both hands, raise the assembly high enough to clear the fixed dowel pin in the table and remove the assembly.

Caution: *The recess in the bottom of the punch and die assembly for the fixed dowel pin does not extend to the front part of the assembly. To avoid damage, take care when removing the assembly that the fixed dowel pin does not strike the end of this recess or the bottom of the assembly.*

(4) **Caution:** *Before mounting the new punch and die assembly, clean the mounting surface of the assembly and the associated mounting surface in the table by wiping them with a clean, dry KS-2423 cloth, taking care that no foreign particles adhere to the mounting surfaces. Make sure that the adjustable dowel pin in the table is underflush with the recess in the table and that the tool is locked.*

(5) Working from the rear of the table, mount the punch and die assembly as follows. Hold the assembly horizontally, with the left hand grasping the curved portion of the casting and with the right hand under the bottom of the rear end of the casting. Insert the assembly into its recess in the table, holding it high enough to clear the fixed dowel at the rear of the recess. When the rear end of the assembly is flush with the edge of the table, carefully lower the assembly, removing the hand from the bottom of the assembly so that the assembly rests in the recess of the table. Carefully slide the assembly forward until the collar of the punch plunger is adjacent to the open end of the slot in the punch coupling. Manually position the punch plunger vertically so that its collar is on the same level as the opening in the punch coupling. Then, slide the assembly forward so that the punch collar is engaged in the coupling.

(6) Check that the punch and die assembly rests solidly on its mounting surface by exerting downward pressure on each side of

the base of the assembly in turn. If the assembly rocks, it is probably due to foreign matter on the mounting surfaces or burrs on the assembly mounting surface. To correct, remove the assembly as covered in (3). Remove the punch plunger from the assembly by pulling the plunger upward through its bearing. Then examine the mounting surface of the assembly for burrs. Remove any burrs using the R-1482 file. Clean the mounting surfaces with a clean KS-2423 cloth and remount the punch plunger in the assembly. Remount the assembly as covered in (5).

(7) Slowly turn the movable dowel pin clockwise so that it engages the punch and die assembly casting. If the dowel pin does not readily enter its hole in the assembly, shift the assembly slightly until the dowel pin enters without binding. Tighten the movable dowel pin fingertight. Insert and securely tighten the mounting screws, using the proper size Allen wrench, making sure the washers are in place.

(8) Check that the assembly is properly mounted by manually turning the punch coupling. If the coupling binds, it is an indication that the assembly is not properly seated on the dowel pins or is resting on some foreign matter on the mounting surface. To correct, remove the assembly, reclean the mounting surfaces on the assembly and table, and remount as covered above. When the assembly is properly mounted, remount the punch guard and chaff bin. Adjust the punch penetration as covered in Section 076-143-701.

Parts of Hydraulic Shelf Assembly (power-driven hydraulic system)

3.17 Punch Coupling and Locknut: Fig. 17 —

To replace the punch coupling or locknut, first remove the associated punch and die assembly as covered in 3.16. Then manually remove the part to be replaced. Substitute the new part and mount the coupling with the locknut above it. Remount the punch and die assembly as covered in 3.16.

3.18 Punch Cylinders: Fig. 20

(1) To replace either of the punch cylinders, remove the punch and die assembly associated with the punch cylinder as covered in 3.15. Manually remove the punch coupling,

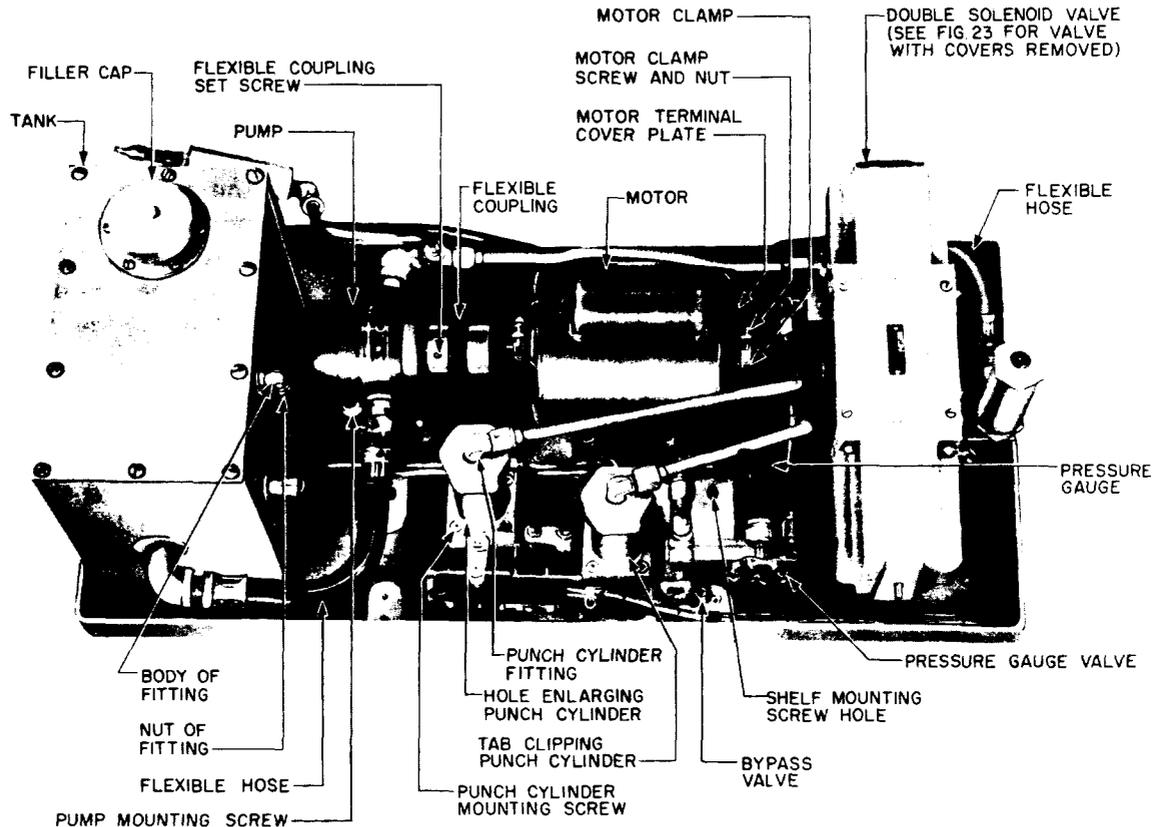


Fig. 20 – Hydraulic Shelf Assembly

locknut, and felt washer. Using the proper size Allen wrench, loosen the clamping screw securing the switch operating arm to the cylinder piston rod below the hydraulic shelf.

(2) Disengage the tubing connections to the cylinder as follows. Place a folded KS-14666 cloth on the hydraulic shelf below the connections to catch any oil which may drip when the connection is broken. Hold the body of the fitting with the R-1542 wrench and unscrew the nut of the fitting with a second R-1542 wrench. In the case of the hole-enlarging punch cylinder, disengage the connections at the tank and tab-clipping punch cylinder on the line from the tee fitting at the bottom of the hole-enlarging punch cylinder. Do not disturb the connections at the tee fitting. Then remove the cylinder mounting screws using the proper size Allen wrench and carefully disengage the tubing from the tank and tab-clipping punch cylinder fittings. Remove the cylinder by raising it and disengaging the piston rod from the Micro-Switch

operating arm. Drain the oil from the fitting near the top of the cylinder into a convenient receptacle by inverting the cylinder.

(3) Transfer the fittings from the cylinder being replaced to the corresponding positions on the new cylinder using the R-1542 wrench. If the cylinder being replaced had the upper tubing connected to the side of the cylinder, transfer this fitting to the top of the new cylinder. When transferring the tee fitting at the bottom of the hole-enlarging punch cylinder, it is not necessary to remove the tubing unless so desired. Apply a small amount of KS-6824 sealing compound to the thread of the fittings that screw into the cylinder, exercising care to keep the compound away from the ends of the fittings to avoid getting it into the hydraulic system.

(4) Mount the punch cylinder on the hydraulic shelf with the piston rod inserted through the hole in the Micro-Switch operating arm mounting. Reconnect the tubing to

the respective fittings and securely tighten the coupling nuts. If the cylinder being replaced had the upper tubing connected to the side of the cylinder, discard the old tubing and use the tubing specified in Fig. 5 for cylinders having the upper tubing connected to the top of the cylinder. Insert and securely tighten the cylinder mounting screws. Remove the KS-14666 cloths.

(5) Position the Micro-Switch operating arm mounting as follows. On the hole-enlarging punch cylinder, position the top of the switch-operating arm mounting $3/16$ inch from the underside of the hydraulic shelf and securely tighten the clamping screw. On the tab-punch cylinder, position the top of the switch-operating arm mounting $11/32$ inch from the underside of the shelf and securely tighten the clamping screw. Remount the felt washer, locknut, and punch coupling in reverse order of removal. Replace the felt washer if damaged or saturated with oil. Remount the punch and die assembly as covered in 3.16. Make sure that the operation of the punch meets the requirements covered in Section 076-143-701.

3.19 Punch-Cylinder Chevron Packing and Associated Parts: Fig. 21

(1) To replace the punch-cylinder chevron packings, remove the punch cylinder involved as covered in 3.18, but do not remove the fittings from the cylinder. On the hole-enlarging punch cylinder, close one of the openings to the tee fitting by placing a piece of cellophane tape over the end of the tubing connected to one end of the tee.

(2) Referring to Fig. 21, punch cylinders may be of the type shown in Fig. 21A or 21B. On the cylinder shown in Fig. 21A, three chevron packings are mounted on the piston rod between the upper and lower packing retaining rings. Below the lower retaining ring is a washer (in most cylinders) and a snap ring which holds these parts in position. In some cases, shims are placed between the washer and lower retaining ring to provide a snug fit of the chevron packing. Some punch cylinders do not have the washer. On these cylinders, shims, if provided, are placed between the snap ring and lower retaining ring.

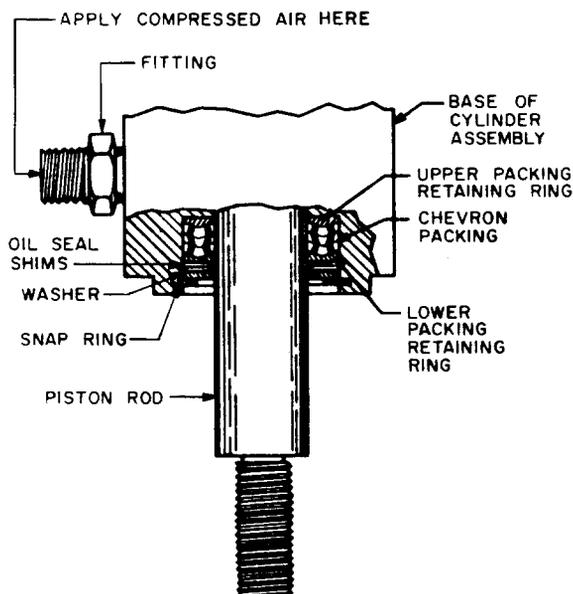


FIG. 21A- CYLINDER FURNISHED INITIALLY—UPPER TUBING ON SIDE OF CYLINDER.

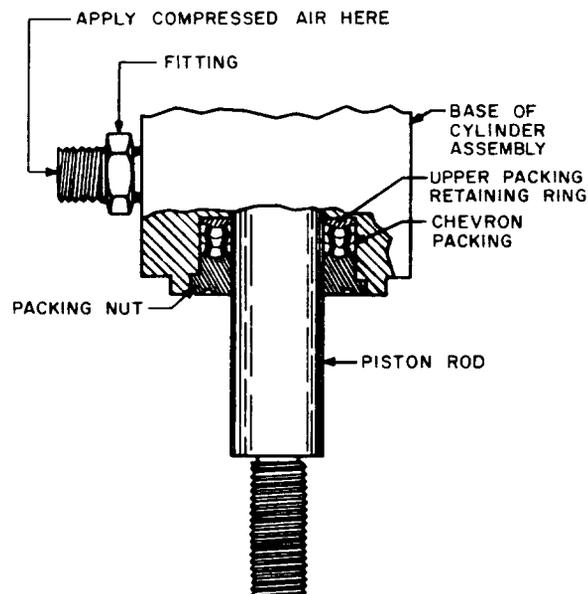


FIG. 21B- CYLINDER FURNISHED ON LATER TOOLS AND AS REPLACEMENT—UPPER TUBING ON TOP OF CYLINDER.

Fig. 21 – Punch Cylinders Showing Oil Seals

(3) Remove the snap ring at the bottom of the punch cylinder using the R-2291 pliers. If a washer is mounted above the snap ring, remove the washer.

(4) On the cylinder shown in Fig. 21B, three chevron packings are mounted on the piston rod between the upper packing retaining ring and packing nut. Remove the packing nut at the bottom of the cylinder using the Williams adjustable spanner wrench.

(5) Remove the chevron packing, packing retaining rings, and shims, if provided, by momentarily blowing compressed air through the fitting near the bottom of the cylinder. (Fig. 21). In the case of the hole-enlarging punch cylinder, place a finger over the cellophane tape, closing one of the openings to the tee fitting to hold the tape in place while blowing compressed air through the piping at the other end of the tee.

Caution: Do not blow compressed air directly on the finger.

(6) Substitute new parts as required. Mount the upper packing retaining ring in the punch cylinder with its flat surface facing inward. Mount the three chevron packings, one at a time with the concave surfaces facing the upper retaining ring. Use the KS-6320 orange stick to firmly seat each packing in place.

(7) On the cylinder shown in Fig. 21B, mount and tighten the packing nut. Remove the cellophane tape if used. Remount the punch cylinder as covered in 3.18.

(8) On the cylinder shown in Fig. 21A, mount the lower packing retaining ring with its concave surface facing the packing. Mount the washer, if provided, and the snap ring. Using the KS-6320 orange stick, lightly press inward on the washer or the lower packing retaining ring if a washer is not provided. If a gap can be detected between the washer or lower retaining ring and the snap ring, remove the snap ring and washer, if provided, and add shims as required to fill the gap. Remount the washer, if provided, and snap ring. If more than slight pressure is required to position the snap ring snugly in its retaining groove, this indicates that too great a thickness of shims has been used. Remove shims as necessary to properly mount the snap ring. Remove the

cellophane tape if used. Remount the punch cylinder as covered in 3.18.

Note: The shims are obtained from the B-228228 washer which is made up of 0.002-inch laminations. Individual laminations are removed and used as required.

3.20 *Micro-Switch Operating Arm:* Fig. 21 —

To replace the Micro-Switch operating arm, remove the operating arm nut and washer using the 245 wrench. Remove the arm by pulling it upward off the arm mounting. Remove the Micro-Switch actuating screw and locknut from the arm using the R-3193 and proper size Allen wrenches and transfer them to the new arm. Mount the new arm on the arm mounting. Securely tighten the nut making sure the washer is in place. Position the Micro-Switch actuating screw so that the punch operating requirement covered in Section 076-143-701 is met.

3.21 *Micro-Switch Operating Arm Mounting:* Fig. 22

(1) To replace the Micro-Switch operating arm mounting, first remove the associated punch and die assembly as covered in 3.15. Then remove the Micro-Switch operating arm as covered in 3.20. Manually remove the punch coupling, locknut, and felt washer from the piston rod. Remove the clamp screw securing the arm mounting to the piston rod using the proper size Allen wrench. Remove the arm mounting by lowering it until it is clear of the piston rod and the bearing in the hydraulic shelf.

(2) Position the new operating arm mounting in the shelf bearing and on the punch cylinder piston rod so that the top of the arm mounting is 3/16 inch below the underside of the hydraulic shelf for the hole-enlarging punch cylinder and 11/32 inch for the tab-clipping punch cylinder. Insert and securely tighten the clamp screw. Remount the Micro-Switch operating arm and securely tighten the nut making sure the washer is in place. Position the Micro-Switch actuating screw so that the punch operation requirement covered in Section 076-143-701 is met.

3.22 *Punch-Guard Micro Switch (D3):* Fig. 22

— Remove the Micro-Switch mounting screws and clamping plate using the proper size Allen wrench. Lift the cover off the Micro Switch

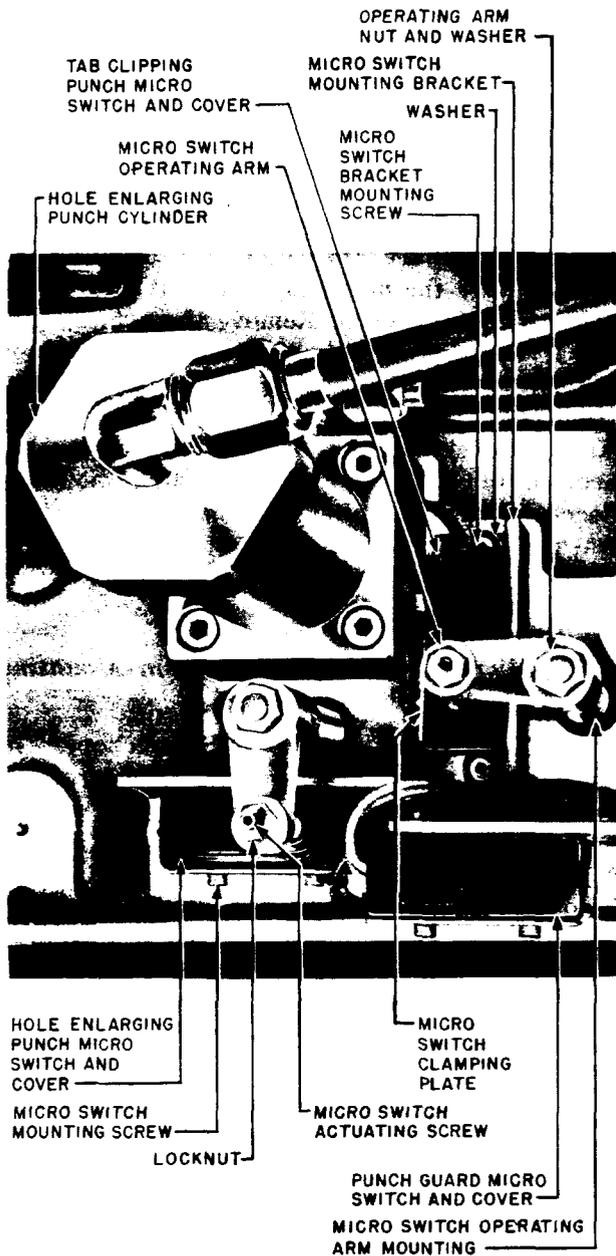


Fig. 22 — Hydraulic Shelf Assembly Micro Switches and Associated Parts (viewed from top)

and slide it back on the leads to obtain access to the Micro-Switch terminals. Transfer the terminals with leads from this Micro Switch to the corresponding terminal positions on the new Micro Switch using the 3-inch C screwdriver to remove and tighten the terminal mounting screws. Apply a small amount of KS-6824 sealing compound around the head of each Micro-

Switch terminal mounting screw with the KS-14164 brush. Mount the Micro Switch and associated parts in reverse order of removal. Securely tighten the mounting screws. Check the operation of the Micro Switch as covered in Section 076-143-701.

3.23 Hole-Enlarging Punch Micro Switch (D6): Fig. 22 —

Remove the Micro-Switch mounting screws and clamping plate using the proper size Allen wrench modified as follows. Use the R-1482 file to file a notch around the short leg of the wrench approximately 3/8 inch from the end of this leg. Break the short leg at the notch. Remove any burrs and chamfer the edges using the R-1482 file. Lift the cover off the Micro Switch and slide it back on the leads to obtain access to the Micro-Switch terminals. Transfer the terminals with leads from this Micro Switch to the corresponding terminal positions on the new Micro Switch using the 3-inch C screwdriver to remove and tighten the terminal mounting screws. Apply a small amount of KS-6824 sealing compound around the head of each Micro-Switch terminal mounting screw with the KS-14164 brush. Mount the Micro Switch and associated parts in reverse order of removal. Securely tighten the mounting screws. Check the operation of the hole-enlarging punch as covered in Section 076-143-701.

3.24 Tab-Clipping Punch Micro Switch (D8):

Fig. 22—Remove the Micro-Switch mounting bracket using the proper size Allen wrench. Remove the Micro-Switch mounting screws and clamping plate from the bracket using the proper size Allen wrench. Lift the cover off the Micro Switch and slide it back on the leads to obtain access to the Micro-Switch terminals. Transfer the terminals with leads from this Micro Switch to the corresponding terminal positions on the new Micro Switch using the 3-inch C screwdriver to remove and tighten the terminal mounting screws. Apply a small amount of KS-6824 sealing compound around the head of each Micro-Switch terminal mounting screw with the KS-14164 brush. Mount the Micro Switch and associated parts on the mounting bracket in reverse order of removal, tightening the mounting screws securely. Remount the bracket and securely tighten the screws making sure the washers are in place. Check the operation of the tab-clipping punch as covered in Section 076-143-701.

3.25 Bypass Valve: Fig. 20

(1) To replace the bypass valve, completely drain the tank as covered in 3.06. Remove the manifold block on which the valve is mounted as follows. Place a folded KS-14666 cloth on the hydraulic shelf below the connections to the valve and the manifold block to catch any oil which may drip when the connections are broken. Disengage the connections to the valve and to the block by holding the body of the fitting with the R-1542 wrench and unscrew the nut of the fitting with a second R-1542 wrench. Remove the manifold block bracket mounting screw using the proper size Allen wrench. Remove the manifold block, carefully disengaging the tubing.

(2) Transfer the fitting from the top of the valve being replaced to the corresponding position on the new valve using the R-1542 wrenches. With the KS-14164 brush, apply a small amount of KS-6824 sealing compound to the threads of the fitting that screw into the valve, taking care to keep the compound away from the end of the fitting to avoid getting it into the hydraulic system. Remove the valve from the manifold block using the wrenches. If the short threaded nipple remains in the base of the valve, mount a new nipple in the new valve using fine lampwick and KS-6824 sealing compound on the threads as follows. Starting at approximately the middle of the nipple, wind fine lampwick between the threads clockwise toward one end of the nipple, crossing a thread upon completion of each turn. The first turn should be double to secure the starting end of the lampwick and the last turn should terminate at approximately the beginning of the second thread from the outer end. Similarly wind lampwick between the threads at the other end of the nipple. Then apply KS-6824 sealing compound over the lampwick as covered above. Never remove and re-use the old nipple as leakage may be introduced due to damaging of the threads during removal. Mount the new valve on the manifold block and position the block on the shelf. Reconnect the tubing to the respective fittings and securely tighten the manifold block bracket mounting screw.

3.26 Pressure Gauge: Fig. 20 — To replace the pressure gauge, make sure that the pressure-gauge cut-off valve is fully closed. Then

hold the pressure-gauge valve with the R-1542 wrench and remove the pressure gauge using a second R-1542 wrench. With the KS-14164 brush, apply a small amount of KS-6824 sealing compound to the thread of the new gauge, exercising care to keep the compound away from the end of the threaded portion to avoid getting it into the hydraulic system. Mount the new gauge securely in the valve with the dial facing the tank.

3.27 Pressure-Gauge Valve: Fig. 20 — To replace the pressure-gauge valve, partially drain the tank as covered in 3.06. Then, remove the pressure gauge as covered in 3.26. Remove the valve with the R-1542 wrench while holding the pipe on which it is mounted with the R-1538 wrench. Apply a small amount of KS-6824 sealing compound to the threads of the pipe before mounting the new gauge, exercising care to keep the compound away from the end of the threaded portion to avoid getting it in the hydraulic system. Mount the new valve with its handle facing the front of the table. Remount the pressure gauge as covered in 3.26.

3.28 Double-Solenoid Valve: Fig. 23 — The double-solenoid valve furnished initially had a single cover over the valve and solenoids. The double-solenoid valve furnished on later tools and for replacements has separate covers for each solenoid which are chained to the valve body. If a valve with a single cover is replaced, the top cover of the tool must be notched at the front and rear as covered in (5) to clear the covers of the new solenoid valve. To replace the valves, proceed as follows.

(1) Partially drain the tank as covered in 3.06.

(2) On valves with a single cover, remove the cover using the 5-inch E screwdriver. On valves with separate covers over each solenoid, remove the flat cover over the body of the valve using the 4-inch E screwdriver. Remove the gasket over the terminal strips. Tag and remove the external leads to the terminal strip using the 3-inch C screwdriver. Transfer the strap from the terminal strip on the valve being replaced to the corresponding terminals on the new valve. Remove the valve mounting screws using the proper size Allen wrench. Remove the valve.

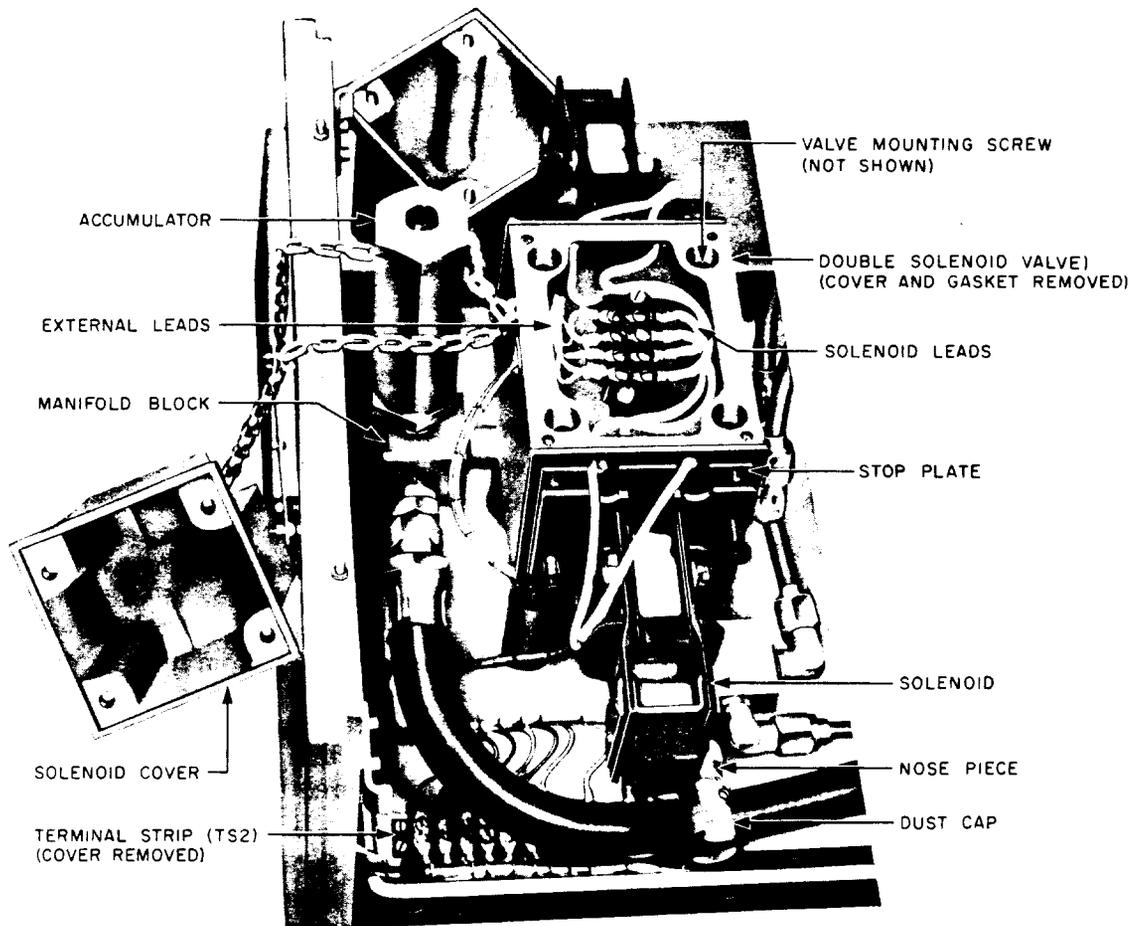


Fig. 23 – Hydraulic Shelf Assembly (partial view with double-solenoid valve cover and gasket removed)

(3) Skin the leads from the solenoids of the replacement valve approximately $\frac{3}{4}$ inch from the ends using the KS-7139 pliers. Twist and solder the ends of the leads to prevent unraveling. Dress the leads and connect them to the valve terminal strip as follows. Connect the leads from the solenoid (S3) which will be at the front of the tool to terminals 1 and 2 on the terminal strip. (Two terminals furthest from S3 solenoid as shown on wiring diagram inside rear cover of tool.) Connect the leads from the solenoid (S4) which will be at the rear of the tool to terminals 3 and 4 on the terminal strip. Wrap each lead clockwise around its terminal screw and securely tighten the screw with the 3-inch C screwdriver.

(4) Mount the valve, making sure the "O" rings are in place in the base of the valve and that the valve ports line up with the ports

in the mounting plate. Insert and securely tighten the valve mounting screws. Connect the external leads to the terminal strip. Re-mount the gasket and cover.

(5) If the frame on the underside of the top cover is not notched at the front and rear for clearance with the solenoid valve covers, cut notches as follows. Mark points on each of the inner sides of the frame, 4- $\frac{1}{4}$ and 7 inches from the outer end of the cover furthest from the circular hole for the tank cap. Then measure $\frac{1}{4}$ inch from these points toward the outer sides of the cover and draw lines joining these points. Using the all-angle drill equipped with the $\frac{5}{32}$ -inch twist drill, drill holes at the marked corners for each notch and cut out each notch with the coping saw. Smooth rough edges with the R-1482 file.

3.29 Solenoid of Double-Solenoid Valve: Fig. 23

— Individual solenoids of double-solenoid valves having a single cover cannot be replaced as they are not the same as those furnished for replacement. Therefore, if it is necessary to replace one of these solenoids, order a complete new double-solenoid valve of the type having separate covers for each solenoid, now furnished on the tool and shown in Fig. 23. Individual solenoids of this valve are replaceable as covered below.

(1) Remove the flat cover over the body of the valve using the 4-inch E screwdriver. Using the 3-inch C screwdriver, remove the solenoid leads from the terminal strip on the valve, noting the terminals to which they were connected.

(2) Remove the push pin in the end of the cover of the solenoid to be replaced. Using the 5-inch E screwdriver, loosen the captive screws mounting this cover sufficiently to remove the cover. Place the cover and chain by which it is secured to the valve body so that they are clear of the solenoid. Remove the solenoid guide screws using the proper size Allen wrench. Remove the solenoid.

(3) Before mounting the new solenoid, skin the solenoid leads approximately 3/4 inch from the ends using the KS-7139 pliers. Mount the new solenoid, making sure that the solenoid plunger is in place. Insert the guide screws and turn them in as far as they will go. Insert the solenoid leads through the openings in the end of the valve as shown in Fig. 23. Mount the solenoid covers and securely tighten the cover mounting screws. Remount the push pin in the cover. Dress the solenoid leads and connect them to the valve terminal strip. Wrap the leads clockwise around the proper terminal screws and securely tighten the screws. Remount the valve gasket and cover.

3.30 "O" Rings in Mounting Surface of Double-Solenoid Valve

(1) To replace "O" rings in the annular recess around the four ports in the mounting surface of the double-solenoid valve, remove the valve as covered in 3.28. Remove the "O" ring using a KS-6320 orange stick. Clean the bottom surface of the valve and its associated mounting surface on the hydraulic shelf using a KS-14666 cloth moistened with

KS-7860 petroleum spirits. Mount new "O" rings in the recesses after first coating the rings with a film of the oil used in the hydraulic system. Remount the valve as covered in 3.28 and check for leaks at the base of the valve as covered in Section 076-143-701.

3.31 "O" Rings in Interior of Double-Solenoid Valve**(1) Valves With Single Cover**

(a) The double-solenoid valve with a single cover has two "O" rings, mounted in recesses in the valve wall approximately 1-1/2 inches from each end of the valve. Replace both "O" rings even if the indications are that only one is defective.

(b) To replace the "O" rings, partially drain the tank as covered in 3.06. Then, remove both solenoids as covered in 3.29. Remove the valve spool centering springs at each end of the valve. Remove the valve spool and collar at each end of the spool using the R-1102 spudger.

(c) To remove an "O" ring, insert the TP-75503 push spring hook into the valve and dislodge the ring from its recess in the valve wall as follows. Place the tip of the hook between the "O" ring and the nearer edge of the annular recess in the valve wall as shown in Fig. 24. Take care when doing this not to scratch the valve wall. Use of the KS-14250 L1 flashlight will facilitate positioning the tip of the hook.

(d) When the tip of the hook has been positioned as covered in (3), move the hook so that the tip enters the recess and en-

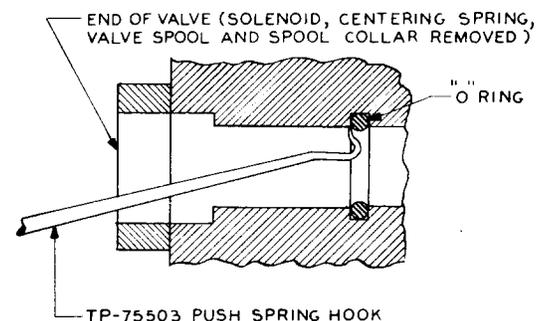


Fig. 24 – Removing "O" Ring From Interior of Valve Having Single Cover

gages the "O" ring. Then rotate and move the hook to pull this portion of the "O" ring out of the recess. Then engage the "O" ring with the hook and remove the ring from the valve.

Caution: *Exercise care not to score or scratch the valve wall when using the hook.*

(e) Coat the new "O" ring with a film of the oil used in the hydraulic system and mount the "O" ring as follows. Insert the "O" ring in the valve and, with the hook, position the ring so that a portion of it is adjacent to the recess. Using the back of the hook, push this portion of the ring into the recess. Then push the rest of the ring into place with the back of the hook.

Caution: *Exercise care not to score or scratch the valve wall when using the hook.*

(f) After replacing both "O" rings, insert the valve spool using the R-1102 spudger and mount the collars and springs at each end of the valve. Remount the solenoids, making sure each extension plunger and guide is in place, as covered in 3.29.

(2) Valves With Separate Cover for Each Solenoid

(a) The double-solenoid valve with a separate cover for each solenoid has two "O" rings at each end of the valve. One "O" ring is positioned in the recess in the surface behind the guide bushing, and the second "O" ring in the groove in the bore of the bushing. The guide bushing is positioned directly behind the stop plate and is held against the stop plate by the helical spring. If either "O" ring at one end of the valve requires replacement, replace the other "O" ring at this end also. However, do not replace the "O" rings at the other end of the valve unless necessary.

(b) To replace the "O" rings at either end of the valve, partially drain the tank as covered in 3.06. Then, remove the associated solenoid as covered in 3.29. Remove the stop plate using the 3-inch C screwdriver. Remove the guide bushing and associated spring.

(c) Remove the "O" ring in the valve recess using a KS-6320 orange stick. Remove the "O" ring in the bushing using a procedure similar to that covered in 1(c) and (d).

(d) Clean the surface of the valve on which the stop plate mounts and the associated surface on the stop plate using a KS-14666 cloth moistened with KS-7860 petroleum spirits.

(e) Coat the new "O" rings with a film of the oil used in the hydraulic system.

(f) Mount the "O" ring in the guide bushing using a procedure similar to that covered in 1(e).

(g) Mount the "O" ring in the valve recess. Remount the spring and guide bushing. Remount the stop plate and securely tighten the mounting screws.

(h) Remount the solenoid as covered in 3.29 making sure the solenoid plunger is in place.

3.32 Nosepiece: Fig. 23 — To replace the nosepiece, fully drain the tank as covered in 3.06. Remove the solenoid directly above the nosepiece as covered in 3.29. Place a folded KS-14666 cloth beneath the nosepiece to catch any oil which may drip when the nosepiece is removed. Remove the nosepiece dust cap using the 3-inch C screwdriver. Hold the pipe in which the nosepiece is mounted with the R-1538 wrench and remove the nosepiece using the R-1542 wrench. Apply a small amount of KS-6824 sealing compound to the threads of the pipe, exercising care to keep the compound away from the ends of the threaded portion to avoid getting it into the hydraulic system. Securely mount the new nosepiece on the pipe. Remount the dust cap. Remount the solenoid as covered in 3.29. Remove the KS-14666 cloth.

3.33 Motor: Fig. 20

(1) Remove the cover from the terminal strip (Fig. 23) using the 3-inch C screwdriver. Tag and disconnect the motor leads at the terminal strip, using the screwdriver. Disconnect the ground strap at the motor terminal coverplate, if provided, using the 565A offset screwdriver. Then loosen the setscrew of the driving member of the flexible coupling using the proper size Allen wrench, and slide this member back on the motor shaft to disengage the coupling from the nonmetallic member. Using the screwdriver, loosen the motor clamp screws and remove the clamps. Remove the motor.

(2) Using the screwdriver, remove the coverplate over the motor terminals of both the old and new motors. Using the 33 wrench, remove the leads from the motor to be replaced and transfer them to the corresponding terminals of the new motor. Remount the terminal coverplates on both motors and securely tighten the screws except the one used to fasten the ground strap if a ground strap was provided. Transfer the driving member of the coupling to the new motor. Remove the new motor from its mounting bracket by removing the clamps as covered in (1).

(3) Mount the new motor on the bracket on the hydraulic shelf with the oil cups up. Remount the motor clamps and securely tighten the clamp screws. Reconnect the coupling and securely tighten the setscrew of the driving member against the flat on the motor shaft. Connect the motor leads to the terminal strip. Remount the terminal strip cover. Connect the ground strap if provided. Check the motor and pump shaft alignment requirement as covered in Section 076-143-701.

3.34 Flexible Coupling: Fig. 20 — To replace the flexible coupling, first remove the motor as covered in 3.33, but do not disconnect the leads at the motor terminals. Then, slide the driving member of the coupling off the motor shaft. Loosen the setscrew on the driven member of the coupling using the proper size Allen wrench and slide it off the pump shaft. Separate the new coupling, leaving the nonmetallic member which is mounted between the coupling halves on the half to be mounted on the pump shaft. Mount this half of the coupling on the pump shaft and position it with the surface against which the nonmetallic member is mounted, flush or slightly overflush with the end of the pump shaft. Securely tighten the setscrew against the flat on the shaft. Mount the other half of the coupling on the motor shaft. Remount the motor as covered in 3.33 and connect the coupling. Securely tighten the coupling setscrew of the driving member against the flat on the motor shaft.

3.35 Pump: Fig. 20

(1) To replace the pump, partially drain the tank as covered in 3.06. Then, remove the motor as covered in 3.33. Remove the half of

the flexible coupling from the pump and transfer it to the shaft of the new pump as covered in 3.34. Place folded KS-14666 cloths beneath the connections on both sides of the pump to catch any oil which may drip when these connections are broken.

(2) Disconnect the flexible hose to the pump by holding the fitting that screws into the pump with the R-2593 wrench while unscrewing the hose connection with the 33C Williams wrench. Disconnect the tubing from the tee fitting, leaving the tee in the elbow on the pump. To do this, hold the tee with the R-1542 wrench, unscrew the nuts from the tee with a second R-1542 wrench, and slide the nuts back on the tubing. Remove the pump mounting bolts and washers using the R-1542 wrench. Remove the pump, carefully disengaging it from the tubing.

(3) The new pump comes equipped with fittings including the elbow and tee with two nuts and sleeves. Remove the nuts and sleeves from the tee. Mount the pump, carefully engage the tubing, and securely tighten the nuts on the tee. Securely tighten the pump mounting bolts, making sure the washers are in place. Connect the flexible hose and securely tighten the fittings. Remount the motor as covered in 3.33. Remove the KS-14666 cloths. Check the motor and pump shaft alignment requirement as covered in Section 076-143-701.

3.36 Flexible Hoses: Fig. 20

(1) To replace the short hose, partially drain the tank as covered in 3.06. To replace the long hose, fully drain the tank as covered in 3.06. Place folded KS-14666 cloths beneath the connections to catch any oil that may drip when the connections are broken.

(2) Disconnect the swivel coupling end of the hose first as covered in (3). (The non-swivel end of both of the hoses is connected to the tank.)

(3) To disconnect the swivel coupling of the hose, hold the fitting to which the swivel is connected with the R-2593 wrench while unscrewing the coupling with the 33C Williams wrench. After disconnecting this end, drain any oil which may be in the hose into a container. Then hold the elbow on the tank with

the Billings and Spencer No. 9 wrench and disconnect the hose using the R-2593 wrench.

(4) Before connecting the new hose, apply a small amount of KS-6824 sealing compound to the ends of the threads of the male fitting on the hose and the fitting in the part to which the swivel coupling on the hose is connected, taking care to keep the compound from the ends of the threaded portion to avoid getting it into the hydraulic system. Connect and securely tighten the male fitting on the hose to the tank elbow. Then, connect and securely tighten the swivel coupling on the hose to its associated fitting.

3.37 Tubing: Fig. 20 — Before replacing any tubing, completely drain the tank as covered in 3.06. Then place folded KS-14666 cloths below the fitting at each end of the tubing to catch oil that will drip when the connections are broken. Hold the body of the fitting at one end of the tubing with the R-1542 wrench and unscrew the nut with a second R-1542 wrench. Similarly break the connection at the other end of the tubing. Remove the tubing. Position the flare at each end of the new tubing against the body of the associated fitting and securely tighten each nut. Remove the KS-14666 cloths.

3.38 Drain Cock: Fig. 20 — To replace the drain cock, fully drain the tank as covered in 3.06. If the drain cock is being replaced because it cannot be opened, the tank cannot be fully drained as covered in 3.06. In this case, place a container large enough to hold approximately 2 quarts of oil below the drain cock; otherwise, use a small container to catch oil that may drain when the drain cock is removed. Remove the drain cock using the R-1542 wrench. Apply a small amount of KS-6824 sealing compound to the threads on the end of the new cock that screw into the reservoir. Exercise care to keep the compound away from the end of the threaded portion to avoid getting it into the hydraulic system. Mount the new cock with the handle facing the rear of the tool. Make sure the drain cock is in the closed position before refilling the reservoir and circulating the oil through the system as covered in 3.07.

3.39 Terminal Strip (TS2): Fig. 23 — To replace the terminal strip, remove the terminal strip cover using the 3-inch C screwdriver.

Tag and remove the leads to the terminal strips using the screwdriver. Then, remove the terminal strip mounting screws with the screwdriver. Substitute the new terminal strip and securely tighten the mounting screws. Reconnect the leads and securely tighten all screws. Remount the terminal strip cover.

Punch Control System

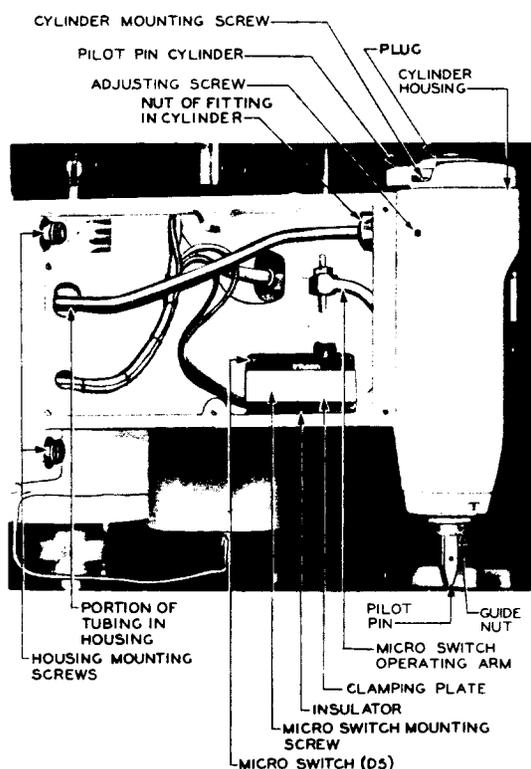
Hole-Enlarging Control Unit

3.40 Hole-Enlarging Control Micro Switch (D5): Fig. 25 — To replace the Micro Switch, remove the cover from the left side of the housing of the hole-enlarging control unit using the proper size Allen wrench. Then, remove the Micro-Switch mounting screws and clamping plate with the proper size Allen wrench. Remove the switch taking care not to displace the insulator. If the insulator is damaged, replace it. Transfer the terminals with leads from this Micro Switch to the corresponding terminal positions on the new Micro Switch using the 3-inch C screwdriver to remove and tighten the terminal mounting screws. Apply a small amount of KS-6824 sealing compound around the head and adjacent surface of each Micro-Switch terminal mounting screw with a KS-14164 brush. Mount the switch and securely tighten the mounting screws. Check the Micro-Switch operation as covered in Section 076-143-701. Remount the cover and securely tighten all screws.

3.41 Pilot Pin: Fig. 25 — To replace the pilot pin, loosen the pilot pin guide nut using the R-1542 wrench. Then bend out the end of a paper clip and insert this end into the hole in the pilot pin. Remove the pilot pin by turning it counterclockwise with the clip. Mount the new pilot pin. Adjust the clearance between the pilot pin and carriage as covered in Section 076-143-701, and securely tighten the locknut while holding the pilot pin in position with the paper clip.

3.42 Pilot Pin Cylinder "O" Rings (659A and 659D tools only)

- (1) The pilot pin cylinder has two "O" rings, one in the plug at the top of the cylinder (Fig. 25) and one on the upper section of the shaft. Remove and replace both "O" rings even if the indications are that only one is defective.

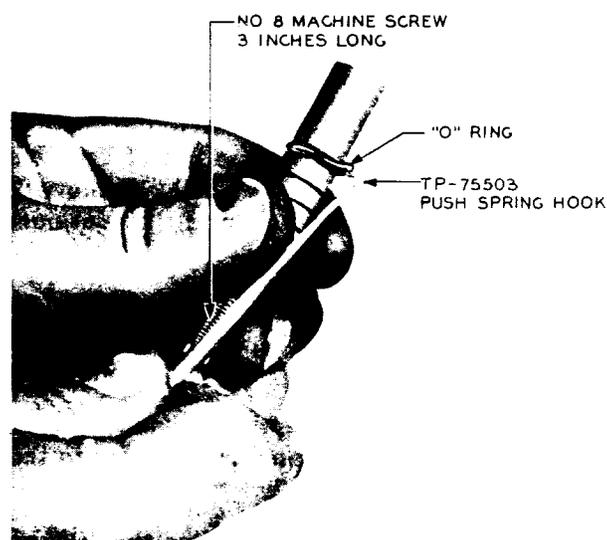


**Fig. 25 — Hole-Enlarging Control Unit (cover removed)
— 659A and 659D Tools Only**

(2) Remove the plug with the 347 wrench. Then insert a No. 8 machine screw, 3 inches long, into the threaded hole at the top of the upper section of the shaft. Pull this section of the shaft out of the cylinder with the screw.

(3) "O" Ring on Upper Section of Shaft:

Fig. 26 — To remove the "O" ring, hold the shaft in one hand as shown in Fig. 26. With the other hand, hold the TP-75503 push spring hook with the end of the hook toward the outer end of the shaft. This will prevent possible injury to the fingers if the hook slips while removing the "O" ring. Insert the tip of the hook between the "O" ring and the nearer edge of its recess in the shaft. Press the hook inward until its tip is behind the "O" ring. Lift this part of the ring with the hook as shown in the figure and at the same time twist the hook to fully engage the ring. Remove the ring. Apply a film of the oil used in the hydraulic system to the new "O" ring and manually mount the "O" ring in the recess. Check that the "O" ring is not twisted in the recess.



**Fig. 26 — Removing "O" Ring From Upper Section
of Pilot Pin Shaft — 659A and 659D
Tools Only**

Caution: Exercise extreme care not to score or scratch the shaft when using the hook.

(4) **"O" Ring on Plug:** To replace the plug "O" ring, proceed as follows. With one hand, hold the plug by its flange with the threaded end away from the fingers and, with the other hand, hold the TP-75503 push spring hook with the end of the hook toward the threaded end of the flange. Remove and replace the "O" ring as covered in (3).

Caution: Exercise extreme care not to score or scratch the plug when using the hook.

(5) After replacing the "O" rings, insert the shaft into the cylinder with the screw and remove the screw from the shaft. Mount the plug in the top of the cylinder.

Tab-Clipping Control Unit

3.43 Cylinder "O" Rings (659A and 659D tools only)

(1) The cylinder has two "O" rings, one on the plug and one on the piston. Remove and replace both "O" rings even if only one is considered defective. To replace these "O" rings, proceed as covered in (2) through (6).

(2) Remove the cylinder as follows. Place a container below the fitting on the cylinder to catch any oil which may drip while the connection is broken. Then, while holding the body of the fitting on the cylinder with the R-1542 wrench, unscrew the nut of the fitting using a second R-1542 wrench. Remove the cylinder and drain the oil into the container.

(3) Remove the plug using the 347 wrench. Remove the retaining ring at the bottom of the cylinder using the R-2975 adjustable snap ring pliers. Remove the piston.

(4) **"O" Ring on Piston:** Replace the "O" ring following procedures similar to those covered in 3.42(3).

(5) **"O" Ring on Plug:** Replace the "O" ring as covered in 3.42(4).

(6) Remount the piston in reverse order of removal. Remount and securely tighten the plug. Remount the cylinder with the tubing engaging the fitting. Securely tighten the cylinder mounting screws and the nut of the fitting.

3.44 Selector Valve (659A and 659D tools only): Fig. 27

(1) To replace the selector valve, remove the selector valve rack cover using the proper size Allen wrench. Using the P-long-nose pliers, remove the retaining ring from one end of the selector valve rack pin connecting the selector valve rack to the valve. Remove the pin.

(2) Before disengaging the tubing connections to the valve, place a container below the connections to catch any oil which may drip when the connections are broken. Hold the fitting in the valve with the R-1542 wrench, and unscrew the nut from the fitting with a second R-1542 wrench. While supporting the valve, remove the valve bracket mounting screws and washers using the proper size Allen wrench modified as follows. Use the R-1482 file to file a notch around the short leg of the wrench approximately 3/8 inch from the end of this leg. Break the short leg at the notch. Remove any burrs and chamfer the edges using the file. Remove the valve and mounting brackets by carefully disengaging the valve from the piping and drain the oil into the container.

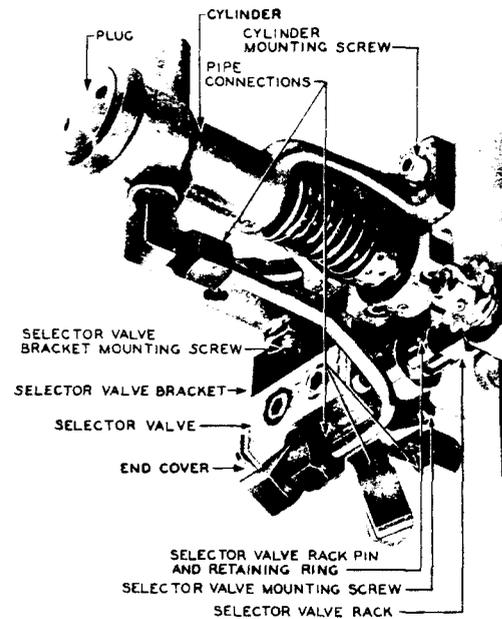


Fig. 27 - Tab-Clipping Control Unit (partial view from below right front of table with selector valve gear rack cover and chain removed) — 659A and 659D Tools Only

(3) Remove the valve brackets and end cover from the valve being replaced and transfer them to the corresponding positions on the new valve using the proper size Allen wrench. Note the position of each fitting on the valve being replaced. Remove the fittings from this valve using the R-1542 wrench and transfer them to the corresponding positions on the new valve, applying a small amount of KS-6824 sealing compound to the threads of the fittings which screw into the valve. Exercise care to keep the compound away from the ends of the fittings to avoid getting the compound into the hydraulic system.

(4) Mount the new valve, carefully engaging each tubing in its fitting. Securely tighten the valve bracket mounting screws and the nut on each fitting. Mount the selector valve rack pin and retaining ring. Mount the selector valve rack cover.

3.45 Selector Valve Spool "O" Rings (659A and 659D tools only)

(1) The selector valve has two spool "O" rings, one near each end of the valve spool. Replace both "O" rings even if the indi-

cations are that only one is defective. To replace these "O" rings, first remove the selector valve, mounting brackets, and end cover as covered in 3.44.

(2) Loosen the setscrews in the knurled nut and coupling on the ends of the valve spool using the proper size Allen wrench. Remove the nut and coupling by unscrewing them from the spool. Remove the spool from the valve by pushing it out with the R-1102 spudger.

(3) Replace the spool "O" rings by following a procedure similar to that covered in 3.42(3).

(4) Remount the knurled nut on one end of the valve spool so that it is flush with the end of the spool and securely tighten the setscrews. Insert the valve spool into the end of the valve on which the end cover is mounted. Push the spool into the valve until the nut touches the end of the valve body. Hold the 0.250-inch end of the 110B gauge on the other end of the valve and mount the coupling so that it just touches the gauge. Securely tighten the coupling setscrews.

(5) Remount the valve brackets and end cover on the valve as covered in 3.44(3). Remount the valve as covered in 3.44(4). Check for the requirement covering the pilot pin travel of the hole-enlarging control unit and stylus travel of the tab-clipping control unit in Section 076-143-701. If these requirements are not met and the trouble is not due to leaks in the hydraulic system, recheck the positioning of the knurled nut and the coupling on the valve spool as covered in (4).

3.46 Stylus: Fig. 28 — To replace the stylus, set the tool for tab clipping. Then depress the lock cylinder to remove power from the tool. Remove the stylus clamping screws using the proper size Allen wrench. Remove the stylus. Mount the new stylus with its pointed end toward the carriage and securely tighten the clamping screws. Check for the requirement covering the positioning of stylus as covered in Section 076-143-701.

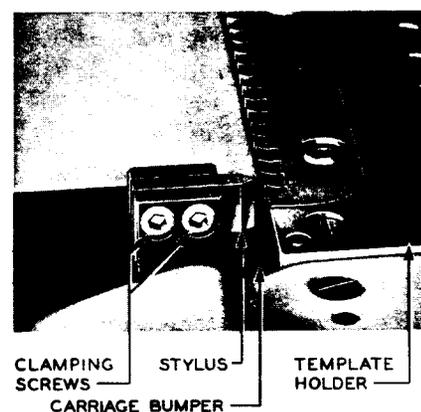


Fig. 28 — Tab-Clipping Control Stylus (elevated position viewed from side)

3.47 Tab-Clipping Control Micro Switch (D7):

Remove the Micro-Switch mounting nuts and clamping plate using the 418A wrench. Remove the Micro Switch and cover. Lift the cover off the Micro Switch and slide it back on the leads to obtain access to the Micro-Switch terminals. Transfer the terminals with leads from this Micro Switch to the corresponding terminal positions on the new Micro Switch using the 3-inch C screwdriver to remove and tighten the terminal mounting screws. Apply a small amount of KS-6824 sealing compound around the head of each Micro-Switch terminal mounting screw with the KS-14164 brush. Remount the Micro-Switch cover and mount the switch on the bracket. Remount the clamping plate and securely tighten the nuts. Check the requirement covering operation of the Micro Switch with respect to the stylus as covered in Section 076-143-701.

Foot-Pedal Assembly (659A and 659D tools only)

3.48 Hydraulic Cylinder: Fig. 29

(1) To replace the foot-pedal hydraulic cylinder, remove the cylinder mounting screws, washers, and nuts using the proper size Allen and R-1542 wrenches. Remove the cylinder from the pedal mounting.

(2) Hold the elbow fitting with the R-1542 wrench and loosen the connection between the elbow and the fitting in the cylinder using the Billings and Spencer No. 9 wrench on the

cylinder fitting. Then hold the cylinder so that the elbow is over the drip pan on the floor, and manually turn the cylinder to break the connection between the elbow and cylinder fitting. Drain the oil from the cylinder and elbow into the drip pan.

(3) Apply a small amount of KS-6824 sealing compound to the threads of the fitting in the new cylinder. Exercise care to keep the compound away from the end of the fitting to avoid getting it into the hydraulic system. Connect the cylinder fitting to the elbow by turning the cylinder. Then, securely tighten the connections, positioning the elbow so that it faces the rear of the tool as shown in Fig. 29.

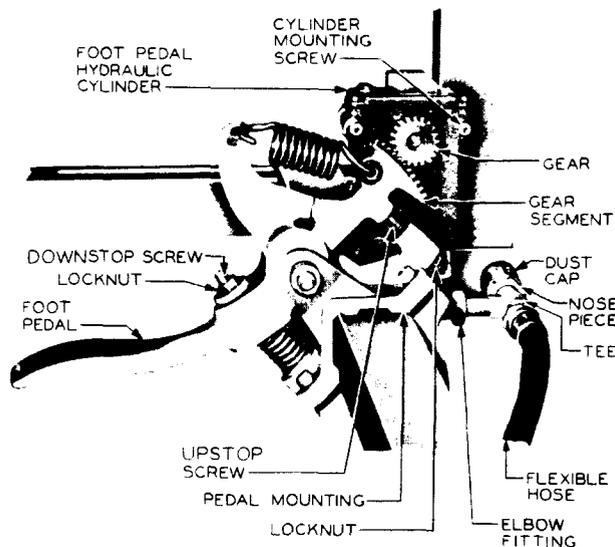


Fig. 29 – Foot-Pedal Assembly (drip pan and covers removed) — 659A and 659D Tools Only

(4) Before mounting the cylinder on the pedal mounting, loosen the stopnut on the upstop screw using the 245 wrench. Turn the screw counterclockwise one-third turn using the proper size Allen wrench. While holding the screw in this position, securely tighten the locknut. Then turn the gear on the hydraulic cylinder counterclockwise as far as possible. While holding the gear in this position, mount the cylinder so that its gear engages the gear segment. Securely tighten the cylinder mounting screws and nuts, making sure that the

washers are in place. Loosen the locknut on the upstop screw and turn the screw clockwise one-third turn. While holding the screw in this position, securely tighten the locknut. Check for the pilot pin travel requirement as covered in Section 076-143-701.

3.49 Hydraulic Cylinder “O” Rings

(1) The hydraulic cylinder has three “O” rings, one in the cylinder bore and one in each bearing of the gear shaft. Replace all “O” rings even if the indications are that only one is defective. To replace these “O” rings, first remove the cylinder as covered in 3.48.

(2) Remove the cylinder cover using the 3-inch C screwdriver, taking care not to damage the cover gasket. Replace the cover gasket if it is torn or otherwise damaged. Remove the setscrew securing the piston lever to the gear shaft using the proper size Allen wrench. Remove the gear shaft by pulling outward on the gear end while pressing inward on the other end of the shaft. Remove the piston by pulling the lever out of the cylinder.

(3) Replace the “O” rings as covered in 3.31 (3), (4), and (5). Remount the parts in the hydraulic cylinder in the reverse order of their removal. Remount the cylinder as covered in 3.48. Check for the pilot pin travel requirement as covered in Section 076-143-701.

3.50 Nosepiece: Fig. 29

(1) Before replacing the nosepiece, place the drip pan below the nosepiece to catch the oil which will drain when the connection is broken. Remove the nosepiece dust cap using the 3-inch C screwdriver. While holding the fitting in the tee with the R-1542 wrench, remove the nosepiece using a second R-1542 wrench.

(2) Apply a small amount of KS-6824 sealing compound to the threads of the fitting in the tee on which the nosepiece is mounted. Exercise care to keep the compound away from the end of the threads to avoid getting the compound into the hydraulic system. Securely mount the new nosepiece and remount the dust cap.

3.51 Flexible Hose: Fig. 29

(1) Before replacing the flexible hose, place a KS-14666 cloth below the hose connection to the tubing which is clamped to the leg of the tool and place the drip pan below the hose connection to the tee fitting of the foot-pedal assembly hydraulic cylinder to catch the oil that will drain from these parts when the hose connections are broken.

(2) Hold the connector attached to the hose fitting at the tubing end with the R-1542 wrench and unscrew the nut above the connector with a second R-1542 wrench. Disengage the connector from the tubing. Hold the fitting on the hose with the 245 wrench and remove the connector. Then hold the tee fitting on the hydraulic cylinder with the R-1542 wrench and disconnect the hose using the 245 wrench.

(3) Place a small amount of KS-6824 sealing compound on the threads of the fittings at both ends of the new hose. Exercise care to keep the compound away from the ends of the fittings to avoid getting it into the foot-pedal hydraulic system. Mount the connector that was removed from the hose being replaced on one end of the new hose. Connect the other end of the hose to the tee fitting on the hydraulic cylinder. Place the connector on the hose over the end of the pipe and securely tighten the nut on the connector taking care not to twist the hose.

3.52 Solenoid Cut-Off Valve: Fig. 19

(1) To replace the solenoid cutoff valve, pull out the slack in the solenoid leads through the hole in the valve cover. Remove the tape over the splices and unsolder the connections.

(2) Hold the fittings on the valve with the R-1542 wrench and unscrew the nuts with a second R-1542 wrench. Remove the clamps on the tubing on each side of the valve using the proper size Allen wrench, and carefully disengage the tubing from the valve fittings.

(3) While holding the solenoid valve, remove valve mounting plate screws with the proper size Allen wrench. Remove the valve. Remove the valve from the mounting plate using the 3-inch C screwdriver. Manually remove the inserts from both ends of the new solenoid valve. Remove the fittings from the valve being replaced using the R-1542 wrench, noting the end of the valve from which each

fitting is removed. Apply a small amount of KS-6824 sealing compound to the threads of the fittings that screw into the valve taking care to keep the compound away from the ends of the threads to avoid getting it into the foot-pedal hydraulic system. Mount the fittings in the corresponding positions in the new valve and tighten them securely.

(4) Remove the cover nut on the new valve using the R-1542 wrench. Remove the lock washer, nameplate, and cover. Cut the leads from the solenoid to a length of approximately 6 inches using the KS-7139 pliers. Skin the leads approximately 3/4 inch from the ends. Wrap both leads one turn around the coil and then pass the leads through the hole in the cover. Remount the cover, nameplate, and lockwasher on the valve. Securely tighten the cover nut. Mount the valve on the mounting plate and securely tighten the screws. Position the valve mounting plate on the tool so that the bleeder screw in the side of the valve faces the rear of the tool. Securely tighten the mounting plate screws. Reconnect the tubing and securely tighten the nuts on the fittings. Remount the tubing clamps on each side of the valve. Splice the solenoid leads to the associated leads from the cable form and tape the splice. Push the spliced portion of the leads into the solenoid cover. Check for the pilot pin travel requirement in Section 076-143-701.

3.53 Tubing Between Pilot Pin Cylinder and Selector Valve

(1) **General:** This tubing consists of two sections which are connected together by a compression-type elbow fitting at the rear of the tool above the table. The upper section is connected to the pilot pin cylinder, and the lower section to the selector valve on the tab-clipping control unit. If this tubing is connected with black fittings, replace both upper and lower sections of the tubing and all associated fittings if any replacement is necessary. If other than black fittings are provided, the upper or lower sections may be replaced independently. In the latter case, the nut and sleeve for the compression-type fittings and the nut for the flare-type fitting, covered in the ordering information, must be used to make the connections. If necessary to replace fittings, except nuts and sleeves on tubing, follow the procedure covered in 3.55.

(2) *Upper Section of Tubing:* Fig. 17 and 25

- (a) Remove the cover from the left side of the hole-enlarging control unit housing using the proper size Allen wrench. Place a KS-2423 cloth over the Micro Switch and operating arm below the fitting in the pilot pin cylinder to catch oil that will drip when the connection is broken.
- (b) Unscrew the nut from the fitting in the pilot pin cylinder using the R-1542 wrench. Disengage the tubing from the fitting, tapping the tubing lightly at the adjacent bend, with the 4-ounce riveting hammer if necessary. Bend out the portion of the tubing in the housing so that the end of the tubing is approximately 2 inches from the cylindrical portion of the housing.
- (c) Place a KS-14666 cloth on the table below the end of the tubing. Slide the nut as far as possible on the sleeve at the end of the tubing. Grasp the tubing just behind the sleeve with the combination pliers and, using the hacksaw, saw through the tubing as near as possible to the front of the hydraulic shelf. Remove the KS-14666 cloth from the table, making sure that no metal particles are left on the table or associated parts.
- (d) Remove the punch guard and hole enlarging punch as covered in 3.13 and 3.15.
- (e) Place a clean KS-14666 cloth on the table below the elbow fitting at the rear of the tool to catch oil that will drip when the connection is broken. Hold the body of the fitting with the R-1542 wrench and unscrew the nut from the fitting using a second R-1542 wrench. Disengage the tubing from the fitting.
- (f) Place several KS-14666 cloths on the table below the hole-enlarging control unit housing to protect the carriage and table top. Remove the two screws on the front mounting surface of the housing (Fig. 25) and the three mounting screws at the side using the proper size Allen wrench. Remove the housing from its support and free it from the tubing. Use the 4-inch E screwdriver, if necessary, to pry the housing from its support taking care not to damage

the dowels or mounting surfaces. Place the housing on the KS-14666 cloths on the table taking care not to damage the leads to the Micro Switch and lamp. Remove the tubing from the rear of the table.

(g) Working from the rear, lift the hole-enlarging control unit housing from the table and insert the long leg of the new tubing through the hole at the rear of the housing. Then, insert the short leg of the tubing through the hole at the rear end of the groove in the housing support. Position the tubing in the groove and the housing on its support taking care to insert the housing dowels in their associated holes in the support. With the housing supported by the dowels, insert all the housing mounting screws working from the front of the table. Gradually tighten the side mounting screws in succession until the housing is fully seated on its support. Then securely tighten the two mounting screws at the front.

(h) Place the nut of the fitting on the end of the tubing in the housing and then place the associated sleeve over the end of the tubing. Push the end of the tubing into the cylinder fitting until it seats against the shoulder of the fitting and securely tighten the nut. Similarly connect the other end of the tubing to the elbow fitting. Remove the KS-14666 cloths. Remount the housing cover, hole-enlarging punch, and punch guard.

(3) *Lower Section of Tubing:* Fig. 18

- (a) Place a KS-14666 cloth below the fitting at each end of the tubing to catch oil that will drip when the connections are broken. Hold the body of the fitting at one end of the tubing with the R-1542 wrench and unscrew the nut of the fitting with a second R-1542 wrench. Similarly break the connection at the other end of the tubing. Remove the tubing clamps using the proper size Allen wrench. Disengage the tubing from the fittings and lower the tubing below the table as far as possible. Using the hacksaw, saw through the leg of the tubing which extends from above the table. Remove the tubing.
- (b) Place the nut for the flared-type fitting at one end of the tubing over the other end of the tubing and push the nut up to the

sleeve at the flared end. Insert the short (unflared) leg of the tubing through the hole in the table. Position the tubing in the clamps and partially tighten the clamp screws. Position the flared end of the tubing against the body of its associated fitting and securely tighten the nut. Securely tighten the clamp screws. Place the nut of the compression-type elbow fitting on the end of the tubing above the table and then place its associated sleeve over the end of the tubing. Push this end of the tubing into the elbow fitting until it seats against the shoulder of the fitting and securely tighten the nut. Remove the KS-14666 cloths.

3.54 *Tubing Entirely Below Table*

- (1) Place a KS-14666 cloth below the fitting at each end of the tubing to catch oil that will drip when the connections are broken. Hold the body of the fitting at one end of the tubing with the R-1542 wrench and unscrew the nut of the fitting with a second R-1542 wrench. Similarly break the connection at the other end of the tubing. Remove the clamps using the proper size Allen wrench and remove the tubing.
- (2) If the tubing being replaced has black fittings, replace the fittings to which each end of the tubing was connected as covered in 3.56 before mounting the new tubing.
- (3) Mount the new tubing by positioning the flare at each end of the tubing against the body of the associated fitting and securely tightening the nut. Remount the clamps and remove the KS-14666 cloths.

3.55 *Fittings*

- (1) The following procedures cover replacement of the body of the fitting which screws into a cylinder or other part. Replacement of the associated nut and sleeve of the fitting necessitates replacement of the tubing which is covered in 3.53 and 3.54. If a black fitting is to be replaced, replace the tubing connected to the fitting and also the fitting at the other end of the tubing.
- (2) Disconnect the tubing from the fitting to be replaced as covered in 3.53 and 3.54. Remove the fitting using the R-1542 wrench. To replace the fitting that screws into the

pilot pin cylinder, first remove the cylinder as covered in 3.43.

- (3) Wind fine lampwick between the threads of the new fitting that screw into the cylinder or other part as follows. Starting at approximately the second thread from the inner end of the threaded portion, wind the lampwick clockwise toward the outer end of the fitting, crossing a thread upon completion of each turn. The first turn should be double to secure the starting end of the lampwick and the last turn should terminate at approximately the beginning of the second thread from the outer end of the fitting. Then, with the KS-14164 brush, apply a small amount of KS-6824 sealing compound over the lampwick, exercising care to keep the compound away from the outer end of the threaded portion to avoid getting it into the hydraulic system. Do not apply the lampwick or compound to the threads on which the nut is mounted.

- (4) Mount the fitting and tighten it as securely as practicable in its required angular position without backing it off. If the pilot pin cylinder was removed, remount it as covered in 3.43. Reconnect the tubing and securely tighten the nuts as covered in 3.53 and 3.54. If the pilot pin cylinder was removed, check the requirement covering the position of the blank in the nest as covered in Section 076-143-701.

Other Parts

Parts of Carriage

3.56 *Front Carriage Stops:* To replace a front carriage stop, remove the stop mounting screws using the proper size Allen wrench. Remove the stop. Position the new stop so that it just touches the rail on the carriage when the carriage is in its locked position. Securely tighten the mounting screws.

3.57 *Rear Carriage Stops:* To replace a rear carriage stop, remove the stop mounting block using proper size Allen wrench. Unscrew the stop from the block. Screw the new stop into the block. Position the stop to meet the requirement covering position of rear carriage stops covered in Section 076-143-701 and securely tighten the mounting screws.

3.58 Ball Retainer Stops and Carriage Bumper:

To replace a ball retainer stop or carriage bumper, unlock the carriage and move it as required to obtain access to the mounting screw. Remove the mounting screw using the 3-inch C screwdriver. Remove the stop or bumper. Use the screwdriver, if necessary, to pry the part from the dowel pin, taking care not to damage the dowel pin or adjacent surfaces. Mount the new part and securely tighten the mounting screw.

3.59 Card Jaws

(1) Card jaws furnished initially had plates soldered to the jaws to support the 200A blank during the coding operations. Subsequently, card jaws were adopted in which three discs on each jaw are provided instead of the plates for supporting the blank. The discs are secured to the jaws by screws and are easily replaceable as covered in 3.60. If complete jaws having plates are to be replaced, the new jaws having discs must be used. The following procedures cover jaw replacement using jaws having discs.

- (2) Remove the 660A or 660B punch and die assembly as covered in 3.16.
- (3) If a 660B punch and die assembly is to be mounted on the 659-type tool after replacement of the card jaws, proceed as covered in (4) through (16). If a 660A punch and die assembly is to be remounted, proceed as covered in (17) through (45).

660B Punch and Die Assembly

- (4) Turn the power switch off. Unlock the carriage. Remove the card jaw mounting screws using the proper size Allen wrench.
- (5) Move the carriage to position the left-hand card jaw over the well previously occupied by the punch and die assembly as shown in Fig. 30.
- (6) Lightly tap the card jaw to remove it from the dowel pins using the 4-ounce riveting hammer. Position one or more 200A blanks under the carriage arm, as shown in Fig. 30, to serve as shims in the space between the arm and the carriage. Then, drive the dowel pins out of the arm using the hammer and 1/8-inch drive pin punch. Remove the blanks.

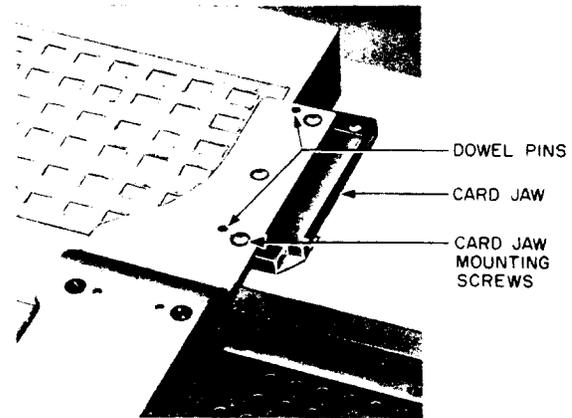


Fig. 30 – Card Nest Jaws With Plate for Supporting Card

- (7) Slide the replacement left-hand jaw under the carriage arm and position it so that the screw holes in the jaw are aligned with the corresponding holes in the carriage arm.
- (8) Insert and tighten the jaw mounting screws just enough to hold the jaw in position on the carriage arm. It should be possible to move the jaw by light tapping with the blade of the 4-inch E screwdriver or equivalent.
- (9) In a similar manner, replace the right-hand jaw by following procedures covered in (4) through (8).
- (10) Place a blank in the nest between the two jaws and position the jaws to contact the two sides and upper edge of the blank. To do this, lightly tap the jaws as required with the blade of the 4-inch E screwdriver.
- (11) Set the selector handle of the 659-type tool for tab clipping. With the card jaws contacting the blank as covered in (10), move the carriage to the right and adjust the left-hand jaw as follows. Engage the stylus of the tab-clipping control unit in the notch corresponding to the tab on the extreme left of the blank. Position the jaws so that the tab to be clipped is centered with respect to the two sides of the die opening as gauged by eye, and a space of 0.129-inch is maintained be-

tween the end of the tab and the back edge of the die. To gauge the space, insert a No. 30 drill in this space. To shift the position of the jaws, lightly tap the jaws with the 4-inch E screwdriver.

(12) Adjust the right-hand jaw in a manner similar to the procedure covered in (11) except move the carriage to the left and manually push the stylus into the notch at the extreme right. Then recheck and readjust if necessary until both ends of the card are positioned in accordance with the conditions covered in (11).

(13) Move the selector handle to the hole-enlarging position and carefully move the carriage toward the front of the table.

(14) Press the blank against the left-hand jaw and moderately tighten this jaw. Lightly tap the right-hand jaw with the screwdriver to obtain a clearance of 0.007 inch as gauged by eye between the side of the blank and the adjacent side of the right-hand jaw.

(15) Securely tighten the mounting screws of both jaws. Then, move the selector handle to the tab-clipping position. While maintaining the upper edge of the card in contact with the jaws, check that the length of each clipped tab is approximately equal and meets the requirements specified in Section 076-143-701. If the minimum length (.178 inch) is not met, check as covered in (12) for proper space between the end of the tab and the back edge of the die.

(16) Mount the 660B punch and die assembly in position as covered in 3.16 and adjust the hole-enlarging pilot position as covered in Section 076-143-701, if necessary, to obtain the proper size hole and alignment.

660A Punch and Die Assembly

(17) If a 660A punch and die assembly is to be remounted when the card jaws are replaced, proceed as follows.

(18) Before replacing the jaws, check that the card nest is properly positioned with respect to the hole-enlarging and tab-clipping punches by checking the requirement covering position of blank in card nest and part (b) of the requirement covering the performance of tab-clipping punch in Section 076-143-701.

This is important since the replacement jaws are located to correspond to the position of the jaws being replaced.

(19) Insert a 200A blank in the card nest. Set the tool for tab clipping. Fully open the bypass valve to prevent operation of the punches. Engage the stylus in any notch in the template holder and note the lateral position of the corresponding tab on the blank with respect to the hole in the punch die. Release the stylus and fully close the bypass valve.

(20) Pull the blank to the front of the card nest and, while holding it in this position, clip off the extreme left and right tabs on the blank. Set the tool for hole enlarging and remove the blank from the card nest.

(21) Remove the punch guard as covered in 3.13.

(22) Using the proper size Allen wrench, check that the screws securing each jaw to the card nest are tightened securely.

(23) Remove the carriage and jaw dowel pins as covered in (a) and (b). Then remount the carriage as covered in (c). Do not disturb the jaw mounting screws.

(a) **Removing Carriage:** Remove the front carriage stops using the proper size Allen wrench. Unlock the carriage and move it to the rear of the table to obtain access to the mounting screws of the front ball retainer stops of the stationary raceways. Remove the stop mounting screws using the 4-inch E screwdriver. Remove the stops using the screwdriver if necessary to pry the stop from the dowel pin. Take care not to damage the dowel pin or adjacent surfaces. A ball retainer and seven ball bearings are associated with each raceway. Slowly move the carriage forward and take care not to lose the ball bearings as they are simultaneously released from each raceway. After all ball bearings have been removed, remove the ball retainers and carriage.

(b) **Removing Jaw Dowel Pins:** Place the carriage upside down on a flat surface (template holder facing downward). Then support the arm of the carriage on which the jaw is to be removed as follows. On each side of the dowel pins, place a 1- by 6- by 1-inch wood block under the portion of the arm to

which the jaw is secured parallel to the arm. The blocks should be clear of the dowel pins so as not to interfere with removal of the pins. Remove the dowel pins using the 1/8-inch drive pin punch and 4-ounce riveting hammer, taking care not to damage or lose the pins. Then remove the wood blocks and turn the carriage over.

(c) **Remounting Carriage:** Before remounting the carriage, clean the raceways and apply KS-7471 grease to the ball-bearing surfaces of the raceways as covered in Section 076-143-701. Start the carriage raceways in the table recesses so that they engage the associated stationary raceways and then move the carriage to its innermost position at the rear of the table. Position the ball retainer in one of the raceways so that the first three ball retainer holes are accessible through the recesses at the front of the table. Place a ball bearing in the ball retainer hole adjacent to the stationary raceway and push the ball retainer inward so that the next ball retainer hole is adjacent to the stationary raceway. Continue mounting ball bearings in the retainer in this manner until all the ball bearings have been mounted. Similarly mount the ball bearings in the other retainer. Then remount the ball retainer stops and securely tighten their mounting screws. Lock the carriage. Position the front carriage stops so that they just touch the carriage raceways and securely tighten the mounting screws. Check the requirement covering freedom of movement of carriage as covered in Section 076-143-701.

(24) With the carriage unlocked, reinsert in the card nest the blank from which the end tabs were clipped.

(25) Perform the following operations indicated for the respective tool code.

659A Tool

(a) Fully open the bypass valve.

(b) Move the carriage so that the uppermost hole on the extreme left of the template holder is directly under the pilot pin of the hole-enlarging control unit.

(c) With power on the tool, fully depress the foot pedal and hold the pedal operated.

(d) Clamp the C clamp on the pilot pin shaft adjacent to the base of the hole-enlarging control unit to hold the pilot pin fully engaged in the hole.

(e) Release the foot pedal.

659B and 659C Tools

(a) With power off the tool (carriage and power switch lock depressed), move the carriage so that the uppermost hole on the extreme left of the template holder is directly under the pilot pin of the hole-enlarging control unit.

(b) Fully depress and hold operated the plunger knob of the hole-enlarging control unit.

(c) Clamp the C clamp on the pilot pin shaft adjacent to the base of the hole-enlarging control unit to hold the pilot pin fully engaged in the hole.

(d) Release the plunger knob.

(26) Apply a length of cellophane tape to the long side of the 0.010- and 0.011-inch blades of the 74D gauge. Pull the blank as far as possible toward the front of the tool. While holding the blank in this position, place one gauge against the tabs on the bottom of the blank adjacent to the position from which a tab has been removed. Securely tape the gauge to the table top in this position. Similarly position and tape the second gauge adjacent to the position from which the other tab was removed.

(27) Apply a length of cellophane tape so that it overlaps both edges of the long side of the 0.012-inch blade of the 74D gauge leaving at least 3/8 inch of the gauge at one end free of the tape. Push the blank against the right-hand jaw and the gauges taped to the table in (26). While holding the blank in this position, carefully tape the 0.012-inch gauge to the table top with the side of its untaped end against the right edge of the center notch (guide-bar notch) in the blank. Although there should be no lateral play of the blank between the 0.012-inch gauge and the right-

hand jaw, it should be possible to lift the right end of the blank without bind.

- (28) Remove the blank from the card nest taking care not to disturb the gauges.
- (29) Using the proper size Allen wrench, remove the right-hand jaw mounting screws and slide the jaw from under the carriage arm.
- (30) Slide the replacement right-hand jaw under the carriage arm and position it so that the screw holes in the jaw are aligned with the corresponding holes in the carriage arm.
- (31) Insert the jaw mounting screws and tighten the screws friction tight.
- (32) Reinsert the blank in the card nest and position it so that it rests against the gauges as covered in (26) and (27).
- (33) While maintaining slight pressure of the blank against the gauges, carefully position the jaw against the side and bottom of the blank.
- (34) Hold the jaw firmly in position against the blank and tighten the jaw mounting screws alternately until the jaw is mounted securely. After tightening each screw, check that there is no lateral motion of the blank, that the bottom edge of the blank rests against the two gauges, and that the right side of the blank can be lifted. If these conditions are not met, loosen the jaw mounting screws and repeat (33) and (34).
- (35) Remove the blank from the card nest.
- (36) Scribe a line on the table top along each gauge with a sharp pencil. Remove the gauges.
- (37) Remove the clamp from the pilot pin shaft, allowing the pilot pin to release.
- (38) Reinsert the blank in the card nest and set the tool for tab clipping.
- (39) Move the carriage to the left and manually push the stylus of the tab-clipping control unit into the notch corresponding to the tab which is adjacent to the clipped tab on the extreme right of the blank. The tab should be positioned over the die hole as noted in (3). If the tab is appreciably off from this position,

the jaw is improperly positioned. In this case, release the stylus, tape the gauges back in position along the scribed lines, loosen the jaw mounting screws until they are friction tight, and reposition the jaw as covered in (32) through (39).

- (40) Release the stylus. Position the carriage so the stylus is aligned with the notch corresponding to the clipped tab.
- (41) Manually operate the stylus. The edge of the clipped tab should be aligned with the edge of the die, with the blank pulled to the front of the card nest.
- (42) On 659A tools, close the bypass valve. On 659B and 659C tools, turn power on the tool.
- (43) Push the blank to the rear of the card nest and clip the tabs adjacent to the positions from which tabs were previously clipped. All the clipped edges should be in alignment. Check part (b) of the requirement covering performance of tab-clipping punch in Section 076-143-701. If the requirement is not met, tape the gauges back in position, loosen the jaw mounting screws until they are friction tight, and reposition the jaw as covered in (32) through (41).
- (44) To replace the left-hand jaw, repeat (25) through (43) with the pilot pin inserted in the uppermost hole on the extreme left of the right group of template holes, reversing the lateral directions given above.
- (45) After both jaws have been mounted and properly positioned with respect to the tabs, check the requirement covering position of blank in card nest in Section 076-143-701. If the requirement is not met, adjust the pilot pin as covered in the adjusting procedures for the requirement.

3.60 Card Jaw Discs

- (1) Unlock the carriage and move it against the front carriage stops. If replacing discs on the left jaw, move the carriage to the extreme left. If replacing discs on the right jaw, move the carriage to the extreme right.
- (2) Remove the disc mounting screw using the proper size Allen wrench. When the screw is removed, the disc will drop down on the

table. Move the carriage as required to remove the disc and then return the carriage to the position from which it was moved.

(3) Place one end of a 200A blank adjacent to the jaw on which the disc is being replaced. Position the replacement disc on the blank near the edge adjacent to the jaw with the bushing of the disc facing upward. Slide the blank under the jaw until the threaded hole in the disc bushing is approximately in line with its associated hole in the jaw. Insert the disc mounting screw from the top of the jaw. Raise the disc so that its bushing enters the hole in the jaw by lifting the 200A blank and securely tighten the mounting screw. Lock the carriage.

Carriage and Power Switch Lock

3.61 Lock Cylinder: Fig. 31

(1) To replace the lock cylinder, remove the cover attached to the underside of the table below the lock using the proper size Allen wrench. Disconnect the power plug and unlock the lock. Using the R-1542 wrench, remove the Micro-Switch locknuts and stopnuts adjacent to the actuating plate of the lock. Remove the Micro Switch and allow it to hang by its leads.

(2) Move the carriage to the rear of the table so that it is clear of the lock assembly mounting screws in the top of the table. While supporting the lock assembly, remove the mounting screws using the proper size Allen wrench. Remove the lock assembly. Remove the snap rings from one end of each of the pins passing through the Micro-Switch actuating plate using the R-2975 pliers. Remove the pins. Remove the lock cylinder and actuating plate.

(3) Remove the actuating plate from the lock cylinder using the 4-inch E screwdriver. As the screw holding the lock cylinder and plate is staked, considerable initial force must be exerted to start the screw. Transfer the actuating plate to the new lock and securely tighten the screw. Stake the screw in place by applying the R-1640 center punch to the plate at one end of the screw slot and tapping the center punch with the 4-ounce riveting hammer to stake the plate in the screw slot.

(4) Assemble the parts and mount the lock assembly in the reverse order of removal. Securely tighten the mounting screws. Remount the Micro Switch. Position the Micro-Switch plunger so there is 1/8-inch clearance between the end of the plunger and the actuating plate by adjusting the locknuts and stopnuts as required. Securely tighten both stopnuts against the bracket and then tighten both locknuts. Check for the requirements covering the position of the Micro Switch and the operation of the lock in Section 076-143-701 and remount the cover.

3.62 Lock Micro Switch (D4): Fig. 31

(1) To replace the Micro Switch, remove the Micro Switch from its mounting bracket as covered in 3.61(1). Transfer the terminals with leads from this Micro Switch to the corresponding terminal positions on the new Micro Switch using the 3-inch C screwdriver to remove and tighten the terminal mounting screws. Apply a small amount of KS-6824 sealing compound around the head of each Micro-Switch terminal mounting screw with the KS-14164 brush.

(2) The new Micro Switch comes equipped with two locknuts and two stopnuts. Remove the outer locknuts and stopnuts from the plunger of the new Micro Switch using the R-1542 wrench. Insert the plunger of the Micro Switch into the hole in the mounting bracket with the stopnut on the plunger against the bracket. Mount the outer stopnuts and locknuts in the order named on the

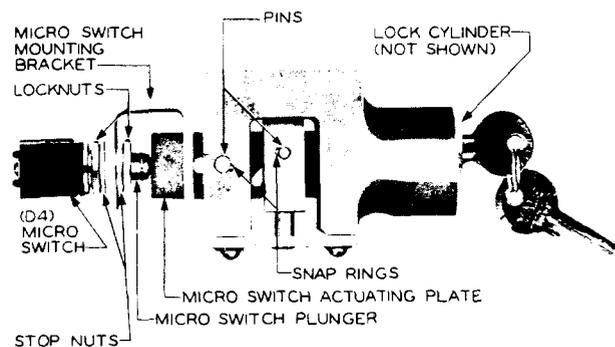


Fig. 31 - Carriage and Power Switch Lock (underside of table)

plunger. Position the Micro Switch so that there is 1/8-inch clearance between the end of the plunger and the actuating plate by adjusting the locknuts and stopnuts as required. Securely tighten both stopnuts against the bracket and then tighten both locknuts. Check for the requirement covering the position of the Micro Switch in Section 076-143-701 and remount the cover.

Parts of Selector Handle Assembly

3.63 Selector-Handle Micro Switch (D9):

Fig. 32 — To replace the (D9) Micro Switch, remove the Micro-Switch mounting screws and clamping plate using the proper size Allen wrench. Lift the cover off the Micro Switch and slide it back on the leads to obtain access to the Micro-Switch terminals. Transfer the terminals with leads from this Micro Switch to the corresponding terminal positions on the new Micro Switch using the 3-inch C screwdriver to remove and tighten the terminal screws. Apply a small amount of KS-6824 sealing compound around the head of each terminal mounting screw using the KS-14164 brush. Mount the cover on the new Micro Switch and mount the Micro Switch and clamping plate securely tightening the screws. Check the requirement covering the operation of the (D9) Micro Switch in Section 076-143-701.

3.64 Selector-Handle Micro Switch (D10):

Fig. 32

(1) To replace the (D10) Micro Switch, remove the mounting plate of the (D9) Micro Switch using the proper size Allen wrench and allow the (D9) Micro Switch and mounting plate to hang by the leads. Then remove the (D10) Micro Switch and clamping plate from the bracket using the 3-inch C screwdriver. Lift the cover off the Micro Switch and slide it back on the leads.

(2) Transfer the terminals with leads from this Micro Switch to the corresponding terminal positions on the new Micro Switch using the 3-inch C screwdriver to remove and tighten the terminal screws. Apply a small amount of KS-6824 sealing compound around the head of each terminal mounting screw using the KS-14164 brush. Mount the cover on the new (D10) Micro Switch. Mount the (D10)

Micro Switch and clamping plate on the bracket and securely tighten the screws. Remount the (D9) Micro-Switch mounting plate with the Micro Switch and securely tighten the screws. Check for the requirements covering the operation of the (D9) and (D10) Micro Switches in Section 076-143-701.

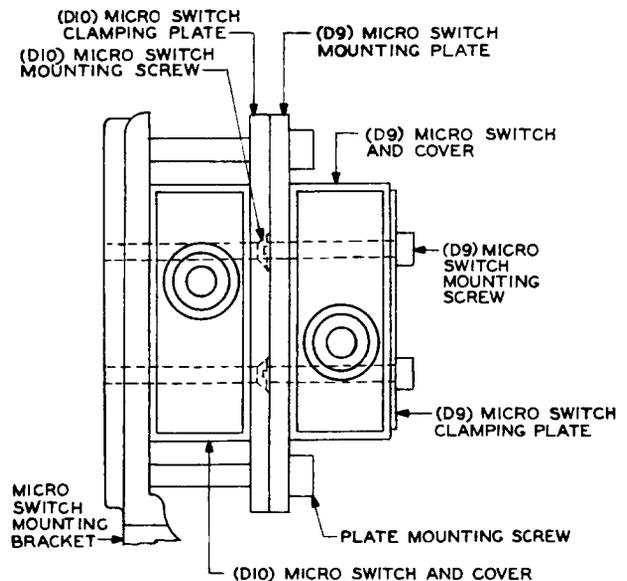


Fig. 32 — Selector-Handle Micro Switches

Parts on Control Panel

3.65 Hole-Enlarging Punch Relay (S1) and Tab-Clipping Punch Relay (S2):

Fig. 33

— To replace either of these relays, manually disengage the control panel thumbscrew and swing the panel outward to gain access to the relays. Tag and disconnect the leads to the relay to be replaced using the 3-inch C screwdriver. Remove the relay from the panel using the screwdriver. Transfer the strap wires from the terminals of both sides of the relay being replaced to the corresponding terminals of the new relay, using the 3-inch C screwdriver. Mount the new relay and securely tighten the mounting screws. Reconnect the leads and securely tighten the terminal screws. Check for the requirement covering the operation of the associated punch in Section 076-143-701. Close the panel and securely tighten the thumbscrew.

3.66 TEST-OPERATE Switch (D1) and OFF-ON Switch (D2): Fig. 33

(1) To replace either of these switches, manually disengage the control panel thumbscrew and swing the panel outward to gain access to the switches. Tag and disconnect the leads to the switch to be replaced using the 3-inch C screwdriver. Remove the switch mounting screws from the outside of the panel with the screwdriver and remove the switch. If the TEST-OPERATE switch is being replaced, transfer its strap wire to the corresponding terminals of the new switch using the 3-inch C screwdriver.

(2) Mount the switch and securely tighten the mounting screws. Reconnect the leads and securely tighten the terminal screws. Close the panel and securely tighten the thumbscrew.

(3) Unlock the tool and check that the OFF-ON switch starts and stops the motor when the switch is placed in the ON and OFF positions, respectively. Then, place the OFF-ON switch in the ON position and the TEST-OPERATE switch in the TEST position. With the tool set for hole enlarging as covered in Section 076-143-701, check that the punch will not restore as long as the foot pedal is held depressed. Failure to meet this condition is probably due to incorrect wiring or omission of the strap wire on the TEST-OPERATE switch. After correcting this condition, check for the requirement covering the operation of the hole-enlarging punch in Section 076-143-701.

3.67 Terminal Strip (TS1): Fig. 33 — To replace the terminal strip, manually disengage the control panel thumbscrew and swing the panel outward to gain access to the terminal strip. Tag and remove the leads using the 3-inch C screwdriver. Remove the terminal strip mounting screws with the screwdriver and remove the terminal strip. Substitute the new terminal strip and securely tighten the mounting screws. Reconnect the leads and securely tighten all screws. Close the panel and securely tighten the thumbscrew.

Miscellaneous Parts

3.68 Plug-On Power Cord: To replace the plug, remove the terminal insulator from the prongs of the plug. Disconnect the leads from the terminals using the 5-inch E screwdriver.

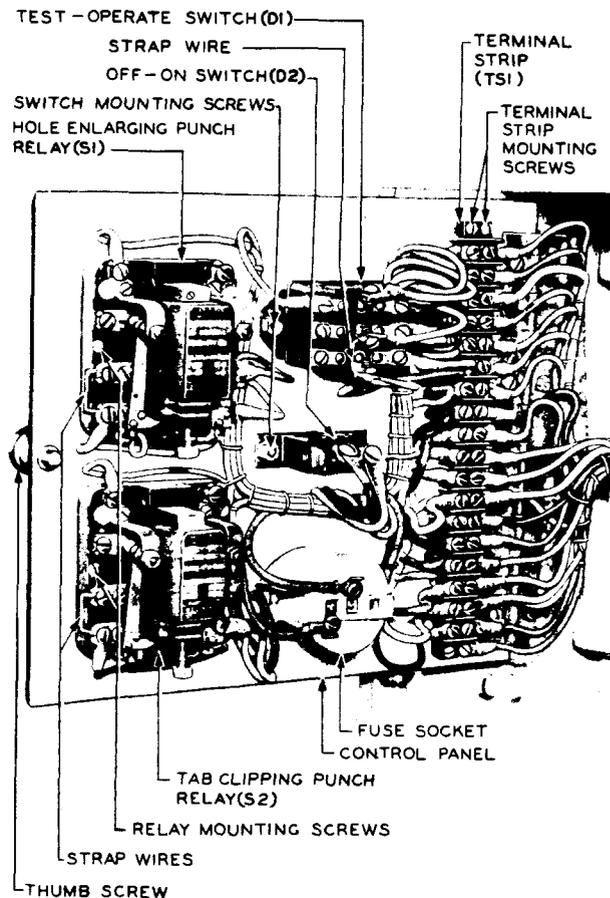


Fig. 33 — Control Panel (open position)

Loosen the cord clamping screws with the screwdriver and pull the cord out through the opening in the plug. Substitute the new plug and connect the leads as shown in Fig. 33. Securely tighten all screws and mount the terminal insulator.

3.69 Chain: To replace the chain, release the tension on the chain by loosening the idler sprocket lever clamping screw using two 245 wrenches. Then, with the 3-inch C screwdriver, spread the split end of the spring clip holding the chain connecting link shown in Fig. 34. Remove the coverplate and connecting link. Remove the chain. Mount the new chain in reverse order of removal. Check for the requirements covering chain tension and position of tab-clipping control stops in Section 076-143-701.

3.70 Micro-Switch Covers: To replace any of the Micro-Switch covers, remove the associated Micro Switch as covered in the procedures

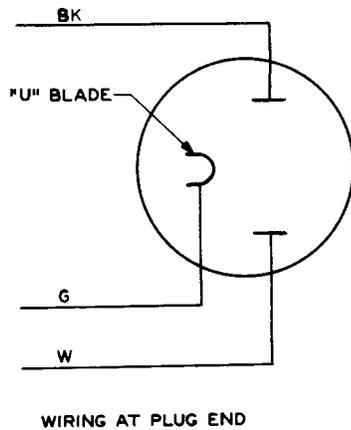


Fig. 34 – Power Plug Cap Wiring

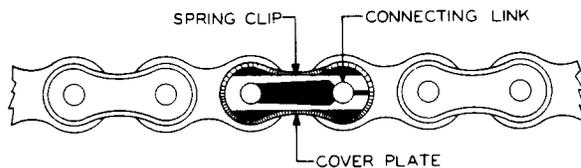


Fig. 35 – Chain (partial view showing connecting link)

for the individual switch but tag and unsolder the Micro-Switch leads instead of removing the terminals. Substitute the new cover, reconnect and solder the leads. Remount the Micro Switch in reverse order of removal. Check for the requirement covering the operation of the Micro Switch in Section 076-143-701.

3.71 Counter: To replace the counter, gain access to the counter mounting screws by removing the lower shelf of the left bin with the proper size Allen wrench. Tag the spliced connections to the counter leads. Remove the tape over the splices and unsolder the connections.

Remove the counter using the 3-inch C screwdriver. Mount the new counter on the bracket so the numerals may be read from left to right and securely tighten the mounting screws. Splice the counter leads to the tagged leads and tape each splice. Remount the shelf.

REASONS FOR REISSUE

1. To add information covering use of 660B punch and die assembly (1.03).
2. To add information covering 659D, 659E, and 659F tools (1.04 and 1.05).
3. To revise the index (2.05).
4. To revise Fig. 1, 2, 3, 4, 10, 12, and 16.
5. To omit Fig. 15 of previous issue.
6. To revise the List of Tools, Gauges, and Materials (3.01).
7. To add Fig. 18.
8. To revise the procedures for replacing punch and die assemblies (3.15).
9. To add procedures for substituting a 660B tool in place of a 660A tool (3.16).
10. To omit procedure covering replacement of pilot pin cylinder (3.41 of previous issue).
11. To revise title of procedure for replacing cylinder "O" rings (3.43).
12. To revise title of procedure for replacing selector valve (3.44).
13. To revise title of procedure for replacing selector valve spool "O" rings (3.45).
14. To revise heading over procedure for replacing hydraulic cylinder (3.48).
15. To revise Fig. 29 and 30.
16. To revise procedure for replacing card jaws (3.59).