

**659-TYPE TOOLS**  
**(FOR CODING CARDS USED WITH 1-TYPE TRANSLATOR)**  
**REQUIREMENTS AND ADJUSTING PROCEDURES**

**1. GENERAL**

**1.01** This section covers the requirements and adjusting procedures for 659-type tools. These tools are used for enlarging rectangular holes and clipping tabs from blanks to obtain coded cards for use in the 1-type translator in the No. 4A and 4M toll switching systems.

**1.02** This section is reissued to revise figures and add requirements and adjusting procedures for the 659D, 659E, and 659F tools. It is also reissued to revise the requirement covering performance of tab-clipping punch. Detailed reasons for reissue will be found at the end of the section. Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

**1.03** The 659A and 659B tools are similar except that 659A tools are equipped with foot-pedal control whereas 659B tools have hand-operated control. 659C tools are modified 659A tools which were recoded after conversion from foot control to hand control in accordance with procedures covered in Section 076-143-802. The 659A, 659B, and 659C tools are similar to 659D, 659E, and 659F tools, respectively, except for a difference in wiring and in that the former three tools are equipped with the 660A tool (punch and die assembly) and the latter three are equipped with the 660B tool.

**1.04** Reference shall be made to Section 020-010-711 covering general requirements and definitions for additional information necessary for the proper application of the requirements listed herein.

**1.05** Reference shall be made to Section 034-700-812 for the methods of inserting a blank in the card nest, enlarging holes, and clipping tabs from a blank and checking the blank for burrs, when necessary, in connection with checking requirements listed herein.

*Caution: Do not attempt to clip tabs or punch holes on more than one blank at a time or life of punch and die assembly will be shortened.*

**1.06** Unless otherwise specified, the requirements shall be checked with power on the tool and the tool unlocked. After completing maintenance work, the selector handle shall be in its extreme left position and the tool locked. For locking, the carriage is positioned at the front of the table with the hole in the carriage locking plate in line with the locking pin and the lock cylinder depressed.

**1.07** The covers and punch guard shall be kept in place on the tool except when necessary to remove them for maintenance reasons. Procedures for removing and remounting the covers and punch guard are given in Part 3.

**1.08** *Socket head screws* on apparatus covered in this section shall be loosened and tightened with Allen socket screw wrenches of the proper size as listed in 3.001.

**1.09** After making any adjustments on the tool, it is recommended that several holes in a blank be enlarged and several tabs clipped off and the blank checked for burrs, as covered in Section 034-700-812, to insure that the tool is functioning properly.

**1.10** *The tool is set for enlarging* rectangular holes when the selector handle is at its extreme left position and the carriage is unlocked. This setting permits the carriage to move freely within the limits of its stops.

**1.11** *The tool is set for clipping* tabs when the carriage is unlocked and moved to its innermost position at the rear of the table with the selector handle at its extreme right position. This setting raises the stylus to its uppermost position and permits the carriage to move only in a lateral direction.

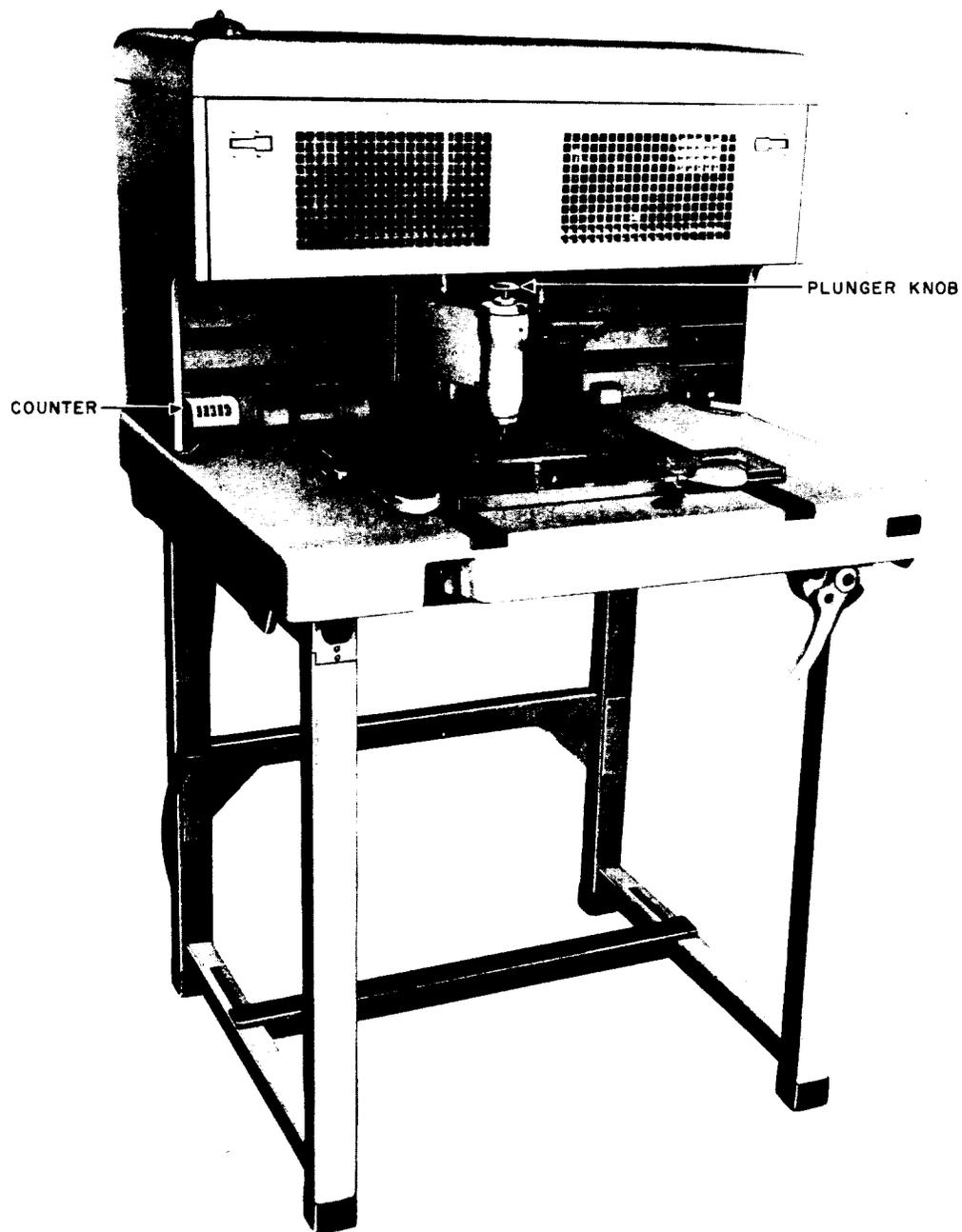


Fig. 1 - 659B, 659C, 659E, and 659F Tools

**1.12 Preparation of KS-16832 L2 Lubricant:**

This lubricant is provided in 2-ounce and 1-pint containers. A small wide-mouth container, such as the 2-ounce jar in which the lubricant is available, should be used as a receptacle from which to dispense the lubricant. If allowed to stand more than 1 day without agitation, the lubricant ingredients tend to separate; therefore, before each day's use, shake the container of lubricant for approximately 30 seconds to insure

mixing of the ingredients. The proper method of shaking the lubricant consists of repeated, rapid turning of the container to an upside down position and back to the upright position. If the lubricant from a 1-pint container is to be used, the lubricant must be mixed as just described before it is poured into the smaller container. Under storage conditions, the cover should be tight on the container.

**1.13** *One drop of KS-7470 oil* for the purpose of this section is obtained when the adjustable stop collar of the KS-14796 oiler is set for the discharge of this quantity from the nozzle when the plunger is depressed and released once.

**1.14** *One dip of KS-7470 oil* for the purpose of this section is the amount of oil deposited on the surface of a part after being brushed with the KS-14164 brush which has been dipped into the oil to a depth of 3/8 inch and scraped lightly against the side of the container as the brush is removed.

*Note:* This definition does not apply to requirement 2.02(a)(4). The procedure for applying a film of oil to the holes, notches, and top surface of the template holder is covered in 3.02(8).

**1.15** The following index lists the items covered in Parts 2 and 4 of this section. Part 3 is not covered in the index as the items in Part 3 are the procedures corresponding to the individual requirements of Part 2.

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SECTION 076-143-701

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**2. REQUIREMENTS**

**GENERAL REQUIREMENTS**

**2.01 Cleaning**

- (a) The tool shall be cleaned, when necessary, in accordance with approved procedures.
- (b) **Before Tool Is Placed in Operation After Storage or Shipment Only:** The holes, notches, and top surface of the template holder shall be cleaned in accordance with approved procedures.

**2.02 Lubrication:** The following parts shall be lubricated as specified below.

- (a) **KS-7470 Oil:** The following parts shall be adequately lubricated with KS-7470 oil. When lubrication is necessary, the oil shall be applied as follows.

**Motor**

- (1) Ten drops to each of the two cups.

**Punches and Dies**

- (2) Three drops to the upper surface of the punch plunger where it enters the bearing [Fig. 2(A)].

**Carriage**

- (3) Two drops to each track of the four ball-bearing raceways [Fig. 2(B)].
- (4) **Just Prior to Storage or Shipment of Tool Only:** A film on the surface of the template holder and the surface of each hole and notch in the holder [Fig. 2(C)].

**Tab-Clipping Control Unit**

- (5) Four drops on the coupling shaft front bearing, two drops on each side of the bearing [Fig. 3(A)].
- (6) Four drops on the coupling shaft rear bearing, two drops on each side of the bearing [Fig. 3(B)].
- (7) Four drops on the stylus support front bearing, two drops on each side of the bearing [Fig. 3(C)].
- (8) Four drops on the stylus support rear bearing, two drops on each side of the bearing [Fig. 4(A)].
- (9) **659A, 659C, 659D, and 659F Tools:** One drop on each of the coupling pins (three) where they make contact with the pin plate [Fig. 3(D)].
- (10) Four drops on the carriage restraining pin gear shaft bearing, two drops on each side of the bearing [Fig. 3(E)].
- (11) Four drops on the stylus gear bearing, two drops on each side of bearing [Fig. 3(F) and Fig. 4(B)].
- (12) Four drops on the carriage restraining pin rack, one drop on each side of rack [Fig. 4(C)].
- (13) **659A, 659C, 659D, and 659F Tools:** One dip distributed over the rubbing surfaces of the selector valve rack on both sides of the mounting [Fig. 3(G)].
- (14) One dip distributed evenly over the rubbing surfaces of the stylus rack [Fig. 4(D)].

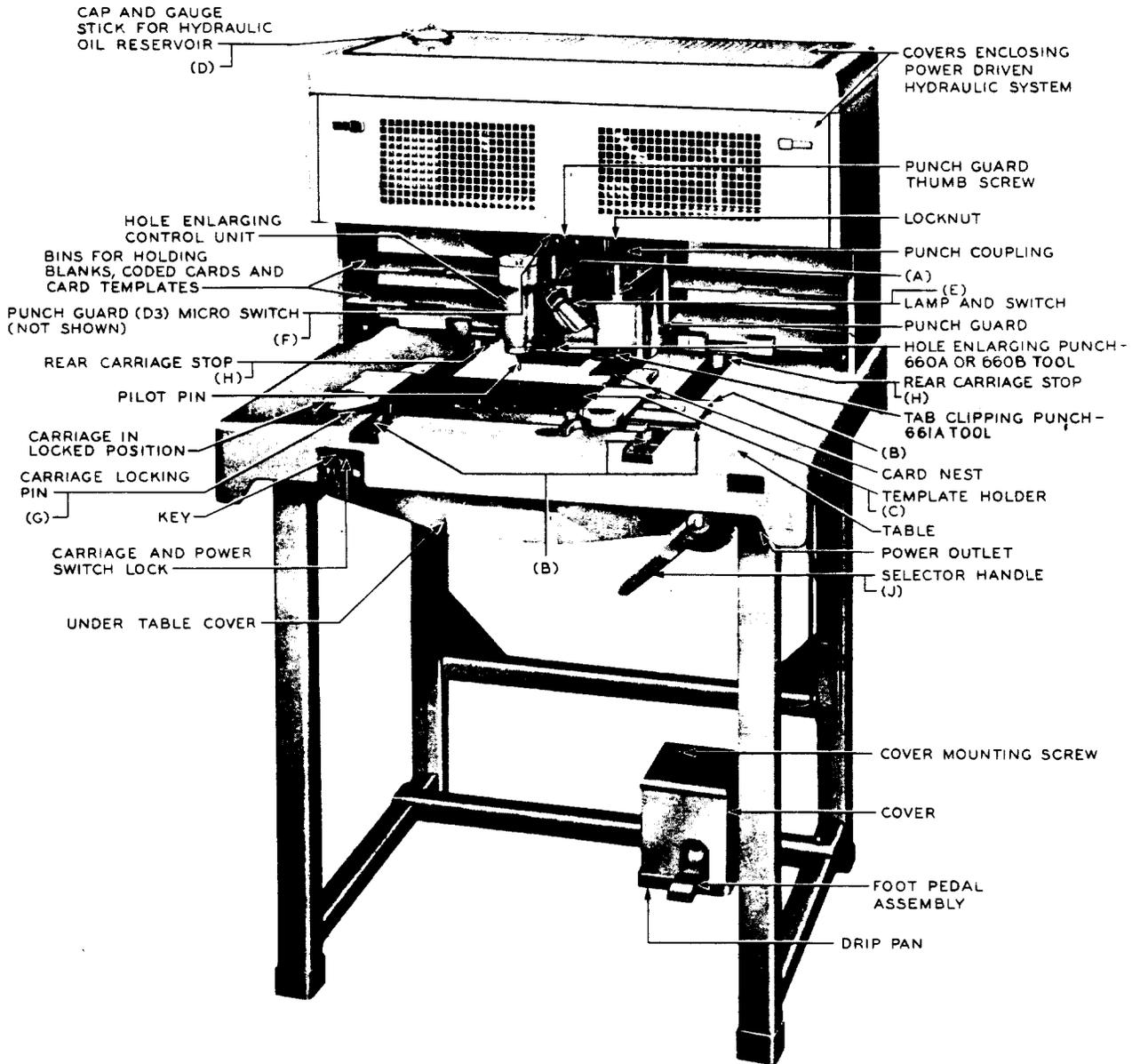


Fig. 2 - 659A and 659D Tools (front view)

(15) One drop near each end of both rails between the rails and the stylus plate [Fig. 5(A)].

(16) One dip distributed evenly over the rubbing surfaces of the stylus holder [Fig. 5(B)] and carriage restraining pin [Fig. 5(C)].

#### Selector Handle

(17) Four drops to the oil hole to front bearing of shaft [Fig. 6(A)].

(18) Four drops to rear bearing of shaft where shaft enters bearing [Fig. 6(B)].

(19) One dip distributed evenly over the rubbing surfaces of the detent collar [Fig. 6(C)].

(20) Two drops to the oil hole to the idler sprocket bearing [Fig. 6(D)].

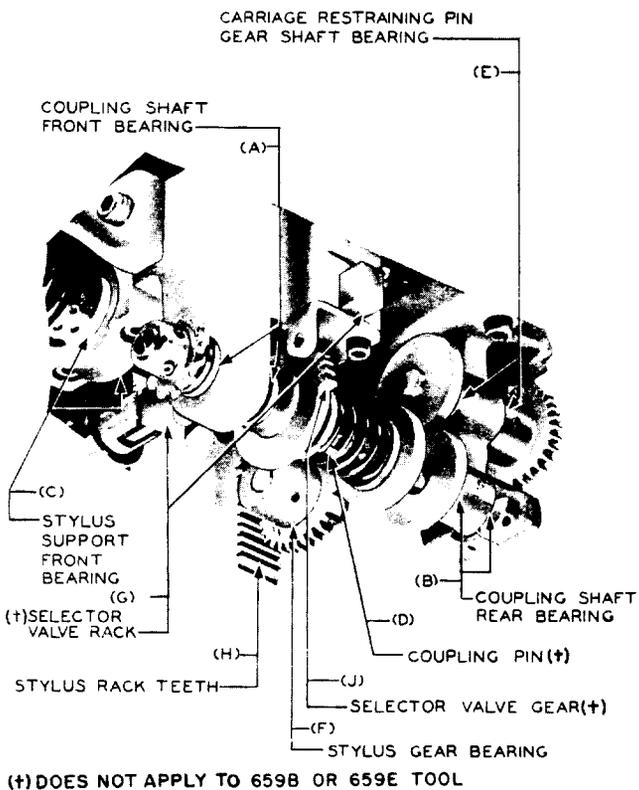
**Hole-Enlarging Control Unit****(21) 659B, 659C, 659E, and 659F Tools:**

One dip distributed evenly over the accessible surface of the pilot pin shaft above the guide nut [Fig. 7(A)] and the rubbing surface of the plunger [Fig. 7(B)].

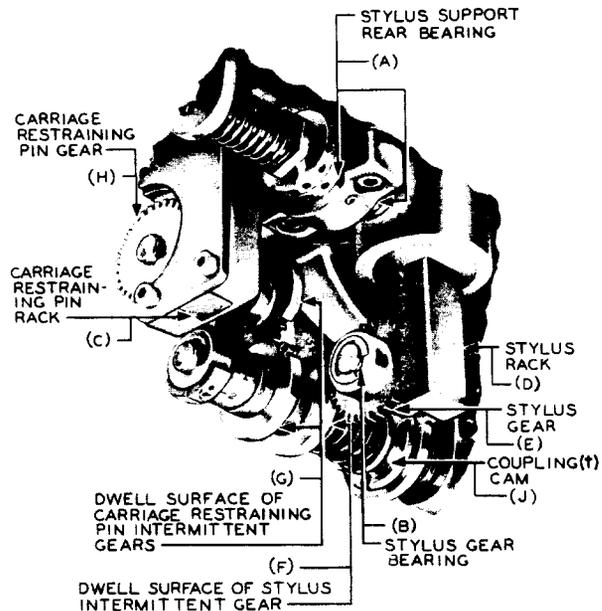
(b) **KS-7471 Grease:** The following parts shall be adequately lubricated with KS-7471 grease. When lubrication is necessary, the grease shall be applied as follows.

**Tab-Clipping Control Unit**

- (1) A film distributed evenly over the teeth of the stylus rack [Fig. 3(H)].
- (2) A film distributed evenly over the teeth of the stylus gear [Fig. 4(E)].
- (3) A film distributed evenly over the teeth and dwell surface of the stylus intermittent gear [Fig. 4(F)].
- (4) A film distributed evenly over the teeth and dwell surface of the carriage restraining pin intermittent gears [Fig. 4(G)].



**Fig. 3 - Lubrication Points - Tab-Clipping Control Unit - Chain Removed (partial view from below right front of table)**



(+) DOES NOT APPLY TO 659B OR 659E TOOL

**Fig. 4 - Lubrication Points - Tab-Clipping Control Unit (partial view from below right rear of table)**

- (5) A film distributed evenly over the teeth of the carriage restraining pin gear [Fig. 4(H)].
- (6) **659A, 659C, 659D, and 659F Tools:** A film distributed evenly over the teeth of the selector valve gear [Fig. 3(J)].

**Selector Handle**

- (7) A film distributed evenly over the teeth of the idler sprocket [Fig. 6(E)].
  - (8) A film distributed evenly over the teeth of the chain sprocket [Fig. 6(F)].
- (c) **KS-16832 L2 Lubricant:** The following parts shall be adequately lubricated with KS-16832 L2 lubricant. When lubrication is necessary, the lubricant shall be applied as follows.

**Tab-Clipping Control Unit**

- (1) **659A, 659C, 659D, and 659F Tools:** A film distributed evenly over the abutting surfaces of the coupling cam [Fig. 4(J)].
- (d) **Recommended Lubrication Interval:** After turnover, it is recommended that the parts listed in requirements (a), (b), and (c) be

lubricated semiannually. These intervals may be extended if periodic inspections have indicated that local conditions are such as to insure that the requirements will be met during the extended interval.

**2.03 Record of Lubrication:** During the period of installation, a record shall be kept by date of lubrication of the 659-type tool and this record shall be turned over to the telephone company with the equipment. When no lubrication has been done, the record shall so state.

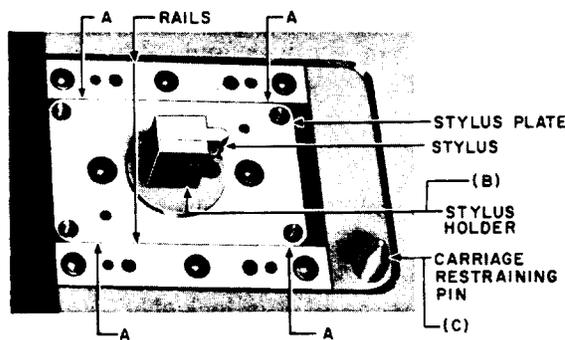


Fig. 5 - Stylus (raised position with coverplate removed)

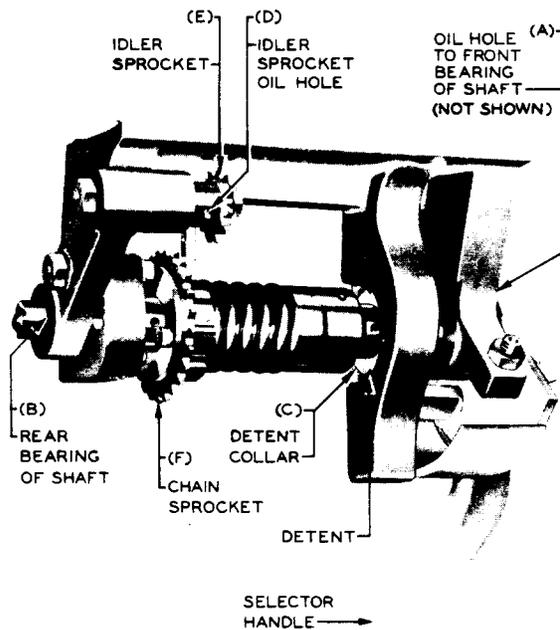


Fig. 6 - Lubrication Points - Selector Handle - Chain Removed

**2.04 Reservoir Oil Level:** Fig. 2(D) - The oil in the reservoir shall touch the bottom of the gauge stick attached to the filler cap cover but shall not be above the gauge hole in the stick.

Gauge by eye.

**2.05 Freedom of Parts From Oil**

**All Tools**

(a) There shall be no oil on the table, upper surface of the carriage, punch and die surfaces, and bins.

Gauge by eye and feel.

(b) There shall be no leakage from any part of the power-driven hydraulic system which will cause an appreciable amount of oil to collect on the shelf of the power-driven hydraulic system.

Gauge by eye and feel.

**659A and 659D Tools**

(c) There shall be no leakage from any part of the foot-pedal hydraulic system which will cause an appreciable amount of oil to collect on the foot-pedal assembly drip pan or undertable cover.

Gauge by eye.

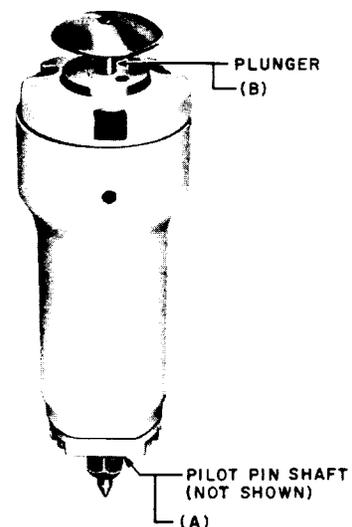


Fig. 7 - Hole-Enlarging Control Unit - 659B, 659C, 659E, and 659F Tools

**2.06 Positioning of Tool:** When the tool is placed in the position where it is to be used, the carriage shall not roll from any position in which it is placed when downward pressure is exerted on each corner of the table in turn.

Gauge by eye.

**2.07 Lamp Operation:** Fig. 2(E) — With the lock unlocked, the lamp shall light and be extinguished by operation of its associated switch.

Gauge by eye.

**2.08 Operation of Punch Guard (D3) Micro Switch With Respect to Punch Guard:**

Fig. 2(F) — The Micro Switch contacts shall open when the punch guard thumbscrew is disengaged and shall close when the thumbscrew is fully engaged to hold the guard securely in position.

Gauge by ear.

To check, disengage and engage the punch guard thumbscrew and listen for the clicks in the Micro Switch.

**2.09 Chain Tension:** Fig. 8(A) — The chain shall not deflect downward more than 3/8 inch under finger pressure applied to the lower portion of the chain midway between the sprockets.

Gauge by eye and feel.

#### CARRIAGE AND POWER SWITCH LOCK

**2.10 Operation of Lock:** Fig. 2(G) — With the lock cylinder depressed to its innermost position, the locking pin shall extend above the top of the carriage locking plate and, with the lock cylinder in its outermost position, the top of the locking pin shall be underflush with the top of the table.

Gauge by eye.

**2.11 Position of (D4) Micro Switch:** Fig. 8(B) — The Micro Switch shall start the motor when the lock is unlocked and shall stop the motor when the lock is locked.

Gauge by ear.

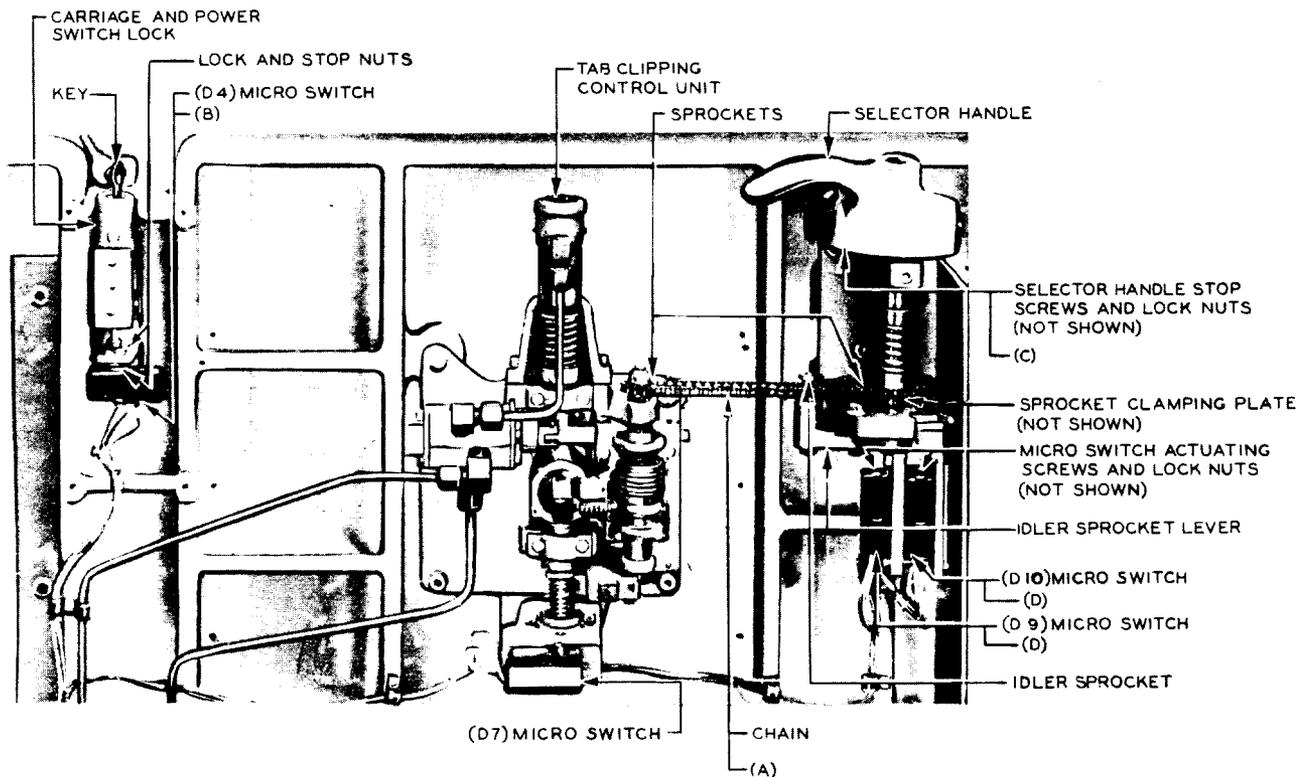


Fig. 8 — 659A and 659D Tools (partial view of front underside of table)

**CARRIAGE**

**2.12 Freedom of Movement of Carriage:** With the tool set for hole enlarging, the carriage shall move freely in any direction within the limit of its stops.

Gauge by eye and feel.

**2.13 Position of Rear Carriage Stops:** Fig. 2(H) — With the carriage in the tab-clipping position, the clearance between the rear stops and their associated rails shall be

1/32 inch

Gauge by eye using the R-2965 adjustable mirror.

**2.14 Position of Card Nest:** (Fig. 9A)

(a) **659A, 659B, and 659C Tools:** As the hole-enlarging punch is slowly moved downward to its fully operated position, the sides of the blank shall not bind in the card nest. This requirement is considered met if:

(1) During the downward movement of the punch, the corners of the blank can be raised with no more than slight rubbing on the card nest. If there is more than slight rubbing, the requirement is not met and this condition should be corrected before checking (2).

(2) At the fully operated position of the punch, the corners of the blank can be raised with no more than slight rubbing and the blank does not lift from the nest during restoral of the punch.

Gauge by eye and feel.

To check, place the TEST-OPERATE switch on the control panel in the TEST position. Fully open the bypass valve (Fig. 20). Set the tool for hole enlarging. Remove the gate, if provided, from the card nest using an Allen wrench. Place a blank in the card nest. Move the carriage to align any one of the holes in the template holder with the pilot pin. On 659A tools, fully depress the foot pedal; on 659B and 659C tools, fully depress the plunger knob. Then, while holding the pedal or knob depressed, slowly close the bypass valve and, at several points during the downward movement of the punch, stop closing the valve and check for bind by attempting to raise the corners of the blank. If the blank binds in the nest at any point

in the downward movement of the punch, do not allow the punch to move further downward. If there is no more than slight rubbing of the blank in the card nest when the punch is in its fully operated position, fully close the bypass valve and place the TEST-OPERATE switch in the OPERATE position. Then, enlarge several holes near each corner of the blank, noting if the blank lifts from the card nest during restoral of the punch in each case.

(b) **659D, 659E, and 659F Tools:** The position of the card nest shall be such that when any hole in a card is enlarged:

(1) The height of the enlarged portion of the hole shall be

Min 0.312 inch

Use the shank of the 5/16-inch drill.

(2) The cut sides of the enlarged hole shall be within 0.015 inch of the precut sides.

Gauge by eye.

To check, insert the control pilot pin into a hole near the upper left corner of the template holder just sufficiently to engage the maximum diameter of the pilot pin. Manually position a card in the upper left corner of the card nest and, after removing the hand from the card, enlarge a hole by slowly completing the pilot pin engagement to operate the punch. Then, likewise enlarge a hole near the upper right corner of the card with the card in the upper right corner of the card nest.

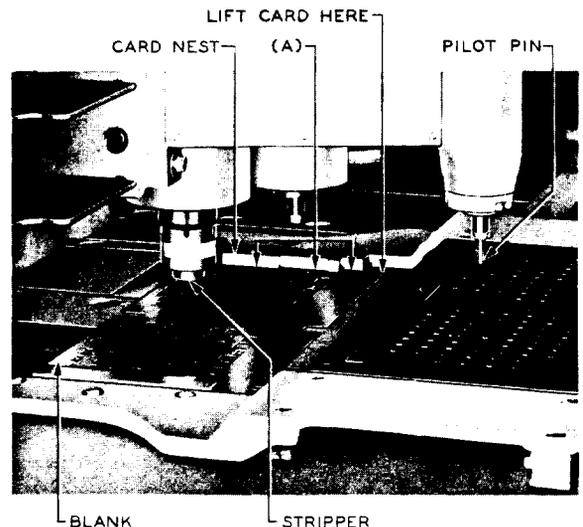


Fig. 9 — Clearance Between Blank and Card Nest

**SELECTOR HANDLE**

**2.15 Selector Handle Stops:** Fig. 8(C) — With the tool set for hole enlarging and tab clipping, respectively, there shall be perceptible clearance between the handle stop and the associated stop screw in each position of the handle. Gauge by eye using the P-220366 dental mirror and KS-14250 L1 flashlight.

**2.16 Selector Handle Movement:** Fig. 2(J) — The force required to move the selector handle from either the hole-enlarging or tab-clipping position applied to the handle 5 inches from the center of the handle shaft shall be

Max 6000 grams

Use the 79F gauge equipped with P-10A878 finger and R-8550 scale.

**2.17 Operation of (D9 and D10) Micro Switches With Respect to Selector Handle:** Fig. 8(D) — The (D10) Micro Switch shall operate just before the selector handle reaches the hole-enlarging position and the (D9) Micro Switch shall operate just before the handle reaches the tab-clipping position.

Gauge by ear.

To check, set the tool for tab clipping. Then slowly move the selector handle to the hole-enlarging position and back to the tab-clipping position. Note the click of the Micro Switches as they close just before the selector handle reaches the respective positions and the click as the Micro Switches open just after the selector handle leaves these positions.

**HOLE-ENLARGING CONTROL UNIT**

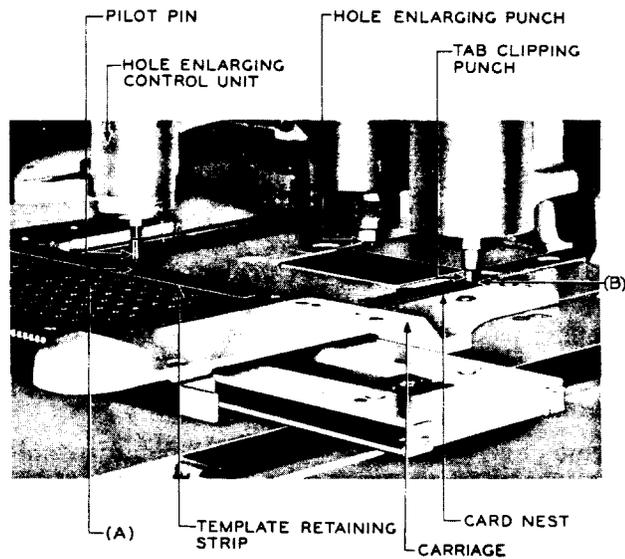
**2.18 Clearance Between Pilot Pin and Carriage:** Fig. 10(A) — With the pilot pin in its unoperated position, there shall be a clearance between the pilot pin and template retaining strip of

Min 0.010 inch

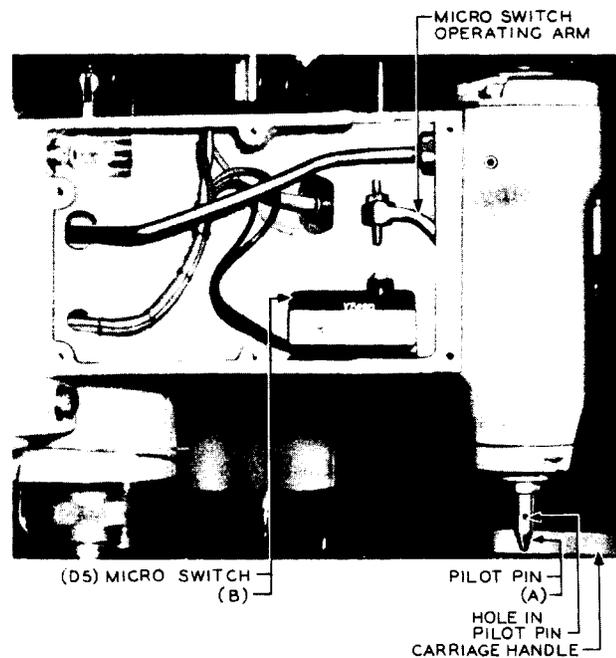
Gauge by eye.

**2.19 Pilot Pin Travel****659A or 659D Tools**

(a) Fig. 11(A) — With the tool set for hole enlarging, the pilot pin shall rest against the downstop when the foot pedal is fully



**Fig. 10 — Clearance Between Pilot Pin, Tab-Clipping Punch, and Carriage**



**Fig. 11 — Hole-Enlarging Control Unit — 659A and 659D Tools (cover removed)**

depressed and, when the foot pedal is released, the pilot pin shall return to its unoperated position without hesitation.

Gauge by eye and feel.

To check, place the OFF-ON switch on the control panel in the OFF position. Position the

carriage clear of the pilot pin and depress the foot pedal. When the pilot pin comes to rest, continue holding the foot pedal fully depressed and check that there is no further downward movement of the pilot pin by pulling downward on the pin. Release the foot pedal. When the pilot pin comes to rest after moving upward, check that it cannot be moved further upward by pushing upward on the pin.

(b) With the carriage locked and power removed from the tool, there shall be no movement of the pilot pin when the foot pedal is held depressed for approximately 1 minute. Gauge by eye.

#### 659B, 659C, 659E, and 659F Tools

(c) When the plunger knob is released after manual operation, it shall restore freely to its unoperated position.

Gauge by eye.

To check, place the OFF-ON switch on the control panel in the OFF position. Position the carriage clear of the pilot pin. Then operate and release the plunger knob. When the pilot pin comes to rest after moving upward, check that it cannot be moved further upward by pushing upward on the pin.

**2.20 Operation of (D5) Micro Switch With Respect to Pilot Pin:** Fig. 11(B) — The Micro Switch shall operate when the bottom of the hole in the pilot pin is above the template holder

Min 0.020 inch

Max 0.040 inch

Use the 131A gauge.

To check, place the OFF-ON switch on the control panel in the OFF position. Then, insert the 0.062-inch drill rod in the hole in the pilot pin. Set the tool for hole enlarging and move the carriage so that a hole in the template holder is aligned with the pilot pin. Place the 0.020-inch blade of the 131A gauge on the template holder below the drill rod and clear of the hole in the template holder under the pilot pin. Depress the foot pedal or plunger knob and listen for a click in the Micro Switch. Release the foot pedal or plunger knob and repeat the check with the 0.040-inch blade of the 131A gauge, checking that the switch does not click.

## HOLE-ENLARGING PUNCH

**2.21 Position of Hole-Enlarging Punch Stripper** (all 659-type tools): Fig. 12(A) — With the hole-enlarging punch in its unoperated position, the bottom surface of the stripper shall be overflush with respect to the cutting edges of the punch

0.010 inch

Gauge by eye using the R-2965 mirror.

**2.22 Position of Hole-Enlarging Punch Pilot** (659A, 659B, and 659C tools only): Fig. 12(B) — The shoulder of the hole-enlarging punch pilot shall rest against the punch.

Gauge by eye.

Make the check from the rear of the tool using the R-2965 mirror and KS-14250 L1 flashlight.

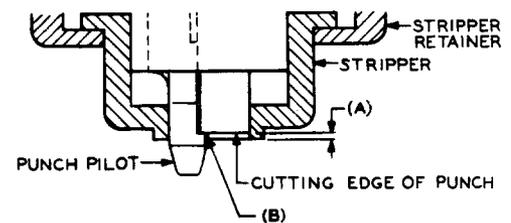


Fig. 12 — Position of Hole-Enlarging Punch Stripper and Pilot (660A tool shown)

**2.23 Clearance Between Hole-Enlarging Punch Stripper Retainer and Card Nest:** Fig. 13(A) — When the hole-enlarging punch is fully operated, the stripper retainer shall not touch the card nest.

Gauge by eye.

To check, place the TEST-OPERATE switch on the control panel in the TEST position. Enlarge a rectangular hole in a blank, adjacent to one side of the card nest, and make the check while holding the foot pedal or plunger knob depressed. Repeat the check at the other side of the card nest.

**2.24 Operation of Hole-Enlarging Punch:** Fig. 14(A)

(a) **All 659-Type Tools:** The hole-enlarging punch, when fully operated, shall penetrate the die block

Max 0.015 inch

Gauge by eye.

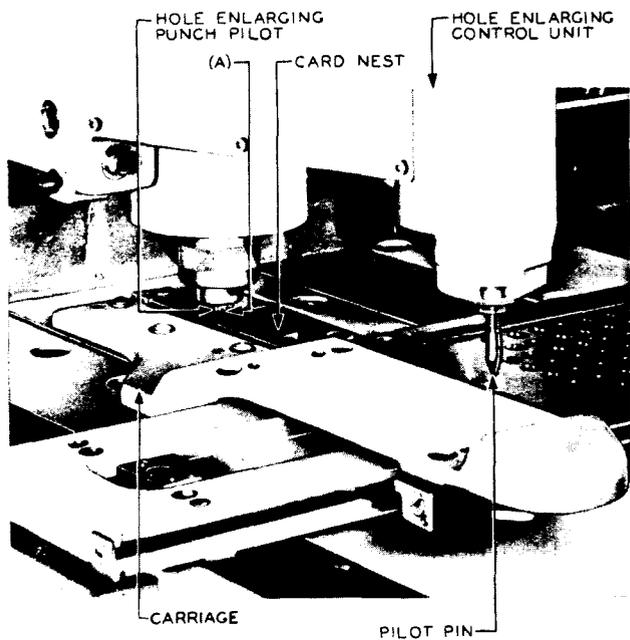


Fig. 13 - Clearance Between Hole-Enlarging Punch Stripper Retainer and Card Nest

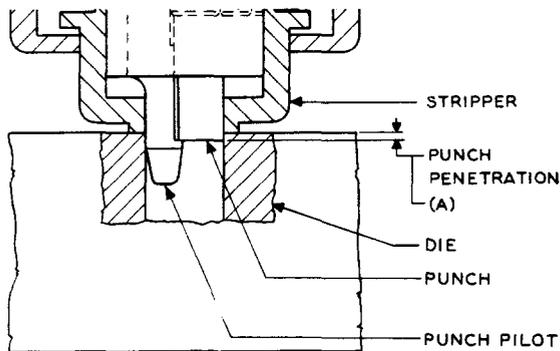


Fig. 14 - Punch Penetration - Hole-Enlarging Punch (660A tool shown)

To check, enlarge a rectangular hole in a blank. The slug punched out will remain in the die. Check the punch penetration by observing the distance that the surface of the slug is below the surface of the die block.

(b) **659A, 659B, and 659C Tools:** While the foot pedal or plunger knob is held depressed, the punch shall restore to its unoperated position without hesitation.

Gauge by eye.

(c) **659D, 659E, and 659F Tools:** When the foot pedal or plunger knob is released, the punch shall restore to its unoperated position without hesitation.

Gauge by eye.

**2.25 Performance of Hole-Enlarging Punch and Die:** Burrs, if any, resulting from hole enlarging shall be only on the underside of the card and shall be

Max 0.003 inch

To check, enlarge several holes in a blank and check for burrs as covered in Section 034-700-812.

**TAB-CLIPPING CONTROL UNIT**

**2.26 Positioning of Stylus: 659A and 659D Tools** — Fig. 15(A) — With the stylus engaged in each end notch in the template holder in turn and the foot pedal held fully depressed, the clearance between the forward stopnut and adjacent surface of the bearing support shall be

Min 0.003 inch

Use the 74D gauge.

To check, place the OFF-ON switch on the control panel in the OFF position.

**2.27 Operation of Stylus**

**659A and 659D Tools**

(a) Fig. 16(A) — With the tool set for tab clipping, the stylus shall fully engage a selected notch in the template holder when the foot pedal is fully depressed and the stylus shall return to its unoperated position when the foot pedal is released.

Gauge by eye.

**659B, 659C, 659E, and 659F Tools**

(b) With the tool set for tab clipping, the stylus shall fully engage a selected notch in the template holder when manually pushed forward and, when the stylus is released after manual operation, it shall restore freely to its unoperated position.

Gauge by eye.

To check, place the OFF-ON switch on the control panel in the OFF position.

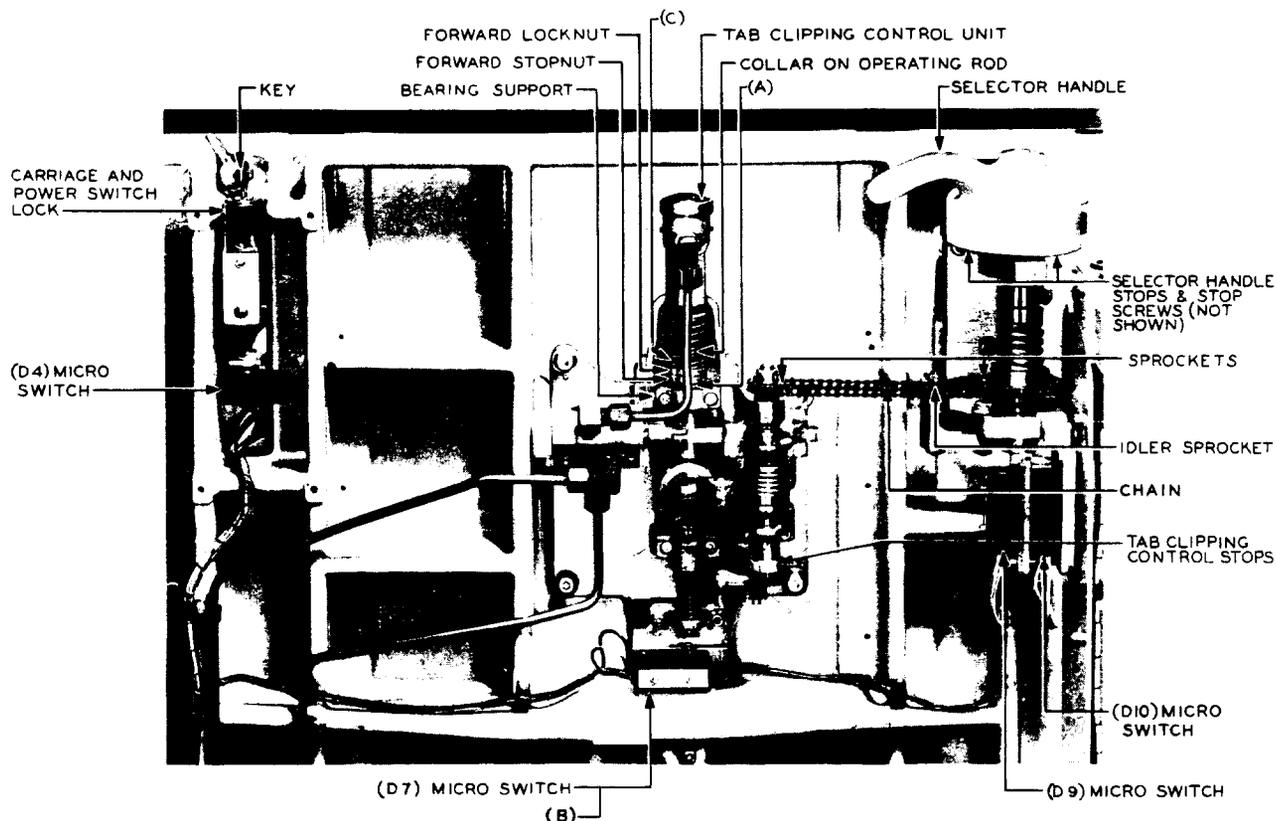


Fig. 15 - 659A and 659D Tools (partial view of front underside of tool)

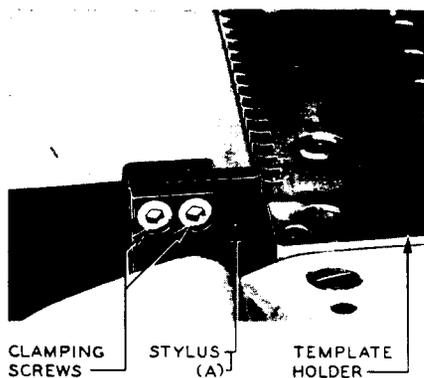


Fig. 16 - Tab-Clipping Control Unit Stylus — Elevated Position

**2.28 Operation of (D7) Micro Switch With Respect to Stylus — Fig. 15(B)**

**659A and 659D Tools**

(a) With the tool set for tab clipping, the tab-clipping control Micro Switch shall not operate when the stylus is manually pushed to fully engage a notch in the template holder.

Gauge by ear that the Micro Switch does not click.

(b) Fig. 15(C) — With the foot pedal depressed and the stylus fully engaged in a notch of the template holder, the Micro Switch shall operate when the gap between the collar on the operating rod and the adjacent surface of the forward stopnut and locknut mounting is

Min 0.010 inch

Use the 74D gauge.

To check, place the OFF-ON switch on the control panel in the OFF position. Insert the 0.010-inch blade of the 74D gauge between coils of the spring and between the collar and adjacent surface of the forward stopnut and locknut mounting. If necessary, turn the spring to permit easier insertion of the gauge. Depress the foot pedal and listen for the click of the Micro Switch.

**659B, 659C, 659E, and 659F Tools**

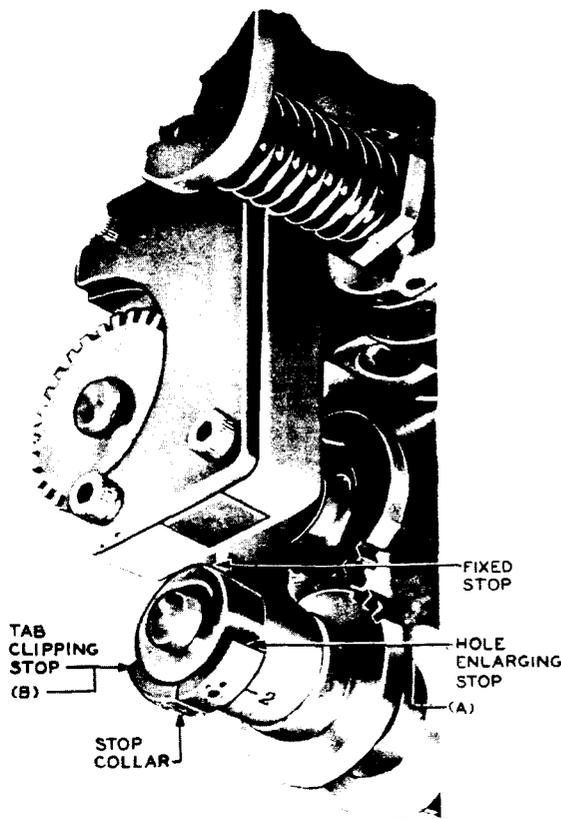
(c) With the tool set for tab clipping, the tab-clipping control Micro Switch shall operate when the stylus is

- Min 0.010 inch
- Max 0.020 inch

from full engagement with either of the two extreme notches in the template holder.

Use the 131A gauge.

To check, place the OFF-ON switch on the control panel in the OFF position. Move the carriage so that one of the extreme notches in the template holder is in line with the stylus. Place the 0.010-inch blade of the 131A gauge against one side of this notch. Manually push the stylus into the notch so that the stylus touches the gauge and the other side of the notch and listen for a click in the Micro Switch. Release the stylus and repeat the check with the 0.020-inch blade of the 131A gauge, checking that the Micro Switch does not click.



**Fig. 17 – Tab-Clipping Control Unit With Selector Handle in Approximately Midposition (partial view from below right rear of table)**

**2.29 Position of Tab-Clipping Control Stops:**

Fig. 17(A) and (B) — When the selector handle is held against its stops in the hole-enlarging and tab-clipping positions, respectively, the clearances at the corresponding stops of the tab-clipping control shall be

- Min 0.005 inch

Use the 92T gauge.

To check, set the tool for hole enlarging. Then move the selector handle further until it touches the stop and make the check. Repeat the check with the selector handle against its stop in the tab-clipping position.

**TAB-CLIPPING PUNCH**

**2.30 Clearance Between Tab-Clipping Punch and Carriage:** Fig. 10(B) — With the tab-clipping punch in the unoperated position and with the carriage in any position below the punch, there shall be a clearance between the punch and carriage of

- Min 1/32 inch

Gauge by eye.

To check, set the tool for hole enlarging and move the carriage in all directions beneath the tab-clipping punch.

**2.31 Operation of Tab-Clipping Punch:** The tab-clipping punch, when fully operated, shall clip a tab from the blank and the punch shall restore to its unoperated position without withdrawing the tab from the die when the foot pedal is held depressed or the stylus is manually held in a notch in the template.

Gauge by eye.

**2.32 Performance of Tab-Clipping Punch**

- (a) Burrs, if any, resulting from tab clipping shall be only on the undersurface of the card and shall be

- Max 0.003 inch

To check, clip several tabs from a blank and check for burrs as covered in Section 034-700-812.

(b) The tab-clipping punch shall clip tabs evenly from the 200A blank, and the length of clipped tabs as measured from the bottom edges of the unclipped tabs shall be

Min — 0.178 inch

Max — Not more than length of unclipped tab

Use the 173A gauge.

#### POWER-DRIVEN HYDRAULIC SYSTEM

**2.33 Hydraulic Pressure:** Fig. 18(A) — When either punch is operated, the oil pressure delivered by the power-driven hydraulic system shall be

Min 330 pounds

Max 370 pounds

Gauge by pressure gauge.

To check, place the TEST-OPERATE switch on the control panel in the TEST position. Set the tool for hole enlarging and depress the foot pedal or plunger knob. Then turn the pressure gauge cut-off valve handle counterclockwise approximately one-eighth turn. Observe the reading of the pressure gauge and close the valve.

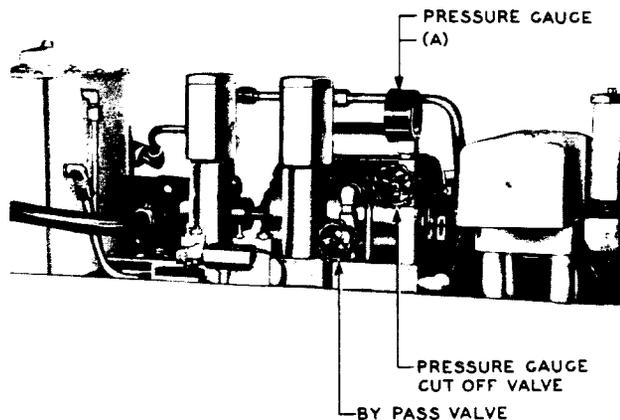


Fig. 18 — Power-Driven Hydraulic System (partial front view)

**2.34 Punch Operation:** With the selector handle in its midposition, neither punch shall operate when the foot pedal or plunger knob is depressed.

Gauge by eye.

To check, set the tool for tab clipping and then move the selector handle to its midposition. Position the carriage so that it is clear of both punches. Depress and release the foot pedal or plunger knob.

**2.35 Motor and Pump Shaft Alignment:** The motor and pump shafts shall be in vertical and horizontal alignment with each other within

0.010 inch

Gauge by eye using the gauge prepared as covered in 3.010.

To check, place the notched portion of the gauge over the center section of the coupling. Hold one straight edge of the gauge squarely against one of the coupling collars with the gauge in line with the shaft center lines and check for a gap between the other straight edge of the gauge and coupling collar. Check the vertical alignment with the gauge held vertically at the top of the collars and the horizontal alignment with the gauge held horizontally, 90 degrees from this position.

### 3. ADJUSTING PROCEDURES

#### 3.001 List of Tools, Gauges, and Materials

CODE OR SPEC NO.	DESCRIPTION
<b>TOOLS</b>	
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
KS-6320	Orange Stick
KS-14164	Brush
KS-14250 L1	Flashlight
KS-14796	Oiler
KS-16075 L1,L2,L3,L4 (furnished with 659A tool)	Filling and Bleeding Hoses
P-220366	Dental Mirror
R-1324	8-Inch Screwdriver

**SECTION 076-143-701**

CODE OR SPEC NO.	DESCRIPTION	CODE OR SPEC NO.	DESCRIPTION
<b>TOOLS</b>		<b>TOOLS</b>	
R-1482	Combination H-Type File	R-3416	9/64-Inch Allen Socket Screw Wrench
R-1542 (2 reqd)	3/4-Inch Adjustable Single-End Wrench	R-3416	9/64-Inch Allen Socket Screw Wrench (modified — see 3.03)
R-1770	1/2- and 9/16-Inch Hex. Open Double-End Flat Wrench	—	15/16- and 1-Inch Open Double-End Wrench — J. H. Williams and Co No. 33C (or equivalent)
R-2291	Short-Nose Skinning Pliers	—	3-Inch Screwdriver (or replaced 3-inch cabinet screwdriver)
R-2485	5/32-Inch Allen Socket Screw Wrench	—	4-Inch E Screwdriver (or replaced 4-inch regular screwdriver)
R-2486	5/16-Inch Allen Socket Screw Wrench	—	One-Pound Ball-Peen Hammer
R-2593	7/8- and 1-1/16 Inch Open Double-End Wrench	—	B-Splicer Scissors
R-2670	3/32-Inch Allen Socket Screw Wrench	—	Arkansas Stone, Hard, Norton HB13 (or equivalent)
R-2671	1/8-Inch Allen Socket Screw Wrench	—	Adjustable Spanner Wrench, No. 482 J. H. Williams & Co (or equivalent)
R-2671	1/8-Inch Allen Socket Screw Wrench (modified — see 3.30)	—	5/16-Inch Twist Drill
R-2672	1/4-Inch Allen Socket Screw Wrench	<b>GAUGES</b>	
R-2673	3/8-Inch Allen Socket Screw Wrench	74D	Thickness Gauge Nest
R-2812	3/16-Inch Allen Socket Screw Wrench	79F	0 to 6000 Gram Push-Pull Tension Gauge (equipped with P-10A878 finger)
R-2895 (2 reqd)	3/4- to 2-Inch Adjustable Spanner Wrench	92T	0.005-Inch Nonmagnetic Offset Thickness Gauge
R-2958	5/64-Inch Allen Socket Screw Wrench	131A	Thickness Gauge Nest
R-2959	1/16-Inch Allen Socket Screw Wrench	173A	0.178- and 0.191-Inch Double-End Thickness Gauge
R-2964	7/32-Inch Allen Socket Screw Wrench	R-8550	6-Inch Steel Scale
R-2965	Adjustable Mirror	—	Pump and Motor Shaft Alignment Gauge (prepare locally as covered in 3.010)
R-2966	No. 5 Artist's Stiff Brush	<b>MATERIALS</b>	
R-3040 (2 reqd)	5/8- and 3/4-Inch Hex. Open Double-End Flat Wrench	KS-2423	Cloth
R-3193	9/32- and 11/32-Inch Open Double-End Wrench	KS-6824	Sealing Compound
R-3415	7/64-Inch Allen Socket Screw Wrench	KS-7470	Oil
		KS-7471	Grease
		KS-7860	Petroleum Spirits

CODE OR SPEC NO.	DESCRIPTION
<b>MATERIALS</b>	
KS-16832 L2	Lubricant
KS-14666	Cloth
P-11B755 (as reqd)	Shim (for use with motor shaft)
P-11B756 (as reqd)	Shim (for use with pump shaft)
— (as reqd)	B-228228 Washer (oil seal shim for use with punch cylinders), Airoyal Company
—	0.062-Inch Drill Rod, 2 Inches Long
—	3/4- by 3/4- by 2-Inch Wood Block
—	6- by 6- by 18-Inch Wood Block
—	Eye Dropper (obtain locally)
—	Cotton Swabs (obtain locally)
—	Plastic Apron, Style 2072-D, M. L. Snyder & Son

### 3.002 *Removing and Mounting Outer Covers:*

To remove the front and rear covers of the 659-type tool, depress the snap catches and lift the covers off the locating pins. Remove the top cover by lifting it off its locating pins. Remount the 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.

### 3.003 *Removing and Mounting Undertable*

*Cover:* To remove the cover, pull out on the latch pin located on each side near the front of the table and allow the cover to swing downward. Then 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 remount the cover, engage the locating pins in the slots at the rear of the cover and push the cover up against the framework of the table so that the latch pins engage the mounting holes in the cover.

### 3.004 *Removing and Mounting Foot-Pedal Assembly Cover and Drip Pan — 659A and 659D Tools:*

Remove the drip pan using the 3-inch C screwdriver. Then remove the mounting screw and washer at the top of the cover using an Allen wrench. Remove the cover. Remount the cover and drip pan in reverse order of removal.

### 3.005 *Removing and Mounting Chaff Bin:*

Remove the wing nut at the bottom of the bin and remove the bin. Remount the bin with the opening in the long side of the bin facing the front of the tool. Securely tighten the wing nut.

### 3.006 *Punch Guard:*

To remove the punch guard, unlock the tool. 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 thumbscrew counterclockwise and remove the guard. Remount the guard with the carriage in the same position and securely tighten the thumbscrew.

### 3.007 *Hole-Enlarging and Tab-Clipping Punch and Die Assemblies:*

Remove the punch and die assemblies as covered in 3.008 and mount the assemblies as covered in 3.009.

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

### 3.008 *Removing Hole-Enlarging and Tab-Clipping Punch and Die Assemblies (660A, 660B, and 661A tools):* Fig. 19

(1) To remove a punch and die assembly, proceed as follows. Remove the chaff bin and punch guard as covered in 3.005 and 3.006, respectively. Then lock the tool. Loosen the locknut above the punch coupling using the R-2895 wrench while holding the coupling stationary with a second R-2895 wrench. Then, 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 an Allen wrench. Manually lower the mov-

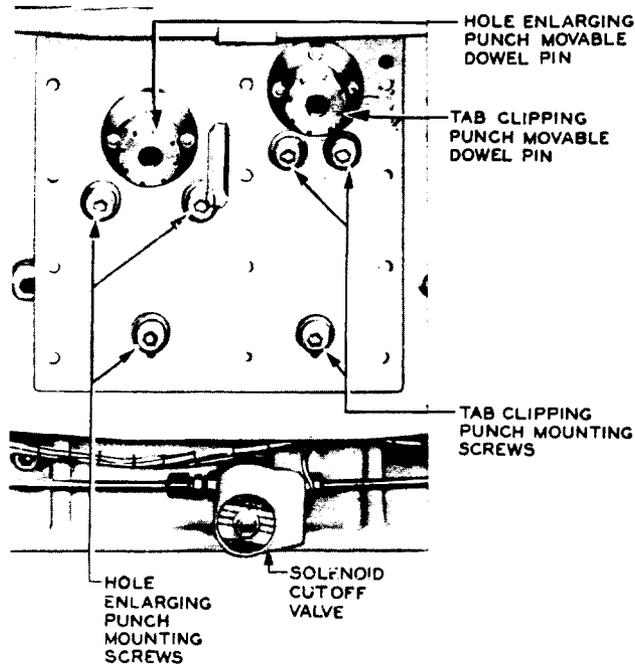


Fig. 19 - 659A Tool (partial view of rear underside of table)

able dowel pin until it is clear of the punch and die casting by turning it counterclockwise three full turns. Use an Allen wrench to start the dowel pin if necessary. Then, 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.*

**3.009 Mounting Hole-Enlarging and Tab-Clipping Punch and Die Assemblies (660A, 660B, and 661A tools):** Fig. 19

(1) Before mounting a 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, making sure no foreign particles adhere to the mounting surfaces.

**Caution:** *Before mounting the punch and die assembly, make sure that the adjustable dowel pin in the table is underflush with the recess in the table and that the tool is locked.*

(2) Working from the rear of the table, mount the punch and die assembly in reverse order of removal (see 3.008).

(3) 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 surfaces. To correct, remove the assembly as covered in 3.008. Remove the punch plunger from the assembly by pulling the plunger upward through its bearing. Then examine the mounting surface of the punch 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 (2).

(4) Slowly turn the movable dowel pin clockwise so that it engages the punch and die assembly. 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 hand tight. Insert and securely tighten the mounting screws using an Allen wrench, making sure the washers are in place.

(5) Check that the assembly is properly mounted by manually turning the punch coupling. If the coupling binds, this 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 surface on the assembly and table, and remount as covered above.

(6) When the assembly is properly mounted, remount the chaff bin, check requirement 2.14, and adjust the punch penetration as covered in 3.24(3). Then, remount the punch guard.

### 3.010 *Preparation of Motor and Pump Shaft*

**Alignment Gauge:** Prepare a gauge which straddles the center section of the motor and pump shaft coupling and provides straight edges for checking the alignment of the coupling collars on both shafts. Make the gauge from a 200A blank or discarded coded card as follows. Measure 3/4 inch from each side of the large notch at the center of the bottom edge of the card or blank. Then draw lines perpendicular to the bottom edge, extending to a line connecting the lower edge of the bottom row of holes. Using the scissors, cut along these lines making a rectangular piece approximately 2 by 1-1/4 inches. Widen the notch by approximately 1/8 inch.

## GENERAL PROCEDURES

### 3.01 *Cleaning* (Req't 2.01)

- (1) Clean the covers and external parts of the tool with a clean KS-14666 cloth.
- (2) To clean the ball-bearing raceways of the carriage, first remove the carriage as covered in (a) and clean the parts as covered in (b). After cleaning, remount the parts as covered in (c). It is recommended that whenever the raceways are cleaned, the stylus and stylus plate be cleaned as covered in (3).

(a) Remove the front carriage stops using an 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. As the carriage is being removed, ball bearings will be released simultaneously from each raceway. Take care not to lose the ball bearings. To facilitate removing the ball bearings, slowly draw the carriage forward

and remove each pair of ball bearings as they are released from their retainers. After all ball bearings have been removed, remove the carriage and ball retainers.

(b) Remove any accumulation of dirt or other loose material from the raceways by wiping them with a KS-14666 cloth slightly moistened with KS-7860 petroleum spirits. Then, wipe the parts with a clean, dry KS-14666 cloth. Clean the stylus and adjacent surfaces, if required, as covered in (3). Apply a film of KS-7471 grease to the ball-bearing surfaces of the raceways using the R-2966 brush before remounting the carriage as covered in (c).

(c) Start the carriage raceways in the table recesses so that they engage the associated stationary raceways and 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 in 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 raceways. Continue mounting ball bearings in the retainer in this manner until all the ball bearings have been mounted. Similarly mount the ball bearing 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 requirement 2.12.

**Caution:** *Make sure that seven ball bearings are placed in each ball retainer when remounting the carriage.*

(3) To clean the stylus and adjacent top surfaces of the tab-clipping control unit, swing the selector handle to its extreme right position to elevate the stylus. Remove any accumulation of dirt or other loose material from the stylus and adjacent surfaces with the vacuum cleaner. Clean the stylus and adjacent surfaces by wiping them with a KS-14666 cloth slightly moistened with KS-7860 petroleum spirits. Then wipe the parts with a clean, dry KS-14666 cloth. After

cleaning, swing the selector handle back to its extreme left position, thus lowering the stylus. Check requirement 2.27.

- (4) **Before Tool Is Placed in Operation After Storage or Shipment Only:** Clean the template holder using a KS-6320 orange stick and a KS-2423 cloth slightly moistened with KS-7860 petroleum spirits as follows. Place the KS-2423 cloth over the template holder. With the orange stick, press the cloth into each hole and move the orange stick so that the cloth wipes over the entire surface of the hole. Make sure that a clean portion of the cloth is used in each hole. After cleaning all holes, clean all notches in the holder in a similar manner. Then wipe the entire surface of the holder with a KS-2423 cloth slightly moistened with petroleum spirits and follow by wiping with a clean, dry KS-2423 cloth.

### 3.02 Lubrication (Reqt 2.02)

**Caution:** Exercise care when lubricating the parts that lubricant is not deposited on surfaces which the cards may contact such as the carriage, punch and die assemblies, tab-clipping and hole-enlarging control units, and the top surface of the table. Use a KS-2423 cloth moistened with petroleum spirits to remove any lubricant which may be deposited on these surfaces.

- (1) **KS-7470 Oil:** Apply the specified quantity of oil to the parts listed in the requirements using the KS-14796 oiler, KS-14164 brush, KS-2423 cloth, or cotton swab.
- (2) **KS-7471 Grease:** Apply the grease to the parts listed in the requirement, using the R-2966 brush.
- (3) **KS-16832 L2 Lubricant:** Make sure the container of lubricant has been shaken as covered in 1.12. Then, apply the lubricant to the parts listed in the requirement using the R-2966 brush.
- (4) To lubricate the tracks of the ball-bearing raceways, set the tool for hole enlarging and move the carriage as required to expose the tracks. After lubrication is completed, move the carriage in all directions several times to distribute the lubricant over the ball raceways.
- (5) To lubricate the selector valve rack of the tab-clipping control unit, first remove the selector valve rack cover using an Allen wrench.

- (6) To lubricate the stylus plate rail, place the motor ON-OFF switch on the control panel in the OFF position. Then, remove the front carriage stops using an Allen wrench. Unlock the carriage and move it to the front of the table to clear the stylus coverplate. Remove the coverplate using the 3-inch C screwdriver. After lubrication is completed, operate the stylus several times to distribute the lubricant. Remount the coverplate and lock the carriage. Position the front carriage stops so that they just touch the carriage rails and securely tighten the mounting screws. Place the motor ON-OFF switch in the ON position.

- (7) To lubricate the pilot pin shaft, place the motor ON-OFF switch in the OFF position and set the tool for hole enlarging. On 659B, 659C, 659E, and 659F tools, depress the plunger. On 659A and 659D tools, depress the foot pedal. After lubrication is completed, operate the hole-enlarging control unit several times to distribute the lubricant over the shaft. Then, restore the ON-OFF switch to the ON position.

- (8) **Just Prior to Storage or Shipment of Tool Only:** Lubricate the holes, notches, and top surface of the template holder as follows. Dip a clean cotton swab into the KS-7470 oil, and remove excess oil from the swab by pressing it against the side of the container when removing the swab. Oil each hole and notch in the holder by lightly pressing the cotton swab against their surfaces with a rotary and up and down motion. To lubricate the top surface of the template holder, slightly moisten a KS-2423 cloth with the KS-7470 oil and lightly rub the cloth over the surface.

### 3.03 Record of Lubrication (Reqt 2.03)

No procedure

### 3.04 Reservoir Oil Level (Reqt 2.04)

- (1) To put KS-7470 oil in the reservoir, remove the filler cap and pour in sufficient oil to fill the reservoir to approximately the bottom of the hole in the gauge stick. Remount the filler cap. Wipe off any oil using a KS-14666 cloth moistened with KS-7860 petroleum spirits and then wipe with a clean, dry KS-14666 cloth.

### 3.05 Freedom of Parts From Oil (Req't 2.05)

(1) Remove any oil from the parts with a KS-14666 cloth moistened with KS-7860 petroleum spirits and then wipe with a clean, dry KS-14666 cloth. Check as in (2) and (3) to eliminate the cause of oil leakage.

#### (2) Power-Driven Hydraulic System: Fig. 22

(a) To determine the location of leaks, place the TEST-OPERATE key on the control panel in the TEST position. Then on the 659A or 659D tool, hold the foot pedal depressed for about 30 seconds with the tool set for hole enlarging and tab clipping. On 659B, 659C, 659E, and 659F tools, depress the plunger knob and manually engage the stylus for about 30 seconds with the tool set for hole enlarging and tab clipping, respectively. Check for leaks. If leakage occurs at the nut of a fitting, tighten the nut using two R-1542 wrenches. If a leak occurs at the portion of a fitting which screws into a cylin-

der or other part, it will be necessary to apply KS-6824 sealing compound to the threads of the fitting as covered in Section 076-143-801.

(b) If leakage from the piston rod of a punch cylinder is observed, the trouble is probably due to insufficiently tight or defective chevron packings in the cylinder (Fig. 21). This condition may be corrected on the cylinder shown in Fig. 21A by adding shims below the lower packing retaining ring and on the cylinder shown in Fig. 21B by tightening the packing nut. In each case, first remove the punch and die assembly associated with the punch cylinder as covered in 3.008. Then, remove the punch cylinder as covered in (c).

(c) Remove the punch coupling, locknut, and felt washer. Loosen the clamping screw securing the Micro Switch operating arm to the punch cylinder piston rod using

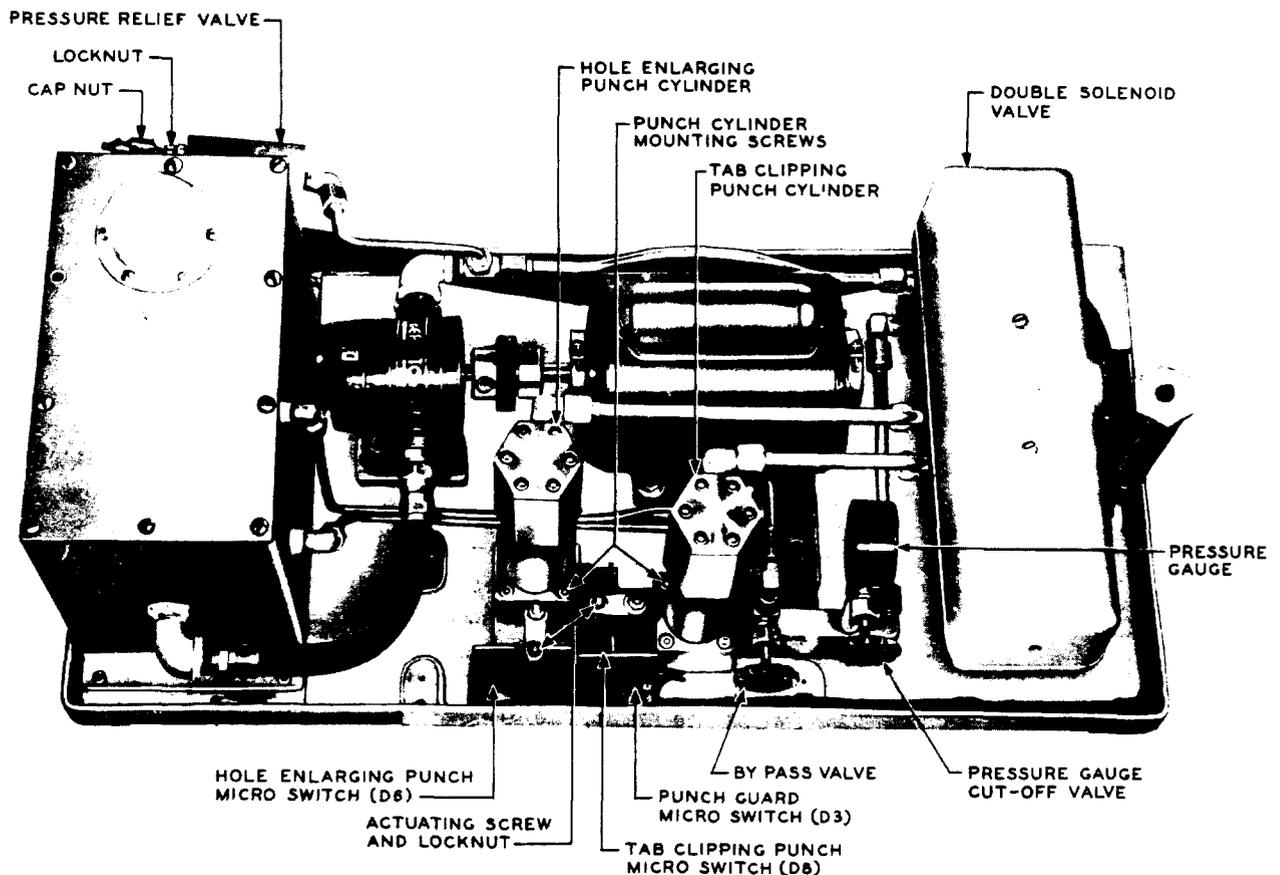


Fig. 20 - Power-Driven Hydraulic System

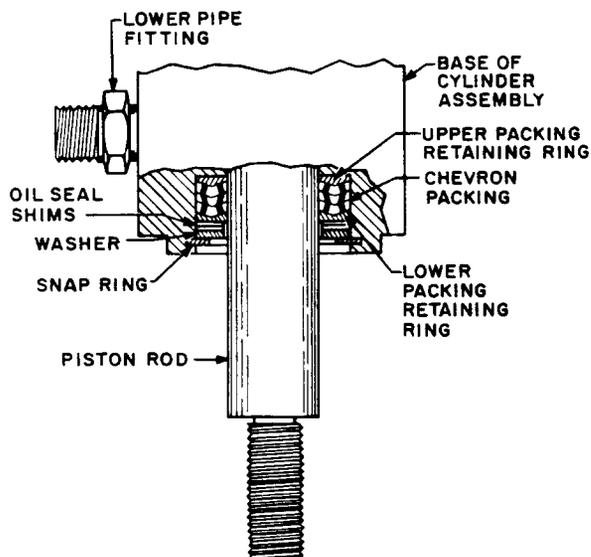


Fig. 21A - Cylinder Furnished Initially - Upper Pipe on Side of Cylinder

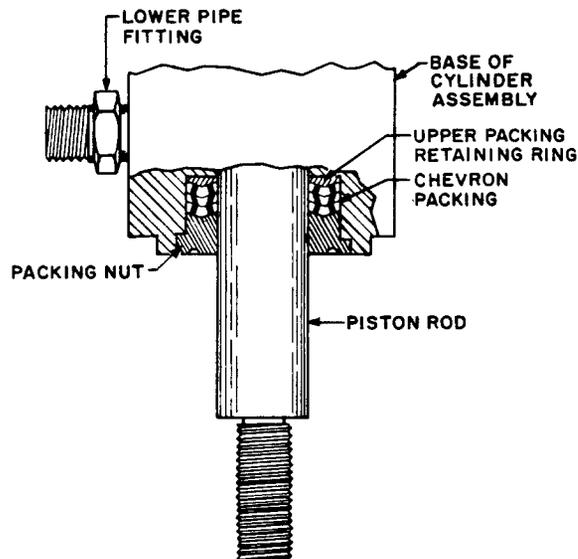


Fig. 21B - Cylinder Furnished on Later Tools and as Replacement - Upper Pipe on Top of Cylinder

Fig. 21 - Punch Cylinders Showing Oil Seals

an Allen wrench. 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 an 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.

(d) To tighten the packing in the cylinder shown in Fig. 21(B), tighten the packing nut at the bottom of the cylinder using the Williams adjustable spanner wrench.

(e) To tighten the packing in the cylinder shown in Fig. 21(A), proceed as follows. Remove the snap ring at the bottom of the punch cylinder shown in Fig. 21(A) using the R-2291 pliers. If a washer is mounted between the snap ring and the lower packing retaining ring, remove the washer. Add shims as required (see note). Remount the washer where provided and remount the snap ring. If more than slight pressure is required to fit the snap ring snugly into 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.

**Note:** The shims are made of 0.002-inch lamination and can be obtained by ordering B-228228 washer from the Airoyal Company. Individual laminations are removed and used as required.

(f) Remount the punch cylinder in reverse order of removal, making sure that the piston rod engages the Micro Switch operating arm mounting. On the hole-enlarging punch cylinder and on the tab-clipping cylinder shown in Fig. 21(B), 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-clipping punch cylinder shown in Fig. 21(A), 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 punch and die assembly as covered in 3.009. Adjust the Micro Switch as covered in 3.24(2) and reset the punch penetration as covered in 3.24(3). Recheck the requirement. If the punch cylinder still leaks, replace the chevron packing, as covered in Section 076-143-801.

(g) If leakage is observed at the base on which the double solenoid valve is mounted, attempt to tighten the solenoid valve mounting screws using an Allen wrench. If this does not stop leakage, replace the "0" rings in the annular recesses around the four ports in the bottom surface of the valve as covered in Section 076-143-801.

(h) If leakage is observed at the ends of the double solenoid valve, replace the "0" rings in the interior of the double solenoid valve as covered in Section 076-143-801.

(i) After tightening connections or replacing parts, add KS-7470 oil to the reservoir as required. Remove oil from the external parts of the tool as covered in (1) and repeat the check for leakage.

**(3) Foot-Pedal Hydraulic System — 659A and 659D Tools:** To determine the location of leaks, place the OFF-ON switch on the control panel in the OFF position. If there is an indication of leakage in the hole-enlarging control unit, remove the cover from the left side of the unit using an Allen wrench. Slowly depress and release the foot pedal approximately ten times with the tool set for hole enlarging and tab clipping, respectively. Observe for leaks at all pipe connections and parts of the foot-pedal hydraulic system. Tighten any loose connections as covered in 2(a). If the foot-pedal hydraulic cylinder, selector valve, solenoid cut-off valve, or one of the control unit cylinders is leaking, replace the "0" rings in these parts as covered in Section 076-143-801. After tightening connections or replacing parts, fill and bleed the system as covered in

Part 4. Remove oil from the external parts of the tool as covered in (1) and repeat the check for leaks as just described. After the requirement is met, place the OFF-ON switch in the ON position and remount the hole-enlarging control unit cover if removed. Securely tighten all screws.

### **3.06 Positioning of Tool** (Reqt 2.06)

(1) The tool is leveled by adding or removing spacers from the cups at the bottom of the legs. These spacers are provided with the tool.

(2) First rock the tool to determine which legs require adjustment. In order to adjust the legs, it is necessary to lift the side of the tool on which the adjustment is required. Because of the weight of the tool, exercise precautions to avoid injury to personnel. Tilt upward the side of the tool on which a leg requires adjustment. Place a 6- by 6-inch block of wood approximately 18 inches long under the crossbar between the legs of the raised side of the tool. Then lower the tool so that it is supported on the block of wood. Remove the cup from the bottom of the leg on which adjustment is required using the ball-peen hammer and a suitable block of wood. Add or remove spacers as required in the bottom of the cup and remount the cup. Remove the block of wood supporting the tool and recheck the requirement. If the requirement is not met, repeat the procedure for other legs in which adjustment is necessary.

### **3.07 Lamp Operation** (Reqt 2.07)

(1) If the requirement is not met, replace the bulb.

### **3.08 Operation of Punch Guard (D3) Micro Switch With Respect to Punch Guard** (Reqt 2.08)

(1) If the operation of the Micro Switch is unsatisfactory, replace the Micro Switch as covered in Section 076-143-801.

### **3.09 Chain Tension** (Reqt 2.09)

(1) Adjust the tension of the chain by slightly loosening the clamp nut securing the idler sprocket lever to the casting using two 245 wrenches. Lower the sprocket lever to increase the chain tension as required. Then, while

holding the lever in position, securely tighten the clamp nut. After making this adjustment, check the position of the tab-clipping control stops as covered in requirement 2.30.

### CARRIAGE AND POWER SWITCH LOCK

#### 3.10 *Operation of Lock* (Reqt 2.10)

(1) Failure to meet the requirement may be due to sticking of the lock cylinder. If the lock cylinder cannot be freed by pulling or pushing on the cylinder with the key turned, replace the cylinder as covered in Section 076-143-801.

#### 3.11 *Position of (D4) Micro Switch* (Reqt 2.11)

(1) If the requirement is not met, remove the cover attached to the framework of the table below the lock using an Allen wrench. Unlock the lock and adjust the position of the Micro Switch with the R-1770 wrench as follows. Depending upon the direction in which the switch is to be moved, back off one set of locknuts and stopnuts and take up on the other until the gap between the edge of the actuating plate and Micro Switch plunger is approximately 1/8 inch as gauged by eye. Securely tighten both stopnuts against the bracket and then tighten both locknuts. Recheck the requirement. If the requirement still is not met, replace the Micro Switch as covered in Section 076-143-801.

### CARRIAGE

#### 3.12 *Freedom of Movement of Carriage* (Reqt 2.12)

(1) Failure of the carriage to move freely may be due to a loose screw in the table rail cover touching the carriage or an accumulation of dirt and foreign particles in the ball-bearing raceways. Tighten any loose screws in the table rails with an Allen wrench. Clean the raceways as covered in 3.01(2).

#### 3.13 *Position of Rear Carriage Stops* (Reqt 2.13)

(1) To adjust the position of the rear stops, remove the stop mounting block using an Allen wrench. Then turn the stop clockwise

to increase the clearance and counterclockwise to decrease the clearance as required. Re-mount the block and securely tighten the mounting screws.

#### 3.14 *Position of Card Nest* (Reqt 2.14)

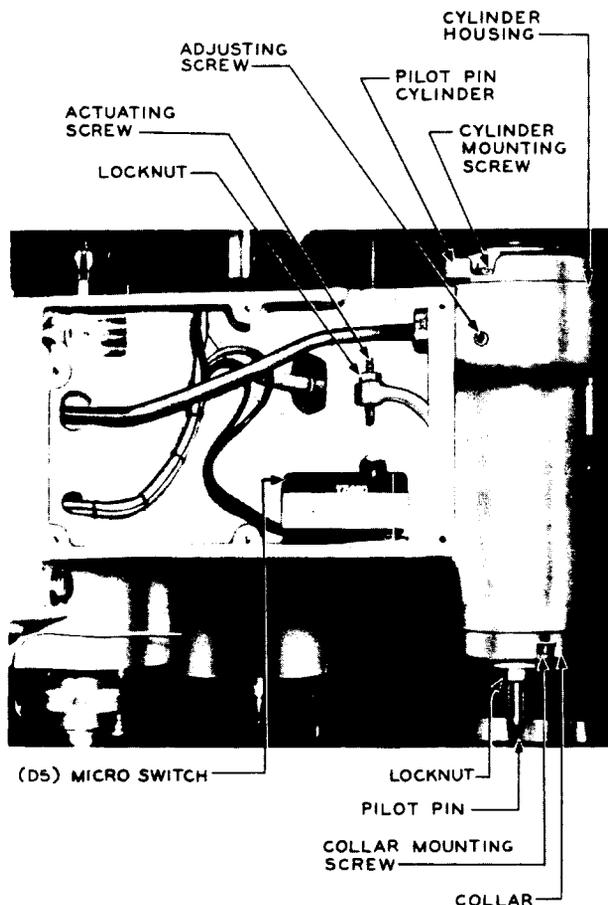
##### 659A, 659B, and 659C Tools

(1) If the requirement is not met, check requirement 2.21. If requirement 2.21 is met, check for improper positioning of the punch and die assembly in the table due to the movable dowel pin (Fig. 19) not being fully engaged in the punch and die assembly. If the movable dowel pin is not fully engaged, loosen the punch and die assembly mounting screws (Fig. 19) using an Allen wrench. Then tighten the movable dowel pin hand tight, so that it engages the punch and die assembly without binding. Securely tighten the punch and die mounting screws and recheck the requirement.

(2) If the punch and die assembly is properly positioned and the requirement is still not met, realign the hole-enlarging control unit pilot pin with respect to the hole-enlarging punch as follows. Place the TEST-OPERATE switch on the control panel in the TEST position. Fully open the bypass valve (Fig. 20). Using an Allen wrench, slightly loosen the mounting screws at the top of the pilot pin cylinder (Fig. 22) so that they are friction tight. Then, with the wrench, loosen the mounting screws securing the collar at the bottom of the cylinder. Place a blank in the card nest.

(3) Align a hole in the template holder with the pilot pin and fully depress the foot pedal or plunger knob. This will cause the pilot pin to fully enter the hole in the template holder. Slowly close the bypass valve until the punch pilot just enters the hole in the blank. Then properly align the pilot pin with the hole-enlarging punch pilot by carefully following the procedures covered in (4) through (9).

(4) Three adjusting screws (Fig. 22) are provided around the periphery of the pilot pin cylinder housing to position the pilot pin. With the punch pilot in the position described in (3), check whether the blank binds in the card nest when the corners of the blank are raised. If there is binding, slightly shift the



**Fig. 22 – Hole-Enlarging Control Unit — 659A and 659D Tools (cover removed)**

position of the pilot pin until the blank is free in the nest by alternately taking up and backing off on the adjusting screws using an Allen wrench. Take care to exert only slight force when turning the adjusting screws.

(5) Bring the punch pilot down in several steps by continuing to close the bypass valve further until the punch pilot fully enters the die and the stripper rests on the blank. At each stop in the downward movement of the punch pilot, check whether the blank binds in the card nest. If the blank binds, shift the position of the pilot pin with the adjusting screws, as covered above, until the blank is free, before bringing the punch pilot further downward. When the stripper rests on the blank, slowly close the bypass valve further to just bring the cutting edges of the punch against the blank. Again check

for bind of the blank in the nest and eliminate any bind with the adjusting screws as just described.

(6) Successively tighten each pilot pin cylinder mounting screw a little at a time, checking for bind of the blank in the card nest after taking up on each screw. If the blank binds during tightening of the mounting screws, take up or back off on the adjusting screws as required to clear the bind and continue the procedure of tightening the mounting screws until all mounting screws have been securely tightened and no bind exists. Release the foot pedal or plunger knob and remove the blank from the nest. If there is any indication of turned down edges or distortions at the sides of the hole where the punch pilot entered, proceed as covered in (7). If there is no indication of turned down edges or distortions, proceed as covered in (8).

(7) Place the blank in the card nest and move the punch pilot slowly downward to engage another hole in the blank until the cutting edges of the punch rest on the blank. Do not disturb the position of the adjusting screws. Check for bind. If there is bind, repeat the entire adjusting procedure. If there is no bind, proceed as covered in (8).

(8) With the bypass valve closed and the TEST-OPERATE switch in the OPERATE position, enlarge a hole near each corner of the blank. If the blank does not lift from the nest during the restoring of the punch and if no turned down edges or distortions are noted at the position of the enlarged hole entered by the punch pilot, tighten the collar mounting screws as covered in (9). If the above conditions are not met, repeat the entire adjusting procedure.

(9) Securely tighten the collar mounting screws successively a little at a time. Then check whether the blank binds in the card nest. Binding of the blank at this point is due to uneven tightening of the collar mounting screws. If the blank binds, loosen the collar mounting screws and carefully retighten them to eliminate the bind. Then make a final check of the adjustment of the pilot pin by enlarging holes near each corner of the blank as covered in (8).

**659D, 659E, and 659F Tools**

(10) If the requirement is not met, loosen the three cylinder mounting screws at the top of the hole-enlarging control unit so that they are friction tight and loosen the three collar mounting screws at the bottom, using an Allen wrench. Refer to Fig. 22. Shift the pilot pin by moving the adjusting screws which are located around the periphery of the pilot pin cylinder. Tighten the mounting screws and check for the requirement. Repeat the pilot pin adjustment, if necessary, until the requirement is met.

**SELECTOR HANDLE****3.15 Selector Handle Stops** (Reqt 2.15)

(1) To adjust the position of the selector handle stops, set the selector handle in the desired position (hole enlarging or tab clipping). Then loosen the locknut of the stop screw associated with this position using the 245 wrench. Using an Allen wrench, turn the stop screw clockwise to decrease the clearance and counterclockwise to increase the clearance. When the proper clearance has been obtained, securely tighten the locknut and recheck the requirement. After the requirement is met, check requirement 2.29.

**3.16 Selector Handle Movement** (Reqt 2.16)

(1) Failure to meet the requirement may be due to bind in the tab-clipping control or selector handle units. Clean the accessible parts of the gears and gear racks of these units using a KS-2423 cloth slightly moistened with KS-7860 petroleum spirits. Then lubricate these parts as covered in 2.02. If after doing this the requirement is not met, refer the matter to the supervisor.

**3.17 Operation of (D9 and D10) Micro Switches With Respect to Selector Handle** (Reqt 2.17)

(1) To adjust the operation of the Micro Switches, set the selector handle in the desired position (hole enlarging or tab clipping). Loosen the locknut on the Micro Switch actuating screw associated with this position using the 245 wrench. Then, with an Allen wrench, back off the actuating screw to a position where it will not operate the Micro Switch. Turn the actuating screw clockwise until it

just operates the Micro Switch. Turn the actuating screw one full turn further and securely tighten the locknut.

**HOLE-ENLARGING CONTROL UNIT****3.18 Clearance Between Pilot Pin and Carriage** (Reqt 2.18)

(1) To adjust the clearance between the pilot pin and carriage, loosen the pilot pin locknut (Fig. 24) using the R-1770 wrench. Then insert the 0.062-inch drill rod into the hole in the pilot pin and use the drill rod to turn the pilot pin upward or downward as required. When the proper clearance has been obtained, remove the drill rod and securely tighten the locknut.

**3.19 Pilot Pin Travel** (Reqt 2.19)**659A and 659D Tools**

(1) Failure to meet part (a) of the requirement may be due to the solenoid cut-off valve failure to open, leaks or air pockets in the foot-pedal hydraulic system, or incorrect setting of the foot-pedal stop screws causing insufficient movement of the foot pedal.

(2) If the pilot pin does not move downward as the foot pedal is depressed, feel the solenoid cut-off valve. If the valve is cold to the touch, this is an indication that the valve coil is defective and the valve should be replaced. If the pilot pin does not complete its downward movement, attempt to move the pilot pin upward exerting light pressure. If there is perceptible "give" when pressure is applied, this indicates probable air pockets in the foot-pedal hydraulic system. Check and correct the cause of leakage causing air pockets in this system as covered in 3.05(3). If there is no "give" of the pilot pin when upward pressure is applied, adjust the foot-pedal stop screws as covered in (3).

(3) The upstop and downstop screws (Fig. 23) control the travel of the foot pedal which in turn controls the travel of the pilot pin. Adjust the upstop screw in the foot-pedal assembly mounting (to the rear of the gear segment) as follows. Loosen the locknut using the 245 wrench. Back off the stop screw with an Allen wrench to a position where it does not engage its associated stop on the gear segment.

Then turn the stop screw clockwise until it just touches the stop on the gear segment. Turn the stop screw 20 degrees further clockwise and, while holding the screw in this position, securely tighten the locknut. Adjust the downstop screw on the foot pedal in a similar manner while holding the foot pedal fully depressed. After adjusting the stop screw, recheck the requirement.

- (4) If part (b) of the requirement is not met, replace the solenoid cut-off valve.

#### 659B, 659C, 659E, and 659F Tools

- (5) If requirement (c) is not met, lubricate the pilot pin shaft as covered in 2.02.

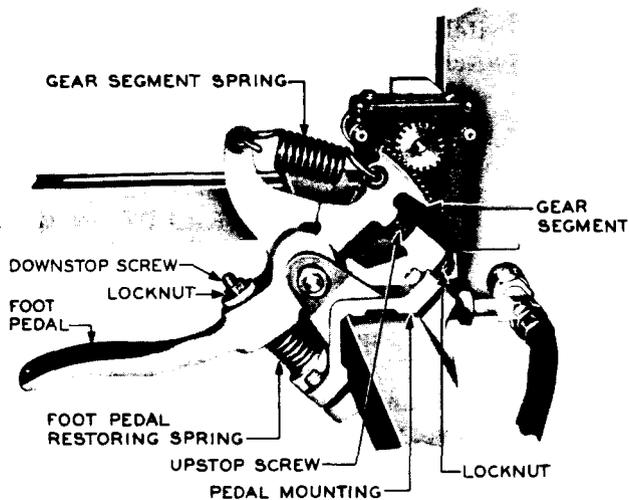


Fig. 23 - Foot-Pedal Assembly (cover and drip pan removed)

#### 3.20 Operation of (D5) Micro Switch With Respect to Pilot Pin (Reqt 2.20)

- (1) To adjust the operation of the Micro Switch, remove the cover from the left side of the hole-enlarging control unit using an Allen wrench. Then loosen the locknut on the Micro Switch actuating screw (Fig. 22) using the R-3193 wrench. Turn the actuating screw upward with an Allen wrench until it does not operate the Micro Switch when the foot pedal or plunger knob is depressed. Place the 0.015-inch blade of the 131A gauge on the template holder below the drill rod in the pilot pin hole and clear of the hole in the tem-

plate holder under the pilot pin. Fully depress the foot pedal or plunger knob and make sure that the drill rod rests on the gauge. Turn the actuating screw downward until the Micro Switch clicks. Then, while holding the screw in this position, securely tighten the locknut. Release the foot pedal or plunger knob and recheck the requirement. After the requirement is met, replace the cover and securely tighten all screws.

#### HOLE-ENLARGING PUNCH

##### 3.21 Position of Hole-Enlarging Punch Stripper (Reqt 2.21)

- (1) If the position of the hole-enlarging punch stripper is not satisfactory, re-adjust the stripper as follows. First remove the hole-enlarging punch and die assembly from the tool as covered in 3.008. Place the assembly on a clean, flat surface. Remove the punch plunger and associated parts from the assembly by pulling the plunger upward through its bearing. Remove the stripper retainer setscrew (Fig. 24) using an Allen wrench. Then turn the stripper retainer until the lower surface of the stripper is flush with the cutting edges of the punch. From this position, turn the retainer downward one notch. If a notch in the retainer is not aligned with

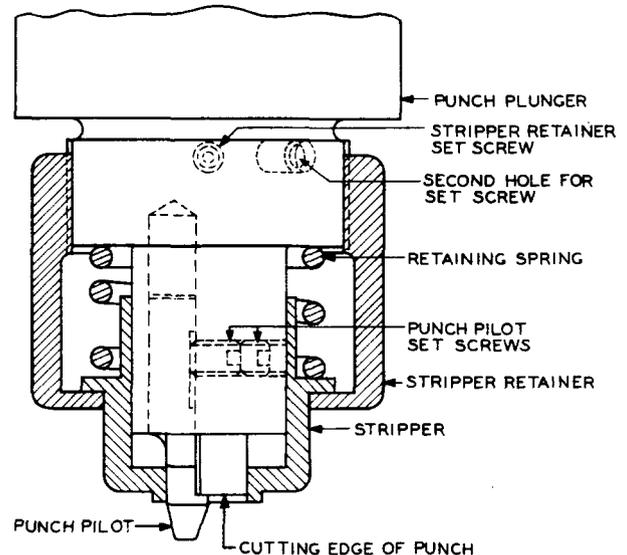


Fig. 24 - Hole-Enlarging Punch (side view) (660A tool shown)

one of the setscrew holes in the punch plunger, turn the retainer upward, only by hand, until the nearest setscrew hole in the plunger is aligned with a slot in the retainer. Insert and securely tighten the setscrew. Remount the punch plunger and associated parts in the assembly. Remount the assembly as covered in 3.009.

**3.22 Position of Hole-Enlarging Punch Pilot**  
(659A, 659B, and 659C tools only)  
(Reqt 2.22)

(1) To position the hole-enlarging punch pilot, first remove the punch plunger and associated parts as covered in 3.21. Remove the stripper retainer setscrew using the R-2959 wrench. Then turn the stripper retainer counterclockwise to remove the stripper, retaining spring, and stripper retainer. Loosen the setscrew holding the punch pilot, using an Allen wrench. The punch pilot is held in position by two setscrews mounted in the same hole. Remove the outer setscrew using the Allen wrench to gain access to the inner setscrew. Position the pilot so that its shoulder rests against the cutting surface of the punch. While holding the punch pilot in this position, securely tighten the setscrew. Insert and securely tighten the second setscrew. Remount the stripper retainer, retaining spring, and stripper in reverse order of removal. Position the stripper and remount the assembly as covered in 3.21.

**3.23 Clearance Between Hole-Enlarging Punch Stripper Retainer and Card Nest**  
(Reqt 2.23)

(1) If the requirement is not met, check requirements 2.21 and 2.24. Make the necessary adjustments covered by the procedures for these requirements and recheck the requirement.

**3.24 Operation of Hole-Enlarging Punch**  
(Reqt 2.24)

**659A, 659B, and 659C Tools**

(1) Improper penetration of the punch may be due to a partially open bypass valve, insufficient oil pressure, premature operation of the hole-enlarging punch Micro Switch, or improper setting of the punch. Check that the

bypass valve (Fig. 20) is fully closed by attempting to turn the handle clockwise. Check the oil pressure as covered in requirement 2.33. Adjust the Micro Switch operation and punch setting, if necessary, as covered in (2) and (3), respectively.

(2) To adjust the Micro Switch operation, place the TEST-OPERATE switch on the control panel in the TEST position. Then loosen the locknut on the Micro Switch actuating screw (Fig. 22) using the R-3193 wrench. Turn the actuating screw upward with an Allen wrench to a position where it does not operate the Micro Switch when the foot pedal or plunger knob is fully depressed. While holding the foot pedal or plunger knob depressed, turn the actuating screw downward with the wrench until it just operates the Micro Switch which is the point at which the Micro Switch clicks. Release the foot pedal or plunger knob and turn the actuating screw one full turn further downward. While holding the actuating screw in this position, securely tighten the locknut. Place the TEST-OPERATE switch in the OPERATE position and recheck the requirement.

(3) To reset the punch penetration, first remove the punch guard and place the TEST-OPERATE switch in the TEST position. Place a blank in the card nest. Loosen the locknut above the punch coupling with the R-2895 wrenches and turn the locknut and coupling upward as far as possible. Adjust the position of the punch so that it just punches out a slug from the blank when the foot pedal or plunger knob is fully depressed and released. To do this, gradually turn the punch coupling and locknut downward when the punch is in its unoperated position after successive punching operations. When a slug is just punched out from the blank, turn the punch coupling downward one quarter of a turn (three notches on the coupling) further. While holding the coupling in this position with the R-2895 wrench, securely tighten the locknut against it with another R-2895 wrench. Place the TEST-OPERATE switch in the OPERATE position. Recheck the requirement and check requirement 2.23.

(4) Failure of the hole-enlarging punch to restore to its unoperated position in accordance with the requirement may be due to

improper operation of the hole-enlarging punch Micro Switch or the S1 relay on the control panel or to sticking of the double solenoid valve or associated punch cylinder. Adjust the Micro Switch, if necessary, as covered in (2), and check the relay as covered in Section 040-816-701. Recheck the requirement. If the requirement is not met, remove the cover from the double solenoid valve (Fig. 20) with the 4-inch E screwdriver and note if the solenoid fails to release when the relay operates. If the solenoid fails to release, remove power from the tool by depressing the lock. Insert the long arm of the R-2812 wrench in the hole in the end of the solenoid housing and operate the solenoid several times using the wrench. If after doing this the solenoid still sticks, replace the solenoid valve as covered in Section 076-143-801.

#### **659D, 659E, and 659F Tools**

(5) Improper penetration of the punch may be due to premature release of the pilot pin, insufficient hydraulic pressure, or improper setting of the punch. If the punch fails to penetrate properly only when the pilot pin is prematurely released, adjust for proper Micro Switch operation as covered in (2). If improper penetration occurs with a correctly adjusted Micro Switch, check for proper hydraulic pressure as covered in requirement 2.33 and, if necessary, reset the punch as covered in (3). If the hole-enlarging punch fails to restore to its unoperated position in accordance with the requirement, proceed as covered in (4).

#### **3.25 Performance of Hole-Enlarging Punch and Die (Reqt 2.25)**

(1) If the burrs on the undersurface of the card are of sufficient height to be detected by the method of check, replace the punch and die.

(2) If burrs are noted on the top surface of the card, this may be due to metal particles adhering to the punch and stripper. Remove the stripper as covered in 3.22(1). Clean the stripper and punch by wiping with a clean, dry KS-2423 cloth, making sure that all metal particles are removed. Reassemble and remount the punch and die assembly as covered in 3.22(1). Recheck the requirement. If the

requirement is still not met, replace the punch and die assembly.

#### **TAB-CLIPPING CONTROL UNIT**

#### **3.26 Positioning of Stylus: 659A and 659D Tools (Reqt 2.26)**

(1) To adjust the position of the stylus, place the OFF-ON switch on the control panel in the OFF position. Then slightly loosen the stylus clamping screws using an Allen wrench. Align one of the end notches in the template holder with the stylus. Place the 0.010-inch blade of the 74D gauge between the forward stopnut and adjacent surface of the bearing support and fully depress the foot pedal. While holding the foot pedal depressed, fully engage the stylus in the notch and securely tighten the stylus clamping screws. Release the foot pedal and remove the gauge. Recheck the requirement.

#### **3.27 Operation of Stylus (Reqt 2.27)**

##### **659A and 659D Tools**

(1) Failure to meet the requirement may be due to the solenoid cut-off valve failing to open, leaks or air pockets in the foot-pedal hydraulic system, or incorrect setting of the foot pedal stop screws causing insufficient movement of the foot pedal. Check and correct for these conditions as covered in 3.19. If after doing this the requirement is not met, the cause may be binding in the tab-clipping control unit. Clean the accessible gears and racks of the unit using a KS-2423 cloth slightly moistened with KS-7860 petroleum spirits and relubricate as covered in 2.02. Then clean the stylus and stylus plate as covered in 3.01(3). If the requirement still is not met, refer the matter to the supervisor.

##### **659B, 659C, 659E, and 659F Tools**

(2) Failure to meet the requirement may be due to binding in the tab-clipping control unit. Clean the accessible moving parts using a KS-2423 cloth slightly moistened with petroleum spirits and relubricate as covered in 2.02. Recheck the requirement. If the requirement still is not met, refer the matter to the supervisor.

### 3.28 *Operation of (D7) Micro Switch With Respect to Stylus* (Reqt 2.28)

#### All Tools

(1) To adjust the operation of the tab-clipping control Micro-Switch, place the OFF-ON switch on the control panel in the OFF position. Then loosen the actuating screw locknut with the R-3193 wrench while holding the retainer at the rear of the spring stationary with the R-3040 wrench. Turn the Micro Switch actuating screw clockwise with the 418A wrench to a position where it does not operate the Micro Switch when the foot pedal is depressed on 659A and 659D tools or the stylus is manually operated on 659B, 659C, 659E, and 659F tools.

#### 659A and 659D Tools

(2) Place the 0.010-inch blade of the 74D gauge between the collar and adjacent surface of the forward stopnut and locknut mounting. Depress the foot pedal. While holding the foot pedal depressed, turn the Micro Switch actuating screw counterclockwise until the Micro Switch clicks. Remove the gauge and release the foot pedal. While holding the actuating screw in position, securely tighten the locknut. Recheck the requirement.

#### 659B, 659C, 659E, and 659F Tools

(3) Place the 0.015-inch blade of the 131A gauge against one side of the notch. Manually push the stylus into the notch so that the stylus touches the gauge and the other side of the notch. While holding the stylus operated, turn the Micro Switch actuating screw counterclockwise until the Micro Switch clicks. Release the stylus and remove the gauge. While holding the actuating screw in position, securely tighten the locknut. Recheck the requirement.

### 3.29 *Position of Tab-Clipping Control Stops* (Reqt 2.29)

(1) If modified R-2671 and R-3416 wrenches as required in (2) are not available, modify the wrenches as follows. Use the R-1482 file to file a notch around the short leg of each wrench approximately 1/8 inch from the bend. Break off the end of the short leg

at the notch. Remove any burrs and chamfer the edges using the file.

(2) Adjust the position of the tab-clipping control stops by slightly loosening the clamping screws on the selector handle shaft sprocket clamping plate using the proper modified wrench. Then manually turn the sprocket on the selector handle shaft to increase the clearance as required. Securely tighten the clamping screws and recheck the requirement.

#### TAB-CLIPPING PUNCH

### 3.30 *Clearance Between Tab-Clipping Punch and Carriage* (Reqt 2.30)

(1) If the requirement is not met, reset the punch following a procedure similar to that covered in 3.24(3) for the hole-enlarging punch. If after doing this the requirement is not met, check requirement 2.31 covering restoring of the tab-clipping punch.

### 3.31 *Operation of Tab-Clipping Punch* (Reqt 2.31)

(1) Failure of the punch to fully clip a tab may be due to a partially open bypass valve, insufficient oil pressure, premature operation of the tab-clipping punch Micro Switch (Fig. 20), or improper setting of the punch. Check that the bypass valve is fully closed by attempting to turn the handle clockwise. Check the oil pressure as covered in requirement 2.33. Adjust the punch setting and Micro Switch operation, if necessary, by following the procedures similar to those described in 3.24(2) and (3), respectively. After meeting the punch operation requirement, check requirement 2.30.

(2) Failure of the tab-clipping punch to restore to its unoperated position in accordance with the requirement may be due to improper operation of the tab punch Micro Switch or the S2 relay on the control panel or to sticking of the double solenoid valve or associated punch cylinder. Adjust the Micro Switch, if necessary, as covered in 3.24(2), and check the relay as covered in Section 040-816-701. Recheck the requirement. If the requirement is not met, remove the cover from the double solenoid valve (Fig. 20) with the

4-inch E screwdriver and note if the solenoid fails to release when the relay operates. If the solenoid fails to release, remove power from the tool by depressing the lock. Insert the long end of the R-2812 wrench in the hole in the end of the solenoid housing and operate the solenoid several times using the wrench. If after doing this the solenoid still sticks, replace the solenoid as covered in Section 076-143-801.

(3) Clipped tabs adhering to the punch or present on the upper surfaces of the table, carriage, blank, or dies may result in serious damage to the punches and dies during subsequent coding operations. Remove any clipped tabs from these surfaces and inspect the surfaces for the presence of oil or foreign matter. If necessary, clean the surfaces using a KS-2423 cloth moistened with KS-7860 petroleum spirits and then wipe with a clean, dry KS-2423 cloth.

### **3.32 Performance of Tab-Clipping Punch** (Reqt 2.32)

(1) If part (a) of the requirement is not met, replace the punch and die. If part (b) of the requirement is not met for 659A, 659B, and 659C tools, refer the matter to the supervisor. If part (b) is not met for 659D, 659E, and 659F tools, reset the card jaws as covered in Section 076-143-801.

## **POWER-DRIVEN HYDRAULIC SYSTEM**

### **3.33 Hydraulic Pressure** (Reqt 2.33)

(1) To adjust the oil pressure of the power-driven hydraulic system, remove the cap from the pressure relief valve (Fig. 20) using the R-1770 wrench. Loosen the adjusting screw locknut using the R-3040 wrench. Using an Allen wrench, turn the adjusting screw clockwise to increase the pressure and counterclockwise to decrease the pressure. Then, while holding the adjusting screw stationary, securely tighten the locknut. Remount the cap nut and recheck the requirement.

### **3.34 Punch Operation** (Reqt 2.34)

(1) If either punch operates with the selector handle in its midposition, check the operation of the selector handle Micro Switch asso-

ciated with the punch as covered in requirement 2.17.

### **3.35 Motor and Pump Shaft Alignment** (Reqt 2.35)

(1) If the shafts are out of line vertically, raise the lower of the two shafts as follows.

(a) If the motor shaft is to be raised, remove the motor from its mounting bracket as covered in Section 076-143-801. Then, remove the motor bracket mounting screws using the R-1770 wrench. Add the same number of P-11B755 shims under both sides of the mounting bracket as required to align the shafts vertically. A P-11B755 shim is 0.010 inch thick. Insert and securely tighten the bracket mounting screws. Remount the motor as covered in Section 076-143-801 and recheck the vertical alignment.

(b) If the pump shaft is to be raised, remove the pump mounting screws using the R-1770 wrench. Add the same number of P-11B756 shims under both sides of the pump as required to align the shafts vertically. A P-11B756 shim is 0.010-inch thick. Insert and securely tighten the pump mounting screws. Recheck the vertical alignment.

(2) If the shafts are out of line horizontally or angularly, loosen the pump mounting screws and shift the position of the pump as required to align the shafts. Securely tighten the mounting screws and recheck the alignment.

(3) Examine the flexible coupling and, if the nonmetallic member of the coupling appears to be excessively worn, replace the coupling as covered in Section 076-143-801.

(4) After aligning the shafts, unlock the tool and listen to the motor. Excessive vibration is an indication that the shafts are still not properly aligned. Lock the tool and, if necessary, realign the shafts as covered in (1) and (2).

## 4. GENERAL INFORMATION

METHOD OF FILLING AND BLEEDING FOOT-PEDAL  
HYDRAULIC SYSTEM — 659A AND 659D TOOLS

## 4.01 General

(a) Four hose assemblies, KS-16075 L1, L2, L3, and L4, are provided with each 659A tool. Three of the hose assemblies (KS-16075 L2, L3, and L4) are equipped at one end with a complete coupler consisting of a coupler and

a nosepiece but have no fitting at the other end. The fourth hose assembly (KS-16075 L1) has a coupler only at each end. These hose assemblies are used to make connections between the foot-pedal and the power-driven hydraulic systems (Fig. 25 and 26) to facilitate filling and bleeding the foot-pedal system. After using, the hoses should be drained of oil and stored in a convenient place to prevent loss or damage.

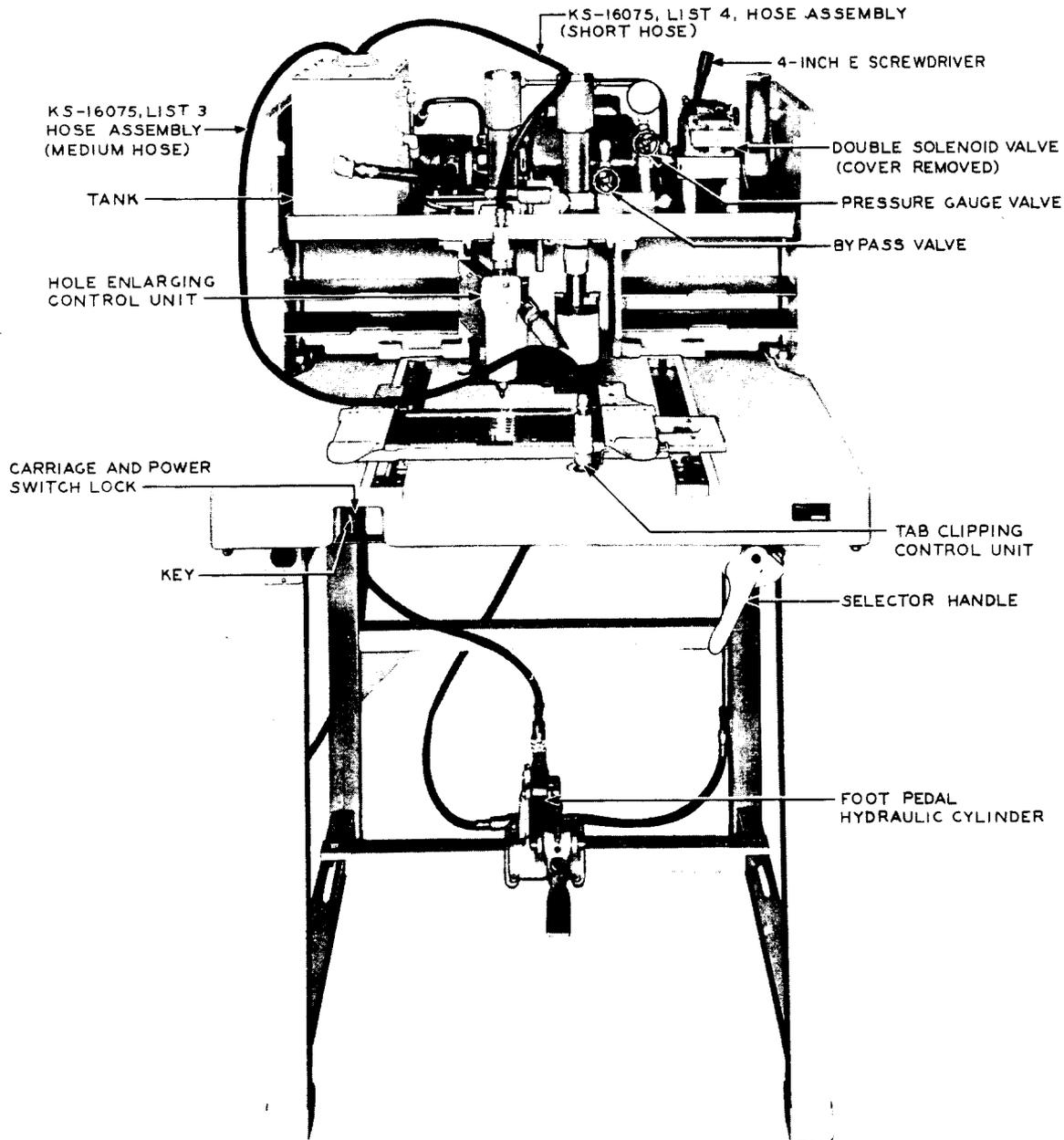


Fig. 25 - Filling and Bleeding 659A and 659D Tools (front view of tool)

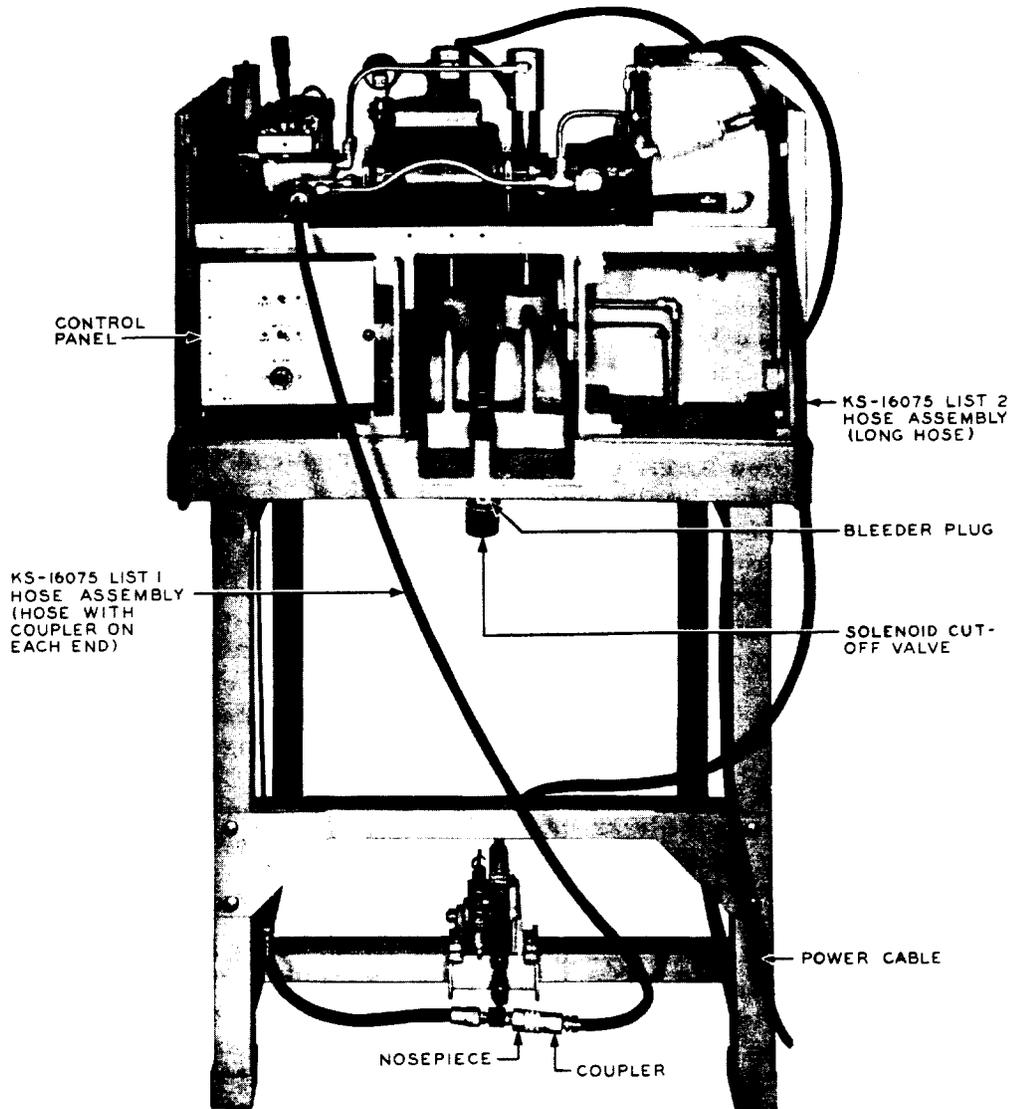


Fig. 26 - Filling and Bleeding 659A and 659D Tools (rear view of tool)

(b) It is recommended that a protective apron such as the Snyder Special 2072-D plastic apron be worn during the filling and bleeding operations to protect clothing from possible oil damage.

#### 4.02 Connecting Hose Assemblies

(a) Before connecting the hose assemblies, check that the oil level in the reservoir is in accordance with requirement 2.04.

(b) Remove the drip pan and cover from the foot-pedal assembly using the 3-inch C screwdriver and an Allen wrench. Place the

drip pan on the floor below the foot-pedal assembly to catch any oil that may drip during the filling and bleeding operations.

(c) Remove the tab-clipping control bleeder plug cover at the front center of the table using the 3-inch C screwdriver. Remove the bleeder plugs from the top of the foot-pedal hydraulic cylinder and tab-clipping control unit using an Allen wrench. Remove the bleeder plug from the top of the hole-enlarging control unit with an Allen wrench, while holding the larger plug in which it is mounted with the 347 wrench. Remove the nosepieces from the couplers of the KS-16075 L2, L3, and

L4 hose assemblies as follows. Pull the movable sleeve of the coupler back toward the hose as far as possible to break the connection. Then remove the nosepiece and release the sleeve on the coupler. Mount these nosepieces at the positions from which the bleeder plugs were removed, tightening the nosepieces securely with the R-1542 wrench.

(d) Fully open the cut-off valve to the pressure gauge and the bypass valve (Fig. 26). Unlock the tool. Center the carriage on the table against its rear stops. Then, working from the rear of the tool, remove the solenoid cover using the 4-inch E screwdriver. Block the solenoid at the rear of the hydraulic unit in the fully operated position by inserting the 4-inch E screwdriver between the armature and housing (Fig. 26). Then close the bypass valve until the pressure gauge registers 75 pounds. Depress the lock to remove power from the tool.

(e) Remove the dust caps from the nosepieces which are mounted at the bottom rear of the foot-pedal assembly and at the rear of the hydraulic shelf below the double solenoid valve, using the 3-inch C screwdriver to loosen the lock screws. Attach the KS-16075 L1 hose assembly, which is equipped with a coupler at each end, to these nosepieces as follows. Pull the movable sleeve of the coupler on one end of the hose back toward the hose as far as possible. Push the coupler over the nosepiece at the bottom of the foot-pedal assembly as far as possible and release the sleeve on the coupler to complete the connection. Connect the other end of the hose to the nosepiece at the rear of the hydraulic shelf using the same procedure.

(f) Following the coupling procedure covered in (e), connect the KS-16075 L2 hose assembly (long hose) to the nosepiece which was mounted on the top of the foot-pedal hydraulic cylinder, the KS-16075 L3 hose assembly (medium length hose) to the nosepiece on the tab-clipping control unit, and the KS-16075 L4 hose assembly (short hose) to the nosepiece on the hole-enlarging control unit. Place the free ends of these hoses in the reservoir of the hydraulic unit through the filler hole as shown in Fig. 26.

#### 4.03 *Filling and Bleeding*

(a) Unlock the lock. Working from the front of the tool, raise the hose connected to the foot-pedal hydraulic cylinder and observe the stream of oil flowing from the hose into the reservoir while slowly depressing and releasing the foot pedal. If air bubbles are detected in the stream, continue to operate the foot pedal until no air bubbles are visible. Then place the end of the hose back in the reservoir of the hydraulic unit.

(b) Raise the ends of the two hoses connected to the control unit and hold them above the filler hole of the reservoir. Fully depress the foot pedal and slowly swing the selector handle back and forth between its extreme left (hole enlarging) and right (tab clipping) positions. Observe the flow of oil from the hoses into the reservoir. Continue swinging the selector handle until the flow of oil from both hoses is free of air bubbles. Then reinsert the hoses into the reservoir and release the foot pedal. A bleeding period of approximately 10 minutes should be sufficient to expel all air. Lock the lock and release the solenoid by withdrawing the screwdriver.

#### 4.04 *Disconnecting Hose Assemblies*

(a) After filling and bleeding the foot-pedal hydraulic system, as covered in 4.03, disconnect the hose assemblies and remount the dust caps on the nosepieces at the bottom rear of the foot-pedal assembly and adjacent to the pressure gauge of the hydraulic unit.

(b) Remove the nosepieces mounted on the foot-pedal hydraulic cylinder and the tab-clipping and hole-enlarging control units using the R-1542 wrench. Apply a small amount of KS-6824 sealing compound to the threads of each bleeder plug which previously had been removed from these positions. Exercise care to keep the cement away from the end of the plugs to avoid getting it into the hydraulic system. Mount a bleeder plug in each position (except the foot-pedal hydraulic cylinder) from which a nosepiece was removed and securely tighten the plugs using an Allen wrench. Connect the nosepieces to the couplers of the KS-16075 L2, L3, and L4 hose assemblies and drain the oil from the hoses into a convenient receptacle. Close the bypass and pressure gauge cut-off valves.

#### 4.05 *Setting Oil Level of Foot-Pedal Hydraulic Cylinder*

(a) Extract sufficient oil to bring the oil level in the foot-pedal hydraulic cylinder to approximately 1/16 inch below the bottom of the gear shaft. To do this, measure the distance from 1/16 inch below the bottom of the gear shaft to the top of the cover of the cylinder using the R-8550 scale. Mark this distance off from the open end of the eye dropper. Insert the eye dropper through the bleeder plug opening in the cylinder to this mark. Extract the oil. When sufficient oil has been extracted with the eye dropper, remount the bleeder plug.

(b) Remove the foot-pedal assembly mounting clamp using an Allen wrench. Raise the foot-pedal assembly and wipe any oil from the mounting bar and foot-pedal assembly using a KS-14666 cloth slightly moistened with KS-7860 petroleum spirits. Then wipe with a clean, dry KS-14666 cloth. After removing all oil, remount the clamp and securely tighten the clamp screws.

#### 4.06 *Bleeding Solenoid Cut-Off Valve:* Fig. 20

(a) After disconnecting the hose assemblies and remounting the bleeder plugs as covered in 4.04 and 4.05, check requirement 2.19. If the requirement is not met, bleed the solenoid cut-off valve located at the rear underside of the table (Fig. 26) as follows. Unlock the lock. Then place the OFF-ON switch on the control panel at the rear of the tool in the OFF position. Depress the foot pedal. Hold the foot pedal depressed and, with the 3-inch cabinet screwdriver, loosen the bleeder plug screw sufficiently to allow oil to seep out slowly. Place a KS-14666 cloth below the bleeder plug to catch the oil. After approximately 5 seconds of oil seepage, securely retighten the plugs. Recheck requirement 2.19.

**Caution:** *Do not release the foot pedal until the bleeder plug screw has been securely tightened.*

#### TROUBLE ANALYSIS AND CORRECTION

**4.07 *General:*** A number of troubles which may be encountered with the 659-type tool are listed below. The paragraph reference covers the trouble in greater detail and also gives the

remedy to correct the condition causing the trouble. In general, if the double solenoid valve of the power-driven hydraulic system operates, the trouble is in the mechanical and hydraulic parts of the tool, the punch restoring Micro Switch, or the control panel relay. If the solenoid valve does not operate, the electrical circuits should be checked first.

ITEM NO.	TROUBLE	PAR. NO.
1	No power	4.08
2	Rough operation of carriage	4.09
3	Excessive burring of cards	4.10
4	Failure of control units to operate properly	4.11
5	Failure of punches to operate properly	4.12

**4.08 *No Power:*** Causes of this trouble are outlined below. If the cause cannot be found and corrected by checking this list, the electrical circuits should be checked using a buzzer or test lamp.

ITEM NO.	CAUSE	REMEDY
1	Plug not connected	Connect plug
2	Power switch lock locked	Unlock lock
3	Punch guard removed	Mount guard
4	OFF-ON switch on control panel in OFF position	Place switch in ON position
5	Fuse blown	Replace fuse (check for short circuit in wiring before inserting new fuse)
6	Punch guard Micro Switch not closed	Check requirement 2.08

**4.09 *Rough Operation of Carriage:*** This condition may be due to one or more of the following causes.

ITEM NO.	CAUSE	REMEDY
1	Foreign matter in ball-bearing raceways	See 3.12
2	Rubbing of carriage on table or dies	See 3.12

**4.10 Excessive Burring of Cards:** This condition may develop from one or more of the following causes. All except item No. 1 below refer to burrs on the undersurface of the card. Item No. 1 refers to burrs on the top surface of the card.

ITEM NO.	CAUSE	REMEDY
1	Metallic slivers adhering to punch and stripper	See 3.25(2)
2	Dull punch and die	See 3.25(1)
3	Chipped punch and die (usually caused by coding with blank not properly positioned in card nest) (660A tool only)	Replace punch and die
4	Misalignment of hole-enlarging control unit pilot pin with hole-enlarging punch (660A tool only)	Check requirement 2.14

**4.11 Failure of Control Units to Operate Properly:** Probable causes of this trouble are listed below.

ITEM NO.	CAUSE	REMEDY
1	Air pockets in foot-pedal hydraulic system — 659A and 659D tools	Fill and bleed as covered in 4.01 through 4.06
2	Solenoid cut-off valve not operated — 659A and 659D tools	Replace valve
3	Incorrect setting of foot-pedal stops — 659A and 659D tools	See 3.19(3)
4	Pilot pin shaft or stylus binding — 659B, 659C, 659E, and 659F tools	{ Clean and lubricate { See 3.01 and 3.02

**4.12 Failure of Punches to Operate Properly:**

The electrical and hydraulic systems for operating the hole-enlarging punch are the same as for operating the tab-clipping punch. However, in addition to the parts common to operation of both punches, each punch has its own actuating cylinder, control unit, Micro Switch, and control panel relay. Probable causes of improper punch operation are listed below.

ITEM NO.	CAUSE	REMEDY
1	Selector handle not properly set	Position handle properly
2	Bypass valve open	Close bypass valve
3	Control unit Micro Switch inoperative	Check requirement 2.20 for hole-enlarging punch and requirement 2.20 for tab-clipping punch
4	Punch does not restore	See 3.24(4) for hole-enlarging punch card and 3.21(2) for tab punch
5	Card lifts from nest (660A tool only)	See 3.14
6	Selector handle Micro Switches inoperative	See 3.17
7	Insufficient oil pressure	See requirement 2.33
8	Punch jammed in die (660A tool only)	Extract punch as covered in 4.13

**4.13 Punch Jammed in Die (660A tool only)**

(a) To extract a jammed punch, depress the lock to remove power from the tool. Place a small block of wood approximately 3/4 inch thick and 2 inches long on the blank close to the side of the punch which is furthest from the adjacent card nest jaw. Place the wide portion of the blade of the R-1324 screwdriver under the stripper retainer, making sure the end of the blade does not touch the stripper. Then, using the block of wood as a fulcrum, pry the punch loose by carefully exerting downward pressure on the handle of the screwdriver.

**Caution:** Do not strike the handle of the screwdriver with a hammer or other object when extracting a jammed punch as this may cause damage to the punch and die assembly or carriage.

(b) Jamming of the punch in the die results from improper positioning of the blank in the card nest or improper alignment of the pilot pin with the hole-enlarging punch. After extracting the jammed punch, carefully examine the punch and die to determine if either is chipped or otherwise damaged. If the punch and die are not damaged, check requirements 2.14 and 2.21 before resuming punching operations. If the punch and die are chipped or otherwise damaged, replace the punch and die assembly.

#### REASONS FOR REISSUE

1. To revise information covering features of 659-type tools (1.03).
2. To add caution note (1.05).
3. To revise title of Fig. 1, 2, 7, 8, 11, 12, 14, 15, 22, 24, 25, and 26.
4. To revise index list (1.13).
5. To revise requirement and procedure covering lubrication (2.02 and 3.02).
6. To revise Fig. 2, 3, and 4.
7. To revise requirement and procedure covering freedom of parts from oil (2.05 and 3.05).
8. To omit requirement and procedure covering card nest gate (2.13 and 3.13 of previous issue).
9. To revise requirement and procedure covering position of card nest (previously, position of blank in card nest) (2.14 and 3.14).
10. To revise requirement and procedure covering pilot pin travel (2.19 and 3.19).
11. To revise requirement and procedure covering position of hole-enlarging punch stripper (2.21 and 3.21).
12. To add requirement and procedure covering position of hole-enlarging punch pilot (2.22 and 3.22).
13. To omit requirement and procedure covering clearance between hole-enlarging punch pilot and carriage (2.23 and 3.23 of previous issue).
14. To revise requirement and procedure covering operation of hole-enlarging punch (2.24 and 3.24).
15. To revise requirement and procedure covering positioning of stylus (2.26 and 3.26).
16. To revise requirement and procedure covering operation of stylus (2.27 and 3.27).
17. To revise requirement and procedure covering operation of Micro Switch (2.28 and 3.28).
18. To revise check of requirement covering clearance between tab-clipping punch and carriage (2.30).
19. To revise requirement and procedure covering performance of tap-clipping punch (2.32 and 3.32).
20. To revise List of Tools, Gauges, and Materials (3.001).
21. To revise information for removing and mounting foot-pedal assembly cover and drip pan (3.004).
22. To revise information for removing hole-enlarging and tab-clipping punch and die assemblies (3.008).
23. To revise information for mounting hole-enlarging and tab-clipping punch and die assemblies (3.009).
24. To revise heading of paragraph covering method of filling and bleeding foot-pedal hydraulic system (4).
25. To revise information covering failure of control units to operate properly (4.11).