ALPHABETIC PRINTING PUNCH

TYPE 036

Customer Engineering Reference Manual

EAM Section 036

CONTENTS

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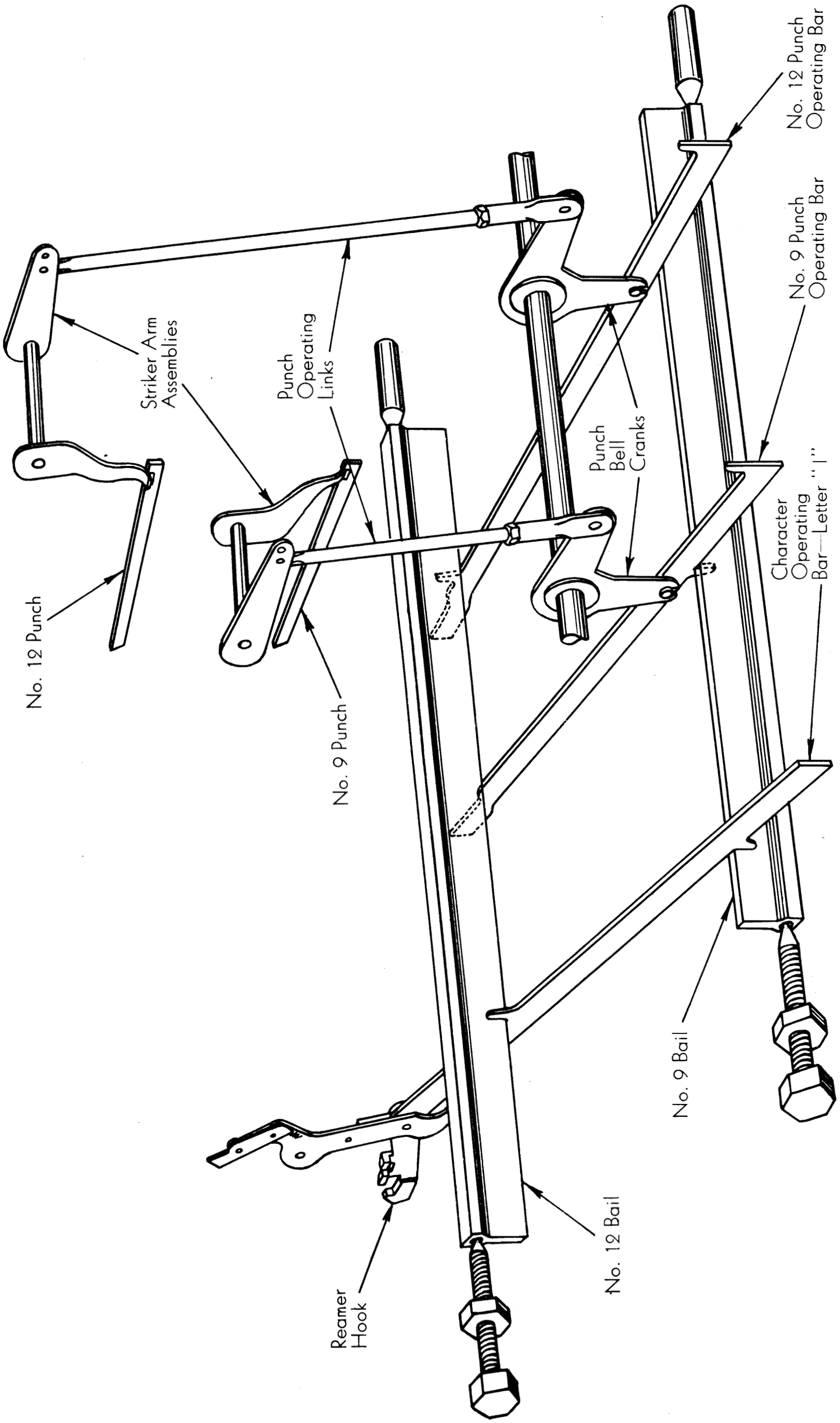

No. 12 Punch
Striker Arm Assemblies
Punch Operating Links
No. 9 Punch
Reamer Hook
No. 12 Bail
No. 9 Bail
Punch Bell Cranks
Character Operating Bar—Letter "I"
No. 9 Punch Operating Bar
No. 12 Punch Operating Bar

FIGURE 1

ALPHABETIC PRINTING PUNCH TYPE 036

Several changes on the Alphabetic Printing Punch will be made soon, and as rapidly as these changes become available, they will be announced to the field by C.E.I. Memoranda.

It is the purpose of this booklet to outline service data and adjustments for the machine as it is at present. Adjustments will be given in the order in which they should be made.

It should be kept in mind that there are six different wiring diagrams in use on 036 machines in the field. They are 185599, 185968, 185968A, 185968B, 177238 and 177238A.

The last wiring diagrams used, 177238 and 177238A, differ widely from the first four wiring diagrams. In the several instances where adjustments differ, depending upon whether the machine is wired to a 177238 number or to a prior diagram, these differences will be pointed out.

CHARACTER OPERATING BARS, REAMER HOOKS AND KEY LEVERS

Punch Bails—Figure 1

The purpose of the punch bails is to transmit motion from the character operating bars to the proper punch operating bars. Figure 1 shows a schematic of the punch bails and their relationship to the character operating bars and punch operating bars.

They should be free on their pivots with a minimum of end-shake. This can be adjusted by the pivot screws with lock nuts on the right hand side frame. Be sure lock nuts are tightened.

Character and Punch Operating Bar Stop—Figure 2.

The purpose of this top is to adjust the length of travel of the character operating bars. The maximum forward limit of travel of these bars is the point of disengagement of the reamer hook and reamer shaft. Since this point of disengagement is fixed, the rear position of the character operating bar is the variable. It should be adjusted for .200″ total movement of the character operating bars. This should be checked carefully on several bars at each end and near the center in order to get the nearest overall condition. Do not attempt to move stop without loosening holding screws and be sure these holding screws are tightened after adjustment.

A gauge, .200″ x .200″ x 1″, is available and may be used to check this clearance by inserting it between the character operating bar and the operating bar stop when the character operating bar is at its maximum forward limit. The gauge should just enter snugly. (This is a temporary gauge and a part number will not be assigned to it. For future use it will be incorporated with another tool on the present tool list.)

Reamer Hook and Shaft Clearance—Figure 3

There should be .020″ to .038″ clearance between a flute on the reamer shaft and the tip of a reamer hook when latched on a key lever. It is preferable to have .028″ for best operating conditions. There is no adjustment provided for this. To change the clearance, it will be necessary to replace the key lever or reamer hook or both. If this is not possible, peening or stoning may be used to make minor corrections.

Stoning the bottom of the stationary portion of the key lever will decrease the clearance. If necessary to increase it, peen about ¼″ above this point. The hook must be free on its pivot and must not bind in the comb.

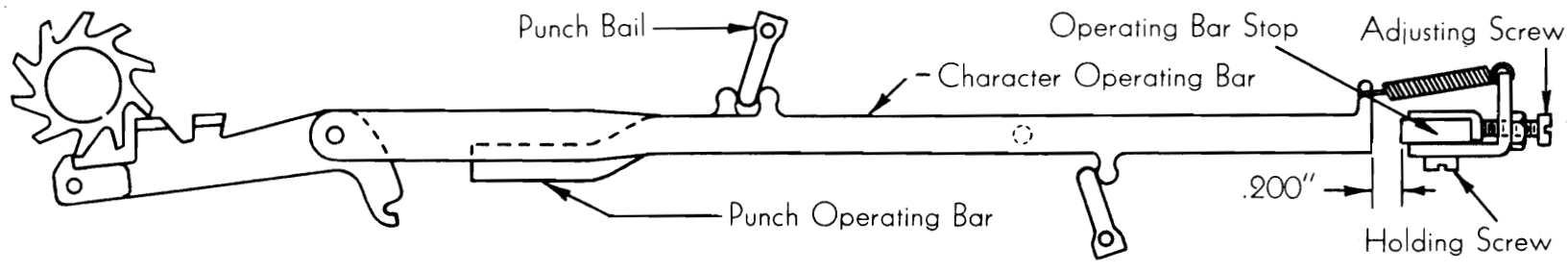


FIGURE 2

The movable portion of the key lever should overlap the boss on the reamer hook approximately .025″ (See Figure 3). If this overlap is too great, the movable portion may fail to get up on top of the boss after a reamer hook operation, and repetitive punching may result. In this case, the foot of the movable portion or the top of the boss may be stoned. When stoning, use care to avoid rounding the edges. Rounded edges on the latching surfaces, or a weak key lever latch spring, may also be the cause of repetitive punching.

Key Lever Upper Stop—Figure 3

The key lever upper stop governs the normal rest position of the key levers which are held upward against the stop by spring tension. As will be noted in Figure 3, this normal rest position determines the amount of latching overlap of the stationary portion of the key lever latch on the boss of the reamer hook. It likewise determines the clearance between the movable portion of the key lever latch and the front of the same boss. The upper key lever stop should be positioned to obtain a clearance of .030″ to .040″ between the movable portion of the key lever latch and the front of the reamer hook boss, as in Figure 3. This insures that as the key lever returns to normal after an operation, the movable portion of the key lever will allow the reamer hook to rise and rest on the fixed portion. It should be remembered that if this clearance is too great it will increase the travel of the key levers and consequently decrease the duplicating speed. It is important that the character operating bar stop be properly positioned as in Figure 2, because it has a direct bearing on this adjustment as well as on many following adjustments.

Before attempting to move this stop bar, be sure to loosen the three holding screws, one at each end and one at the center.

Key Lever Unlatching Clearance—Figure 4

With a key lever fully depressed and resting on the interlock comb, the following unlatching clearances should exist at the point shown in Figure 4.

1st bank (numerical)	.022″
2nd bank	.025″
3rd bank	.026″
4th bank	.022″

There is no adjustment provided for this clearance because it obviously depends upon the position of the interlock comb assembly which is pinned at the factory. However, if it is necessary to install a new interlock, it is well to check the unlatching clearance of one key in each bank at both ends of the keyboard. While this clearance cannot be seen readily, it can be checked for a practical condition by depressing the key lever slowly at the interlock while the machine is running and noting the distance that the key lever goes down after the reamer hook is released. The distance from the pivot point of the key lever to the latching surface of the key lever is approximately 80% of the distance from the pivot point to the interlock comb. For example, in the case of the first bank (numerical bank), if the key lever goes down .027″ *at the interlock* after unlatching, it may be assumed that the unlatching clearance is approximately .022″. See also "Installing a New Interlock Assembly," Page 4.

Care of the Interlock Assembly

The key interlock assembly may be the cause of sluggish or improper key operation. It should first be determined that the comb is clean and free of burrs or binds. If gummy, it may be washed with a cleaning fluid to which oil has been added and then the parts should be wiped with a clean, dry cloth. OIL SHOULD NEVER BE PUT INTO THE INTERLOCKS. If any comb teeth are bent they obviously will obstruct the free movement of the keys or the interlock discs. Any bent teeth should be straightened and the inside surface of the comb should be smoothed with a fine stone. It is well to run a flexstone between the teeth to remove burrs. The channel of the disc guide should likewise be free of burrs and binds.

It is best to assemble the interlock comb and disc guide first without the discs and install it in the machine. This will readily reveal whether any keys are binding between the teeth of the comb and insure that the bind is not due to the adjustment of the discs.

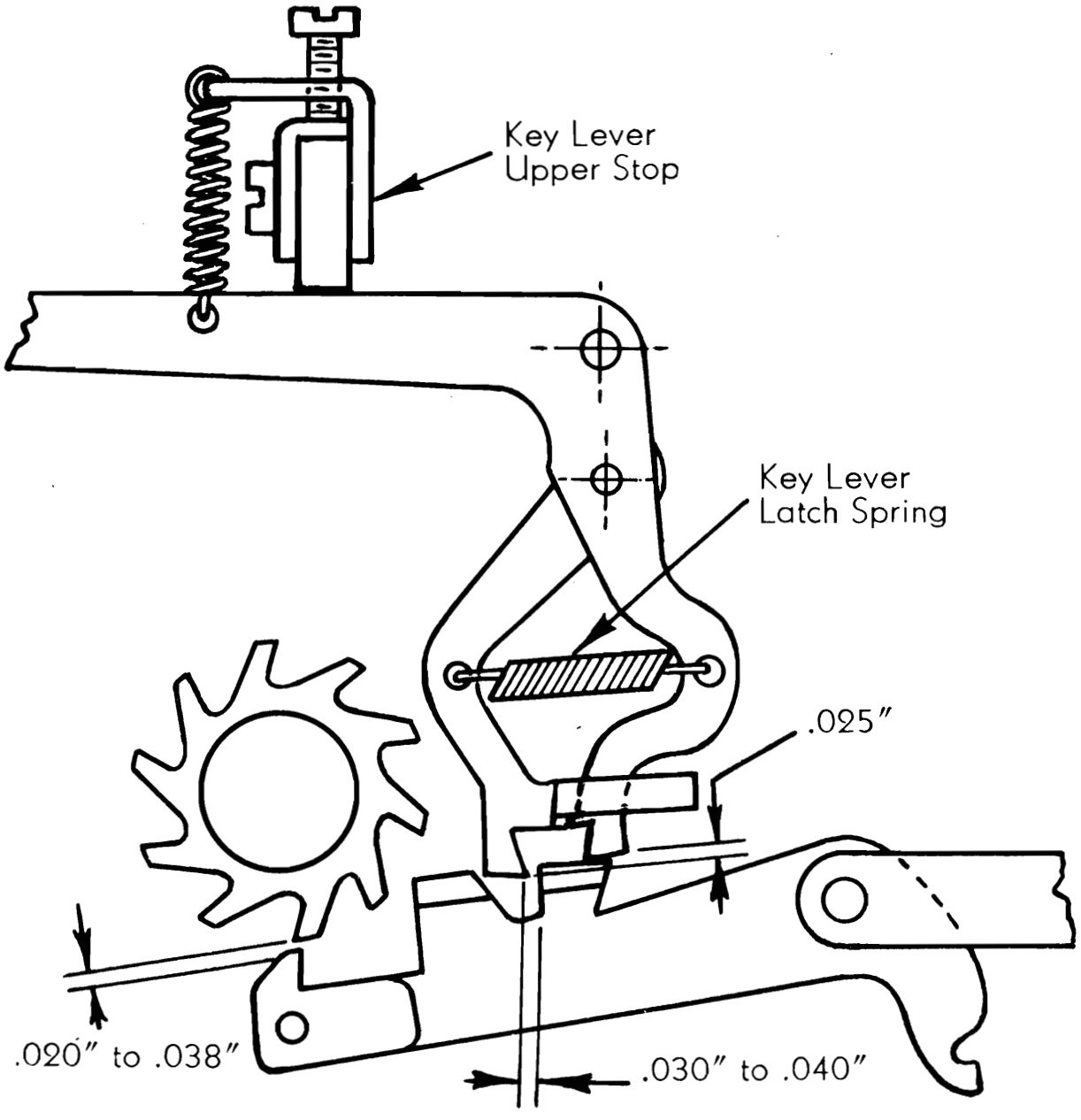


FIGURE 3

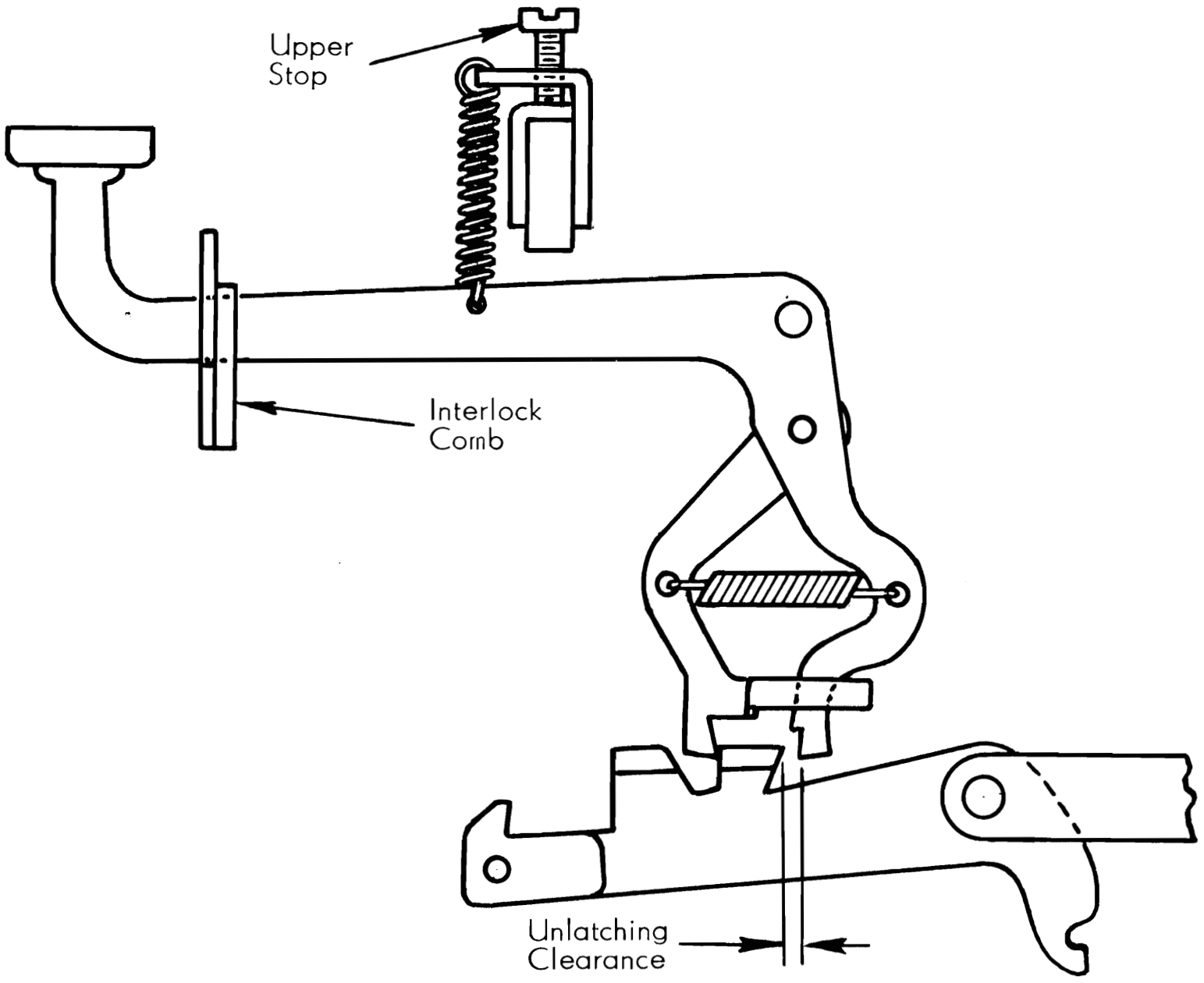


FIGURE 4

Removal of Interlock Assembly

Possibly the easiest way to remove an interlock assembly is to take it out through the bottom of the machine under the reamer shaft and the reamer hooks. Loosen the four screws which hold the duplicating solenoid support plate so that this plate may be dropped down about 3/16". Unhook the duplicating solenoid links from the Q, I and W keys. Remove the holding screws and dowel pins from the interlock. This assembly may now be moved to the left slightly so that the right end can be dropped. It will now slide out between the rear bank of the duplicating solenoids and the reamer shaft.

Interlocks now have the disc channel and comb under cut slightly at the point of contact with the sides of the discs to reduce friction. Also, the comb is harder and has a better finish. The part number has not been changed.

Interlock Disc End Stop Adjustment—Figure 5

The adjustable end stops for the discs may be positioned after finally reassembling the interlock assembly but before replacing it on the machine. Hold the interlock assembly in a vertical position with the left end down. Position the left end stop (single screw) so that, at the upper end, each disc just drops below the level of its tooth but not more than .003". Check several positions, but disregard the third slot from the top; this slot is wider because of the ejector key lever. (It should be noted that even though the ejector key lever is thicker than the other key levers, it has been relieved at the point where it enters between the interlock discs. Therefore, the interlocks affect this key the same as all others.)

Next adjust the right end stop (two screws) so that when the assembly is held with this end down, the disc near the top end will drop below the level of the teeth not more than .003".

The closer this can be held without binding any keys, the better will be the results. After placing the assembly in the machine, check each key position for free operation. If any binds are found it may be necessary to move one end stop or the other, depending on which end is causing the bind. *Note:* Before moving either end, be sure that the bind is due to interlock discs. It may be the teeth of the comb or disc guide.

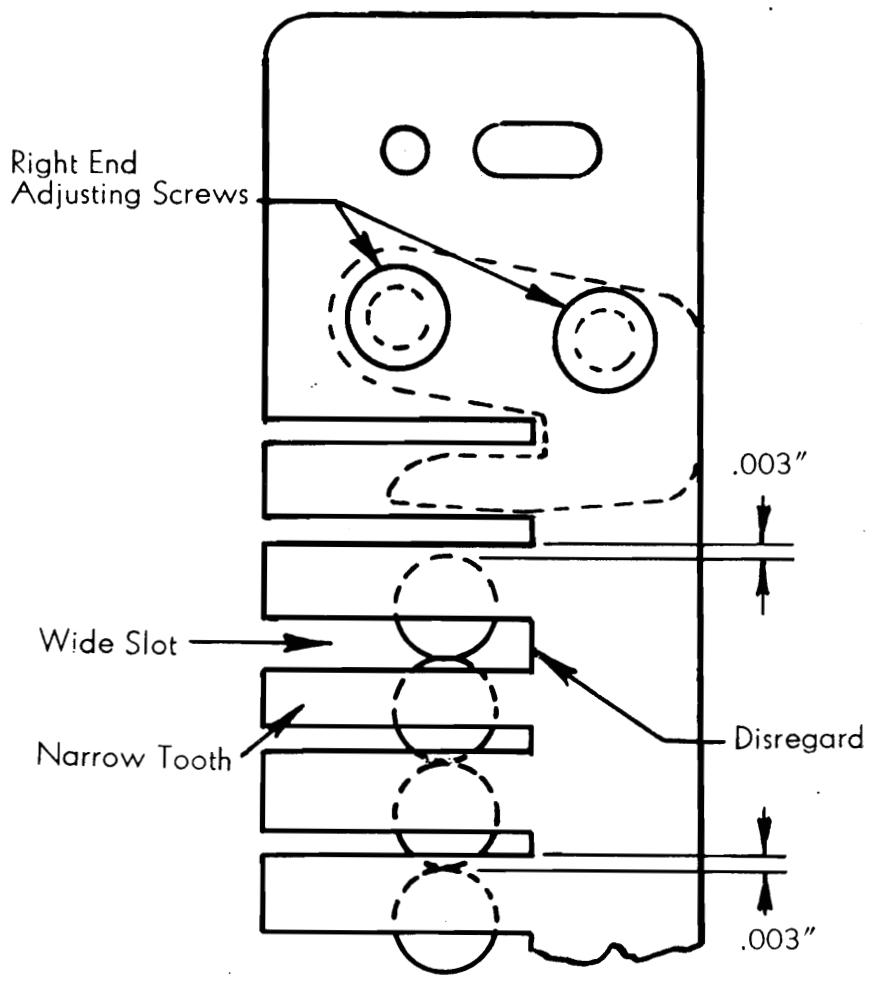


FIGURE 5

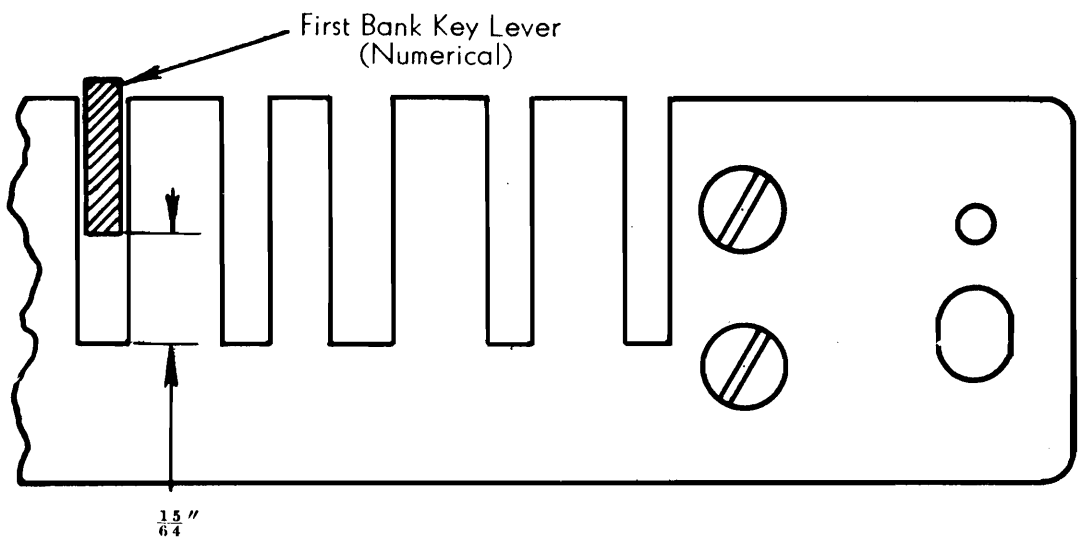


FIGURE 6

Installing a New Interlock Assembly—Figure 6

If it is necessary to install a new interlock assembly, the proper vertical position must be found. As a starting point this should be put in place and held by the two screws through elongations so that the key levers in the first bank (numerical) move downward $\frac{15}{64}$" *at the interlock* before being stopped by the bottom of the slot in the interlock assembly. However, this may be only a starting point. The keys should be checked for actual operation at both ends of the keyboard. Check that it is not possible to "slip by" between two keys at opposite ends of the board. Also, when any one key is held fully depressed, it should be possible to depress the other keys slightly, possibly $\frac{1}{64}$". This will insure that they are not being locked up too tightly. When properly located, the interlock assembly must be doweled in position. Drill with a No. 31 drill (.120") and enlarge the holes with a ⅛" straight reamer (.125"). Use .125" straight dowel stock. Part No. 632 covers dowel pins .125" x ⅜".

This measurement of $\frac{15}{64}$" movement of first bank key lever should result in key lever unlatching clearances no less than those listed under "Key Lever Unlatching Clearance."

Key Interlock Contact

The key interlock contact is opened by the action of the key bail when any character key is depressed. The lower support of this contact should be adjusted by bending so that as the key lever rises after a character operation, the contact will close just after the movable portion of the key lever latch has been pushed off the front of the boss on the reamer hook. Check the keys at both ends of the keyboard.

The tension on the upper strap should be sufficient to insure good contact. If the tension is too light it may cause the machine to "gallop," that is, to operate at an uneven pace when duplicating. Any excess tension is undesirable because it makes the touch harder.

It is important that this contact be in adjustment as stated above because its purpose is to prevent the following condition:

> If a column to be duplicated follows immediately after a column being manually punched, and both columns are being punched with the same digit, it is possible that the key may be pulled down by the key solenoid on the duplicated column before the operator has fully released the key from the manual depression. If this second downward movement of the key begins before the movable portion of the key lever has been pushed off the front of the boss on the reamer hook, the key will be pulled all of the way down without the reamer hook being released. No punching will take place and the machine will stop on this column.

Return Arm and Star Wheel Adjustment—Figures 7 and 8

The return arm and star wheel are for the purpose of assuring that the punches will be withdrawn from the card and all other mechanisms restored to normal immediately after the reamer hook has been tripped off the reamer shaft.

When all character operating bars are in their normal position, there should be .005" to .010" clearance between the return arm and the lobes of the star wheel as the reamer shaft and star wheel are rotated, Figure 7. This adjustment is obtained by means of two adjusting screws (M) with lock nuts, on the return arm adjusting assembly at the extreme right end of the punch bell crank shaft (facing rear of machine). Be sure that the bell crank return bail is held up against the bell cranks while making this adjustment.

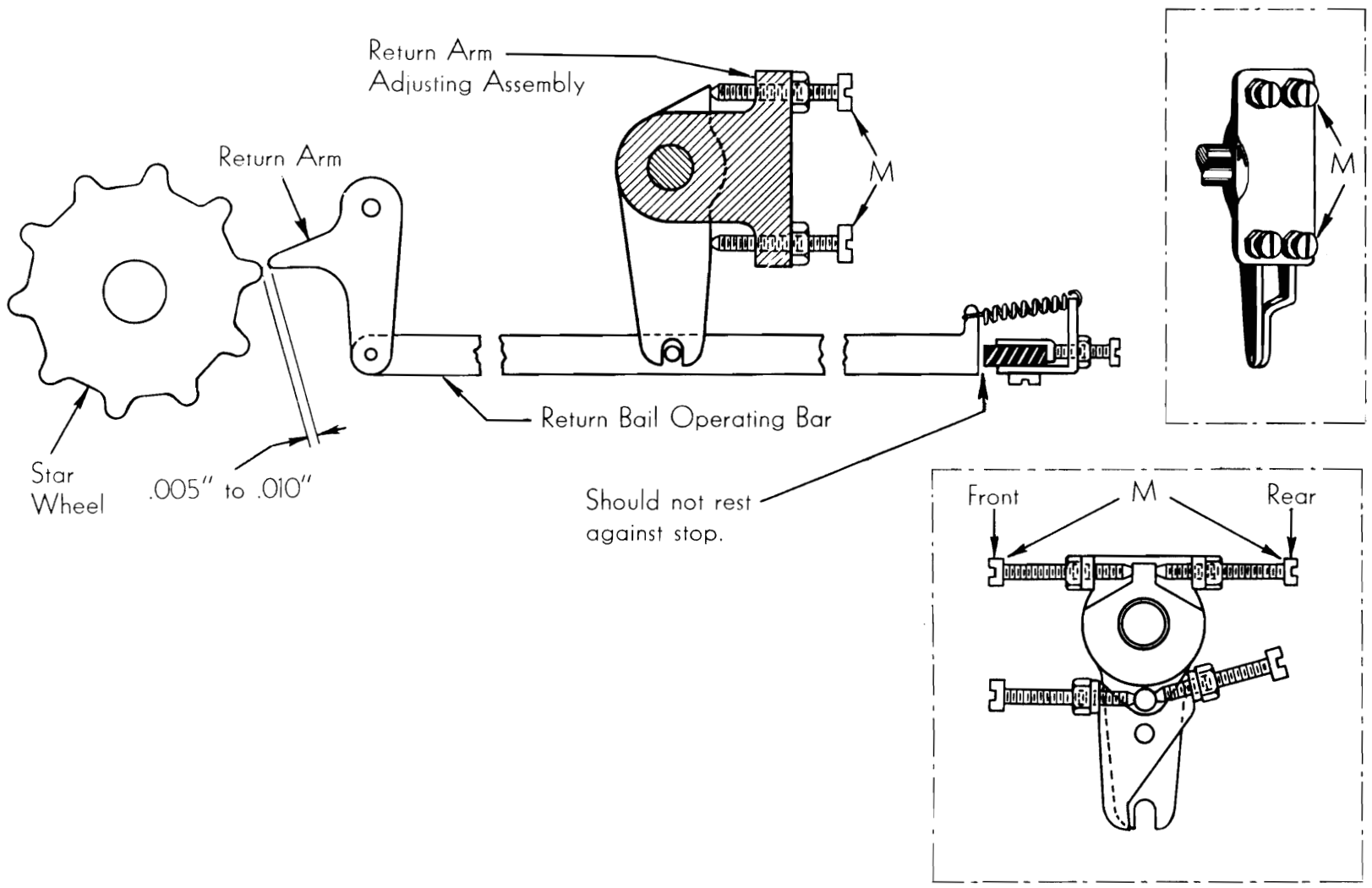


FIGURE 7

A feeler gauge may be inserted between the star wheel and return arm by coming up from the bottom of the machine. Loosening the upper screw and tightening the lower one will decrease the clearance. The return bail operating bar should not strike nor rest against the operating bar stop at the rear of the machine. If necessary, the stop should be filed at the extreme right end (facing rear) to prevent this.

Note: This adjusting assembly for early Type 036 machines is shown in the lower insert in Figure 7. The adjusting screws (M) are used to obtain the .005″ to .010″ clearance. Loosening the screw with its head toward the front of the machine and tightening the screw with its head toward the rear will decrease the clearance between the star wheel and return arm.

The star wheel should be timed to operate against the return arm immediately after the reamer hook has tripped off. To adjust, loosen the star wheel on the reamer shaft, depress a key and turn the machine over by hand until the character operating bar is in its extreme forward position, just before the reamer hook trips off. Turn the star wheel ahead until there is .003″ between the return hook and the oncoming lobe (see Figure 8) and tighten the star wheel in this position. Check this clearance several times, using keys at both ends of the keyboard. In no case should the lobe strike the return arm before the reamer hook has tripped off, but the closer this can be kept, the better will be the results. Be sure the star wheel is tightened on the shaft by *both* screws. It is difficult to get a feeler gauge in position to check this clearance but a strip of paper may be bent and inserted between the return arm and lobe. One thickness of paper should just be pinched between them.

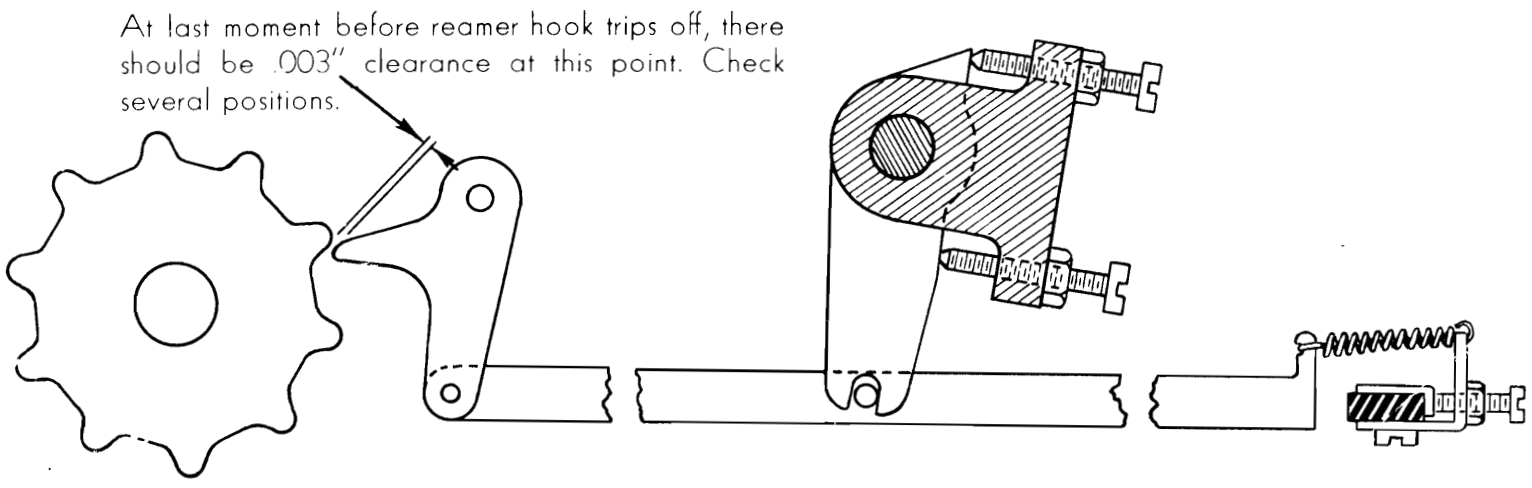


FIGURE 8

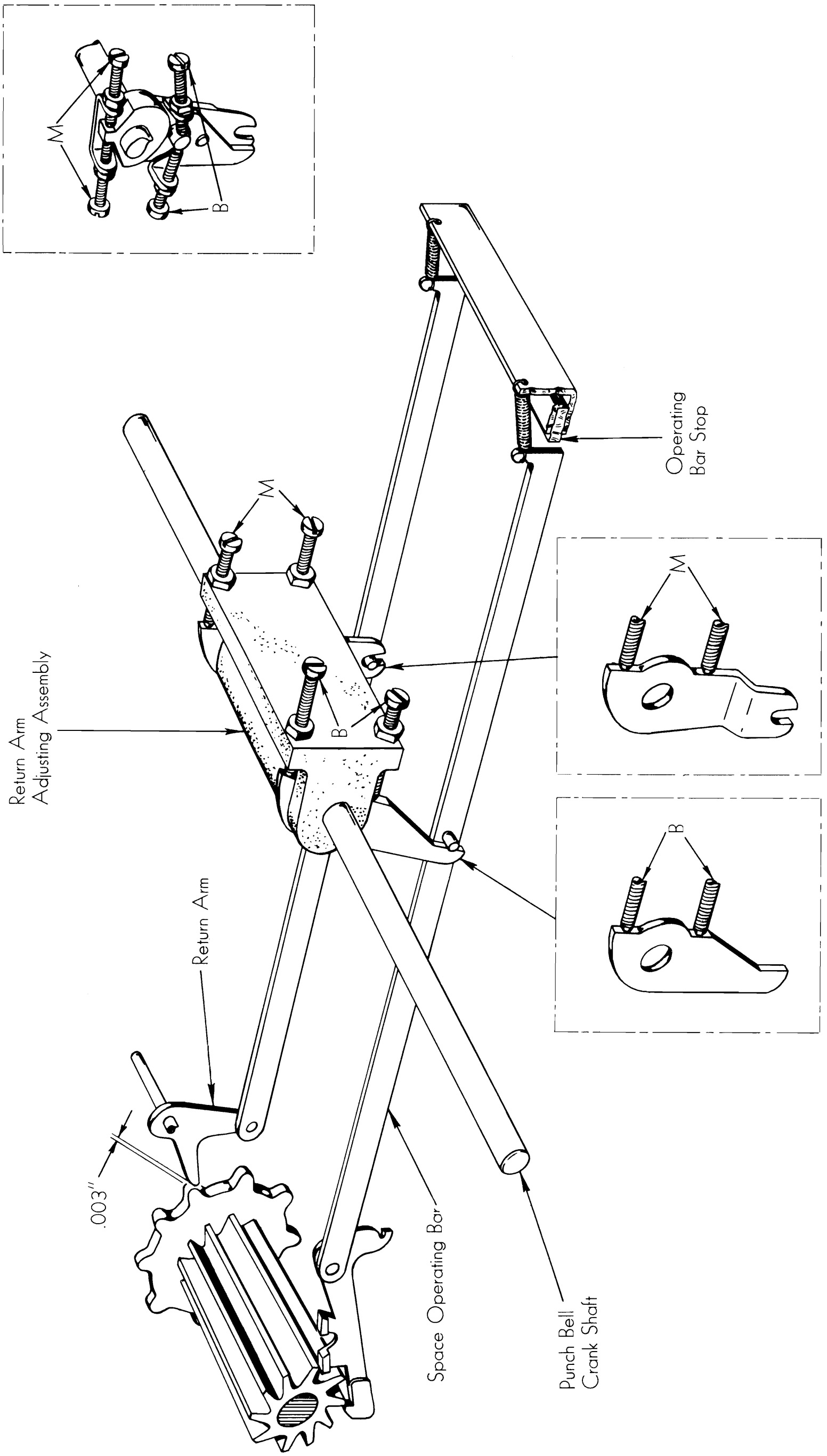

M
B
Operating
Bar Stop
Return Arm
Adjusting Assembly
Return Arm
.003"
Space Operating Bar
Punch Bell
Crank Shaft

FIGURE 9

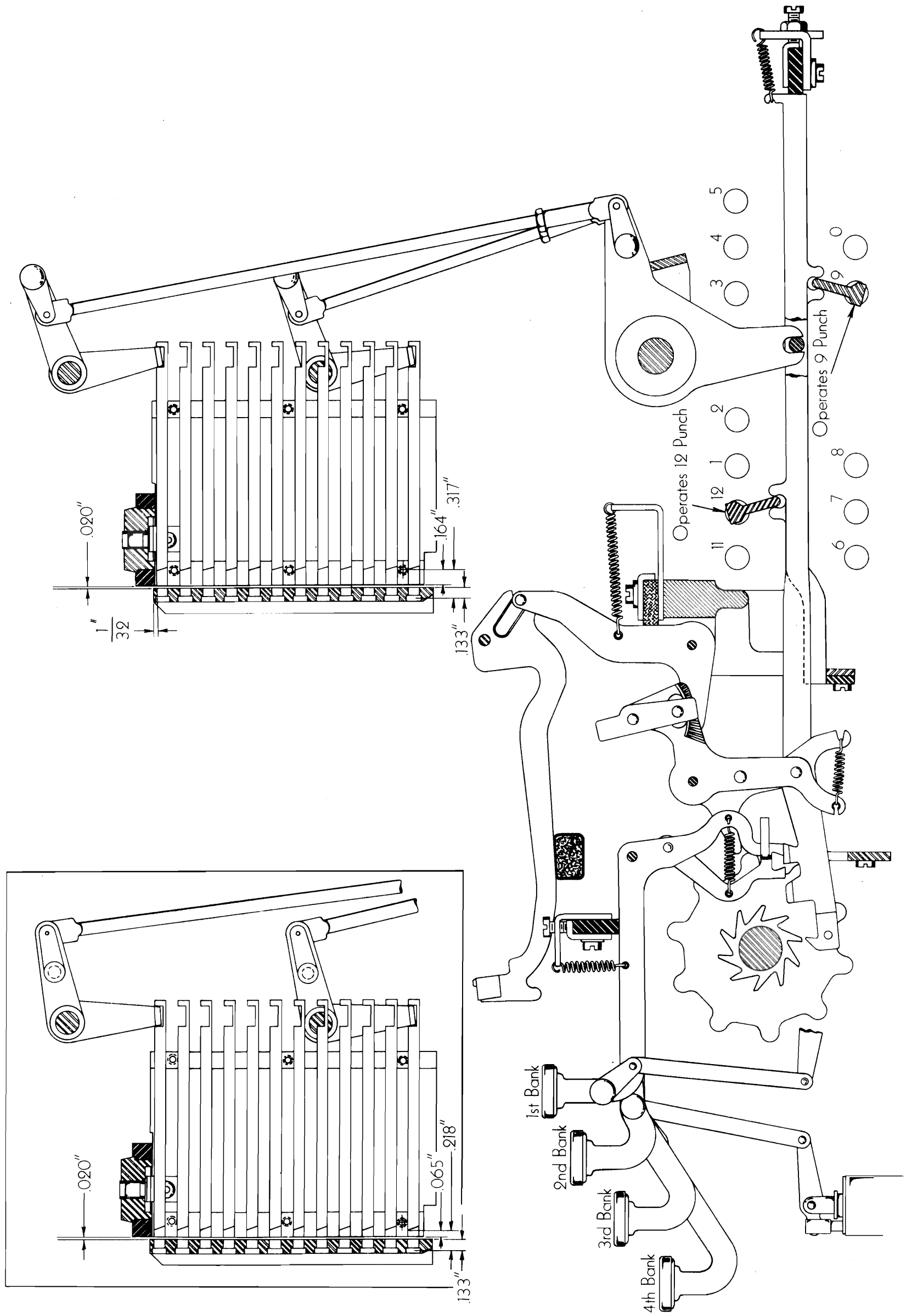

.020"
1/32"
.164"
.317"
.133"
Operates 12 Punch
Operates 9 Punch
1st Bank
2nd Bank
3rd Bank
4th Bank
.020"
.065"
.218"
.133"

FIGURE 10

Return Hook Travel on Spacing Operation—Figure 9

When the reamer hook for the space bar engages with reamer shaft, it pulls forward on the space operating bar. A stud on the side of the space operating bar strikes an adjustable portion of the return arm adjusting assembly. This is for the purpose of moving the return arm in front of a star wheel lobe on the spacing operation the same as on a character operation. Figure 9 shows an extended view of the return arm adjusting assembly and the associated parts.

Adjust by means of two screws (B) on the return arm adjusting assembly so that a clearance of .003″ exists between the return arm and star wheel lobe just before the reamer hook trips off. This produces the same condition for spacing as for normal character operation.

The insert in Figure 9 shows the style of return arm adjusting assembly used on early 036 machines, and indicates the corresponding adjusting screws. If it is necessary to install a new adjusting assembly, it is advisable to replace the entire punch bell crank shaft assembly, Part No. 185617. This includes the newer style of adjusting assembly.

Punch Bail Contacts

Punch bail contact No. 1 should be adjusted for $\frac{1}{32}$″ to $\frac{1}{64}$″ air gap in the normal position.

Punch bail contact No. 2 should be adjusted for a maximum of $\frac{1}{64}$″ air gap when broken at the extreme limit of travel just before the reamer hook trips off. The closer this can be kept, the better will be the results when duplicating, particularly on machines wired to 177238 or 177238A.

Eject Key Contact

1. The eject key contact should be adjusted for at least $\frac{1}{32}$″ air gap when open and $\frac{1}{64}$″ rise off the brass support when closed.
2. Position the eject key solenoid so that when its plunger is fully attracted the eject key will be pulled down far enough to operate the interlocks but not far enough to close the eject key contact.

Tab Key Contact

The adjustments for tab key contact and solenoid are the same as for the eject key contact and solenoid, stated above.

PUNCHING MECHANISM

Die and Guide Block Assembly

The die and guide block are pinned at the factory. If for any reason it is necessary to separate them, extreme care should be used to take them apart evenly so as not to strain any parts or pins. Slight strains will throw the die out of alignment with the punch guide block. These parts should not be separated except when absolutely necessary.

The clearance between the die and guide block should be .020″ (set at factory). There should be a minimum of .010″ clearance between the top of the die and the type head. If this clearance is too small, the effect may be that the type heads strike on top of the die, causing it to collapse into the No. 12 hole. This may be due to the fact that the die is too high. If the top of the die is more than $\frac{1}{32}$″ above the 12 hole, it should be filed down to $\frac{1}{32}$″.

To measure this distance, insert a card into punching position and punch a 12 hole. Using a small knife blade, scribe a fine line on the card even with the top of the die. The card can then be removed and the distance measured from the top of the hole to the line.

Punch Travel—Figures 10 and 11

It is very important that all punches slide freely in the punch guide block and into the die. If it is necessary to stone the punches to free them, use the fine side of a clean, flat stone. Obviously if too much stoning is done, the punched holes will be ragged. It should be possible to slide each punch into its place by hand and without binding until only the recessed driving portion of the punch projects from the rear of the guide block.

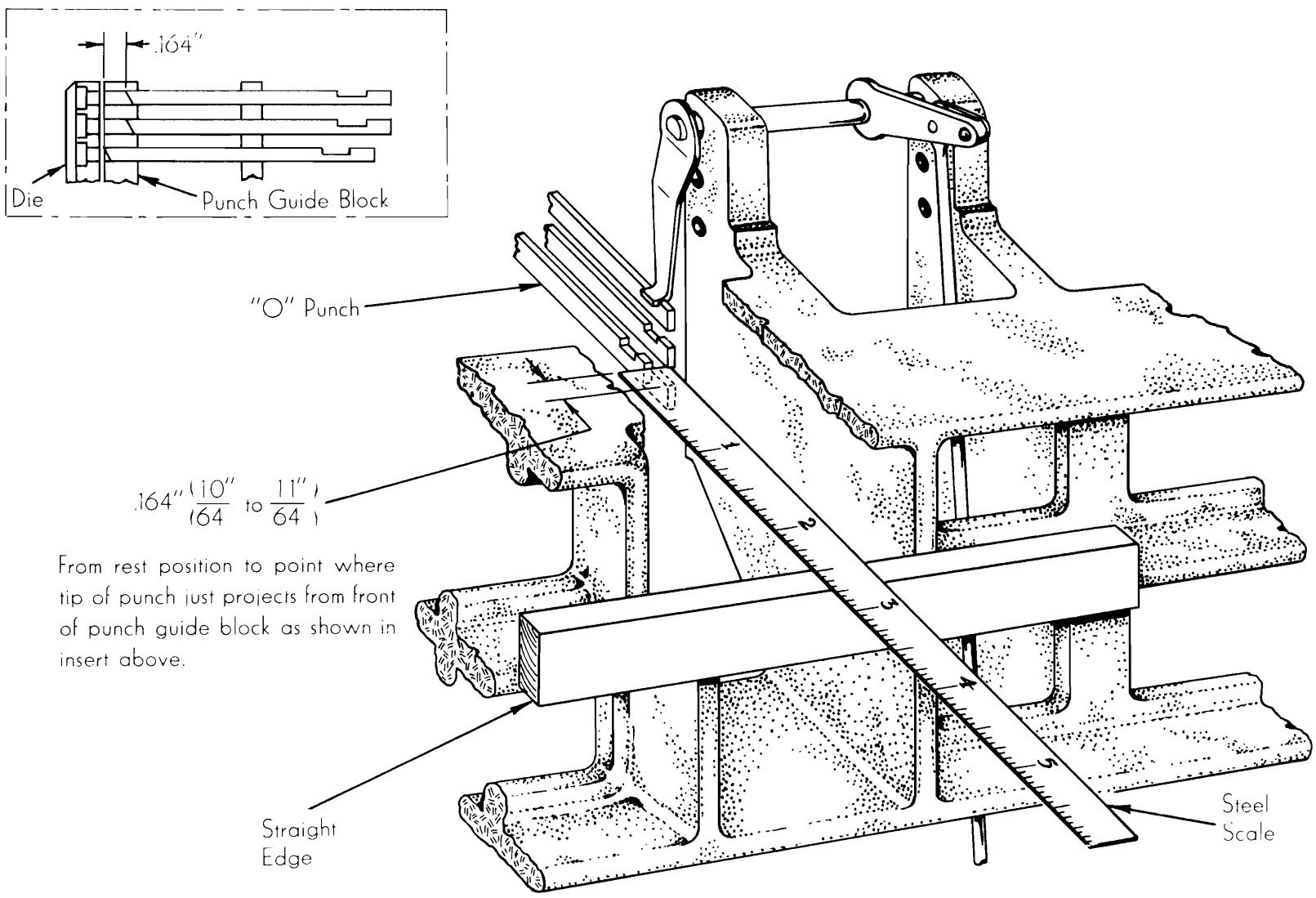


FIGURE 11

A drop of light oil (IBM No. 6) should be placed on each punch where it enters the guides. However, the punches should be perfectly free before oiling. IBM No. 9 should be used on the pivots at the top and bottom of the punch connecting links as well as on the striker arm bearings.

1. The clearance between the die and guide block should be .020″ (set at factory).
2. The total punch travel should be .317″. This figure applies to 036 machines having the top of the punch operating link connected approximately midway on the horizontal portion of the striker arm. (See Figure 10).
3. The tip of the punch should travel .133″ after entering the die. This is established by adjusting the position of the punch in its normal rest position and this in turn will determine the travel into the die because the total travel is fixed at .317″.

The tips of the punches in their rest position should be .164″ behind the front edge of the punch guide block. This is adjusted by means of the turn-

buckle on the punch connecting link. Each half turn of the turnbuckle will produce approximately .018″ change in the position of the punch. Remember that changing this turnbuckle merely changes the position of the stroke of the punch and does not change the length of the stroke.

The striker arms are now being welded to prevent loosening of the vertical member on its shaft.

This distance of .164″ can readily be measured with a steel scale, Figure 11, by putting a straight edge across the back casting of the machine and measuring from the straight edge to the rear of the punch. Measure the distance in the rest position. Then depress a key and turn the machine by hand until the tip of the punch just projects from the front of the guide block and measure again. See insert, Figure 11. There should be a difference of 10/64″ to 11/64″ in the two measurements, indicating that the punch has moved approximately the required .164″ before projecting from the front of the punch guide block.

The tip of the punch can readily be seen when it begins to project from the front of the guide block, by sighting along the card line from near the feed knife, and placing a white card or a light on the other side of the die. If two punches are properly set as described above, for example the zero and seven, the others may be set so that the rear of the punches are even when all punches are in a rest position.

The above adjustment, if properly set, will result in the tip of the punch traveling .133″ into the die.

Note: A few early 036 machines were built on which the punch connecting link was fastened at the extreme rear end of the striker arm. (See insert, Figure 10.) On these machines the total punch travel is .218″. The turnbuckle on the punch connecting link should be adjusted so that the tip of the punch in normal position rests .065″ back of the face of the punch guide block. This adjustment results in .133″ travel of the punch tip into the die. Clearance between die and guide block is .020″. On this style of machine each half turn of the turnbuckle results in a change of approximately .012″ in the position of the punch.

SPEED AND VOLTAGE

Speed

Machines wired to 177238 and 177238A should have a reamer shaft speed of 95 to 100 R.P.M. This covers machines which were changed over to wiring diagram 177238 in the field, as well as those which left Endicott wired to that diagram. This change is covered by C.E.I. Memo No. 399.

This machine is equipped with an adjustable pulley on the end of main drive shaft. It is not necessary, therefore, to change pulleys in order to vary the speed. The part number of this adjustable pulley assembly is 283412. If a longer drive belt is necessary to obtain the necessary speed with the adjustable pulley, belt No. 177219, 27″ long, may be used.

Machines wired to any diagram except 177238 and 177238A should be set for a reamer shaft speed of 100 to 105 R.P.M. It has been necessary to change pulleys to vary this speed (excepting 110 Volt D.C. machines with motor resistor). However, the adjustable pulley assembly mentioned in the previous paragraph may be installed on this machine also.

It is important that the proper speed be maintained on any printing punch. Increasing the speed of the reamer shaft will not necessarily speed up the operation; in fact, it may decrease the speed of operation and may be the cause of "galloping." The reason for this is that the time required for one reamer hook operation plus the unlatching of the next reamer hook may be just sufficient to permit a flute on the reamer shaft to go by if the reamer shaft is too fast. If this occurs it is necessary for the newly unlatched reamer hook to "wait" for a flute, thus delaying the operation.

Duplicating speed of this machine is 80 columns in approximately ten seconds.

Generator Voltage

The variable resistor in series with the field of the D.C. generator should be adjusted so that the generator delivers 110 volts.

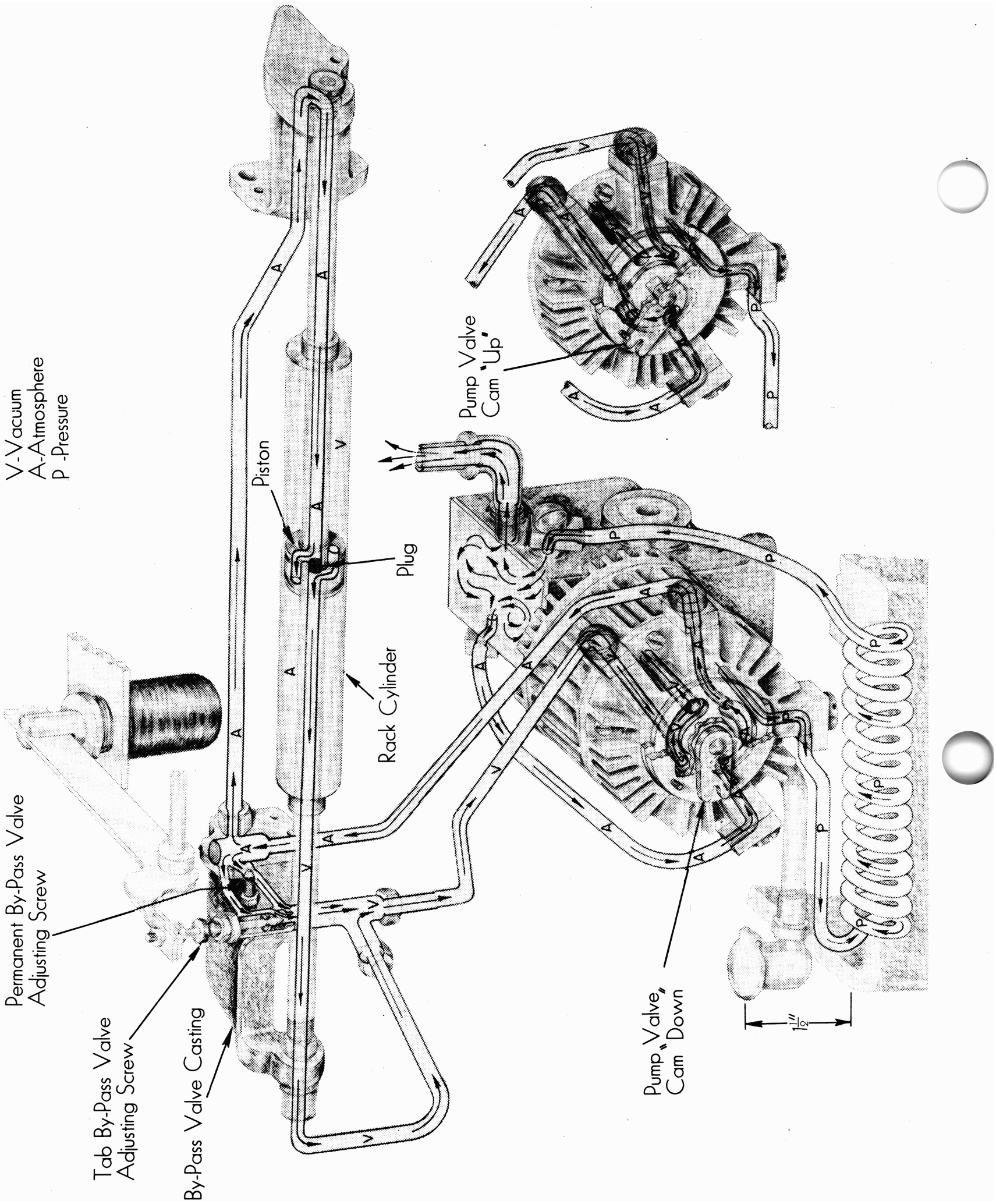


FIGURE 12

PUMP AND RACK DRIVE SYSTEM

Rack Drive System—Figure 12

A schematic of the rack drive system is shown in Figure 12. Note in the large drawing that the pump valve cam is in the upper position and air flows in the direction of the arrows, pulling the cylinder and carriage toward the left or column 80 position of the card.

In the small drawing the valve cam on the pump is shown in the upper position. This reverses the direction of air flow so that the carriage now moves in the opposite direction, toward the Column 1 position.

This style of system has been installed on machines leaving the factory since approximately the latter part of 1942. It drives the rack through vacuum only. The change to this style of pump was made to provide a method of

oiling the pump. Machines built prior to late 1942 have the pressure-vacuum drive. If it is desired to change over to the new vacuum drive, parts may be ordered on B/M No. 292126.

A small oil deflector is fastened to the under side of the drive housing cover and this catches oil as it is carried upward by the gear on the main shaft. The oil flows by gravity from this oil pan into a cup surrounding the shaft and through the rear bearing of the pump onto the rotor and blades. The oil must get onto these parts for lubrication, as well as to provide air seals and increase the effectiveness of the pump. Any excess oil in the pump is blown from the pressure tube of the pump and through the cooling coil, Figure 12, then into the drive housing again. The cooling coil provides a means of dissipating the heat resulting from pressure and friction in the pump.

Oil used in the drive housing should be Kendall 10W. The oil level should be maintained so that the oil cup is half full. Check this level with the machine running and when starting and stopping. Be sure it does not spill over at any time. Too much emphasis can not be placed upon keeping oil at the proper level in the housing because of its effect upon pump efficiency as explained above. The top of the oil cup should be 1½″ above the top level of the base casting just behind the cooling coil. (See Figure 12.)

From the above it will be seen that the pressure does not actually aid directly in driving the rack. The two tubes which connect the cylinder with the pump are alternately atmospheric and vacuum lines.

Vacuum Measurement—Figure 13

The pump should produce a vacuum gauge reading of at least 25 inches when the cylinder is disconnected, as in Figure 13. This gives a measurement of the pump without the effect of leaks or losses in the tube system and cylinder. Be sure the connections to the gauge are tight, at the gauge end and at the pump.

The reversing valve on the front of the pump may be one cause of a low reading. The ring which surrounds the rotating valve must be only slightly thicker than the rotating portion. If it is too thick, it will permit a leak which tends to neutralize the vacuum line with the atmospheric line. If the ring is too thin, it will cause the valve to bind when the five 5-40 screws are tightened. This valve must operate freely enough for the solenoid to operate it, even with a thin film of oil on the sides of the valve. It should also be checked for freedom when the pump is warm. These parts should be replaced if they are found to be incorrect.

It has been found that another reason for lack of vacuum is because some pumps have too much clearance between the rotor and rotor ring. See Figure 14. This clearance should be no more than .0035″ and may be kept as close as possible without straining the parts. If it is necessary to decrease this clearance, the pump cylinder must be moved up and to the left as follows:

1. Remove the cylinder and take out the dowel pins.
2. Elongate (toward the lower right) the ten screw holes in the cylinder and the rear reversing shaft hole, or enlarge them slightly with a reamer.
3. Install the cylinder, without the front head cover, and screw it to the back plate with four of the long screws but do not completely tighten the screws.
4. Remove the rotor blades and springs so the tension does not interfere with positioning the cylinder.
5. Tap the cylinder up and to the left until the rotor ring just touches the rotor at A, Figure 14, and tighten the screws. It will not be harmful to have these parts touching if there is no strain. Turn the shaft to check all sides of the rotor. Also, check with the vanes, springs and pins in place to be sure the vanes can be forced below the circumference of the rotor without jamming.
6. Remove the rotor and take out the four 5-40 screws which hold the cylinder back plate to the drive housing, removing the back plate and cylinder together.
7. Drill and ream new dowel pin holes. Because of the closeness of the radiating fins on the rear, it probably will be necessary to use .125″ dowel pins. Drill with a No. 31 drill and use a .125″ straight reamer. Part No. 632 covers .125″ dowel pins ⅜″ long.

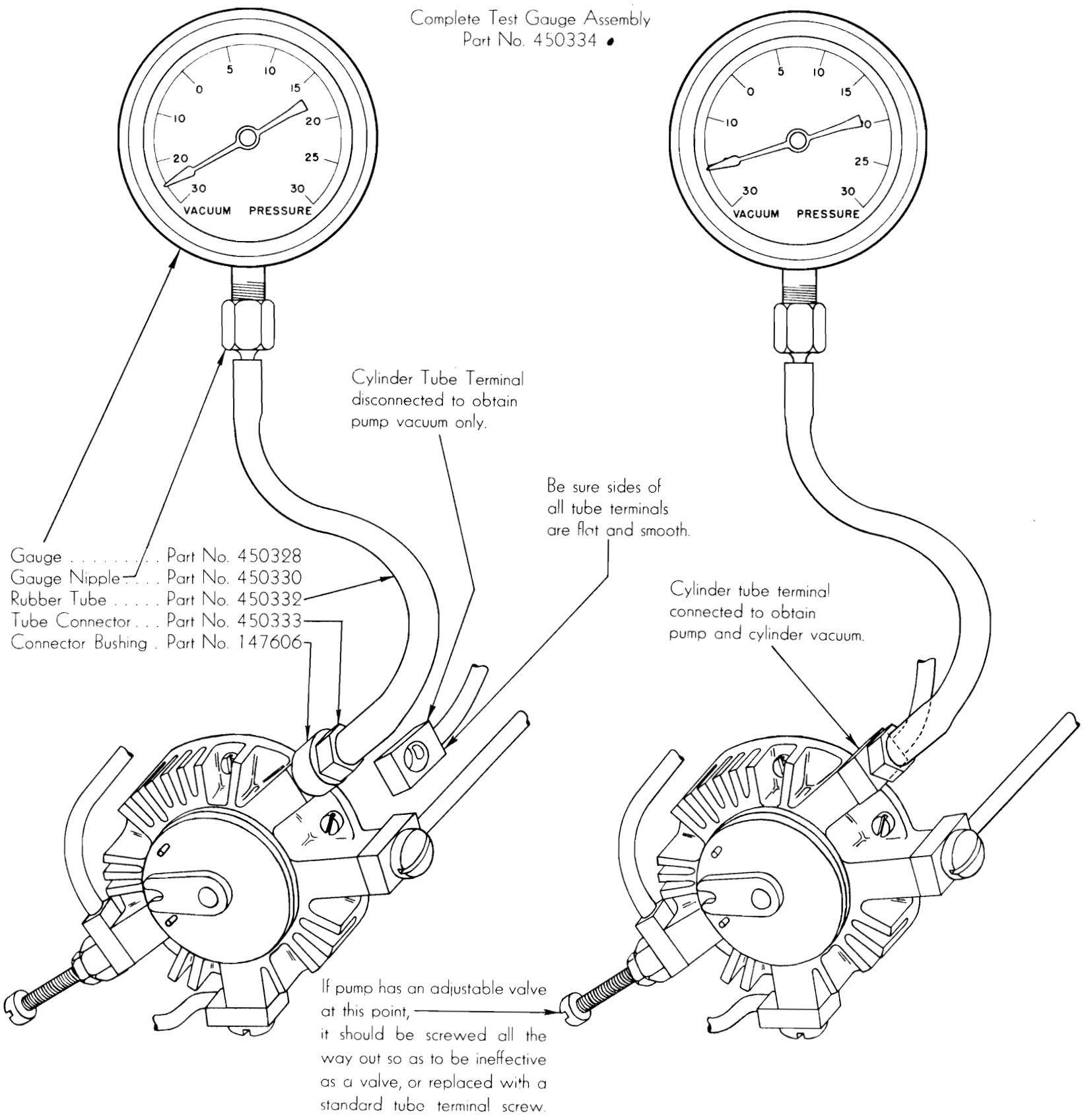


FIGURE 13

Make certain that the oil deflector in the drive housing is tightly screwed in place and is in position to receive oil carried up by the gear; it must not, however, drag on the gear. The spout of the deflector must be in position to deliver the oil into the cup. If the drive housing has a 9/16" shaft, check to see that there is some clearance between the spout and the top of the shaft. It has been found that if the spout is too close to the shaft, the rotation of the shaft at high speed tends to keep the oil from leaving the deflector. It will be found that best pump performance will be obtained when there is a good circulation of oil.

If it is still not possible to obtain 25 inches of vacuum, it probably indicates that tolerances have not been held sufficiently close and that the pump should be replaced. It will be necessary to replace the entire pump and drive housing assembly as a unit. This is part No. 282574.

After proper pump vacuum has been established, a check must be made with the entire system connected and the permanent by-pass valve, Figure 12, tightly closed. Insert the gauge in the line with the tube which leads to the cylinder connected to the pump. The reading should be at least 20 inches. In other words, the loss in the rack cylinder and tube connections should not be more than 5 inches.

If the pump has an adjustable valve in the intake side, it may be turned all the way out so as to be ineffective as a valve (Figure 13), or it may be replaced by a standard tube terminal screw as used on the other tube terminals. The tube terminal screw is part No. 186155. It has been found on some machines that leaks are occurring at the tube terminals. Check that these terminals are perfectly flat and that they do not have small lumps of welding material or solder on them (Figure 13). Hydrol gaskets are now available for use on both sides of the tube terminals. The gasket is part No. 185900.

Check for leaks at the permanent by-pass valve and the tab by-pass valve. It may be necessary to remove the left end cylinder tube support casting to check these valves by blowing into the opening directly under tab by-pass valve with this valve held closed (depressed), and the permanent valve screwed tightly shut. If the permanent by-pass valve leaks it will be necessary to replace the entire casting. If the tab valve leaks, a new valve stem and insert may be installed. The newer valve stems are made of one solid piece so that the shoulder can not be forced down on the stem. The left end tube support casting is part No. 186111, the tab valve stem is No. 186112, and the tab valve seat is No. 186113.

Check the screw in the extreme right end of the cylinder tube to be certain there is no leak at this point. If too much vacuum drop still exists, it probably is due to a loose fit at the rack cylinder end bearings or at the piston. In this case the rack cylinder assembly must be replaced.

Check to be certain that the piston slides freely in the cylinder with both ends of the tube open. This will indicate that there are no mechanical binds in the assembly. A check may be made to determine the relative compression of a cylinder. Hold the tube vertically with the threaded end at the top and slide the cylinder to the top. Close the top end of the tube with the finger and release the cylinder. If there is proper compression, it will require a minimum of approximately 10 seconds for the cylinder to slide to the bottom. This applies to the rack cylinder assembly alone, not installed in the carriage.

In a few instances trouble has been experienced because the plug in the center of the piston (Figure 12) has moved to the right or left, closing one of the ports to the cylinder. If this trouble is present it will be indicated by the fact that the cylinder does not slide freely on the tube when both ends of the tube are open. The "feel" of recoil due to compression in this case will distinguish it from mechanical friction or a bind. It will be necessary to replace the tube and cylinder if this condition occurs.

If it is necessary to install a new rack cylinder, it must first be determined which style of carriage is in the machine, because there are two styles in use in the field now; also, there are three styles of rack cylinders in use and they are not interchangeable in all cases.

The carriage assembly which has been installed in machines built since approximately 1942 is part No. 185970 and is sturdier than the one previously used. It can be identified by the fact that the cylinder is held in place by castings through which the steel ends of the cylinder are inserted, Figure 15A. If the machine has this style of carriage, rack cylinder assembly No. 185973 must be used with it. However, the part No. 185970 for the carriage assembly includes the cylinder.

The carriage used prior to 1942, Part No. 185400, supports the cylinder by means of a metal strap surrounding the brass cylinder about ¼" from each end. See Figure 15B. All orders received at the factory for carriages are being filled with the newer carriage. If the machine has this style carriage, cylinder assembly No. 185601 must be used with it.

Both of these cylinders mentioned above have a 5/16" tube which is reduced to ¼" at the right end where it enters the right cylinder tube support casting.

Note: Some early 036 machines were built using a rack cylinder assembly on which the tube remains its full 5/16" at the extreme right end. These cylinder assemblies are no longer available. In this case the right end tube support casting is clamped around the tube as on a split bearing. Obviously the 5/16" hole in this style of end casting is larger than the ¼" ends on either style of cylinder now being manufactured. Therefore, in replacing a rack cylinder assembly in a machine which has a 5/16" hole in the right end casting, it is necessary to use an adapter. This adapter is a split bushing which can be slipped over the ¼" end of a cylinder tube so that it can be clamped in the

right tube support casting. The adapter is Part Number 101932. Be sure that the elongated hole in the adapter lines up with the air hole in the cylinder tube and in the casting. See Figure 15C.

Extreme care must be used when installing a new cylinder and rack to be sure that binds are not put in them. It must be remembered that the tube is hollow, which decreases its strength, and that it is necessary to have three points in perfect alignment for freedom of movement, namely the cylinder left end bearing, the piston, and the cylinder right end bearing. It will be seen from the above that any slight strain on the tube or cylinder may cause them to bind.

A tenon screw has been used in the left end of the new style carriage (facing front) to keep the cylinder from chucking in its end support castings. This screw, Part No. 185974, may be reached by opening the ribbon mechanism gate. Shims .015″ thick, Part No. 52905, may be installed over the cylinder ends between the brass and the end castings, to take up the space and remove the excess shock from the tenon screw, because trouble has been experienced with the tenon breaking from the screw.

Extreme care must be used with the carriage so that no strains are created, because strains are often transmitted to the rack, causing it to bow.

A new carriage tie rod, Part No. 185899, is now available for the newer style carriages. This tie rod is hex-shaped and heavier, and it prevents drawing the right and left vertical members of the carriage together by tightening the nuts as is possible with the present tie rod.

Procedure for Removing a Carriage

1. Remove ribbon feed.
2. Unhook rebound check solenoid wires from terminal block and machine cable wires from interposer solenoid terminal block.
3. Move carriage to extreme left.
4. Unhook rebound check solenoid spring and plunger lever from rebound check pawl operating link.
5. Place a cloth under rebound check pawl to insure against the pawl's falling into machine. Remove nut from left end of rebound check rod and slide rod out at the right. Remove rebound check pawl link by sliding it out at the left.
6. Remove rebound check pawl.
7. Unhook pull rod from back space pawl and remove back space lever.
8. Remove the tab rack and the eccentric stud under the right end of it.
9. Remove the four 8-32 screws which hold the top cross member to the vertical casting.
10. Remove the two 5-40 screws which hold the escapement mechanism assembly to the top cross member.
11. Remove the two 5-40 flat head screws just to the right of the escapement contact. The escapement mechanism may now be moved back out of the way.
12. Remove the tab control contact group as an assembly by taking out the two 5-40 screws which hold the mounting bracket to the top cross member assembly. Put the contact assembly through the rectangular hole.
13. With the carriage at the extreme left, the top cross member can now be lifted at the right and rolled forward clear of the carriage.
14. Remove the screw from the right end of the rack cylinder tube.
15. Remove four air tube connections, one from the left end of the cylinder tube, two from the under side of the left tube support casting, and one from the right of the same casting (just under the tab break contact.)
16. Remove the last column stop bushings and take off the left tube support casting.
17. The carriage may now be removed by sliding it to approximately the 60 column position. Hold the tab solenoid plunger down while removing and replacing the carriage.

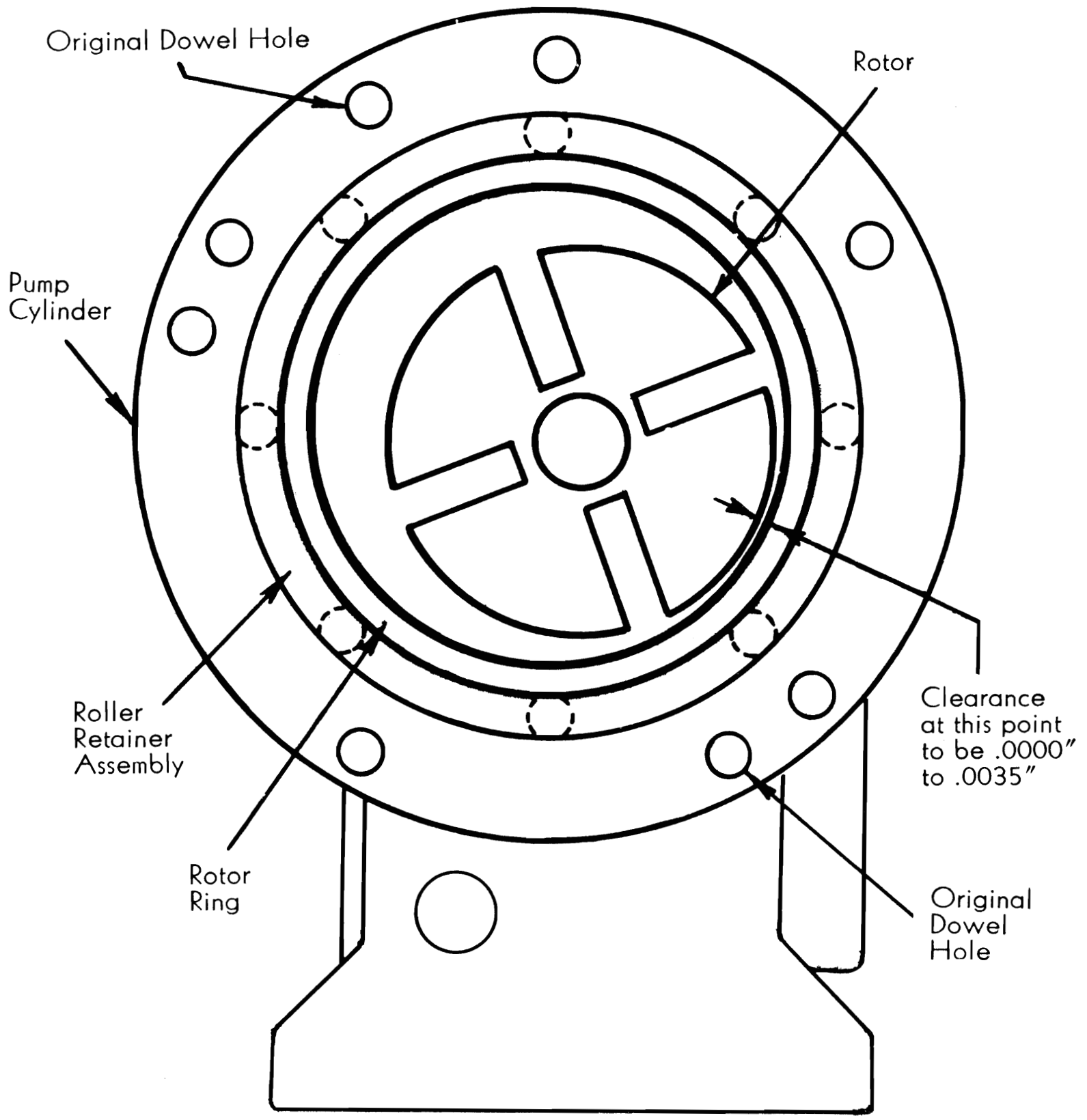


FIGURE 14

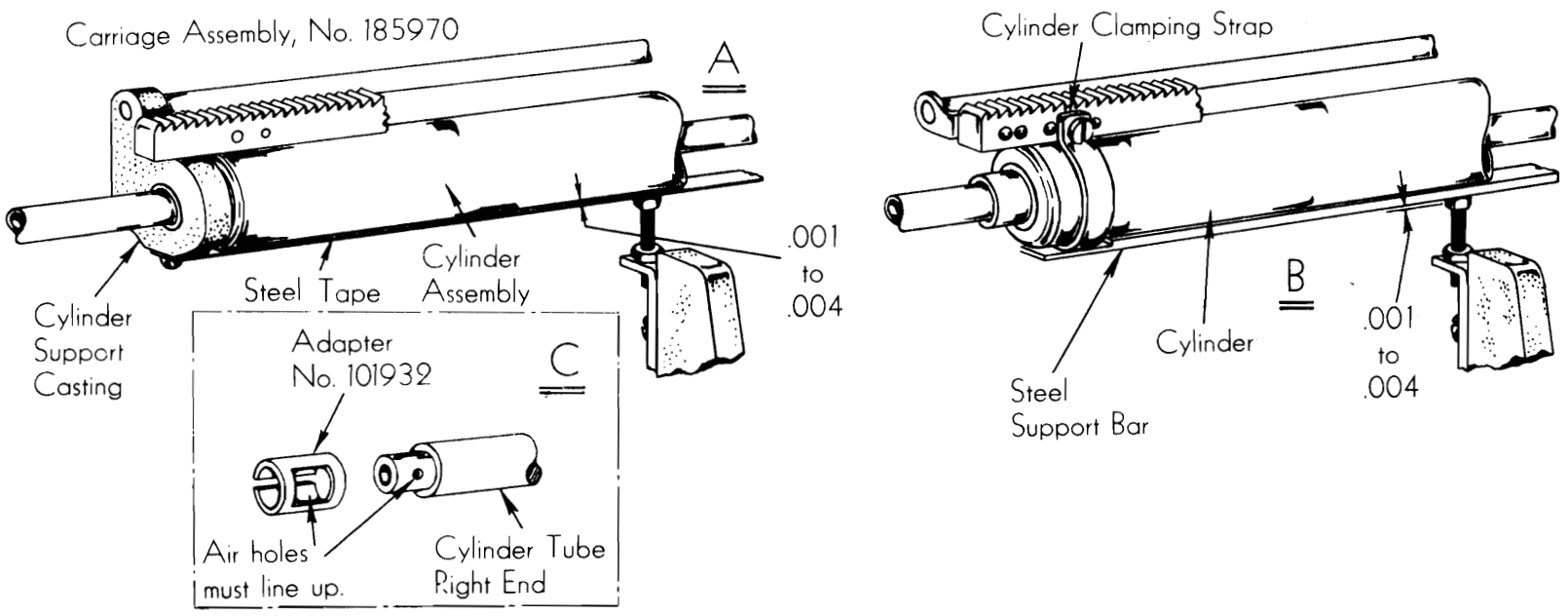


FIGURE 15

If a present style carriage, Part No. 185970, is installed on a machine which had the earlier carriage, it will be necessary to re-work the top cross member assembly at two places as follows. See Figure 16.

1. The cross member is turned at a right angle on the bottom so that the lower edge projects horizontally toward the front of the machine. This bottom edge must be filed so that it projects only ¼″, for a distance of 7½″ from the right end. This provides clearance for the carriage right hand vertical member which is sturdier than on the old carriage.
2. The bracket which supports the rebound check pawl near the bottom center of the cross member must be filed at the left side as shown by the insert, Figure 16, because of interference with the left end of the carriage when it moves to the Column 1 punching position.

Cylinder Support Screw—Figure 15

This screw prevents the cylinder and tube from sagging excessively when the escapement is pulled down into the rack. The screw should be adjusted so that there is approximately .001″ to .004″ clearance between the tape and the cylinder, Figure 15A, when the tape rests on the screw. Check this at both ends and at the center.

The old style cylinder uses a steel support bar instead of a tape under the cylinder. The .001″ to .004″ should be maintained between the support bar and the head of the screw (Figure 15B).

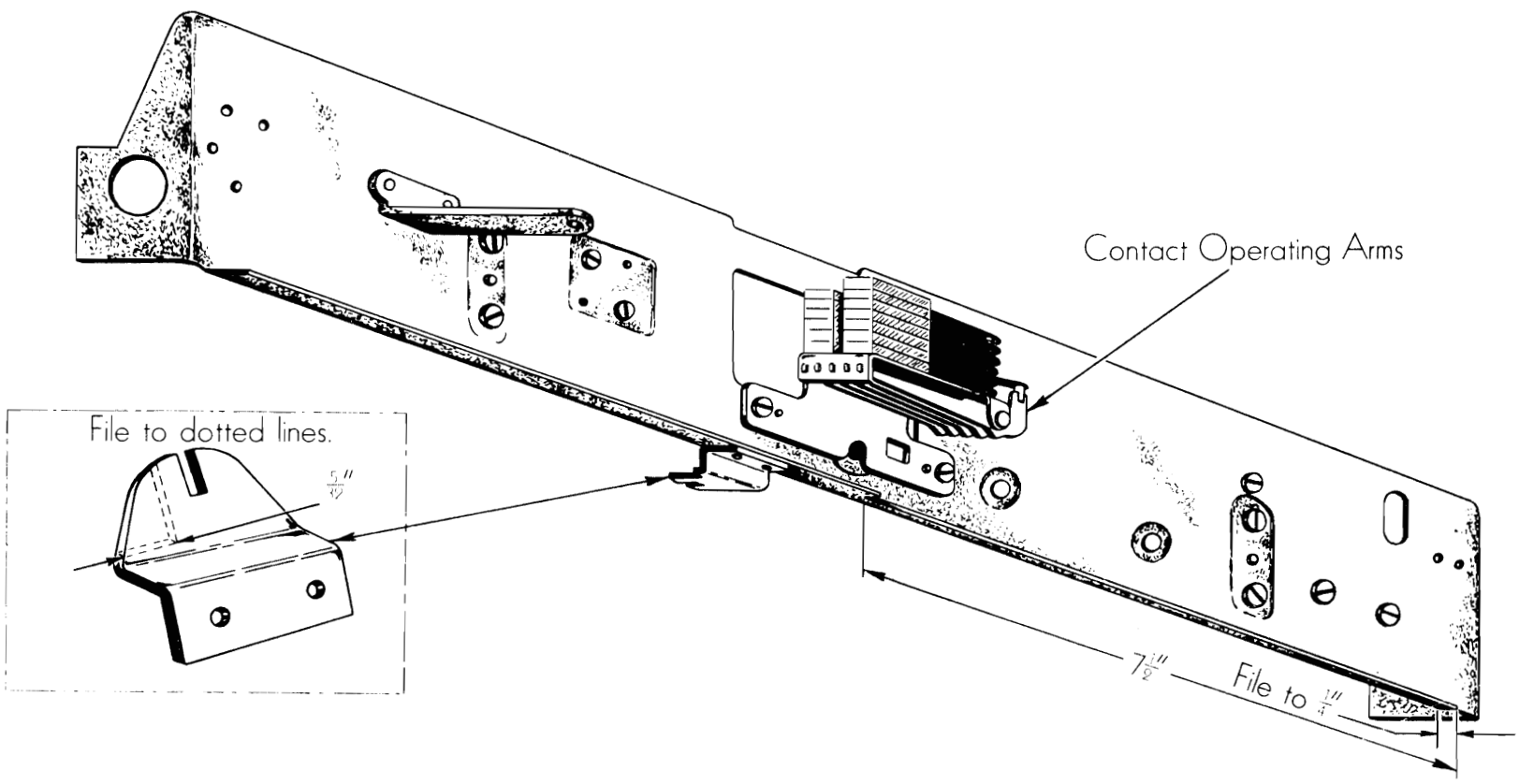


FIGURE 16

RACK CONTROL MECHANISM

Before attempting to make any adjustments of the rack, a check should be made to insure that both the main rack and the duplicating rack operate freely when moved by hand. These may be individually checked by raising the duplicating card bed.

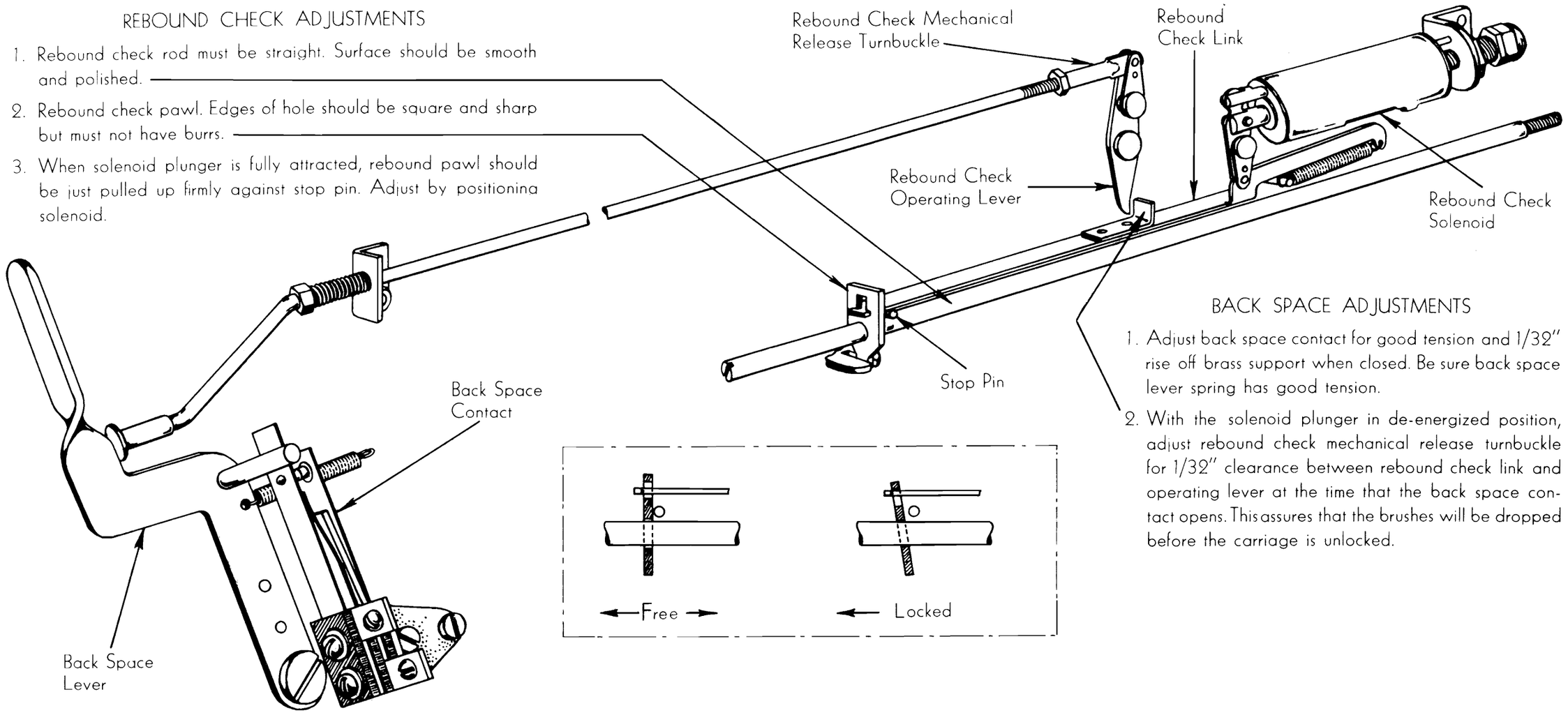
Rebound Check Lock—Figure 17

The stop pin should hold the rebound check pawl in a vertical position when the back space lever is operated, or when the rebound check solenoid is operated.

Remove the rebound check rod by taking off the nut on one end and sliding it out above the card hopper. Examine this rod for a smooth and polished finish. If it does not have this finish or shows any signs of wear or crookedness, it should be replaced.

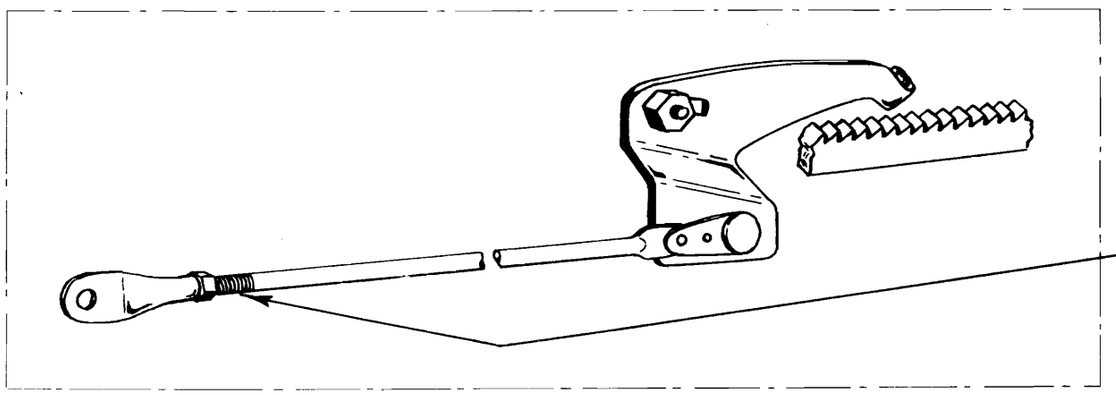
REBOUND CHECK ADJUSTMENTS

1. Rebound check rod must be straight. Surface should be smooth and polished.
2. Rebound check pawl. Edges of hole should be square and sharp but must not have burrs.
3. When solenoid plunger is fully attracted, rebound pawl should be just pulled up firmly against stop pin. Adjust by positionina solenoid.



BACK SPACE ADJUSTMENTS

1. Adjust back space contact for good tension and 1/32" rise off brass support when closed. Be sure back space lever spring has good tension.
2. With the solenoid plunger in de-energized position, adjust rebound check mechanical release turnbuckle for 1/32" clearance between rebound check link and operating lever at the time that the back space contact opens. This assures that the brushes will be dropped before the carriage is unlocked.



3. Adjust back space link turnbuckle so that when the back space lever is fully operated, the rack moves back one full space and the dog drops into the next tooth with a clearance of approximately .015".

FIGURE 17

Remove the rebound check pawl. The edges of the hole should not be worn. They should be square and sharp but without burrs.

After replacing these parts, a check should be made to see that the rack is positively locked against a reverse or rebound movement. Check further to be sure that the rack operates freely in a forward direction.

Adjust the position of the rebound check solenoid by means of the brass nut and bushing, so that when the solenoid plunger is fully attracted the rebound check pawl is just pulled up firmly against its stop pin.

Procedure for Removing a Rebound Check Pawl

1. Move rack to extreme left and remove nut from left end of rebound check rod.
2. Unhook rebound check spring.
3. Unhook rebound check pawl operating link from solenoid plunger lever.
4. Open ribbon feed mechanism gate and put a cloth under the rebound check pawl to insure against its dropping into the machine.
5. Slide rebound check rod out to the right.
6. Remove the pawl operating link by giving it one-half turn and sliding it out at the left. The pawl may now be removed by lifting it with long nose pliers.

Back Space Mechanism—Figure 17

Check to be certain that the back space pawl slides freely on the shoulder screw. The back space pawl now being manufactured is much heavier than the old one and should be installed on all machines to eliminate breakage. The part number of this pawl is 185467.

A square nut has been soldered on the inside of the top cross member assembly, just to the right of the back space lever. This nut interferes with the full stroke of the lever. It is advisable to remove the back space lever and file the corner of the nut to eliminate this interference.

Refer to Figure 17 for back space adjustments.

Escapement Mechanism—Dog and Escapement—Figure 18

The dog and escapement on this machine are much the same as on the other types of key punching equipment. The motion for the dog and escapement comes from the bell crank shaft and return bail; therefore, it is important that previous adjustments affecting the motion of this shaft, for punching and spacing, be properly set.

For adjustments of the escapement mechanism, refer to Figure 18.

It should be noted particularly that adjustments 1 and 2 must be made together as each one has a direct bearing on the other.

It is important that the proper straps be used in the escapement contact. If straps which are too light are used in this contact, they may cause "galloping."

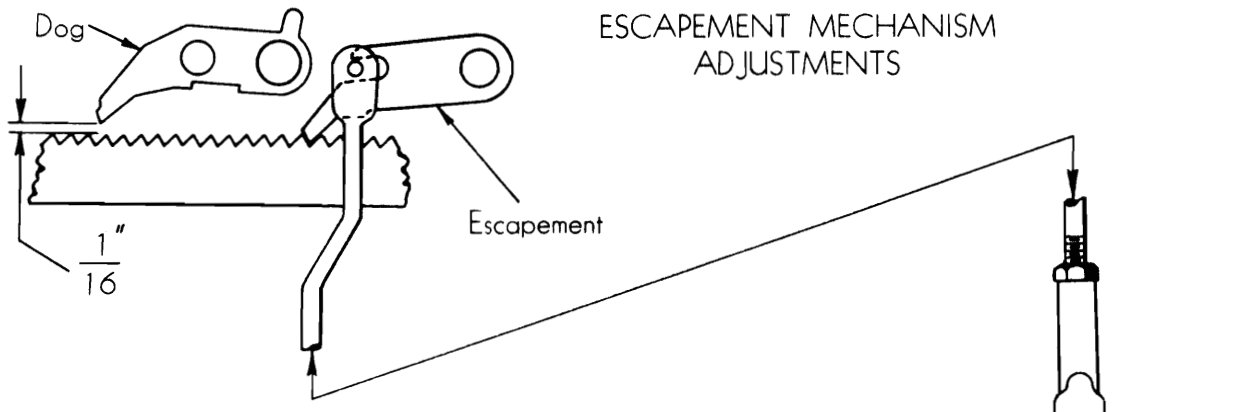
Note from the sketch in Figure 18 that the arm which operates the contact is moved to close the contact only after the dog is moved to the right when the tension of the rack comes upon it. This is important because it permits the brushes to snap through the holes in the master card before the contact is closed, thus preventing arcing and assuring punching both holes of alphabetical characters.

Tabulating Mechanism—Figures 19 and 20

C.E.I. Memo No. 415, May 8, 1944, announced a notched dog for installation on 036 machines where trouble was being experienced on tabbing. The notched dog and associated mechanism has greatly improved the operation of these machines on tabbing. B/M No. 292179 covers the necessary parts.

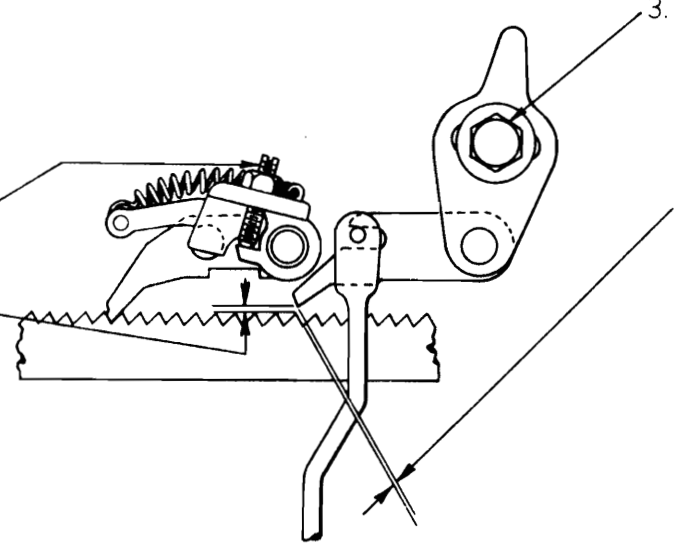
With this new mechanism the dog is raised out of the rack, as before, by the energization of the tab solenoid, but it mechanically drops back into the rack as soon as a No. 6 tab is encountered. Therefore, stopping of the rack does not depend on the de-energization of the tab solenoid and is more positive.

ESCAPEMENT MECHANISM ADJUSTMENTS



1. Depress a character operating key. Turn machine by hand until the reamer hook is drawn forward to a point just before it disengages from the reamer shaft. At this point, adjust the threaded shank and locknut so that the dog has been lifted 1/16" above the rack teeth.

2. Revolve reamer shaft by hand until all parts are restored to normal. At this time the rack will be held in position by the dog. Adjust by means of escapement adjusting screw so that the escapement clears top of rack teeth by .015". Recheck the previous adjustment. These two adjustments will have to be made together.



3. Loosen locking screw and adjust escapement position so that as escapement enters rack teeth it will clear the teeth by .002". Check this over the entire rack and see that the escapement does not strike on top of any teeth.

4. Adjust by bending the support strap for 1/64" lift off brass when contact is in normal closed position. Check to be certain that rack is resting against dog and dog is all the way to the right.

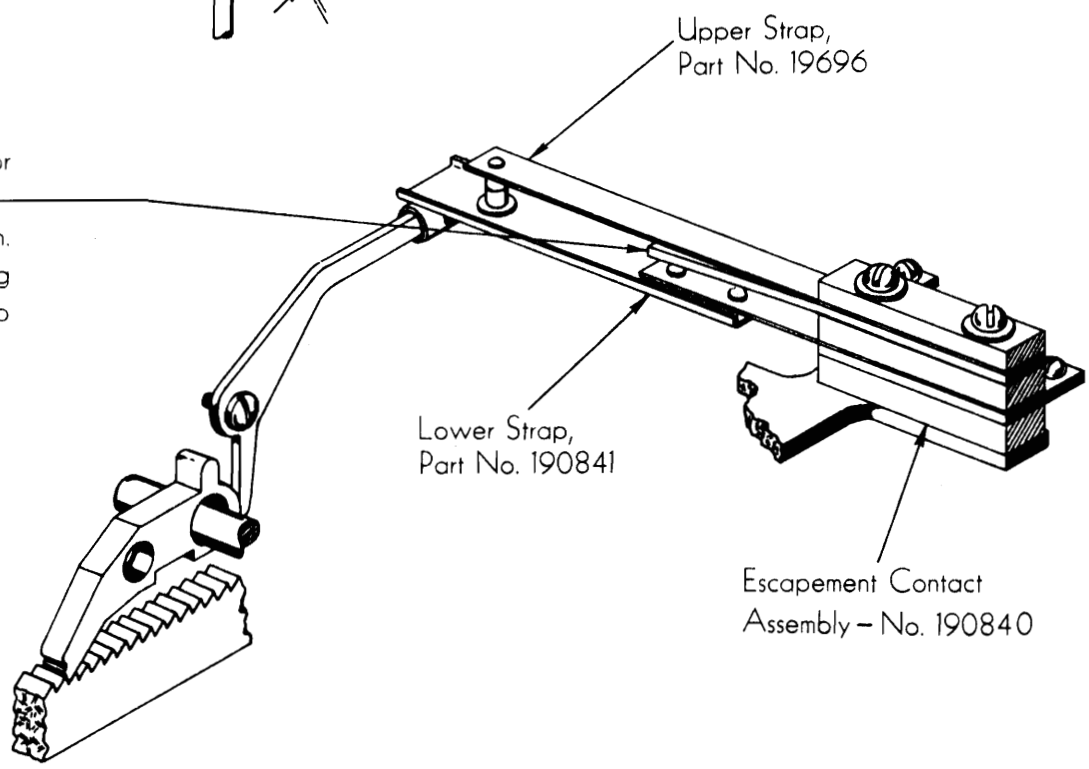


FIGURE 18

TAB MECHANISM ADJUSTMENTS

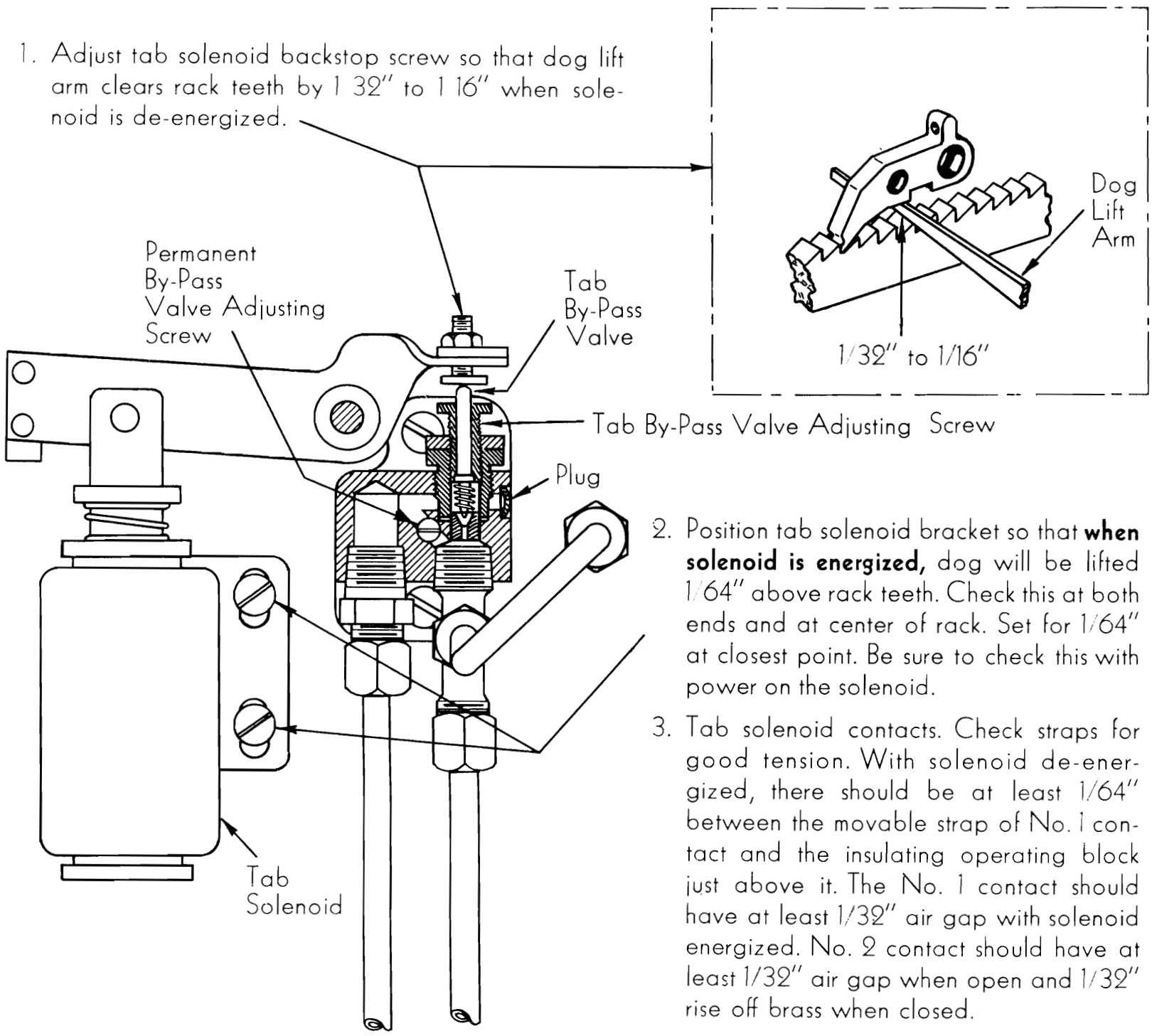


FIGURE 19

For tab mechanism adjustments refer to Figures 19 and 20.

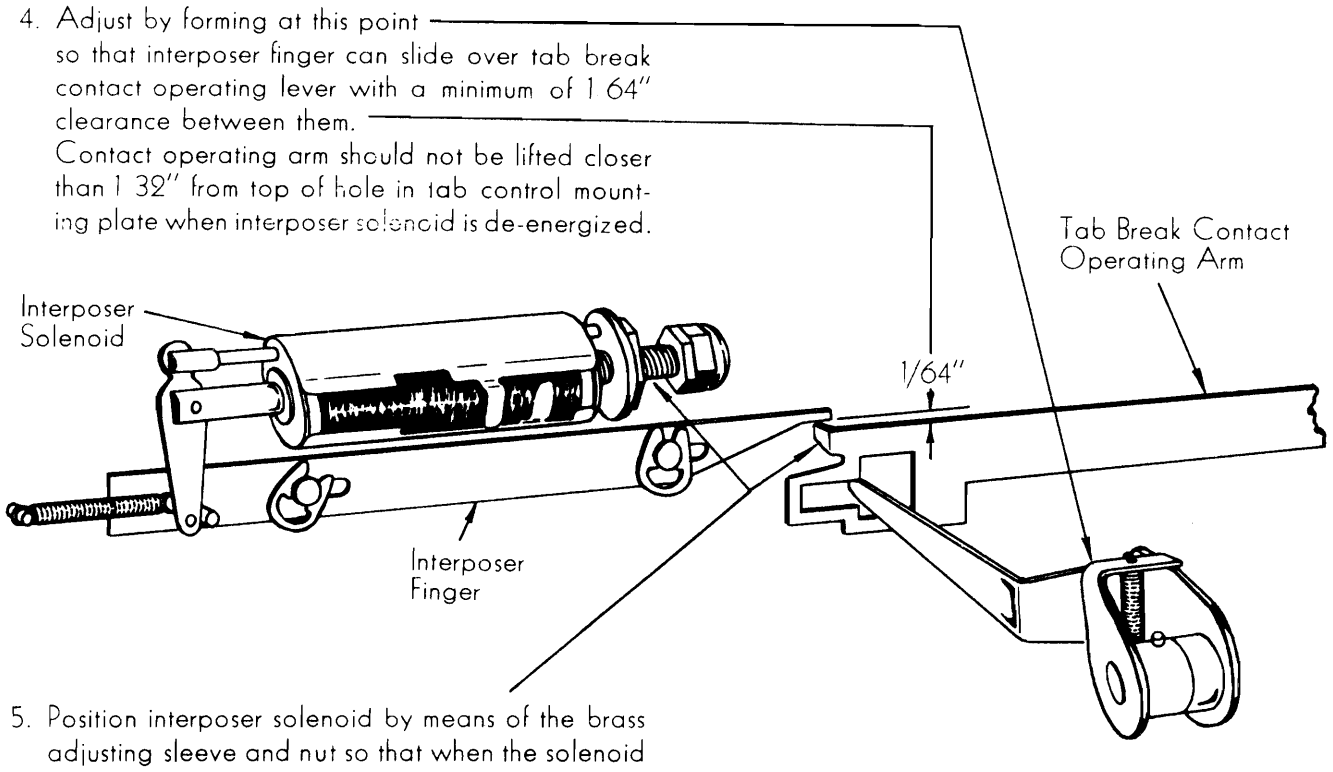
Before making adjustment No. 8, it is important to check the tab break contact operating arm to be certain that it slides freely. On some machines it may be found that it drops low enough to drag on the rebound check rod. If it does drag, adjustment No. 1 (tab solenoid arm backstop screw) and adjustment No. 4 should be re-checked. If these adjustments are correct, it may be necessary to remove the tab break contact operating arm and grind the rear lower edge at the point of interference.

B/M No. 292179, referred to above, requires opening up of the rectangular hole in the contact mounting frame to 5/16". This filing must be done on the side of the hole towards the tab break contact because its purpose is to provide additional sliding space for the contact operating arm in that direction.

These adjustments are most important in relation to proper tabbing and should be set as closely as possible to insure that the dog will drop soon enough to engage the proper tooth even though the rack is traveling at a high speed. It is believed that the dog is often tripped too late, so that instead of being stopped by the dog, the rack is stopped by the tab insert and the tab contact operating arm. When this occurs, the rack can rebound approximately a half-tooth providing the rebound check is not locking immediately. If the rebound check is operating properly when this occurs, the rack will be jammed in a locked position. Naturally, this rebound will result in damage to the duplicating brushes.

TAB MECHANISM ADJUSTMENTS (Cont'd)

4. Adjust by forming at this point so that interposer finger can slide over tab break contact operating lever with a minimum of 1 64" clearance between them. Contact operating arm should not be lifted closer than 1 32" from top of hole in tab control mounting plate when interposer solenoid is de-energized.



5. Position interposer solenoid by means of the brass adjusting sleeve and nut so that when the solenoid plunger is fully attracted the interposer finger overlaps the tab break arm approximately 1/16".
6. Place a tab insert in Column 40 and set the carriage on Column 40. The tab rack should be adjusted laterally so that the insert rests directly below the center of the points on the contact operating arms. (See also Figure 16).
7. Adjust the eccentric stud under the right end of the tab rack (new style carriages only) so that the tab rack can be inserted easily but it must not rock when latched in place.
8. Place a No. 6 tab insert in a predetermined column. With power on machine, hold rack and depress tab key, allowing the rack to move over slowly until the insert just touches the tab break contact operating arm. At this time the dog lifter should allow the dog to drop in the proper tooth, with approximately 1/16" overlap. The dog lifter arm has to be bent to obtain this adjustment. This arm is hardened, particularly near the small end. Bend it only near the center.
9. Adjust the tab break contact so that it has approximately 1/32" air gap at the time dog drops. This willassure that the dog is dropped mechanically.

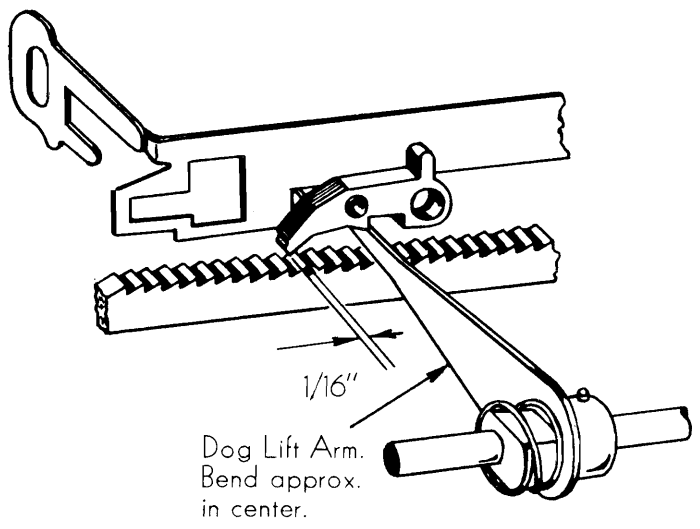


FIGURE 20

Vacuum Control Valves—Figures 12 and 19

As previously mentioned, it is desirable to adjust the permanent by-pass valve adjusting screw by screwing in as far as possible in order to provide a maximum amount of vacuum at the cylinder while duplicating or manually punching. This adjustment may have to be altered as explained later, in order to provide proper tabbing.

The tab by-pass valve adjusting screw should be adjusted by turning the knurled sleeve until the rack will move at proper speed while tabbing and ejecting. A check should be made to see that the rack will tab properly on a short skip (10 columns) at both ends of the rack and should also be checked for a long skip on both ends (approximately 40 columns). If it is found that the rack speed is too great on short skips, particularly on the Column 1 end, it will be found that backing off the permanent by-pass valve adjusting screw will improve this condition. The backing off of this screw causes a reduction of the vacuum in the carriage cylinder while the rack is standing idle. Thus the carriage does not move at an excess speed at the beginning of a tab operation.

Tab Control Contact Assembly

Check the contact operating levers to see that they do not bind.

Be sure the screws which hold the contact assemblies are tight.

The normally open contacts should have .022″ air gap and the normally closed contacts must have good tension.

Check with inserts Nos. 1 through 5 in tab rack and space the rack so that each insert operates the contacts. See that the N/O contacts are closed with good tension and the N/C contacts are opened approximately .022″.

Card Registration Adjustments

1. The card stabilizers, which are located directly over the die and top edge of card, must operate freely without excessive play. The purpose of these stabilizers is to hold the card in position on the card line.
2. Check to be sure that the pivoted card fingers work freely and without binding.
3. The card must be carried so that punched holes will be in correct alignment with the registration gauge. The adjustment is made by loosening the nut on the card finger right and positioning the adjusting screw.
4. Adjust the card finger left adjusting screws until this card finger is depressed .015″ by the card.
5. The left end tube support bushing serves as the left carriage stop. It should be adjusted so that the second hole punched in Column 80 is in proper registration.

80th Column Contact Assembly

Machines wired to 177238 and 177238A have a single contact in the 80th column position. This contact is open at all times except when the rack is in Column 80.

Adjust as follows:

1. With carriage in Column 79 there should be $\frac{1}{32}$″ air gap at the points.
2. With carriage in Column 80, the stationary strap should have $\frac{1}{64}$″ rise off the brass support.

Machines wired to any diagram except 177238 or 177238A will have a transfer contact in the 80th column position. Adjust as follows:

1. With carriage in Column No. 79, the normally closed contact should lift $\frac{1}{64}$″ off its brass support.
2. With carriage in Column No. 79, the normally open contacts should have $\frac{1}{32}$″ air gap between its points.
3. With carriage in Column No. 80, the normally closed contact should have $\frac{1}{64}$″ air gap between points.
4. With carriage in Column No. 80, the normally open contact should lift $\frac{1}{64}$″ off its brass support.

First Column Stop—Figure 21

Adjust the first column stop screw so that when the rack is stopped in Column No. 1, there will be .010″ to .015″ clearance between the screw and the first column contact operating arm.

The first column contact is normally closed and must have good tension. It should open approximately $\frac{1}{32}$″ when the rack drives past the No. 1 column position.

On machines having a wiring prior to 177238, this contact has a pronounced tendency to burn. On those machines it may be necessary to reduce the clearance between the screw and the contact operating arm in Column No. 1 to provide a greater air gap on the drive past the first column. In addition, a newer style first column contact, having larger points, may be installed. This contact assembly is part No. 185483.

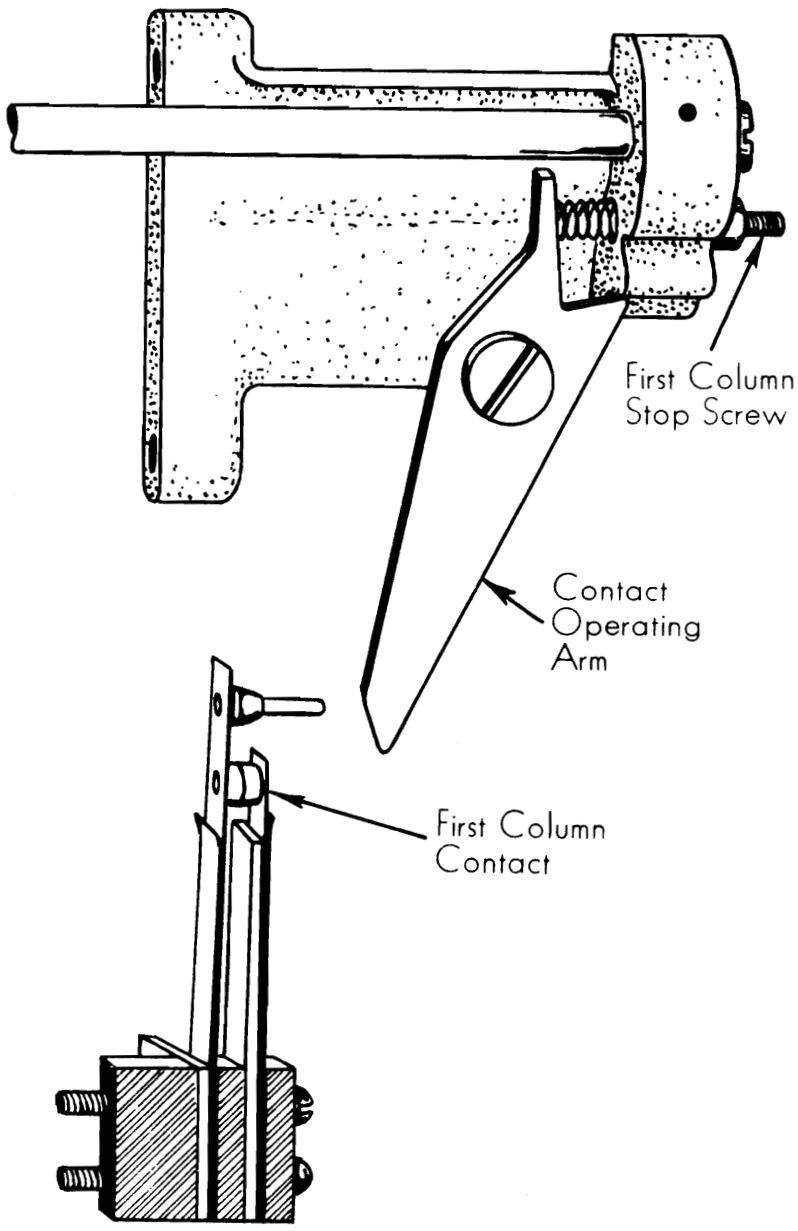


FIGURE 21

CARD FEED MECHANISM

Clutch Solenoid Adjustments

1. With solenoid de-energized, there should be 1/16″ overlap on the cam shaft pawl assembly and its latch when latched.
2. .015″ to .025″ clearance between pawl and cam shaft ratchet teeth when cam shaft pawl assembly is latched.
3. With solenoid energized, shift bracket for at least .010″ clearance between cam shaft latch and cam shaft pawl assembly.
4. With left-hand card finger operating lever on high point of its cam, there should be 1/16″ between card finger and card line.
5. Eject rolls must be parallel and closed at this time. Check for good eject roll tension and for .020″ between rolls when open.
6. The card finger contact should be adjusted for at least 1/32″ rise off the brass when closed.

Pump Solenoid Adjustments

1. Position the pump solenoid by means of the elongated holes so that when the armature is fully attracted, the valve cam arm on the front of the pump is carried upward to approximately 3/32″ of the upper stop pin.
2. Adjust the armature back stop screw so the cam arm drops to approximately 3/32″ of the lower pin when the armature is in its normal position.
3. Check to be sure that the cam arm can not overthrow and cause a bind with its operating lever at either extreme. Check with power.
4. Bend the straps of the solenoid contact so that both points are open with armature in normal position and both points closed with armature attracted. Check with power.

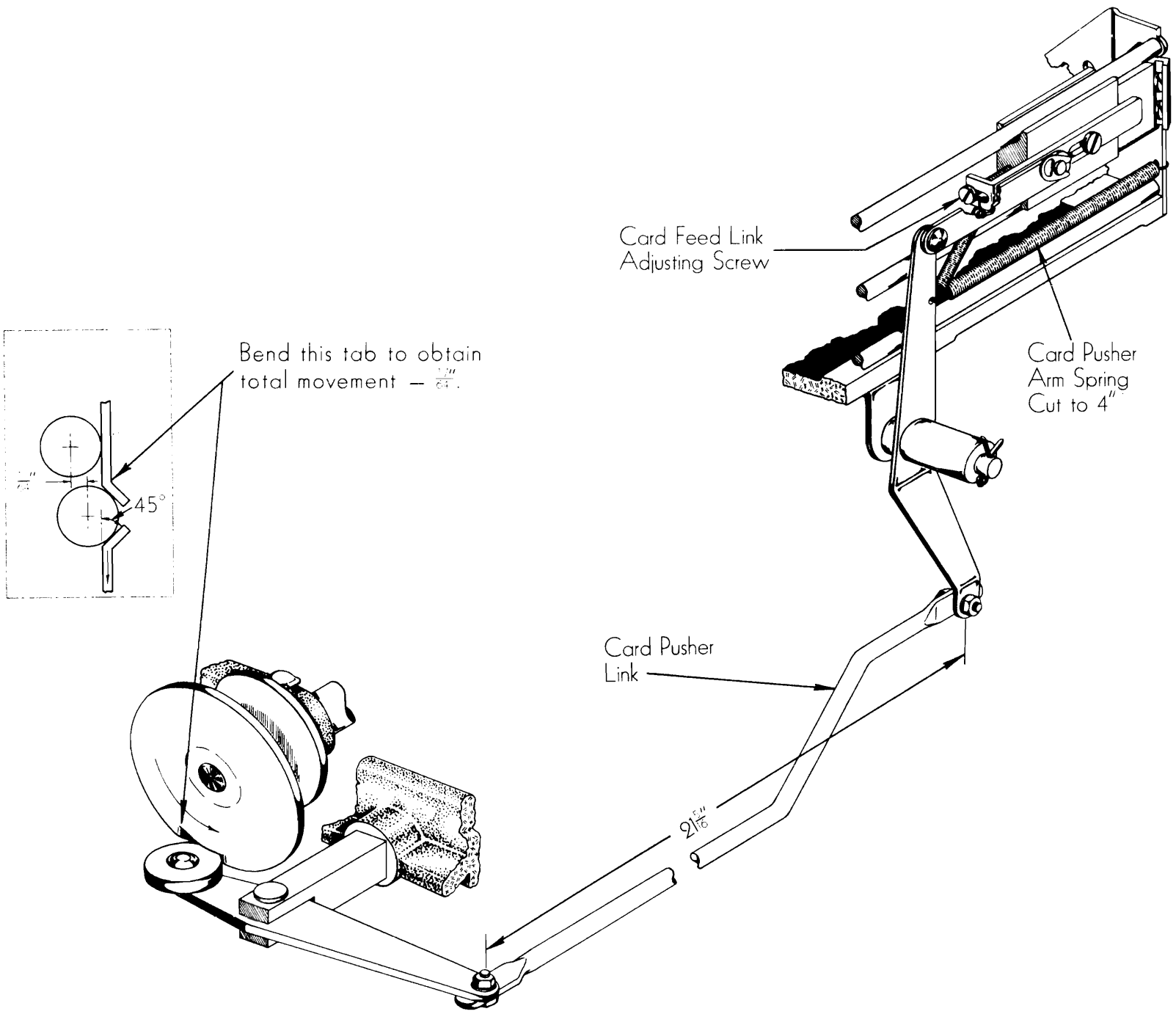


FIGURE 22

Card Feed Adjustments—Figure 22

1. The card hopper should have approximately .010″ clearance over the length of the card.
2. The roller throat should be adjusted so that the center line of the roller is directly in front of the right edge of the throat knife.
3. The throat knife should be adjusted so that the throat opening is .010″. The .010″ gauge should enter snugly.
4. The feed knife should be adjusted for .004″ to .0045″ projection. Check with Go-No-Go Gauge.
5. The card feed cam roller should have a total movement of $\frac{17}{64}$″ as shown in Figure 22. The front tab of the cam (latched position) should stand at an angle of 45°. The rear tab or operating tab may be formed to permit the roller to drop the required $\frac{17}{64}$″ when roller is fully seated.
6. When roller is fully seated, the feeding edge of the card knife should be at least $\frac{1}{32}$″ beyond right end of cards in hopper. This is adjusted by means of the card feed link adjusting screw. Check when roller is out on flat surface of the cam to be sure that knife carries the card into the feed rolls.
7. The feed rolls must have sufficient tension to assure positive feeding. Note that the roller does not stop in a fully seated position when the clutch is latched up, but rather that it rests on the 45° (front) tab. This holds a forward thrust on the card feed cam which helps to keep the dog latched.

It is important that the feed knife block be clean and smooth in order to slide freely. The slide rods also must be smooth and should have a polished surface so that the knife slides freely and quickly. The card pusher arm spring should be cut from its present 4¼″ to approximately 4″ to aid in the action of the card knife.

The small diagonally connected spring fastened at the left end of the card feed knife assembly should have very light tension, only sufficient to balance the excess weight of the knife block to the right of the knife pivot point. The feed may operate best if this spring is removed.

Check the card pusher link to be certain it does not bind at the ends, nor drag on the base casting. Check this when the relay gate is closed because sometimes the cables and relay wiring interfere with its movement.

The operating length of this rod, straight line between centers of holes, should be approximately 21 5/16". See Figure 22. This dimension should be checked if proper adjustment is not obtained by the card feed link adjusting screw.

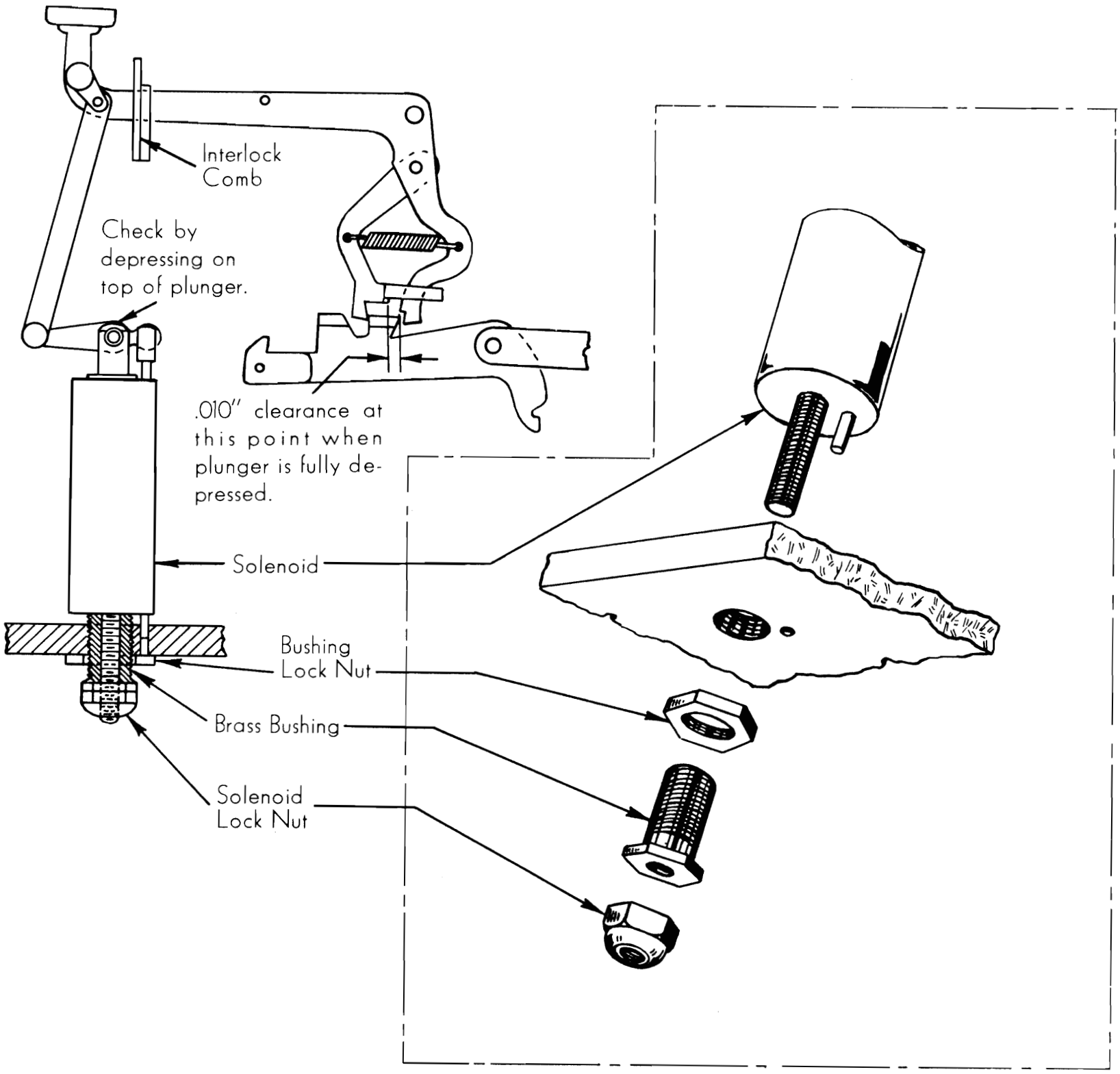


FIGURE 23

DUPLICATING MECHANISM

Duplicating Solenoids—Figure 23

Adjust the duplicating solenoids individually by means of the brass bushing at the bottom so that when the plunger is fully depressed the key lever will be pulled down approximately .010" past the point where the reamer hook unlatches as shown in Figure 23.

When making this adjustment, care must be used to press on the plunger itself and not on the plunger lever.

Duplicating Brushes

Brushes should be installed to duplicating brush gauge No. 13756. After being installed in the machine, they should be checked for alignment to a card which has been punched 9 through 12 in one column, using a glass on top of the card in the master rack. When the brushes are raised to project through the holes against the glass, the line of the brushes should be parallel to the edge of the holes.

Brush Magnet Position

The brush magnet assembly should be positioned so that as the armature is drawn to the cores it strikes squarely and stands perpendicular to the base of the master card bed. It can be shifted by loosening the four holding screws. Be sure all screws are tight after making the adjustments.

Brush Magnet Armature Toggle

The toggle screw provides an adjustment for the distance the brushes rise above the master card bed when the armature is attracted. Adjust so that the bottom strands of brushes are .020″ to .040″ above the insulating separators.

Brush Magnet Armature Back Stop Screw

Adjust the brush magnet armature back stop screw so that the brushes will be at least 1/16″ below the top of the bakelite brush separator when magnet is de-energized.

Brush Magnet Contacts

1. Contact No. 1 should be adjusted for 1/64″ lift off brass support when magnet is de-energized, and 1/16″ air gap when magnet is energized.
2. Contact No. 2 should have approximately 1/64″ lift off brass support when magnet is energized and 1/16″ air gap between points when magnet is de-energized.
3. Contact No. 1 should not make until after brushes are lowered below the surface of the bakelite separator, and contact No. 2 should not make until brushes are raised above the surface of the bakelite brush separator.

Some machines wired to 177238 and 177238A have been found to release the carriage in Column 79 instead of Column 80. Perhaps this is because the right strap of brush magnet contact No. 1 touches the left strap of brush magnet contact No. 2. A strip of card or piece of fibre may be placed between these two straps to prevent this condition.

Roll Housing Door Contact

The purpose of this contact is to open the brush magnet circuit when the roll housing door is raised, thus preventing damage to the brushes when the master card is inserted. Adjust for 1/32″ air gap when the door is raised and sufficient tension to insure good contact when door is closed. Be sure points line up squarely.

Duplicating Contact Roll

Raise or lower the rear pivot bracket of the contact roll housing until the clearance between roll and separator is equal at both ends. Then adjust for a clearance of .010″ to .020″ by bending the contact roll housing door.

Master Card Carriers

1. The master card carriage fits into a forked arm at the top of the main carriage. Check to be sure there is no bind or looseness at this connection.
2. Adjust master card carrier left for clearance over length of master card not to exceed .005″ when master card lies flat and is held against master card carrier right.
3. Position entire master card carriage assembly by means of two adjusting screws at right so that brushes align approximately 2/3 to left in holes punched in master card. Check under actual operating conditions by holding slight tension against card with finger while duplicating. Apply tension first in direction to advance card, then in direction to retard card. Slight tension should not cause machine to miss any holes nor to stop on duplication.

Note: The older machines have the master card carrier left hinged and held by spring action while the newer ones are solid as on the 016. The newer style is more satisfactory but can be used only with the solid contact roll. Consequently it can be used only on machines wired to No. 177238 or 177238A.

The hinged master card carrier left has been the cause of the machine's skipping over one column which should have been duplicated (because of throwing ahead of the master card) then duplicating in the following column the digit which it missed. To avoid this or similar conditions, it is best to keep heavy tension on the springs in the master card carrier left. An additional spring may be installed if necessary to provide sufficient tension.

PRINTING MECHANISM

Ribbon Spacing Adjustments—Figure 24

1. Loosen both ribbon feed adjusting screws and unhook ribbon feed link at the bottom.
2. Depress a key and turn machine over by hand until just before the reamer hook trips off.
3. Slide the ribbon feed operating fork all the way to the left and, holding it in this position, adjust the two screws "O" so that the ribbon feed link can be slipped easily on and off its stud. This will insure that the maximum travel of the punch bell crank shaft will carry the operating fork to its extreme left but not far enough to jam the mechanism.
4. Check operation of ribbon feed mechanism by manually operating machine. When correctly adjusted, the ratchet operating pawls should have the same amount of travel after engaging their feed ratchets so that the two ratchets are operated the same distance. This can be observed from the rear of the machine by moving the carriage first to one end, then to the other. Check while operating the machine by hand. The ribbon feed operating fork should not bind at either end of the stroke. On the earlier 036 machines, it will be found that the adjusting mechanism appears as in the insert, Figure 24. In this case the adjustment is the same, but one of the screws must be reached from the front.

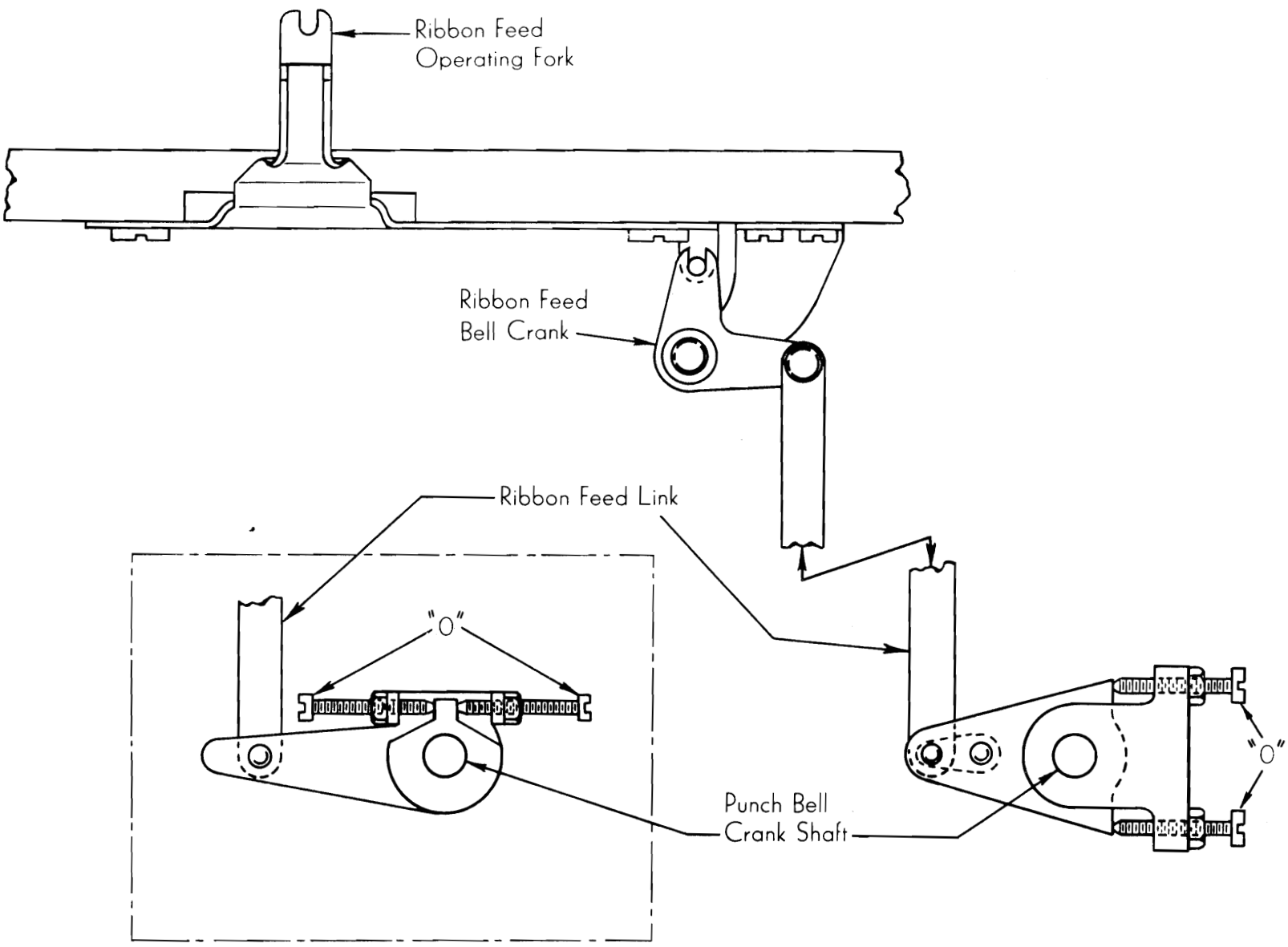


FIGURE 24

Type Bar Adjustments

Refer to MANUAL OF INSTRUCTION, ALPHABETIC PRINTING PUNCH, Type 036, for type adjusting and aligning instructions.

RELAYS AND CIRCUITS

Relays

On machines wired to 177238 and 177238A the following relay adjustments should be made:

1. Armature and core air gaps with coil de-energized:
   R-10, 11, 12, 13 and 14 ..... .020″ to .022″
   R-19 ..... .025″
2. Contact adjustments are standard. It is important that both sets of points on relay 19 open and close at the same time.

On machines wired to 185599, 185968, 185968A and 185968B, the following relay adjustments should be used:

1. Armature and core air gaps with coil de-energized:
   R-1 to R-9 and R-13 ..... .020″
   R-10 and R-12 ..... .010″
   R-11 ..... .030″
2. Make contacts:
   R-1 to R-9, all points .....010″ air gap when open
   R-11 A points .....030″ air gap when open
   B points .....025″ air gap when open
   R-13 AU, AL and BM points .....015″ air gap when open
3. Break contacts:
   R-10, R-12 and R-13—all points to have .003″ to .005″ lift off the support when closed and movable contacts to have very light tension. All other relay adjustments standard.

Galloping

There are many causes of this unevenness of duplicating. The trouble may be electrical or mechanical.

The following list gives some electrical items which should be checked if a galloping condition exists.

1. R-19 points for proper adjustment and for making and breaking at the same time (machines wired to 177238 or 177238A).
2. Escapement contact, for insufficient air gap or insufficient tension (177238 and 177238A).
3. Punch bail contact No. 2 for too much air gap.
4. Key interlock contact for insufficient tension.

If the cause of the gallop is believed to be mechanical, check the following:

1. Speed of reamer shaft. Should be 100 to 105 for old circuits; 95 to 100 for machines wired to 177238 or 177238A.
2. Punches for sticking condition.
3. Interlock assemblies for sluggish interlock discs.
4. Adjustment of duplicating solenoids.
5. Rough or bent rebound check rod.
6. Carriage and master card rack for binds.
7. Too much clearance between star wheel and return hook at extreme forward limit of travel of reamer hook.
8. Insufficient vacuum.

Duplicating tests for galloping should be made with a master card punched P Q No. 1 No. 0.

Circuits

As previously mentioned, there are six different wiring diagrams in use. They were used in the following order: 185599, 185968, 185968A, 185968B, 177238 and 177238A.

The first one listed above, 185599, is shown and explained in the original Manual of Instruction, ALPHABETIC PRINTING PUNCH, Type 036. The following three numbers, 185968, 185968A and 185968B, are similar to 185599. The differences are mainly due to the elimination of the key interlock solenoid after 185599 and the additions of the key interlock contact, the tab solenoid contact, eject key solenoid, R-14, etc.

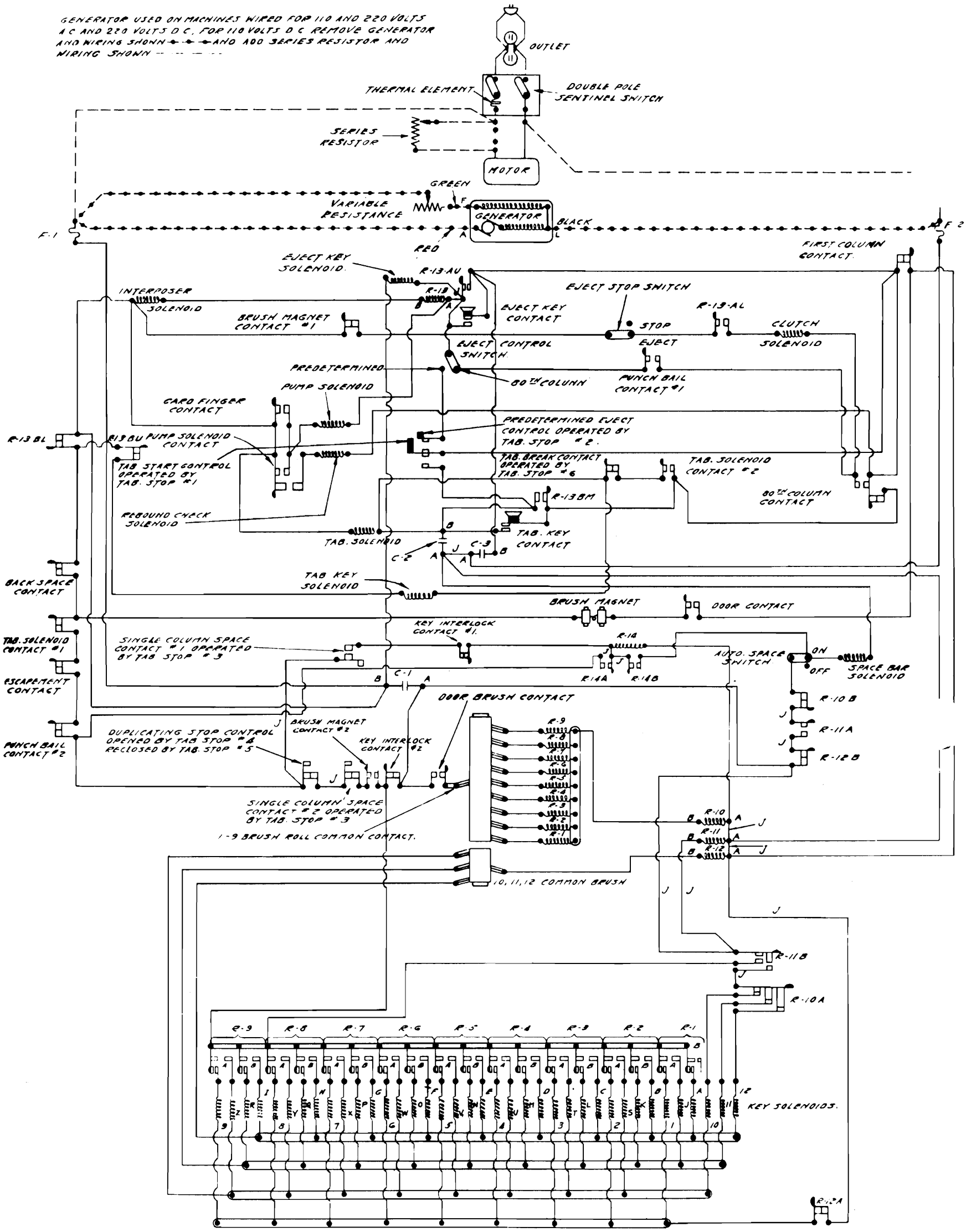
Wiring diagrams 177238 and 177238A differ widely from the previous four. They differ from each other only in that 177238A causes the duplicating brush magnet to drop on tabbing to prevent damage of brushes due to a rebound at the end of a tabulation. To accomplish this, the tab solenoid contact No. 1 was removed from the circuit between the escapement contact and the punch bail contact No. 2, and put in the circuit between the back space contact and the escapement contact.

Wiring diagrams 185968B and 177238A are shown in Figures 25 and 26. Referring to 177238A, in continuous duplication, the cycle of operation is as follows: The escape contact is the final timing contact for energization of the brush relays. Assuming an "A" hole is present in the master card, R-1A and R-1B points close and R-12A points transfer, completing the circuit to the "A" solenoid. R-13A and R-14A points open to prevent energization of the space bar solenoid. R-13B points close, but R-14B opens, both before 19 BU close, thus preventing energization of the 12 solenoid.

R-19, the timing relay, is energized each cycle at the same time the brush relays are energized but, being a slower relay, its points make after R-1, R-12, R-13 and R-14 points have shifted; thus, R-19 BU serves as the timing impulse to energize the key solenoid when auto spacing. R-19 BL serves as a holding circuit for R-19 and the brush relays until the punch bail contact and escapement contact open, dropping out these circuits.

SUMMARY OF PART NUMBERS REFERRED TO IN PRECEDING PAGES

Dowel Pins, .125″ x 3/8″	632
Punch Bell Crank Shaft Assembly	185617
Adjustable Pulley Assembly	283412
Drive Belt, 27″ long	177219
Pump and Drive Housing Assembly	282574
Tube Terminal Screw for Pump	186155
Tube Terminal Gasket for Pump	185900
Left End Support Casting for Rack Cylinder Tube	186111
Tab Valve Stem	186112
Tab Valve Seat	186113
Carriage Assembly (present style) includes cylinder	185970
Rack Cylinder Assembly for use in present style carriage	185973
Rack Cylinder Assembly for use in Carriage which supports cylinder by straps around Cylinder	185601
Adapter for rack cylinder tube when tube with 1/4″ end is used in casting with 5/16″ hole	101932
Tenon Screw (used with carriage 185970)	185974
Cylinder End Shims (used with carriage 185970)	52905
Carriage Tie Rod	185899
Escapement Contact Assembly	190840
Escapement Contact, Upper Strap	19696
Escapement Contact, Lower Strap	190841
Back Space Pawl	185467
First Column Contact Assembly (large points)	185483
B/M—Installation of Vacuum Drive	292126
B/M—Installation of Notched Dog	292178
Vacuum Gauge Assembly, complete	450334
Gauge Only	450328
Gauge Nipple	450330
Rubber Tube	450332
Tube Connector	450333
Connector Bushing	147606



CONTACTS INDICATED ⊢ ARE FIXED.
CONTACTS INDICATED ⊣ ARE MOVABLE

CONTACTS, RELAYS, ETC., ARE NUMBERED IN SEQUENCE, LEFT TO RIGHT, FRONT TO BACK, TOP TO BOTTOM, AS VIEWED FROM FRONT OF MACHINE.

J INDICATES SHORT WIRE JUMPERS NOT INCLUDED IN CABLE ASSEMBLY.

FIGURE 25
Wiring diagram No. 185968B

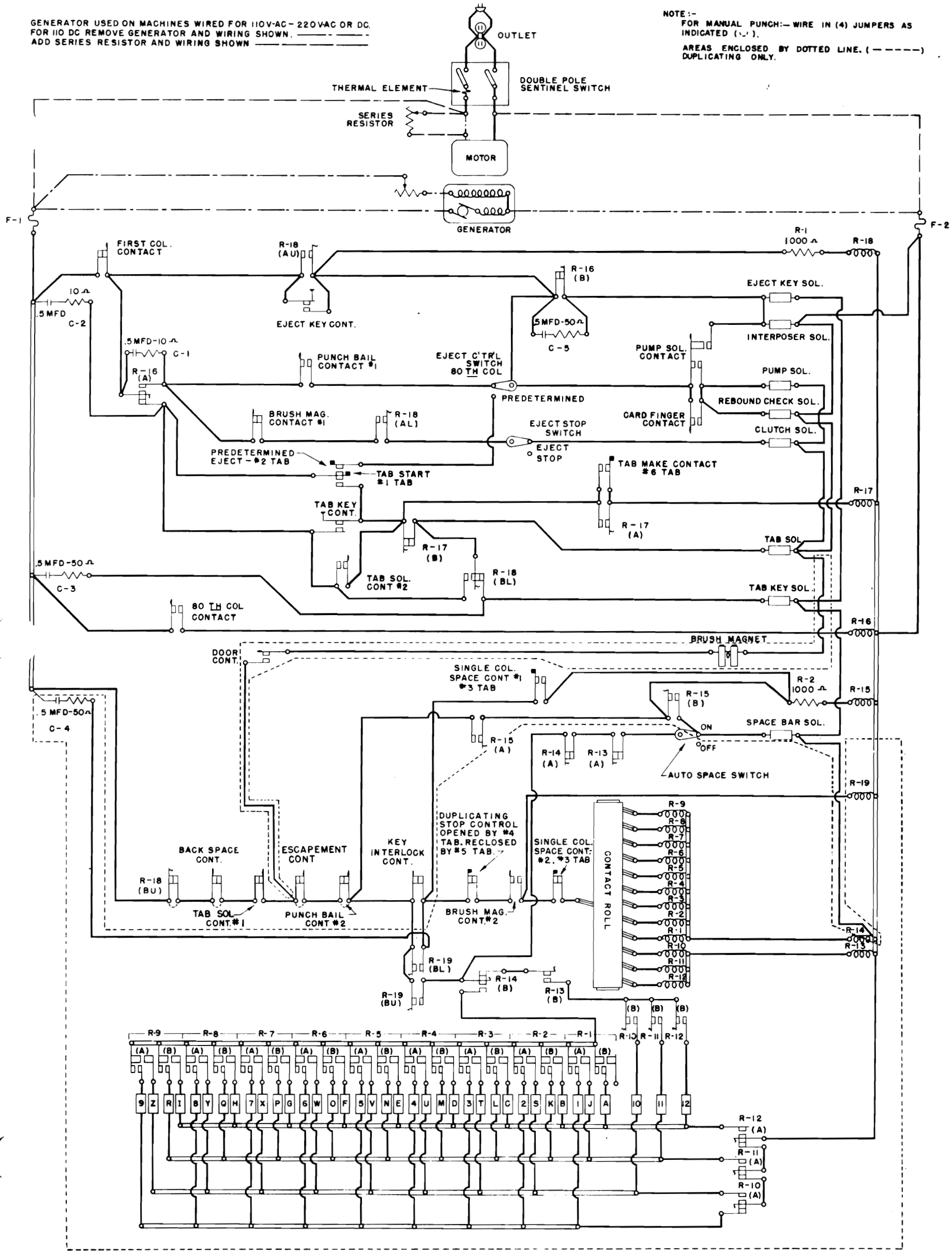


FIGURE 26
Wiring diagram No. 177238A