INSTRUCTION BOOK FOR THE LINOTYPE MANUALLY CONTROLLED HYDRAQUADDER

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MERGENTHALER LINOTYPE COMPANY

INSTRUCTION BOOK
FOR THE
LINOTYPE
MANUALLY CONTROLLED
HYDRAQUADDER

First Edition

Printed in U.S.A.

Set in Linotype Primer and members of the Spartan family

610.42-J-TT-4X

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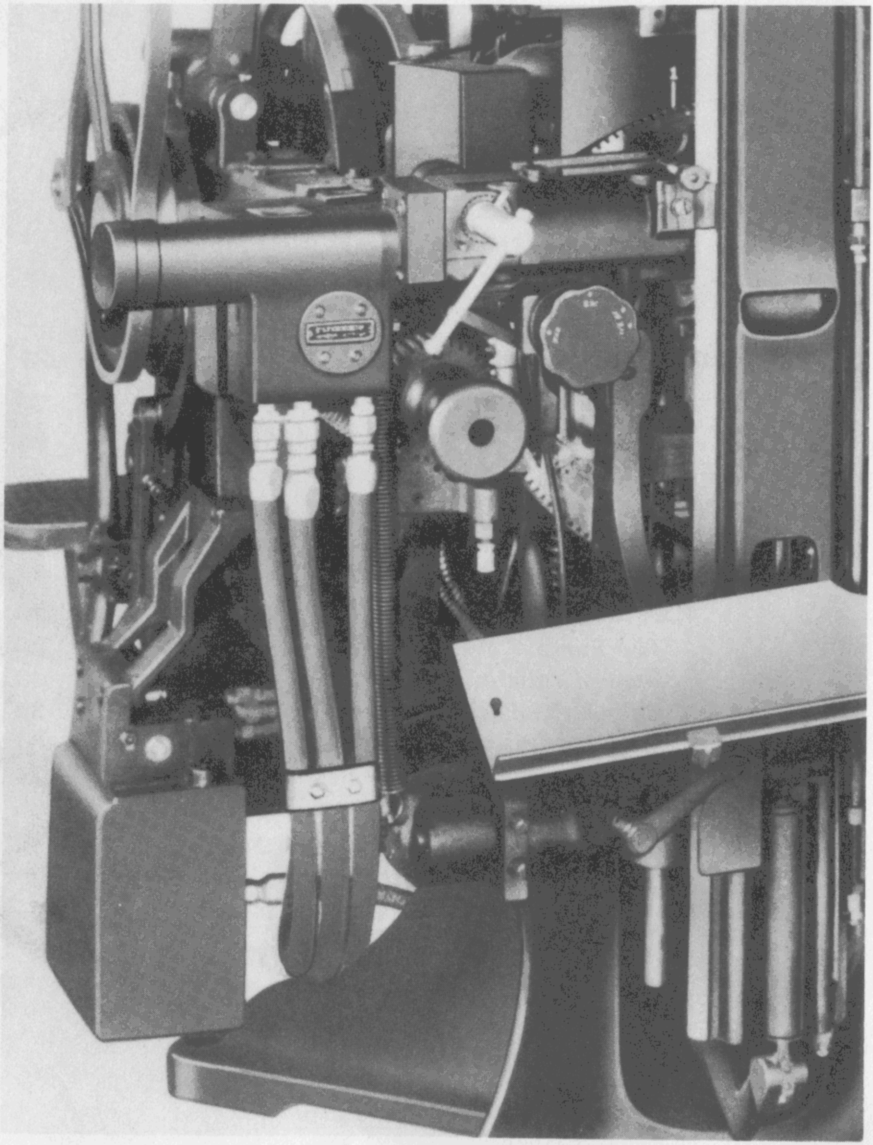

View of manually controlled Hydraquadder installed on a Linotype

I. Introduction

The Linotype Hydraquadder is the result of years of experience and extensive study of the requirements of a quadding mechanism. Incorporated into the design of the Hydraquadder are the objectives of maximum efficiency, dependability and accuracy of operation, and a minimum of maintenance and adjustment.

These objectives have been attained in the Hydraquadder by means of a true hydraulic concept of vise jaw actuation. The vise jaws are moved quietly, positively and with the force necessary to efficiently perform the quadding function desired.

The Hydraquadder is independent of machine functions, except for timing of operations, and does not obtain its driving power from any machine motion. It operates quietly and with exceptional smoothness at any machine speed. Maintenance requirements are practically nil, except for periodic lubrication at a few points.

Wherever composition requirements call for white space with lines set flush left, centered, or flush right, the Hydraquadder effects savings by enabling the operator to set quadded and centered matter at speeds faster than the simplest straight matter.

Basic design of the Hydraquadder is such that it can also be furnished for operation by Teletypesetter tape or manual push button control. This feature was incorporated into the original design so that tape or push button operation is accomplished in the most efficient and dependable manner.

Margin control and accurate centering are inherent in the design of the Hydraquadder, whether manually or tape operated.

An added feature of the Hydraquadder is the use of the Mohr Measure Control which permits simultaneous Left Hand Vise Jaw and Assembler Slide setting when changing measures. This feature in conjunction with the self-locking delivery slide and automatic line stop return makes measure changing a one-step operation. Also an electrical left hand vise jaw safety prevents the cast being made if for any reason the line of matrices is not aligned properly in the first elevator jaws and held firmly between the vise jaws.

Other features and advantages of the Hydraquadder are:

1. Hydraulic fluid is continuously available for precise control of both motion and force of the vise jaws.

2. The vise jaw force is entirely independent of line length.

3. The vise jaw force in centering is the same as in quadding.

4. A controlled wiping action of the vise jaws, as the line of matrices rises after the cast, is incorporated into the design of the Hydraquadder to eliminate accumulation of metal on vise jaw surfaces contacting the matrices.

5. The possibility of trapped air in the hydraulic system is eliminated due to the use of the sump and a true hydraulic system. Thus, it is never necessary to bleed the hydraulic system to overcome difficulties caused by trapped air.

6. The left hand vise jaw electrical safety operates on low voltage and is non-hazardous.

7. The rate of vise jaw travel is automatically controlled, by the hydraulic pump.

8. After the Hydraquadder is installed and the initial adjustments made, there is little maintenance required except for occasional oiling at a few points.

II. General Description

PHYSICAL COMPONENTS

The Hydraquadder consists of six assemblies which are readily applied to the Linotype machine. These are:

1. *The Hydraulic Fluid Circulating Gear Pump 36, Fig. 2A,* which is attached to a bracket 37, fastened to the rear of the Linotype column. It is the function of this pump to circulate the hydraulic fluid through the various parts of the hydraulic system. The circulating pump has a fibre pinion 42, Fig. 2A which meshes with, and is driven by, the regular Linotype machine driving gear. The pump will be driven by the gear whenever the Linotype driving motor is turned on, but there is no pressure in the system except when quadding or centering.

On machines which have the Linotype V-Belt Motor Drive, the hydraulic pump is fastened to the underside of the motor bracket and driven by a V-Belt, Fig. 2B.

2. *The Control Valve 13, Fig. 1, and Sump Assembly 2,* is fastened to the left-hand cam shaft bracket by means of two longer bracket screws 11.

In the control valve body 13, Fig. 1, there are several port openings and a horizontal sliding valve spindle 16, which is actuated by a cam 35, attached to the regular first elevator cam, through a roller 10, and link 8, 18, arrangement. Below the control valve is the sump 2, or reservoir for the hydraulic fluid.

The purpose of the control valve is to time and direct the flow of hydraulic fluid to the remainder of the hydraulic circuit so as to close and open the vise jaws when quadding or centering, and to apply the necessary operating pressures.

There are four hose connectors in the right side of the control valve body and one connector in the lower part of the sump. The connector in the sump is attached to the inlet side of the circulating pump

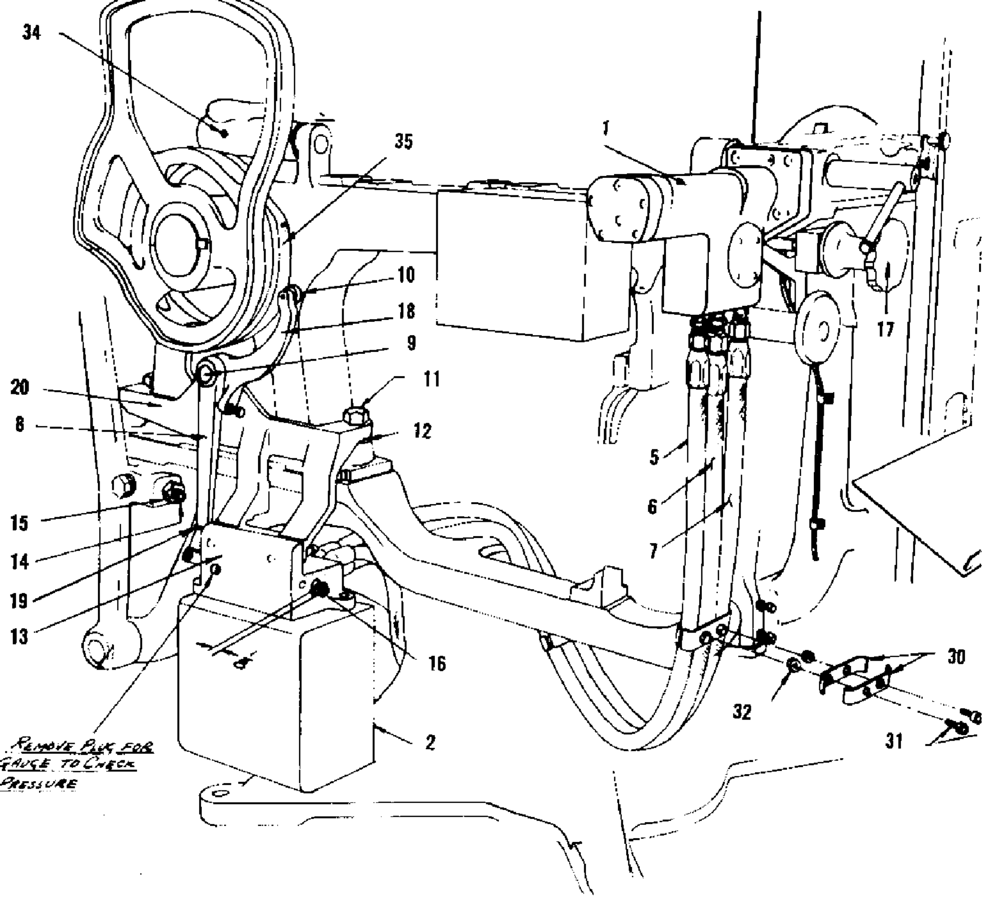

Figure 1 *View showing Hydraquadder Control Valve and Sump Assembly, Cylinder and Selector Valve Assembly, Hydraquadder Operating Cam and Levers Assembly, and Hoses.*

by a hose 3, Fig. 2A. The outlet of the pump is connected by a hose 4, to one of the connectors on the control valve body 13, Fig. 1. The other three connectors on the control valve body are connected by hoses 5, 6, 7, to the cylinder and selector valve housing 1, Fig. 1, which is fastened to the left side of the vise.

Within the sump 2, Fig. 1 (which holds one gallon of fluid) and attached to the bottom of the control valve is a drain pipe to the sump and two pressure relief valves which bleed into the sump. The pressure relief valves are used to control the pressure in the hydraulic system during quadding and centering functions and the drain-pipe allows the hydraulic fluid to be recirculated to the sump, when the Hydraquadder is set for "Reg."

3. *The Cylinder and Selector Valve Housing 1, Fig. 1,* is a casting fastened to the left side of the vise frame and vise cap. It has two horizontal cylinders side by side approximately in line with the vise jaw blocks. Inside each cylinder is a piston 132, Fig. 12, and piston rod 130, 131. The hydraulic fluid acts against the pistons in either or both cylinders to move the vise jaws against the line of matrices. The rear piston 132, is connected through its piston rod 131, to a rack 98, Fig. 6, which is in turn connected to the left hand vise jaw block 97, through its adjusting rod 96. The front piston rod 130, Fig. 12, is connected to a second rack 95, Fig. 6, which is fastened to the right hand vise jaw block 94.

The selector valve 145, Fig. 13, determines whether the machine is to operate at regular, quad left, center or quad right. The position of the selector valve is controlled by a selector handle 17, Fig. 1, which will be described under the "Selector Rack Support Assembly."

The cylinder and selector valve housing 1, Fig. 1, extends 9-⅜ inches to the left of the vise, is 2-⅝ inches thick and 5 inches high.

At the bottom are connected the three hoses 5, 6, and 7, Fig. 1, from the control valve 13, which is on top of the sump at the left of the machine. Two hoses 5, 7, are used to carry fluid for opening and closing the vise jaws. The third hose 6, is used for the return of the hydraulic fluid when machine is set for regular.

A small gear 87, Fig. 5, is located at the rear of the housing. This gear is fastened to the selector valve 145, Fig. 13, and is turned by a rack 88, Fig. 5, controlled by the selector handle 17, Fig. 1, which is in turn controlled by the operator.

Also incorporated in the housing is the left hand vise jaw banking screw arm 121, Fig. 10, and adjusting nut 122, which takes the place of the normal vise closing wedge.

4. *The Selector Rack Support Assembly* 53, *Fig.* 5, includes the selector handle 17, which the operator turns to either of four positions. The selector handle is attached to a shaft which, as it is turned, performs four functions: First, it has a gear 82, on the end which meshes

with a rack 88, extending to the left along the rear of the vise and turns the selector valve 145, Fig. 13. The selector valve is then positioned to direct the flow of hydraulic fluid to move the vise jaws in conformity with the setting of the selector handle.

Second, when the selector handle is turned to any position from regular, it actuates linkage 61, 63, Fig. 4, to move the justification stop lever 69, into position to block out justification, to provide uniform word spacing.

Third, when the selector handle is set for centering, a small pinion 74, Fig. 4, is cammed downward meshing it with the teeth on the two racks 95, 98, Fig. 6, which are connected to the vise jaws. The pinion 74, Fig. 4 meshed with both racks 95, 98, maintains the vise jaws in exact synchronization for accurate centering.

Fourth, when the selector handle 17, Fig. 1, is turned to L.H. Quad from regular, the movement of the rack 88, Fig. 5, which turns the selector valve gear 87, also moves a stop 58 into position to limit movement of the left-hand banking screw arm (takes the place of the wedge) so that the left hand margin is exactly the same as that of a justified line.

5. *The Left Hand Vise Jaw Safety* consists of an electrical switch 150, Fig. 16, built into the L.H. Vise Jaw, a plunger 151 which protrudes from the end of the jaw and actuates the switch when it is depressed, a power supply box to provide low voltage electrical current to the safety circuit, a solenoid and bracket assembly Fig. 7, located under the pot pump lever to actuate the pump stop, and the wiring harness to connect the electrical components of the circuit.

6. *The Measure Control Assembly* is fastened at the right hand end of the vise cap and is designed to move the left hand vise jaw to the measure it is desired to cast. The operator simply turns the Measure Control Dial to any setting from 4 to 30 ems and the L.H. Vise Jaw is moved to the correct measure for casting.

The Measure Control supplied will either have the L.H. Vise Jaw Control and Assembler Slide Mechanism to automatically set the Assembler Slide to the same measure as the L.H. Vise Jaw when the dial is turned, or it will consist of the Jaw Control only, with an em scale and a pointer mounted on the control, to set the left hand vise jaw. Both versions of the Measure Control are offered with the user exercising his option as to the one which best suits his needs.

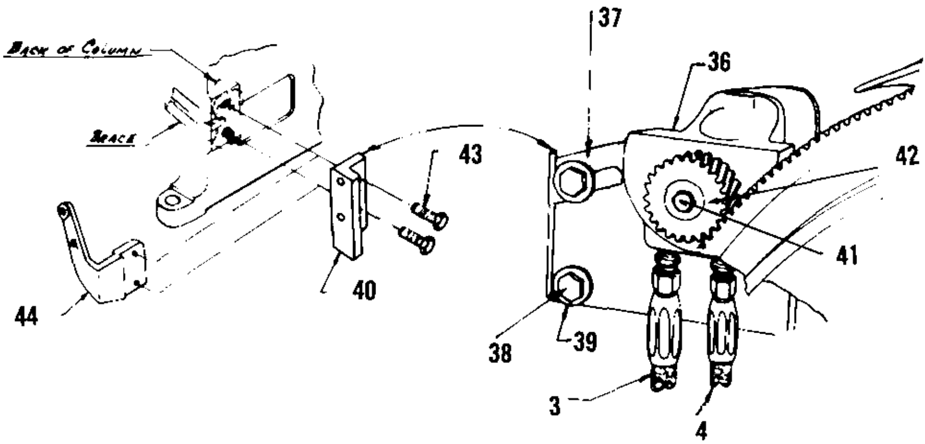

Figure 2A ***View showing Pump and Pinion with Overhead Geared Motor Drive.***

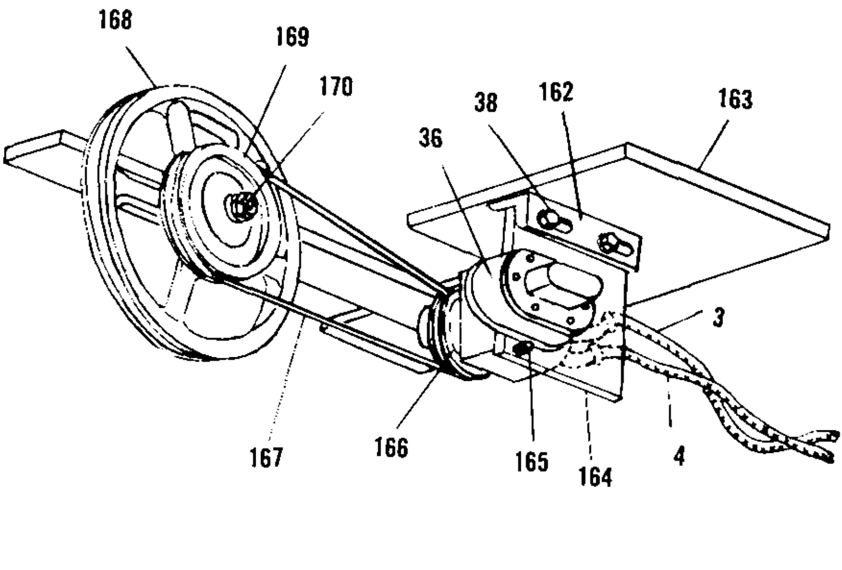

Figure 2B ***View showing Pump with V-Belt Drive.***

III. Operation

BASIC FUNCTIONS OF HYDRAULIC COMPONENTS

In order to assist in the interpretation of the following material pertaining to the operation of the Hydraquadder, here are the basic functions of the various hydraulic components of the Hydraquadder.

The Pump

The pump 36, Figs. 2A and 2B, which supplies the hydraulic pressure in the system consists of two gears enclosed in a close fitting housing. Rotation of the gears, carries fluid from the intake side, around on the outside of the gears to the exhaust side where it is pushed out of the outlet hose.

The Valves

The valves are used to prevent or direct fluid flow. In the hydraulic system of the Hydraquadder there is a control valve Fig. 11, and a selector valve, Fig. 13. The Hydraquadder valves are designed with one moving part which is moved to various positions in order to connect together various internal ports or passages for fluid flow.

The control valve Fig. 11, is of the type in which the horizontal sliding movement of the spindle 16, changes the internal connections of the valve to direct the flow of hydraulic fluid to various inlets and outlets.

The selector valve, Fig. 13, is a rotary type valve. The rotary movement of the spindle 145, in the valve connects the various inlet and outlet ports to direct the fluid flow as required to fulfill a particular function of the hydraulic system.

The Cylinders

The cylinders Fig. 12, are used to transform the hydraulic pressure of the fluid to mechanical motion. This is accomplished by means of the piston 132, and piston rod 130, 131, in each cylinder. The pressure of the fluid against the piston moves the piston and piston rod, which in turn moves the vise jaw.

The cylinders used in the Hydraquadder are double-acting. That is, hydraulic fluid can be directed to either side of the piston (alternately) to move the piston and piston rod in either direction. The piston velocity is determined by the rate the fluid enters the cylinder.

The Relief Valves

The two relief valves extend into the sump 2, Fig. 3. These valves each consist of a spring-loaded piston in a housing. Pressure applied against the piston opens up a port which allows fluid to escape into the sump. The tension of the spring in the relief valve determines at what pressure the piston will permit the fluid to escape. Thus, the pressure is maintained at a constant level.

It should be noted that in a hydraulic system no pressure is exerted until something opposes the flow of the hydraulic fluid. The pressure will build up to that which is required to close the vise jaws against the line of matrices, and the purpose of the relief valves is to assure that the pressure does not exceed a predetermined amount.

The Sump and Hoses

The sump 2, Fig. 3, is a reservoir for the hydraulic fluid. Use of the sump assures a plentiful supply of hydraulic fluid and also eliminates any possibility of an air block.

The hoses, 3, 4, 5, 6, 7, Fig. 3, are a convenient means of transporting and containing the fluid in the hydraulic system.

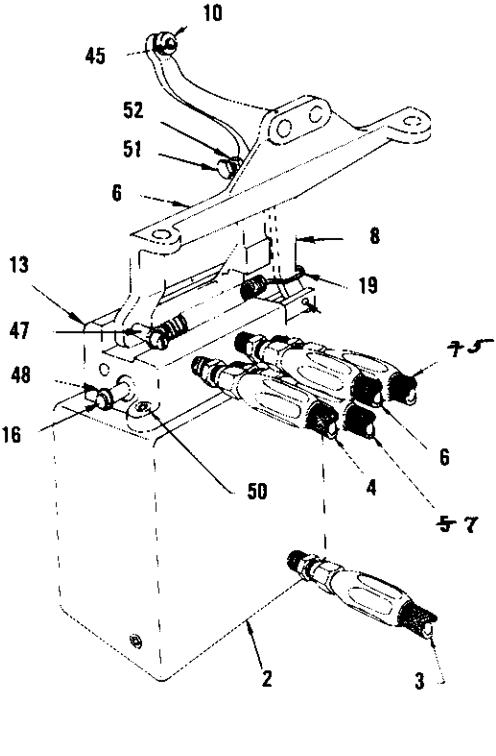

Figure 3
Rear View of Control Valve and Sump Assembly.

THE HYDRAQUADDER OPERATING CYCLE

The basic operating sequence of the Hydraquadder (refer to Fig. 8) is as follows:

1. The pump draws fluid from the sump, and pumps it to the control valve.

2. The fluid passing to the control valve is diverted to the selector valve at the proper time.

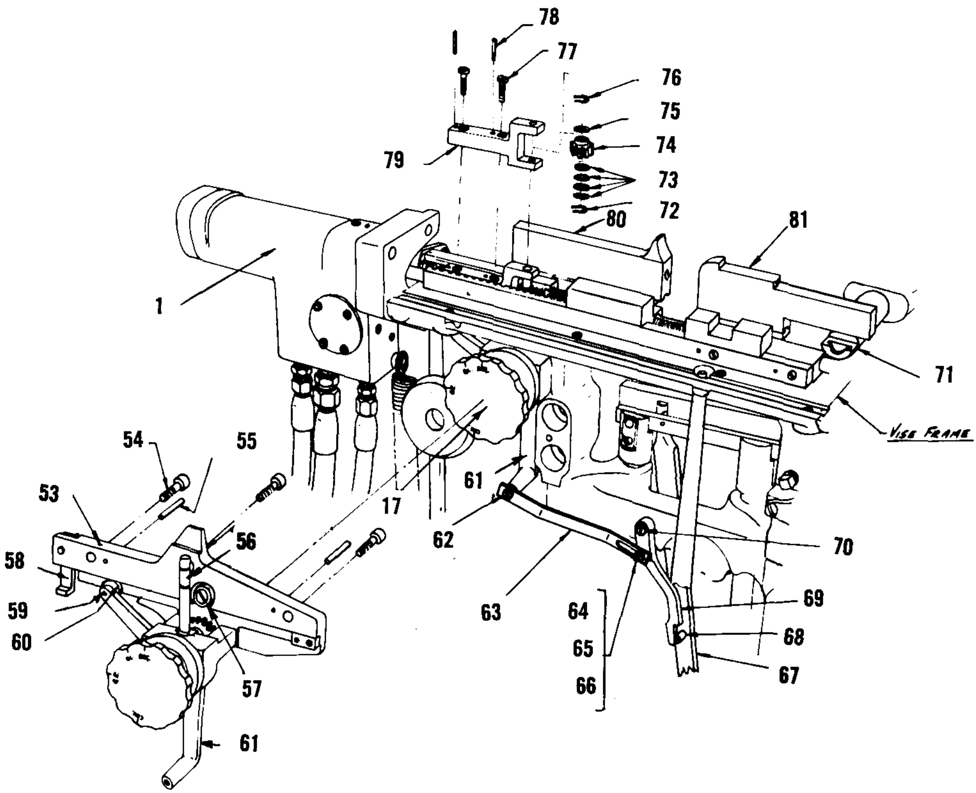

Figure 4 ***Front View showing Hydraquadder Selector Rack Support Mechanism, Justification Blockout Linkage and Cylinder and Selector Valve Assembly. (Vise Cap and First Elevator is removed.)***

3. The selector valve position determines to which piston cylinder the fluid is to be directed to cause the vise jaw closing for the quadding function selected.

4. The control valve, at the proper time, then diverts the flow of fluid to the other side of the piston in order to bring the vise jaw or jaws back to normal position.

A more detailed sequence of the Hydraquadder operation is as follows:

When the Linotype driving motor is turned on, the main driving gear revolves the gear pump 36, Fig. 2A, by means of the fibre pinion 42, on the pump shaft or by a V-Belt and pulley Fig. 2B, if the Linotype V-Belt Motor Drive is used. As the pump is revolved, it pumps hydraulic fluid from the sump 2, Fig. 3. The fluid then passes to the control valve 13.

The following actions then occur for a selected quadding function:

QUAD LEFT

1. *Vise Jaw Closing.* As the cam shaft revolves, the control valve operating cam 35, Fig. 1, attached to the first elevator cam, moves the control valve spindle 16, to vise closing position, by means of a roll 10, attached to a lever 18, and link which is, in turn, attached to the control valve spindle. A spring 19, attached to the control valve linkage 8, causes the roll 10, to follow the periphery of the cam 35.

The first movement of the control valve spindle directs the oil through the vise jaw closing hose to the cylinder and selector valve housing 1, Fig. 1. The selector valve Fig. 13, directs the fluid to the right side of the front horizontal cylinder Fig. 12, where it acts against the right side of the piston and forces it to the left. Since this piston is connected horizontally to the right-hand vise jaw block, its movement to the left forces the right-hand vise jaw to the left to contact the line of matrices for quad left.

The right-hand vise jaw moves in against the line of matrices with an easy motion. This is because the circulating fluid is forcing the jaw to the left under practically no pressure. Pressure builds up only when jaw motion is stopped by contact with the line, or by the banking screws when the jaws are opened.

As the piston connected to the right-hand vise jaw moves to the left, the fluid in the cylinder to the left of the piston flows back through the return hose to the sump. It passes into the sump through a pipe attached to the underside of the control valve housing 13, Fig. 1.

When the right-hand vise jaw meets the line of matrices, its motion is stopped and, since the oil cannot move the piston any further, the oil pressure builds up. Attached to the underside of the control valve 13, Fig. 1, there is a pressure relief valve which is set at 150 lbs. per square inch. When the fluid pressure exceeds this, the fluid will

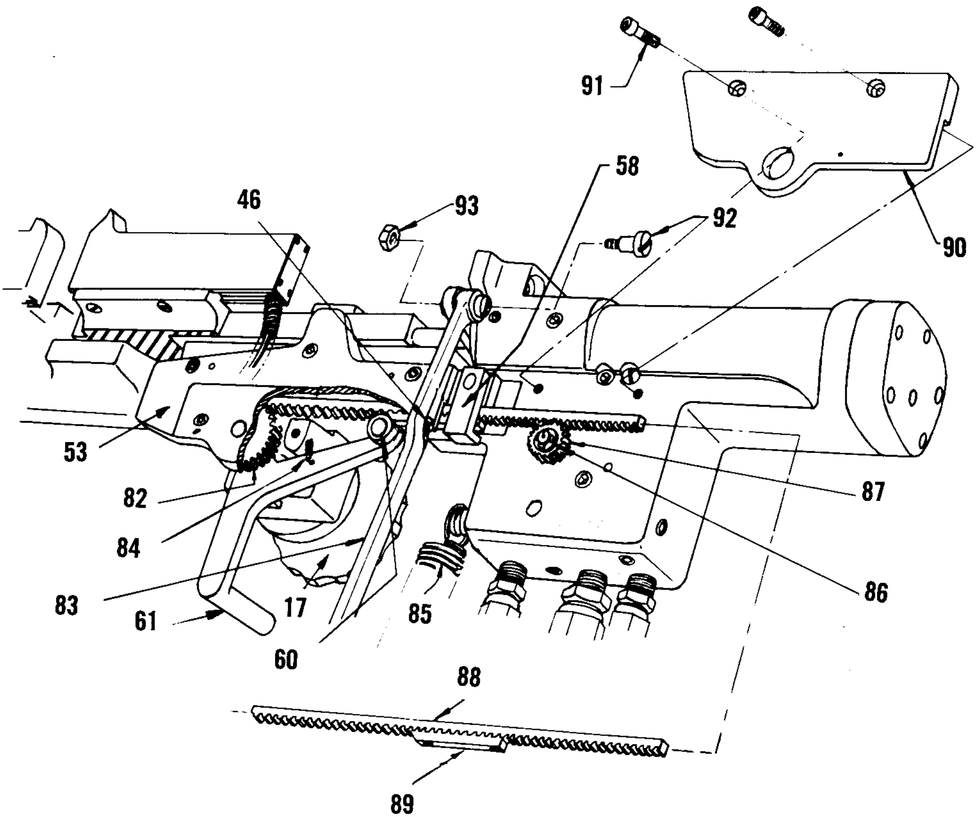

Figure 5 ***Rear View of the Cylinder and Selector Valve Assembly, Selector Rack Support Assembly, and Left Hand Vise Jaw.***

bleed into the sump, thus maintaining an operating pressure of 150 lbs. per square inch, which is equivalent to a vise jaw force of approximately 75 lbs. against the matrices.

2. *Vertical Alignment Position.* At this position, the force of the right-hand vise jaw against the line of matrices is temporarily reduced to permit the vertical alignment to take place. This is accomplished in the vertical alignment position of the control valve spindle. In this position the fluid passes through another relief valve, which is also attached to the bottom of the control valve body 13, Fig. 1, and bleeds into the sump.

By directing the flow of oil through this low-pressure relief valve, which is set at 40 lbs. per square inch, the pressure of the fluid against the front piston is reduced to 40 lbs. per square inch. The force of the right-hand vise jaw against the line of matrices will then be reduced to approximately 12 to 15 lbs. This permits vertical alignment to take place.

3. *Casting.* After the matrices are aligned vertically, the control valve spindle is positioned by cam action so that full hydraulic pressure is applied to the front cylinder, thus exerting maximum force against the line of matrices during the casting operation.

4. *Vise Jaw Wiping.* After the cast, the flow of oil is again directed through the 40 lbs. per square inch pressure relief valve to exert a vise jaw force of 12 to 15 lbs. against the line of matrices, so that the vise jaws will be wiped free of metal as the line of matrices move upward.

5. *Return of Vise Jaws.* The next movement of the control valve spindle directs the oil to the left side of the front cylinder to move the piston to the right, thus moving the right-hand vise jaw away from the line of matrices to its normal position. The fluid in the right side of the front cylinder flows back to the sump as the piston moves to the right.

6. *Normal Position.* The last position of the control valve spindle is the normal position. In this position the oil continues to flow but it merely circulates from the sump, through the pump, and back through the control valve to the sump.

Quad Right

When the selector handle is set for Quad Right, the selector valve directs the flow of oil to the left side of the rear cylinder. This moves the piston to the right and, since the piston rod is connected to the left-hand vise jaw block through its adjusting rod, the left-hand vise jaw will close against the line of matrices. The same valve actions take place as with left-hand quad, the only difference being that the selector valve directs the flow of oil to the rear cylinder instead of the front cylinder.

Centering

When the selector valve is set for centering, it directs the flow of oil to both cylinders causing both vise jaws to move in against the line of matrices.

To insure accurate centering, a small pinion 74, Fig. 4, is used to mesh with the teeth on each of the two racks 95, 98, Fig. 6, which connect the piston rods to the vise jaw blocks. This is done by having the pinion move downward into position to mesh with the teeth of each rack, whenever the selector handle 17, Fig. 1, is set for "Center."

The pinion 74, Fig. 4, revolves on a vertical shaft 56, Fig. 4, which is supported by a bracket attached to the top of the vise frame. The pinion is always in mesh with the teeth of the rack connected to the right-hand vise jaw block and when the selector handle is set for "Center", the pinion is cammed downward to also mesh with the teeth of the rack connected to the left-hand vise jaw piston rod. The pinion does not drive either rack, but is an idler which is used to insure equal motion of the vise jaws.

REGULAR

When the quadder is set for regular, the control valve spindle assumes the same positions as when quadding or centering, but the fluid only flows to the selector valve and returns directly to the sump under no pressure.

HYDRAULIC FLOW CHART

To illustrate the manner in which the control valve and selector valve operate, the hydraulic flow charts (Figures 8 and 9) will be beneficial.

Figure 8 shows the complete Hydraquadder hydraulic system as it is when the Linotype is set for regular and when it is idling.

It will be noted that there are several port openings in the control valve located immediately above the sump. These port openings lead to the various hoses, to the two pressure relief valves and to the exhaust into the sump.

The Neoprene "O" rings shown are fixed in place in the control valve by spacers (see layout of "O" rings, spacers, etc. in adjustment and maintenance section Fig. 11) which have openings to permit the flow of hydraulic fluid. The outside surface of the "O" rings prevent oil passage by their contact with the cylinder wall of the control valve, as shown. The control valve spindle has a cut out portion as shown, to permit fluid passage through the inside "O" ring opening. When a larger diameter section of the control valve spindle is positioned so that one or more "O" rings encircle it, it blocks the passage of hydraulic fluid. The movement of the control valve spindle, therefore, directs the fluid to the proper control valve port opening to control vise jaw movement and to apply the correct jaw operating pressure at the correct time in the machine cycle.

Fig. 8 shows the control valve spindle in normal position with the machine idling. The fluid is drawn from the base of the sump, through the pump and into the control valve body as shown. The direction of flow of the fluid in the control valve is shown by the solid line with an arrow. It will be noted that the fluid, when the machine is idling, passes directly through the drain pipe to the sump and continues to circulate in this way as long as the Linotype motor is operating.

Fig. 9 shows the movement of the control valve spindle when the quadder is set for quad left. The first illustration at the left shows the fluid circulating into the sump when the machine is in normal position. As the cam shaft revolves, the Hydraquadder cam causes the control

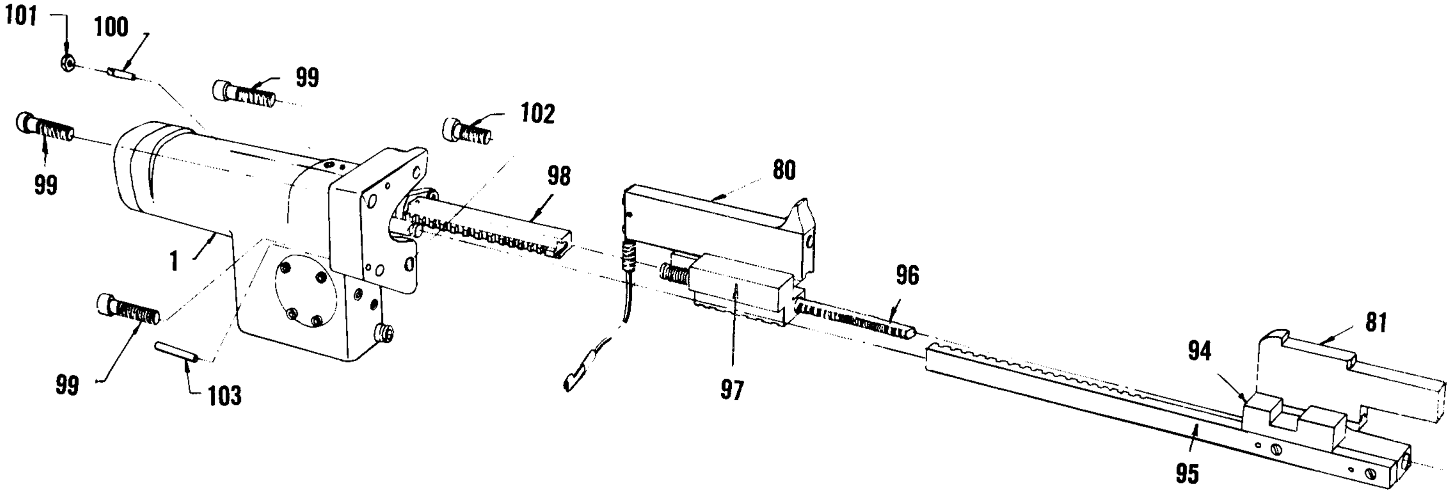

Figure 6 *Front View of the Cylinder and Selector Valve Assembly, L.H. and R.H. Vise Jaws and Blocks, and Racks.*

valve spindle to move towards the front of the machine, to the vise jaw closing position. In this position, the fluid from the pump passes through the valve port and through the vise jaw closing hose to the selector valve. Since the selector valve has been positioned for Quad Left, the fluid is directed to the right side of the piston connected to the right hand vise jaw block, causing the piston rod to move to the left, to bring the right hand vise jaw against the line of matrices for Quad Left.

It should be noted that the fluid is also directed to the high pressure relief valve which maintains the pressure in the system of 150 lbs. per square inch, which exerts the proper force of the vise jaw against the line of matrices.

The next movement of the spindle is for matrix toe alignment. The fluid continues to flow through the vise jaw closing hose to hold the right hand vise jaw against the line of matrices, but the spindle in moving to the rear, opens up a passage to the low pressure relief valve, which reduces the pressure in the system to 40 lbs. per square inch to permit the matrices to be aligned vertically.

After the fluid pressure has been reduced to permit matrix toe alignment the spindle moves to the casting position as shown in the second illustration of Fig. 9. The passage to the low pressure relief valve

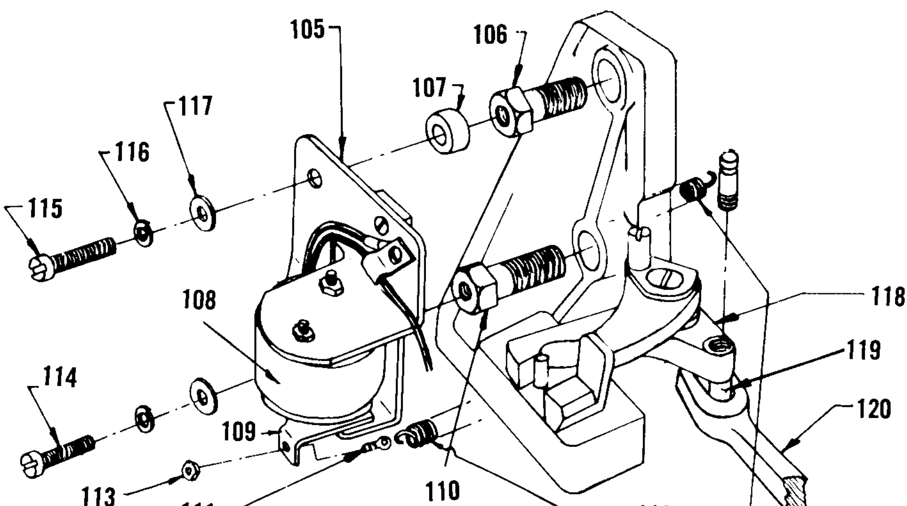

Figure 7 ***View showing the L.H. Vise Jaw Pot Pump Safety Solenoid Bracket Assembly.***

is blocked so that only the high pressure relief valve is in the flow system. Maximum pressure is thus imparted to the vise jaws to hold them securely against the line of matrices for the cast. It will be noted that the position of the spindle for vise jaw closing and casting is the same.

After the cast the spindle moves to the same position it occupied for toe alignment. The passage to the low pressure relief valve is opened to provide a reduced pressure of the vise jaws against the line of matrices. As the first elevator rises after the cast, the end matrices in the line will wipe free any metal which might have accumulated on the vise jaws, to prevent matrix sidewalls being damaged.

In the jaw opening position of the spindle, the passage to the vise jaw closing port is blocked off and that to the return hose opened, permitting fluid to pass to the left of the front cylinder, as shown by the arrow lines, moving the right hand vise jaw to the right and back to normal position.

In the flow charts shown, no attempt has been made to show the fluid returned to the control valve and to the sump. When the right hand vise jaw is forced to the left, as for Quad Left, the fluid to the left of the piston is forced through the left hand hose back to the control valve where it passes through the drain pipe to the sump. When the right hand vise jaw moves away from the line of matrices in returning to normal position, the fluid on the right of the piston is forced back to the control valve and sump through the right hand hose.

The various positions of the control valve spindle during a machine cycle are the same for either of the quadding functions or centering.

The position of the selector valve determines where the fluid is to be diverted for either R.H. quadding, L.H. quadding or centering.

OPERATION OF SELECTOR HANDLE MECHANISM

The selector handle 17, Fig. 4, which the operator turns to various positions—Reg., Q.L., Q.R. and Cen.—to select the quadding or centering function desired, is conveniently located under the vise cap and just to the left of the first elevator slide. The handle is shaped to fit the operators hand for positive control. After the operator turns the handle to a position, a spring detent holds it in place.

Also part of the selector handle assembly is the line centering pinion 74, Fig. 4, and shaft 56, the cam 161, Fig. 17, which controls the line centering pinion action, the rack pinion 82, Fig. 17 which moves the rack 88, Fig. 5, which in turn controls the selector valve 145, Fig. 13, and the justification block out lever 69, Fig. 4.

To insure accurate centering, the line centering pinion 74, Fig. 4, is used to mesh with the teeth on each of the two racks 95, 98, Fig. 6, which connect the piston rods 130, 131, Fig. 12, to the vise jaw blocks 94, 97, Fig. 6. The pinion is cammed downward into position to mesh with the teeth of both racks, whenever the selector handle is set for

"Center." When the selector handle is on Reg., Q.L., or Q.R. the line centering pinion 74, Fig. 4, is disengaged from the left hand rack 98, Fig. 6, but remains in mesh with the right hand rack 95. Since the line centering pinion acts to correlate the movement of both vise jaws with each other, their relationship is held constant for accurate centering.

As shown in Fig. 17 the line centering pinion is cammed into centering position by means of a cam 161, on the selector handle shaft contacting two rollers 155, mounted on the pinion shaft 56.

The pinion 82, Fig. 5, which engages the selector rack 88, is also mounted on the selector handle shaft so that when the handle 17, is turned to a quadding or centering position, the rack 88, moves to turn the selector valve 145, Fig. 13, to the position for the function desired.

JUSTIFICATION LOCKOUT

During the quadding operation the line is not justified by the spacebands being driven up by the justification bar. A lockout lever 69, Fig. 4, blocks the rise of the justification bar brace 67. The positioning of the selector valve by the operator results in a shoe 89, Fig. 5, on the rack 88, moving to contact a roller 60 on the lever 61, which is attached to the selector bracket assembly. Contact of the roller 60, on the shoe 89, causes the lever 61, to pivot. By means of linkage 63, Fig. 4, the lockout lever 69, is swung into position to contact the screw stud 68, in the justification bar brace 67. This blocks the rise of the bar brace and consequently there is no justification of the line by spacebands during a quadding or centering function. When the Hydraquadder is not being used and the selector handle is set on "Reg." the shoe 89, Fig. 5, on the rack 88, does not contact the lever roller 60, and therefore the lockout lever 69, Fig. 4, is swung clear of the stud 68, in the justification bar brace 67, permitting it to rise and justification to occur. A coil spring 84, Fig. 5, fastened to the lever 61, pulls the lockout lever 69, Fig. 4, and its linkage 63, back to permit the lockout lever to clear the stud 68, in the justification bar brace 67.

MARGIN ADJUSTMENT AND VISE CLOSING MECHANISM

The operation of the mechanism for maintaining margins on the slug is uncomplicated and positive. The right hand margin is maintained in the same manner as for a machine without a quadder. This is accomplished by the right hand vise jaw block banking against an adjustable screw.

The left hand margin adjustment is made by means of an adjusting nut 122, Fig. 12, which is located in the cylinder housing 1. A banking screw 121 through the nut is actuated by the vise closing link 83, Fig. 5, to turn the screw in against the L.H. vise jaw rack 98, Fig. 12, just prior to and during the cast.

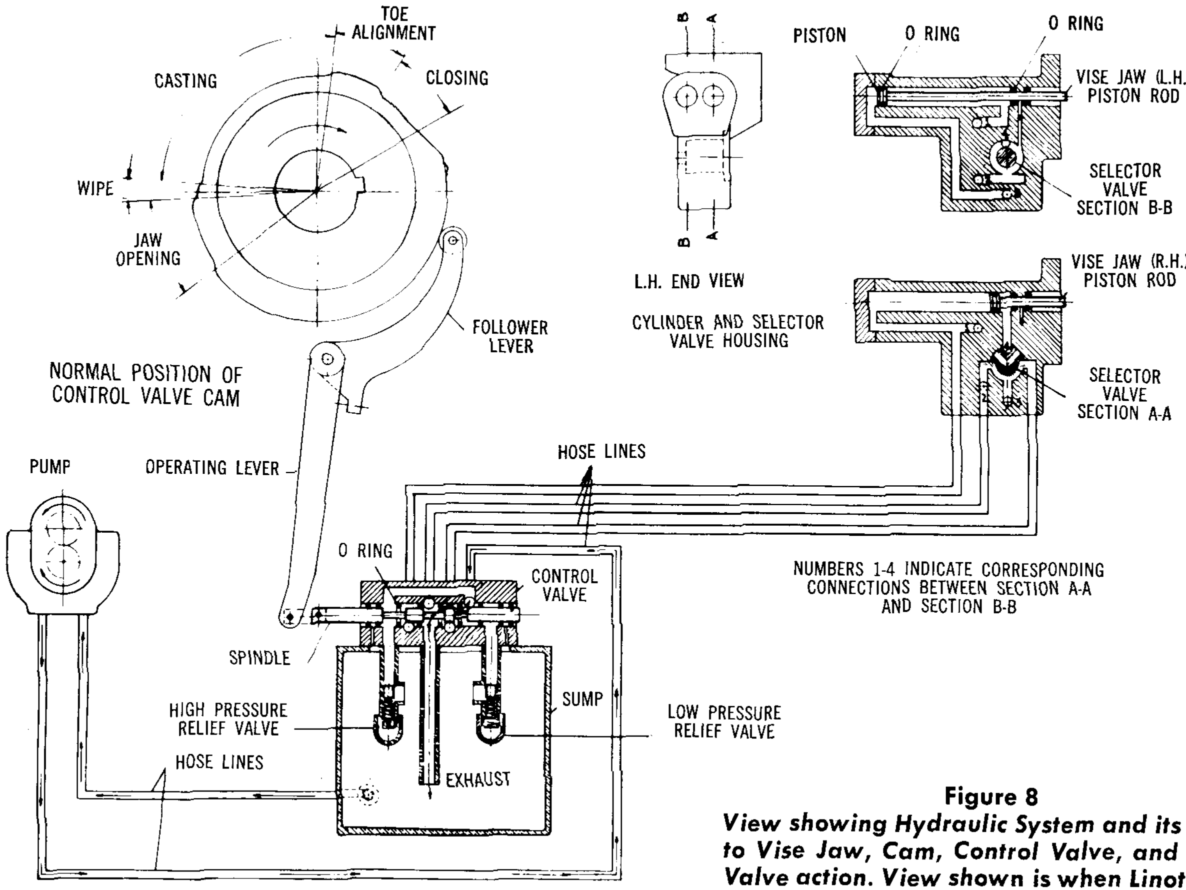

Figure 8

View showing Hydraulic System and its relation to Vise Jaw, Cam, Control Valve, and Selector Valve action. View shown is when Linotype machine is in normal position.

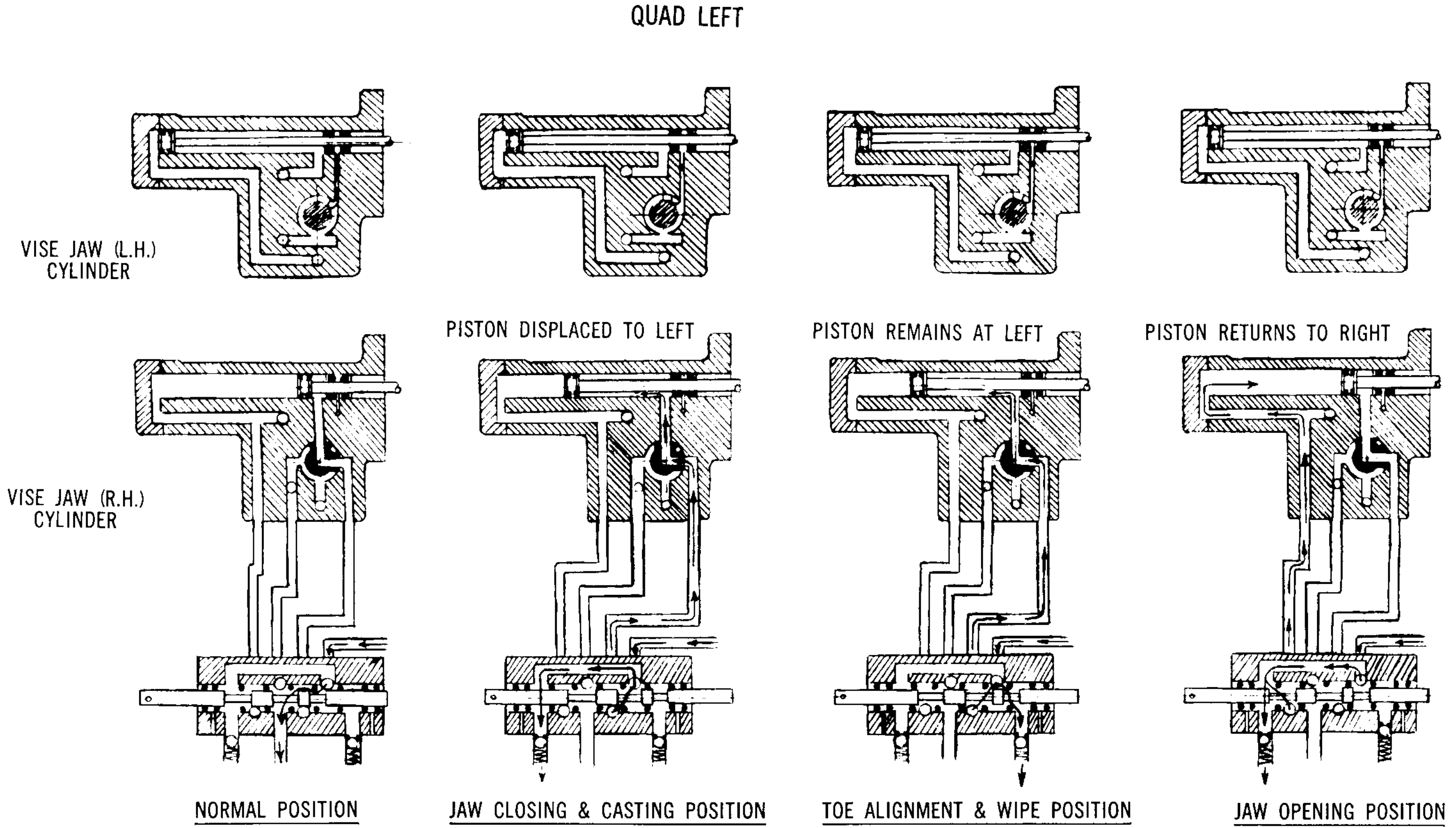

Figure 9 ***View showing sections through the Control Valve Assembly and the Cylinder and Selector Valve Assembly. The relative position of their components are shown during the "Quad Left" cycles of the Hydraquadder.***

A supplementary action occurs during quadding operation. By means of a margin control stop 58, Fig. 5, the vise closing link 83 is only allowed to rise a predetermined distance. This limits the rotation of the banking screw 121, Fig. 12, during quadding. An adjusting screw and lock nut on the link 83, Fig. 5, permits the adjustment of the amount of rise the link will have and the consequent movement of the banking screw. The margin control stop 58, is moved out of the path of the adjusting screw in the vise closing link when the control knob is turned to "Reg." by means of a pin in the rack 88 which actuates the control valve gear 87. A flat spring returns the stop 58 when the selector handle 17 is turned to a quadding position.

By this method, the banking position of the left-hand vise jaw can be controlled when quadding, so that the left-hand margin will be the same as when operating regular.

MEASURE CONTROL

In order to facilitate setting the left-hand vise jaw and the assembler slide when changing measures, the Mohr Measure Control was incorporated into the design of the Hydraquadder. The measure control dial bracket is mounted at the right end of the vise cap. When the operator turns the dial on the measure control, the left vise jaw is moved to the measure selected by the operator. Simultaneously, by means of small bevel gears, screw and linkage, the assembler slide stop is positioned to correspond to the measure selected. The assembler slide feature is optional, some users will have the jaw control only, depending upon what best suits their specific type of composition. The measure control is designed to provide measure-settings of ems and points in the range from 4 to 30 ems.

LEFT HAND VISE JAW SAFETY

The Left Hand Vise Jaw Safety (see Fig. 15) operates both during quadding and non-quadding cycles of the Linotype. When the line of matrices is held between the vise jaws, a switch plunger tip 151, Fig. 16, protruding from the left hand vise jaw 80, is forced flush with the face of the jaw. This closes the circuit to the solenoid 108, Fig. 7, located above the pot pump lever catch block. When the switch plunger is depressed, the circuit is closed, and the solenoid 108, is energized to pull the catch lever 118, out from under the pot pump lever to permit the plunger to descend.

In order to permit the operator to hold the pump stop in position if he should desire a line not to be cast which normally would be cast, a spring 112, Fig. 7, is connected between the solenoid 108 and the catch lever 118. The operator then holds the pot pump lever stop lever operating lever 120, and when the solenoid 108, is energized it merely expands the spring 112, instead of pulling the catch lever 118, clear of the pump lever.

The safety circuit receives its power from a power supply box in which are a transformer for reducing the current from 110 or 220 volts AC to 24 volts AC, a full wave rectifier for converting the current to direct current for more efficient operation of the solenoid, a ½ wave rectifier to suppress arcing in the vise jaw switch, a fuse, and the wiring connections to complete the circuit. The circuit is a "grounded circuit" in that the Linotype machine frame is used to complete the circuit between the solenoid and the power supply box. Since there is only about 18 volts Direct Current being used it is completely safe and offers no possibility of electrical shock to an operator or machinist. When the switch plunger 151, Fig. 16, in the L.H. vise jaw 80 is not depressed the circuit is open and no current is flowing.

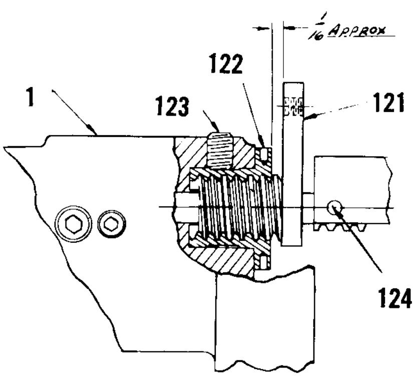

Figure 10 ***Sectional View of Left Hand Margin adjusting mechanism.***

IV. Adjustments and Maintenance

After the Hydraquadder has been installed and adjusted there should be little necessity for making adjustments or performing any maintenance other than routine oiling and cleaning. However the material below pertains to the adjustments and maintenance which will assist in understanding the function of the mechanism and taking care of the small amount of routine lubrication which is required.

LUBRICATION

Since many of the internal parts of the Hydraquadder are moving in a bath of hydraulic fluid, which is a lubricant and rust-preventative, these parts will not wear due to lack of lubrication.

The external parts should be periodically lubricated. The parts requiring periodic lubrication are:

1. Control valve operating levers 8, 18, Fig. 1.
2. Control valve cam follower lever roller 10, Fig. 1.
3. Selector rack 88, Fig. 5.
4. Line centering pinion and shaft 74, Fig. 4.
5. Selector handle operating shaft 161, Fig. 17.
6. L.H. Vise Jaw banking screw 121, Fig. 12.

There is a notch in the control valve cam follower lever 18, Fig. 1, at a point above where the roller stud goes into the lever, to facilitate the oiling of the cam roll 10, and stud. Oil should be applied at this point periodically to keep the roll 10, turning freely on the stud and revolving, as it rides on the cam 35. Do not oil the cam surface or the surface of the roll which contacts the cam, since this would cause the roll to slip rather than to roll on the cam.

The selector rack 88, Fig. 5, and the pinions 82, 87, located on the back of the control knob bracket and the control valve casting should be oiled occasionally and also the pinion studs.

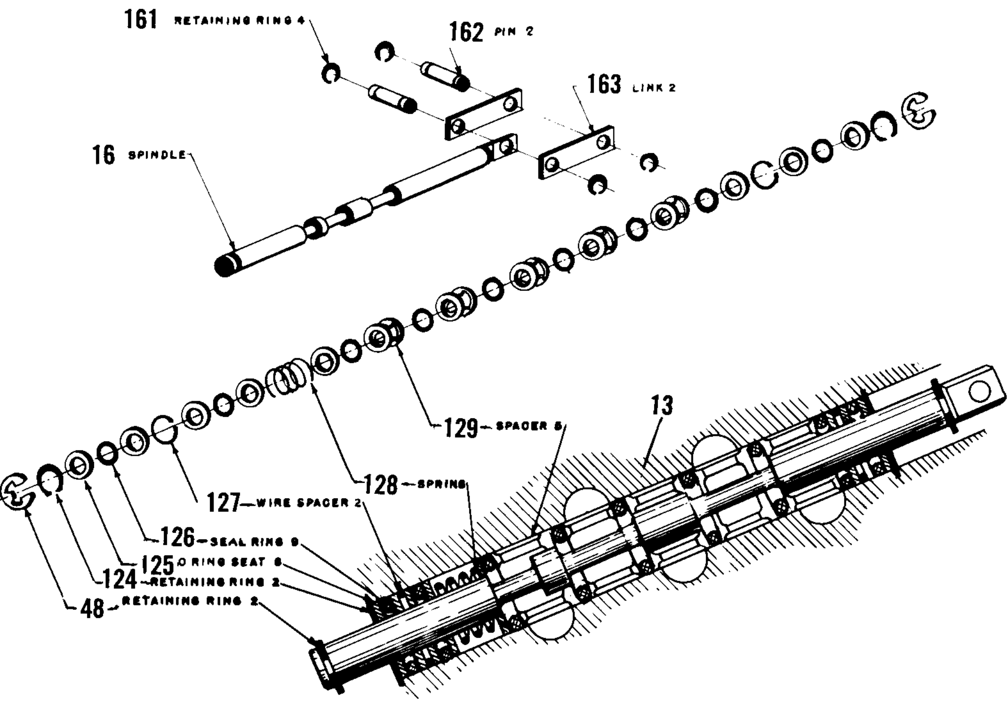

Figure 11 ***View showing assembly of Spindle, O-rings, O-ring seats, Seals, etc., which are in the Control Valve.***

The pivot points 62, 64, 70, Fig. 4, of the linkage and levers of the justification lockout mechanism should have a few drops of oil applied at regular intervals. The stud of the roller 60, Fig. 5, which is contacted by the shoe 89, on the selector rack 88, should be oiled occasionally.

The line centering pinion 74, Fig. 4, and shaft 56, can be oiled by removing the plug in the vise cap above these parts. On some machines there is a small plate held by two screws (instead of a plug) on top of the vise cap, which permits the oiling of the centering pinion and shaft. Only a few drops of oil are necessary.

Oiling of the selector handle shaft 161, Fig. 17, is accomplished by means of a hole in the casting 154, Fig. 17, to the rear of the handle.

The Left Hand Vise Jaw Banking Screw 121, Fig. 12, should be oiled occasionally by squirting a few drops of oil between the banking screw arm and the adjusting nut 122.

ADJUSTMENTS

Control Valve

The necessary adjustment of the control valve spindle 16, Fig. 1, is made when the Hydraquadder is originally installed and once correctly made, should not normally require readjusting. However, if necessary, the spindle should be adjusted as follows:

With machine in normal position, adjust the cam follower adjusting screw 51, Fig. 3, so that the control valve spindle 16, is positioned to allow ⅛" to $\frac{5}{32}$" clearance between the "E" ring 48, at the front end of the spindle and the control valve 13, as shown in Fig. 1. This is an approximate setting. Do not allow machine to turn over with the clearance less than ⅛ of an inch. The "E" ring may bind on the control valve when the cam follower 10 is on the highest point of the cam 35 and may cause the lever to break.

The final adjustment of the control valve spindle is accomplished by observing the action of the vise jaws as the first elevator withdraws the line of matrices from the vise jaws.

As the line of matrices is withdrawn from the vise jaws, the vise jaws should remain against the end matrices of the line until the bottom of the matrices are ¼" from being entirely removed from the contacting surfaces of the vise jaws. To check this timing, turn the machine slowly by hand with the motor running and observe the action of the vise jaws. At the exact instant the vise jaw recedes from either quad position, the top of the first elevator jaw should be approximately 2" above the top finished surface of the vise cap. If it is found that the vise jaw is returning too soon, slightly back off the cam follower adjusting screw 51, Fig. 3. This will increase the ⅛" spindle adjustment a slight amount and thereby retard the timing of the vise jaw return. If the timing of the vise jaw return cannot be retarded sufficiently to obtain the desired results by means of the forementioned spindle adjustment, the washers 12, Fig. 1, under the pads of the control valve support bracket 20, may be removed. It will then be necessary to readjust the spindle adjustment for proper operation.

Exercise care when making this adjustment as increasing the ⅛" spindle adjustment too much will change the normal relative position between the control valve spindle and the ports in the control valve body.

If thin matrices at the end of the line are pulled out of the first elevator jaws, as the vise jaw returns, particularly when quadding left, the vise jaw is returning too soon and the adjustment should be made as explained above.

If matrices are spilled from the first elevator jaws by the vise jaw moving in as the line of matrices is withdrawn from the vise jaws, the vise jaw is receding too late. Advance the timing of the quadder by inserting an additional washer 12, Fig. 1, under the front mounting pad of the control valve support bracket 20. Readjust the cam follower adjusting screw 51, Fig. 4, as previously explained.

Of course, a worn or defective first elevator jaw which permits excessive matrix clearance could also be the cause of matrices falling out of the first elevator jaw.

Vise Jaw Adjustments

1. Right-Hand Margin. The setting of the right-hand vise jaw to bring the type face to correct position on slug is done in the usual manner by means of the screw on top of the knife block.

2. Centering. After the right-hand vise jaw has been set for margin, cast two blank slugs with the quadder set for centering. Turn slugs back to back to check for centering. If centering is not correct, move the left-hand vise jaw by means of the Mohr Measure Control hand dial, until centering is satisfactory. Then set left-hand vise jaw for margin.

3. Left-Hand Margin. Adjust the banking arm adjusting nut 122, Fig. 12, for proper left-hand margin. Cast slugs using spacebands with the Hydraquadder set for regular.

4. Centering Pinion. After the above adjustments have been made, check to make certain that the line centering pinion 74, Fig. 4, engages with the vise jaw rack without interference when the selector handle is rotated to centering position. If the pinion does not engage the rack properly, it will be necessary to change the mesh of the pinion one tooth in relation to the vise jaw rack by means of the banking arm adjusting nut. Then repeat adjustments for Centering and Left-Hand Margin.

The centering pinion should clear the top of the teeth of the left-hand vise jaw rack by .020″, as shown in Fig. 14, when the selector handle is set for either Reg., L.H. or R.H. Quad.

If it is necessary to remove the centering pinion 74, Fig. 4, and the spacing washers 73, 75 above and below the pinion, make sure that the washers are replaced in the same arrangement so that the .020″ clearance will be maintained.

5. L.H. Margin Control. Adjust the screw 46, Fig. 5, so that the left-hand margin is exactly the same as that of a justified line. Cast slugs using a short line of matrices with the selector handle set for L.H. Quad.

Justification Lockout Adjustment

The justification lockout lever 69, Fig. 4, is adjusted to contact the stop stud 68, in the vise justification bar brace 67, by means of the screw 64, and nut 66, which passes through the elongated hole in the lever 63, which joins the lockout lever 69, and the selector handle lever 61.

This adjustment should be made so that the lockout lever 69, swings over the stud 68, when the selector knob is turned to Q.L., Q.R. or Cent. and swings back clear of the stud when the selector knob is in "Reg." position.

Left Hand Vise Jaw Safety

The left hand vise jaw safety circuit (See Fig. 15) operates on 18 volts Direct Current. Either 110 or 220 Volt Alternating Current can be used as a power source and it is stepped down to 24 volts AC by means of a transformer, and converted to approximately 18 volts Direct Current by means of a rectifier.

When the tip 151, Fig. 16, in the face of the left hand vise jaw 80 is depressed, the circuit is completed to ground through the machine frame, and the pot pump solenoid 108, Fig. 7, is energized. The rotary action of the solenoid core moves the catch block 118, out from under the pot pump lever allowing the cast to be made.

Left Hand Vise Jaw Safety Switch

The tip 151, Fig. 16, should protrude .027″ from the face of the vise jaw, which is the standard setting made in our factory. If it is desired to change this setting, the entire switch 150, is removed from the left hand vise jaw. This is done by removing the four screws and the plate on the end of the L.H. Vise Jaw and removing the snap ring 153, Fig. 16, from around the base of the switch. Special pliers are used to remove the snap ring.

The tip 151, is movable and is held in place by a pin 152. There are four slots cut in the tip into which this pin fits. These slots represent a quarter turn and each quarter turn moves the tip .008″. To decrease the distance the tip extends from the face of the vise jaw, remove the pin, turn tip clockwise ¼ turn and replace pin. Turn tip counter-clockwise to increase the distance.

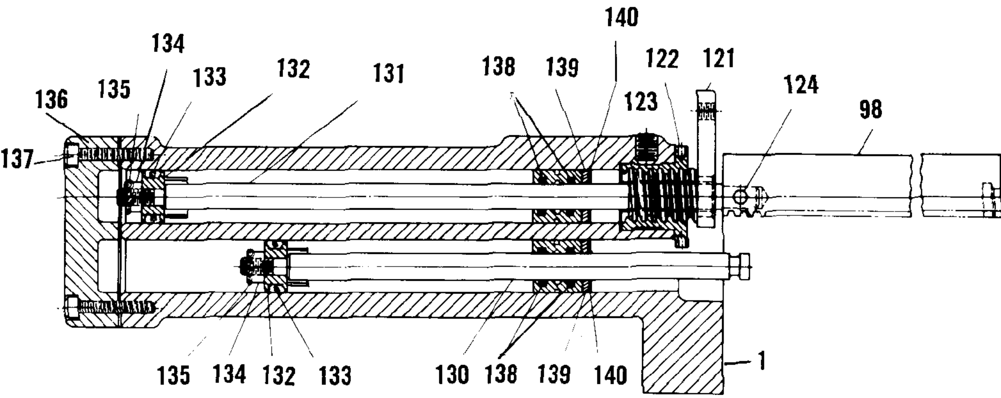

Figure 12 ***Sectional View of Cylinder and Piston Rod Assembly in Cylinder and Selector Valve Housing.***

Checking Switch Action

The left hand vise jaw switch action should be free and smooth. To check the switch action, connect one test lead of an ohmmeter to the knife connector on wire #511, Fig. 15, from the left hand vise jaw and touch the other ohmmeter test lead to a clean, unpainted part of the machine frame. (The power supply should be off while doing this.) With the switch plunger 151, Fig. 16, depressed, there should be no resistance reading on the ohmmeter. When the tip is allowed to come out, the resistance reading should be infinite. If these readings are not obtained, the switch 150, Fig. 16 should be disassembled and checked for a bind or a short circuit, or replaced.

Checking Pot Pump Solenoid

The solenoid 108, Fig. 7, action should be smooth and free, with no bind as the center pivots when the solenoid is energized. To check the solenoid winding electrically, disconnect the solenoid lead with the knife connector on it, and remove the other solenoid lead which is fastened to the bracket by a screw. Then using an ohmmeter, measure the resistance in the solenoid winding by connecting the ohmmeter test leads to the solenoid wires. Resistance should be between 17 and 21 ohms.

To check on the possibility of the solenoid winding being grounded in the casing, attach one of the ohmmeter test leads to one of the wires of the solenoid, and having the other solenoid wire disconnected, touch the other ohmmeter test lead to a part of the solenoid bracket or the solenoid. The resistance reading should be "infinite" if the solenoid winding is not grounded.

Checking Electrical Safety Circuit

The power supply box furnished with the Hydraquadder for supplying the Left Hand Vise Jaw Safety circuit consists of a transformer, a full wave rectifier to convert AC to DC, a fuse and a ½ wave rectifier which is used to suppress arcing in the vise jaw switch. The single plate of the ½ wave rectifier is mounted on the same screw as the four plates of the full wave rectifier.

The primary leads to the transformer (refer to Fig. 15) can be connected in series for a 220 volt AC power source or in parallel for a 110 volt AC power source, as follows:

For 220 volt power source:

Connect wires 304 and 305 together
Connect incoming power line wire 301 to wire 303
Connect incoming power line wire 302 to wire 306

For 110 volt power source:

Connect incoming power line wire 301 to wires 303 and 305
Connect incoming power line wire 302 to wires 304 and 306

If difficulty is experienced with operation of the left hand vise jaw safety, referring to Fig. 15, proceed as follows to check the circuit:

1. Check the 1¼ amp fuse in the power supply box. If fuse is not blown, continue as follows:

2. Start the Linotype and allow the machine cycle to continue until the vise jaws close. Measure the D.C. voltage between ends of wires 507 and 510. It should be between 18 and 24 volts D.C.

3. If no voltage can be read across wires 507 and 510, check the voltage across wires 503 and 504 where they are connected to the rectifier terminals. Voltage should be 24 volts A.C.

4. If no A.C. voltage can be read coming to the rectifier, the next place to check is the line voltage coming to the primary side of the transformer to be certain the line voltage is 110 or 220 volts A.C. and that the transformer primary leads are correctly connected for the voltage as explained above. If voltage of power source is less than 110 or 220 volts, the 28 volt tap (wire 505) of the transformer should be used.

5. If the solenoid 108, Fig. 7, is energized all the time, regardless of whether the vise jaw switch plunger is depressed or not, a check of the wiring should be made for accidental grounds or short circuits and the internal parts of the vise jaw switch should be examined for grounds. Also, the solenoid should be examined to be certain the ball bearings have not dropped out of their tracks and are binding the solenoid in the energized position.

6. It is possible that over a period of years the rectifier in the power supply box may age to the extent that it may not provide the minimum 18 volts D.C. output to operate the electrical components of the circuit. In this case, either the 28 volt tap (wire 505) of the transformer can be used to increase the voltage to the rectifier or the rectifier can be replaced.

CARE AND MAINTENANCE

The Pump

The Pump 36, Figs. 2A and 2B, requires little or no maintenance after the pinion mesh has been made, or the V-Belt is adjusted on the pulleys. The pump bearings are self-lubricated so that there is no necessity for oiling. Since the internal moving parts of the pump are lubricated by the hydraulic fluid, comparatively little wear should result due to friction. However, for this reason, the pump should not be allowed to run at any time when the hydraulic fluid is not present in the system.

If it is desired to make the Hydraquadder inoperative for any reason, the pump can be pivoted on its bracket to disengage the pinion 42, Fig. 2A, from the driving gear or the pinion can be slipped off the shaft by removing the screw 41, and the washer which holds it on the pump shaft. Removing the pinion in this manner eliminates the necessity

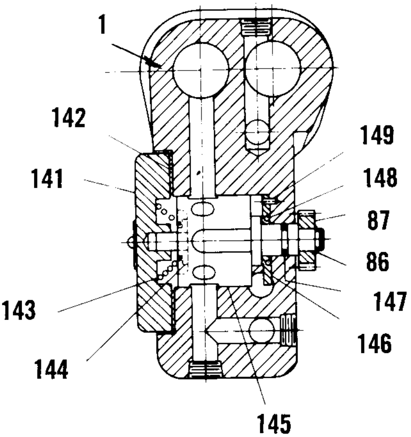

Figure 13
Sectional View of Selector Valve Assembly in Cylinder and Selector Valve Housing.

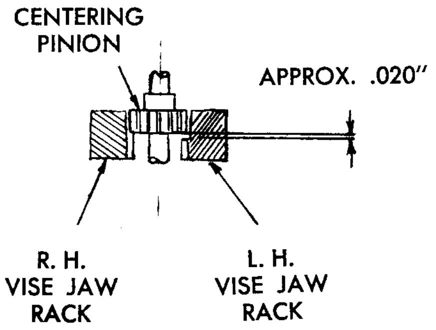

Figure 14
View of Centering Pinion in relation to L.H. and R.H. Vise Jaw Racks when Selector Handle is set for Reg., R.H., or L.H. Quad.

for readjusting the pinion mesh when it is desired to make the quadder operative again. On machines equipped with the Linotype V-Belt Motor Drive, the Hydraquadder pump driving belt is removed to make quadder inoperative.

The pump pinion supplied for use with the Linotype Emerson overhead motor is a 28 tooth fibre pinion. If the Linotype is driven by a Cline Motor Attachment a 24 tooth pinion is used and for a Cushman Motor Attachment a 23 tooth pinion is supplied. A suitable guard, C-2181, is also supplied when the pinions for use with Cline or Cushman motors are used.

Since the pump speed will increase if the Linotype machine speed is increased, the pump will automatically compensate for the increase in machine speed without the necessity of changing the pump driving pinion 42, Fig. 2A, or the pump driving pulley 166, Fig. 2B.

Control Valve and Sump

Control Valve

Maintenance requirements of the control valve 13, Fig. 1, and sump 2, should be practically nil except for possible replacement over long periods of time of the oil seals.

These seals consist of two O-rings 126, Fig. 11, located at each end of the spindle 16, in the control valve casting 13. They serve to prevent the hydraulic fluid from leaking out the ends of the control valve. Any fluid which reaches these seals is re-directed back to the sump through a leakage return port in the valve.

If necessary to replace these oil seals 126, Fig. 11, the spindle 16, should be taken out of the valve. This is done by removing one retaining ring 161, on the pin 162, which connects the link 163, to the spindle and sliding out the pin to disengage the link from the spindle. The retaining ring 48 on the end of the spindle 16 is then removed and the spindle can be slipped out of the control valve towards the front of the machine.

The retaining ring 124 on each end of the control valve is then removed and the O-ring seats 125, spacer 127, and O-ring seals 126, can be slipped out of the valve. New O-ring seals can then be inserted, being careful to insert the O-ring seat so that it fits the O-ring with the lip on the seat in towards the O-ring seal.

Care should be exercised in handling the spindle 16, Fig. 11, to avoid nicking or scratching it. Also, the O-ring seals should be carefully handled to prevent damaging them. Since these parts are controlling the flow of a fluid any nicks in the spindle or cuts in the O-rings could influence the Hydraquadder operation.

If it is necessary to replace the other internal parts of the control valve, refer to Fig. 11 for arrangement of parts.

In the front of the control valve casting 13, Fig. 1, is a plug which can be removed so that pressure gauge X-1889 can be inserted, if necessary, to check the hydraulic pressure. The pressure reading should be approximately 150 lbs. per square inch for high pressure and 40 lbs. per square inch for low pressure.

Sump Maintenance

There is practically no maintenance involved with the sump 2, Fig. 1, except for checking the level of the hydraulic fluid occasionally. This is easily done by removing one of the screws which fastens the sump 2, to the control valve casting 13, and loosening the other screw so that the sump can be pivoted out. Some care should be exercised in doing this to avoid damaging the gasket which is between the sump casting and the control valve casting.

With the sump pivoted out it is possible to see and measure the level of the hydraulic fluid. The fluid level normally should be about 2½ inches from the top of the sump. However, the Hydraquadder will operate satisfactorily until the fluid level reaches the opening in the sump to which the inlet hose 3, Fig. 3, to the pump is connected.

The sump holds about one gallon of hydraulic fluid. It is essential that the hydraulic fluid be of the specific type selected for the Linotype Hydraquadder. This fluid has low viscosity, good lubrication properties and is oxidation and rust preventative. Also, this hydraulic fluid is of the type which will not cause the swelling or shrinking of the O-rings. Therefore, it is essential that only the hydraulic fluid supplied by the Mergenthaler Linotype Company for the Hydraquadder be used. This is part number X-1870 which contains one gallon of fluid.

Located in the sump 2, Fig. 3, are the high and low pressure relief valves which should never require attention or adjusting, since they are set in the factory for the required pressure. They are immersed in the hydraulic fluid, so are not subjected to wear or corrosion.

Cylinder and Selector Valve Housing

Replacing Piston O-Rings

At some time it might be necessary to replace the O-rings 133, Fig. 12, on the pistons 132, in the housing 1, located to the left of the vise frame. While these O-rings should last for a long period, it may at some time be necessary to inspect or replace them. This is done as follows:

1. Turn off the motor. Remove the cylinder and selector valve housing cap 136, Fig. 12, and gasket from the left hand end of the housing. The cap is fastened to the end of the housing with six Allen head screws 137. It is suggested that a few sheets of paper be spread on the floor to absorb the slight amount of oil which will drip from the housing when the cap is removed.

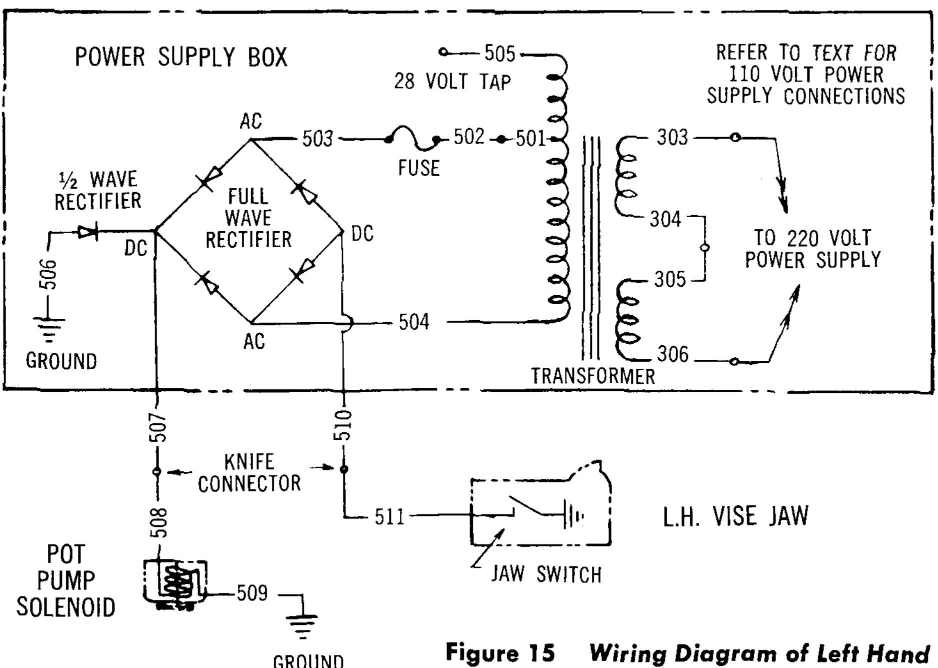

Figure 15 ***Wiring Diagram of Left Hand Vise Jaw Safety Circuit.***

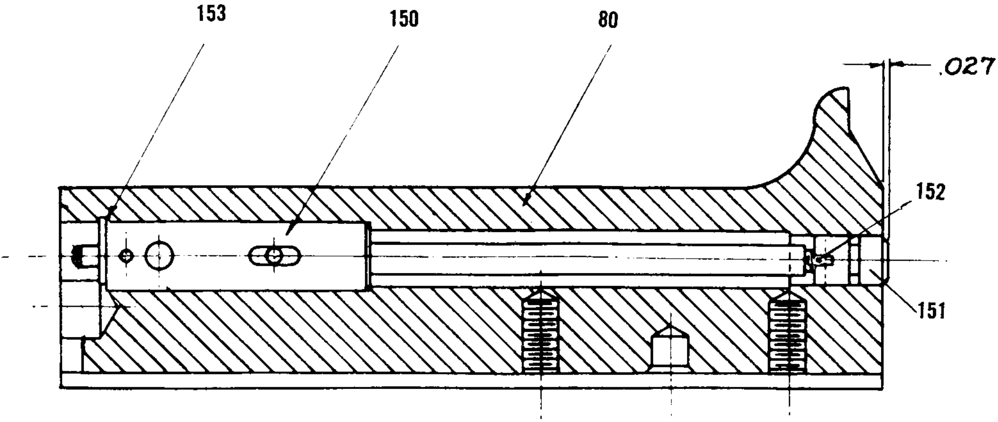

Figure 16 ***Section through L.H. Vise Jaw showing safety switch and plunger safety.***

2. Open the vise jaw measure to its limit, or 30 ems. Remove the R.H. jaw from its jaw block. Push the L.H. vise jaw and R.H. jaw block to the left as far as possible. Removing the R.H. jaw from the block permits the jaw block to be moved further to the left. This allows the front piston 132, to protrude sufficiently from the cylinder for the removal of the cotter pin 135, and the nut 134, which fastens the piston 132 to the piston rod 130.

3. Remove the cotter pins 135, and the nut 134, from the ends of the piston rods 130, 131.

4. Push both vise jaw blocks with piston rods to the right. This should separate the pistons 132, from the rods 130, 131. If the rods do not separate from the pistons at the first attempt, move the vise jaw blocks to the left and right alternately until they do separate.

5. Remove the pistons 132, Fig. 12, from the cylinders with a hook bent from a piece of wire. If necessary, insert the hook in the hole of the piston 132, and then push the vise jaw block and piston rod to the left. The hook will prevent the threaded end of the piston rod from re-entering the pistons so that the pistons can be moved sufficiently to the left for removal. Exercise care so as not to damage the cylinder walls. Remove O-rings 133, from pistons 132, and apply new O-rings.

6. Before replacing pistons 132, rub hydraquadder fluid over O-rings 133, so that the pistons can be inserted without difficulty.

7. After pistons have been applied, set hydraquadder for centering and run machine for a few minutes to eliminate any air which might have entered the system.

When piston rods 130, 131, Fig. 12, are exposed use care to avoid scratching or damaging them in any way, since a nick or scratch might result in damaging the O-ring seals 138, at the right end of cylinder housing.

REPLACING CYLINDER OIL SEALS

O-rings are used as piston rod seals, selector valve seals and control valve seals. When hydraulic fluid pressure is exerted against the seals, they are compressed into the openings around the shaft and the walls of the casting, to block the flow of fluid and prevent leakage. With this type of design, there is no difficulty with high pressures since the higher the pressure the more tightly the seal is compressed into the opening.

The piston rod seals 138, Fig. 12, are applied in such a way that double protection against leakage is provided. Two O-rings 138, are applied at the right hand end of each cylinder. Between the two O-rings is a small port opening in the piston cylinder casting 1, so that if any fluid should get by the first O-ring seal, it is blocked by the second O-ring and drains off through the port in the casting, back to the sump through the return hose. In addition to the two O-ring seals 138, located on the right hand end of cylinder housing 1, there is a felt wiper 139, located at the right hand end of the cylinder. Its purpose is to wipe the piston rod clean of hydraquadder fluid and it also acts as an auxiliary seal.

To replace the piston rod seals 138, Fig. 12, proceed as follows:

I. Remove the selector rack 53, Fig. 4, taper draw pin 100, Fig. 6, and four screws 99, 102, mounting the cylinder housing.

2. Set the measure control for zero pica line length.

3. Pull cylinder casting 1 to the left until piston rod connection to the racks 95, 98, Fig. 6, is seen.

4. Rotate the cylinder housing 1, to disengage the piston rods 130, 131, Fig. 12, from the racks and remove cylinder housing.

5. Remove the cylinder housing cap 136, Fig. 12 and gasket at the left of the cylinders.

6. Remove the cotter pins 135, and pistons 132, from the left end of the cylinders.

7. Remove the left hand vise jaw closing adjustment parts 121, 122, Fig. 12, from the rear cylinder and the snap rings 140 and felt wipers 139, from the right hand end of the two cylinders.

8. Using a blunt hook eye or a piece of wire formed into a hook, remove the four O-ring seals 138. (2 in each cylinder.) A light at the other end of the cylinder will be helpful.

9. Push the new O-ring seal 138, into position in the cylinder with a small wooden dowel so that it is laying horizontal to the grooves in the bushing. Then with a piece of wire, having a slight hook on the end and beveled to eliminate sharp edges, work the O-ring seal into the fur-

thest groove in the bushing. Be careful not to tear or cut the O-ring while doing this. Also be sure the O-ring is not inadvertently seated in the center groove in the bushing as this groove has the small port openings in it, to drain off and return to the sump, any hydraulic fluid which might escape past the O-ring. The second O-ring seal is inserted in the outer groove in the same manner.

Replacing Selector Valve Seal

On the rear of the selector valve 145, Fig. 13, is located an O-ring 148, in a seal 146, which looks very much like a brass washer. Its purpose is to prevent leakage of hydraulic fluid. (The front end of the selector valve has a cover 141, and gasket 142, which prevents leakage from this point.)

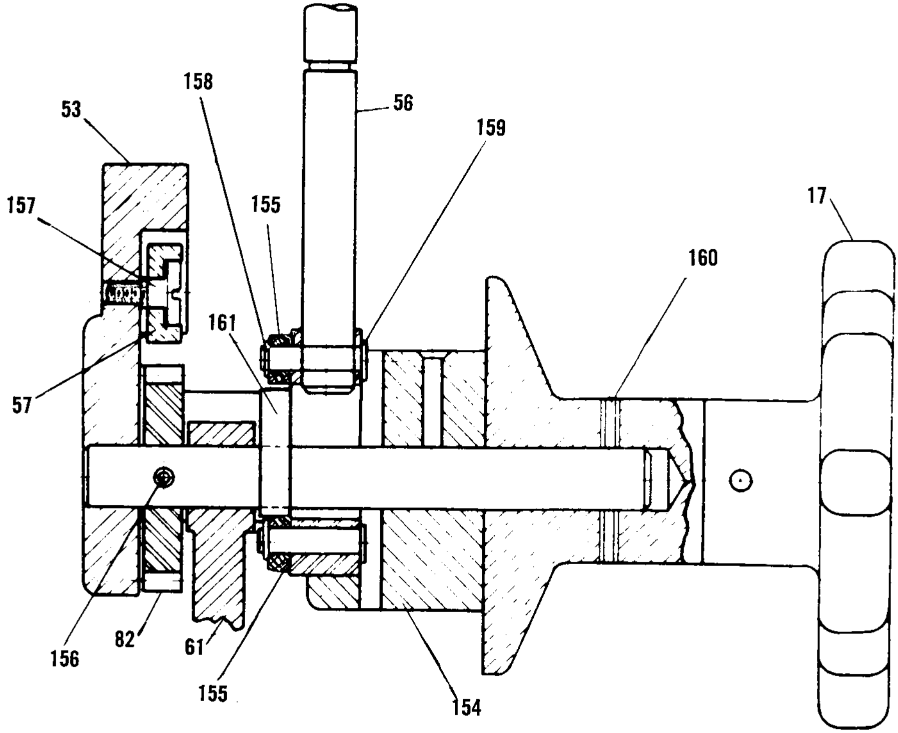

Figure 17 ***Section through Selector Handle Assembly showing Line Centering Pinion Shaft camming mechanism.***

If necessary to replace the selector valve seal 148, proceed as follows:

1. Remove cover 90, Fig. 5, from the rear of the cylinder and selector valve housing.

2. Remove the retaining ring 86, Fig. 13 and pinion 87, from the selector valve 145.

3. Remove the four screws which hold the cover 141 and gasket 142, in position on the front of the selector valve housing.

4. Tap the selector valve lightly at the point where the gear 87, was removed, which will loosen the cover 141, so it can be removed along with the gasket 142, and spring 143.

5. Slide the selector valve 145, out of its housing. There is a small O-ring 147, in a groove on the selector valve shaft. This should be replaced if necessary.

6. Using a piece of wire formed into a hook, reach into the selector valve casting and pull out the selector valve seal 146. The O-ring 148, is in a groove in the seal and will come out with the seal.

7. Put a new O-ring in the groove in the seal.

8. When replacing the seal make certain that the pin 149, in the seal 146, goes into the hole provided in the casting so that the seal will not turn when the control valve is turned. As a check on this, the O-ring 148, should be bearing against the casting wall.

9. When replacing the pinion 87 on the back of the valve 145, the selector handle 17, Fig. 1, should be in "Reg." position and the timing notch on end of selector valve shaft should be on top.

Hoses

The hoses 3, 4, 5, 6, 7, Fig. 3, which connect the components of the hydraulic system, are of neoprene construction. They are not affected by the hydraulic fluid used in the Hydraquadder and should last indefinitely barring accidental damage due to bending or crushing. In this connection, it should be noted that the hoses should not be unreasonably twisted or bent sharply, as this may result in constricting the inside diameter of the hose and prohibiting the free flow of the hydraulic fluid.

If necessary to disconnect the hoses, the disconnected end should be kept at a level above the end which remains connected, in order to prevent the loss of hydraulic fluid from the system out of the open end. When reconnecting hoses do not exert more force in tightening connections than is required to make a tight seal.

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