ELECTROMATIC SAFETY for MODEL 29 LINOTYPE

SALES SERVICE — MERGENTHALER LINOTYPE COMPANY, BROOKLYN 5, NEW YORK

DESCRIPTION

The Electromatic Safety System is designed to prevent shifting of magazines when matrices are in the distributor box or on the distributor bar.

It consists of:

a. A snap action switch operated by the distributor shifter to act as a distributor box safety.
b. Insulated distributor bar so that when matrices are on the bar, an electrical circuit is completed through the distributor screws to ground.
c. Solenoid Latch to lock magazine elevating mechanism.
d. Safety circuit switch operated by automatic matrix guard lever.
e. Distributor indicator light at right of operator.
f. Power supply and control box including Thyratron tube, Relay, Transformer, Rectifier, Fuse, Terminal strips, etc.
g. Wiring harness.

OPERATION

When matrices are in the distributor box or on the distributor bar, a locking latch which is controlled by a solenoid is held against a toothed wheel on the magazine elevating shaft crank shaft, by spring action. This prevents the operator from shifting magazines.

When the operator wishes to shift magazines, he depresses the matrix guard lever. A switch, which is located on the magazine elevating shaft, is then closed. If there are no matrices in the box, or on the bar, the solenoid will pull the latch away from the toothed wheel and the magazines can be shifted. The green indicator light which visually tells the operator he can shift, will go on as soon as the distributor box and bar are clear of matrices.

To keep the distributor signal light from flickering when a single matrix is on the distributor bar, an electronic switch and time delay circuit is employed. This consists of the Thyratron tube, 270 thousand ohm resistance R5 and the 2 micro-farads condenser No. 2. The split-second delay in the control grid circuit allows for the momentary breaking of the circuit to ground, as the single matrix may not be making full contact with the distributor bar at times as it travels the length of the bar.

Distributor Bar Safety

Both distributor bars on mixer models and single bars on other models are insulated from the rest of the machine. With this arrangement a matrix on the distributor bar will complete a circuit to ground and by means of an electronic switch, the safety circuit will remain open and the solenoid latch will remain in locked position until all the matrices are back in the magazine.

It should be noted that the electromatic safety switches, solenoids, etc., are operated on 24 volts or less, thereby assuring complete safety. It should also be noted that the indicating light shows green when it is safe to proceed and also by use of the electronic switch circuit, the indicating light will be steady even though only a thin matrix is on the distributor bar. Also there is no sparking between the matrix and the distributor bar under any operating condition. The normal voltage present on the bar is less than 16 volts D.C.

Electronic Switch

The presence of matrices on the distributor bar or in the distributor box results in the grounding of the electronic tube circuit. This is a Thyratron tube circuit. The Thyratron tube controls the action of a small relay which in turn performs the switching action and subsequent energizing or de-energizing of the latch solenoid. When the distribution system is clear of matrices, the Thyratron tube is conducting current causing the relay contacts to close. When the distributor bar is grounded by a matrix, the Thyratron tube stops conducting, the small relay opens, and the latch solenoid is de-energized, permitting the latch spring to pull the latch against the toothed wheel to prevent shifting of magazines.

In the case of matrices being on the distributor bar, the matrices themselves cause completion of the circuit to ground by connecting the insulated distributor bar to the distributor screws which in turn are fastened to the machine frame.

The Thyratron tube control grid, which controls the current flow from cathode to anode of the tube, is biased negatively when the distributor bar circuit is grounded to the machine frame and this results in the tube not conducting. As soon as the matrices clear the bar, the bias is removed from the control grid and the tube will again conduct, closing the relay.

Since the distributor shifter switch is connected in series with the distributor bars, the opening of this switch by the shifter coming into the distributor box also results in the circuit to ground being broken. Therefore, the switch must be opened and the distributor bars must be clear of matrices at the same time in order for the Thyratron tube to start conducting.

Distributor Box Safety

The snap action switch used for this safety was chosen for its small size and long life expectancy since it operates each time a line of matrices passes through the distributor box. It is so adjusted that it will not open until the distributor shifter is in fully closed position with no matrices in the distributor box. When the switch is open it breaks the electronic circuit to ground, which causes the Thyratron tube to start conducting and the consequent releasing of the locking latch from the toothed wheel.

Fail-Safe Operation

The Electromatic safety works on a fail-safe principle. That is, in the event of power failure or failure of the system itself, the safety operates so that the magazines cannot be shifted, thereby making the presence of the failure evident and preventing damage. However, it is possible where necessity makes it imperative to shift magazines to simply hold the latch back off the toothed wheel so that the magazines can be shifted until difficulty is eliminated.

MAINTENANCE AND SERVICING—MECHANICAL

Magazine Elevating Shaft Switch

The Magazine Elevating Shaft Switch, which is actuated when the Automatic Matrix Guard Lever is depressed, causes the circuit to the solenoid to be completed, thus pulling the locking latch out of engagement with the toothed wheel. An adjustable screw and lock nut which is in the Magazine Elevating Shaft Stop Pawl on the elevating "cannon" permits adjustment for opening or closing this switch. Movement of the Matrix Guard Lever results in the pawl moving to release the magazines and the adjusting screw contacts the switch plunger, closing the switch and completing the circuit.

The screw should be adjusted as follows:

1. Depress matrix guard lever and move magazines to a position somewhere between operating positions.
2. Let go of matrix guard lever so it assumes a natural position when magazines are out of regular operating position.
3. Adjust screw on Stop Pawl so that switch is activated causing solenoid to pull latch off toothed wheel. Care should be taken to have the screw out just far enough to depress the switch plunger without damaging the switch by over-travel of the plunger.
4. Raise or lower magazines to operating position and check to see that the latch engages the toothed wheel when pawl moves adjusting screw away from switch as the pawl locks the magazines in operating position.

This switch is normally open and is closed when the Matrix Guard Lever is depressed.

Distributor Shifter Switch

On Model 29 there is a banking screw in back of shifter switch bracket which stops travel of distributor shifter.

An adjusting screw and lock nut on shifter provides the means of actuating the distributor shifter switch plunger. Adjustment is accomplished when shifter is on banking screw. Adjustment should be such that switch is just "ticked on," to prevent damage to switch by over-travel. This switch is normally closed and is opened when the shifter slider is all the way in the distributor box.

Latch Solenoid and Latch

The necessary adjustment of the latch and toothed wheel can be easily made by means of the threaded link which screws into the solenoid core. There is a lock nut on this threaded link which is tightened after proper adjustment is made so that the latch clears the toothed wheel when the solenoid is activated. The threaded link should not be twisted so that a bind occurs between the link and latch.

Tension spring under solenoid mounting bracket should just have enough tension to pull latch into contact with the toothed wheel when the solenoid is deactivated. It should not be too strong, however, or the solenoid will not be able to pull the latch back.

Latch pivot screw should allow free movement of the latch. A drop or two of non-running oil or graphite at this pivot point will save wear on the solenoid and spring.

When the magazines are in operating position the latch should be located approximately halfway between the ends of cutout portion of the wheel, as shown in the diagram.

MAINTENANCE AND SERVICING—ELECTRICAL

If the safety system is not functioning properly, the following items should be checked:

1. Fuse F-8631 which is located in power and control box F-8706.
2. Thyratron tube located in power and control box F-8706.
3. Action of Relay F-8384 which is located in power and control box F-8706.
4. Action of Distributor Shifter Switch F-8412 and Magazine Elevating Shaft Switch F-8429.
5. Action of Locking Latch Solenoid F-8430.
6. Transformer F-8600 input and output voltages. Also D.C. output voltage of rectifier.
7. Ground or break somewhere in harness system or component parts, such as the distributor bars.

Quick Check for Isolating Difficulty in a Particular Section of Safety System

It should be noted that all wires have code numbers for easy identification and these numbers are also indicated on system and schematic wiring diagrams.

In order to determine if the power and control box F-8706 is functioning properly connector plug F-8408 to main harness F-8707 should be pulled out. If the control box is functioning properly, the relay should immediately click "on" as the plug is pulled out. This action indicates that the trouble is somewhere in the circuit outside the power and control box. Refer to section under heading "The Power Supply and Control Box" for further details.

The harness circuit and component parts can be checked as follows:

1. Check adjustments of Distributor Shifter Switch and Magazine Elevating Shaft Switch to see that they are being properly actuated mechanically. (See section covering mechanical adjustment of switch.)
2. To check the distributor bars for accidental grounds, it is necessary to disconnect each bar, one at a time, from the circuit. This is simply done. To check lower distributor bar, disconnect wire G-4862 (#610) which connects upper and lower bars, from the upper bar. If the lower bar and circuit to the power and control box is correct, the safety system should now operate satisfactorily when the Matrix Guard Lever is depressed. To check upper distributor bar the wire (#602) from the main harness to the lower bar must be disconnected and temporarily attached to the upper bar. Wire (#610) G-4862 which connects the two bars must also be removed. If the upper bar is not grounded and the circuit to the power and control box is all right, the safety system should operate satisfactorily upon depressing the Matrix Guard Lever and it can be assumed that the trouble lies elsewhere.
3. If, after checking both distributor bars and the power and control box, as described in sections 1 and 2 above, the source of trouble is not located, the next step would be to check the wiring of the main harness F-8707 to see that all wires are securely fastened in place and that no grounding or short circuiting has occurred between wires. Wires are code numbered at both ends for easy identification.
4. The two switches should be checked by means of a lamp testing outfit or ohmmeter to see that they are opening and closing properly.

The Thyratron tube which is located in the power and control box F-8706 is rated by the manufacturer at over a year's service under normal operating conditions. This is a standard tube, which is carried by most radio supply dealers, but it is suggested that they be ordered from the Mergenthaler Linotype Company as they are pretested to assure correct operating characteristics. It is suggested that spare tubes be kept on hand.

The distributor bar is insulated from the distributor bracket by a nylon insulating strip. Screws and nuts which hold the bar in position are also insulated and dowels are made of nylon so that the bar is completely insulated.

No metal chips or other conducting material should be allowed to lodge between the distributor bar and the distributor bracket. This would cause the safety circuit to become grounded and the locking latch would remain in contact with the toothed wheel at all times and prevent the magazines from being shifted.

The distributor bars can be checked for grounding with a circuit analizer or ohmmeter. The ohmmeter reading should be infinite when one test lead is held to the bar and the other test lead is grounded to the machine frame. Wire connections to the bar should be removed before testing.

The indicating light is a bayonette type 28 volt A.C. incandescent lamp F-8711.

Over a long period of time, the rectifier may age so that the D.C. output will not be the required minimum necessary to cause the Thyratron tube to stop conducting. Rectifier D.C. output can be checked with a D.C. voltmeter by measuring between terminals 6 and 7 on terminal strip F-8385. Plus lead of voltmeter should be on terminal 7. D.C. voltage should be approximately 10 volts D.C. plus or minus 5% when power supply is 110 or 220 volts A.C.

If the rectifier is not producing the required voltage, the presence of matrices (particularly a single thin matrix) on the distributor bar may cause the distributor indicating light to flicker. In this case the action of the relay in the power and control box will be erratic and consequently the locking action will not be positive.

The rectifier, Thyratron tube, and time delay circuit can be checked as follows:

1. Disconnect the main harness from the power and control box F-8706 by pulling out the amphenol connector plug F-8408.
2. With power on, carefully touch one end of an insulated piece of wire to terminal 7 of the power and control box terminal strip F-8385 and brush the other end of the wire back and forth on terminal 10. This simulates the same condition of a single matrix traversing the distributor bar.
3. If rectifier, tube and time delay circuit are operating correctly the relay should open and remain open as the wire momentarily leaves and returns to terminal 10. Holding the wire across both terminal 7 and 10 steadily, should of course, result in the relay remaining open until shortly after the wire is lifted from the terminals.
4. If relay does not remain open the rectifier direct current output should be checked with a D.C. voltmeter to be sure there is approximately 10 volts D.C. output.

Check resistance R5 and condenser 2 with an ohmmeter. Resistance R5 should be approximately 270 thousand ohms. To check condenser connect one ohmmeter lead to either terminal of the condenser 2 (with all wires to condenser disconnected) and the other test lead to ground. The resistance as measured from either terminal to ground should be infinite. If values of voltage and resistance as given above are not approximately close, the offending part should be replaced.

THE POWER SUPPLY AND CONTROL BOX

The Power Supply and Control Box F-8706 houses the following:

A transformer for changing voltage; a small selenium rectifier to change alternating current to direct current, and electronic Thyratron tube, a small relay, two condensers, five resistances, a fuse and terminal strip. The internal circuit of this box for a specified voltage is the same for all model machines.

When a Linotype machine leaves the factory the transformer hook-up is arranged for the voltage specified in the machine order. If it is necessary to change the voltage from 220 volt A.C. to 110 volt A.C., or vice-versa, the connections to the transformer must be changed as shown on the diagram. The transformer primary coils are connected in series for 220 volt operation and in parallel for 110 volt operation.

The transformer, which can be hooked up to operate from either 110 volt or 220 volt A.C. power source, transforms the voltage to 150 volts on secondary output leads No. 709 and 710, to 24 volts on output leads No. 715 and 711 to 6.3 volts on leads No. 713 and 721 and 3.15 volts on center tap lead No. 714.

There is also a 26 volt tap No. 722 which is not used in this circuit.

The voltage in the Electromatic Safety System, outside of the power and control box does not exceed 24 volts at any time. The relay contacts, solenoid and indicating light operate on 24 volts A.C.

The Thyratron tube cathode-plate circuit, and relay coil operate on 150 volts, A.C.

The heating filament of the Thyratron tube operates on 6.3 volts A.C.

A transformer cannot be used with direct current, and for this reason a rotary converter or some other means must be used to provide alternating current as the primary power source when only direct current is available. Mergenthaler Linotype Company supplies these converters for 110 volt and 220 volt D.C. operation under part numbers X-1845 and X-1846 respectively.

The Thyratron tube 2050, part number F-8355, has a life expectancy of approximately one year under normal operating conditions and should be replaced periodically as a matter of preventive maintenance.

The relay F-8384 is a rugged double contact type and should not require adjustment since it is adjusted for correct operation by the manufacturer. It is in the circuit as a switch to cause the solenoid action. This relay will be activated each time the distributor box and bars are clear of matrices.

The fuse F-8631, used to protect the power and control box, is known as a "fusestat" and is of two amps capacity. It is located in a small self-contained assembly mounted on the power and control box and can be checked from the outside of the box by simply snapping up the cover of the small containing recepticle. If necessary to replace fuse, the same type fuse must be used. These can be ordered from the Mergenthaler Linotype Company or may be procured locally in an electrical supply shop. It is suggested that spares be kept on hand.

Condenser 1, F-8378, and resistance R3, F-8426, are in the circuit to prevent the relay from chattering.

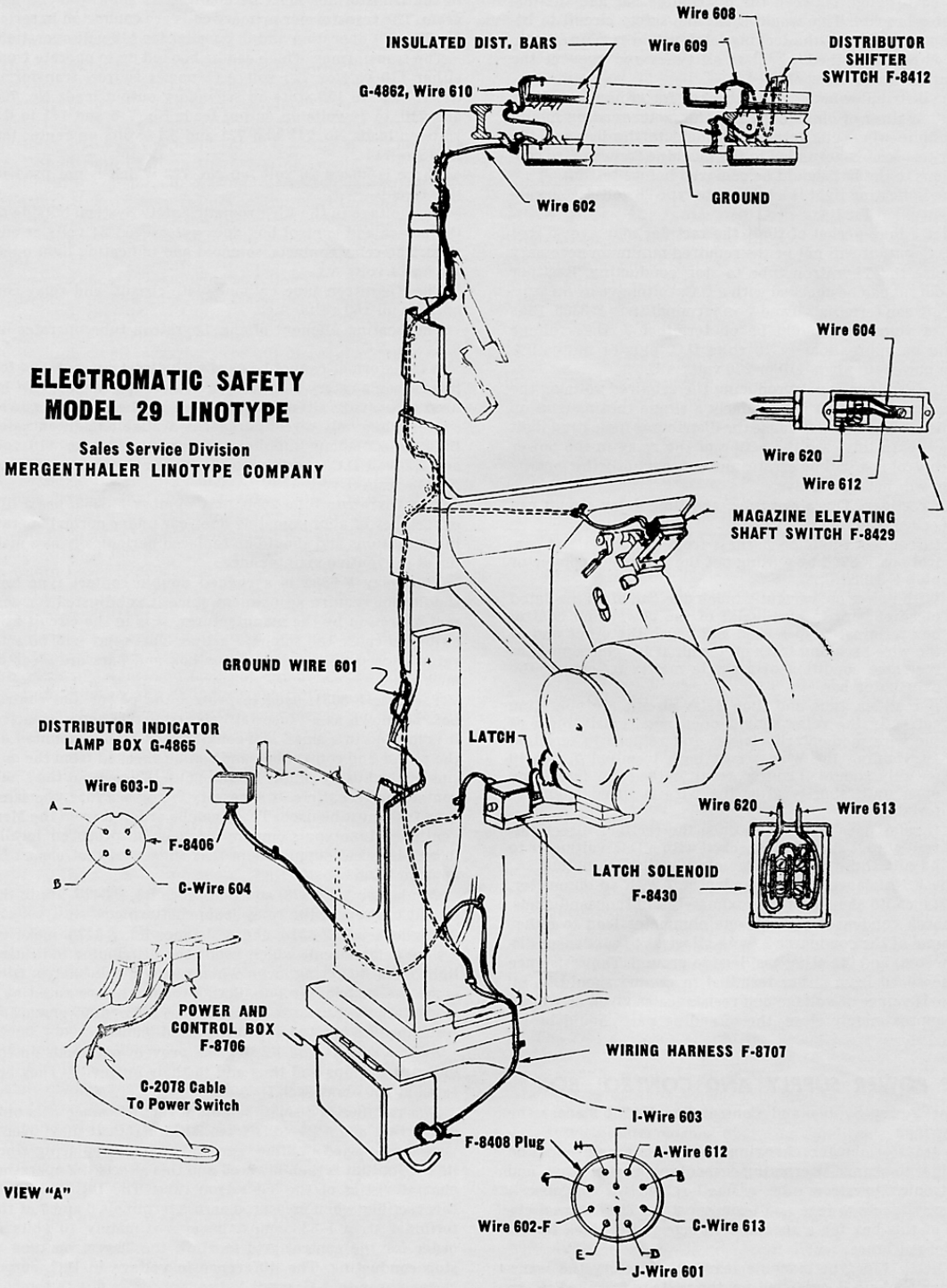
Condenser 2, F-8378, and resistance R5, F-8428, make up a time delay circuit which keeps the distributor indicating light from flickering, even when a single thin matrix traverses the distributor bar. Both condensers are rated at 2 micro-farads, resistance R3 is rated at 820 or 1000 ohms, and resistance R5 is rated at 270 thousand ohms.

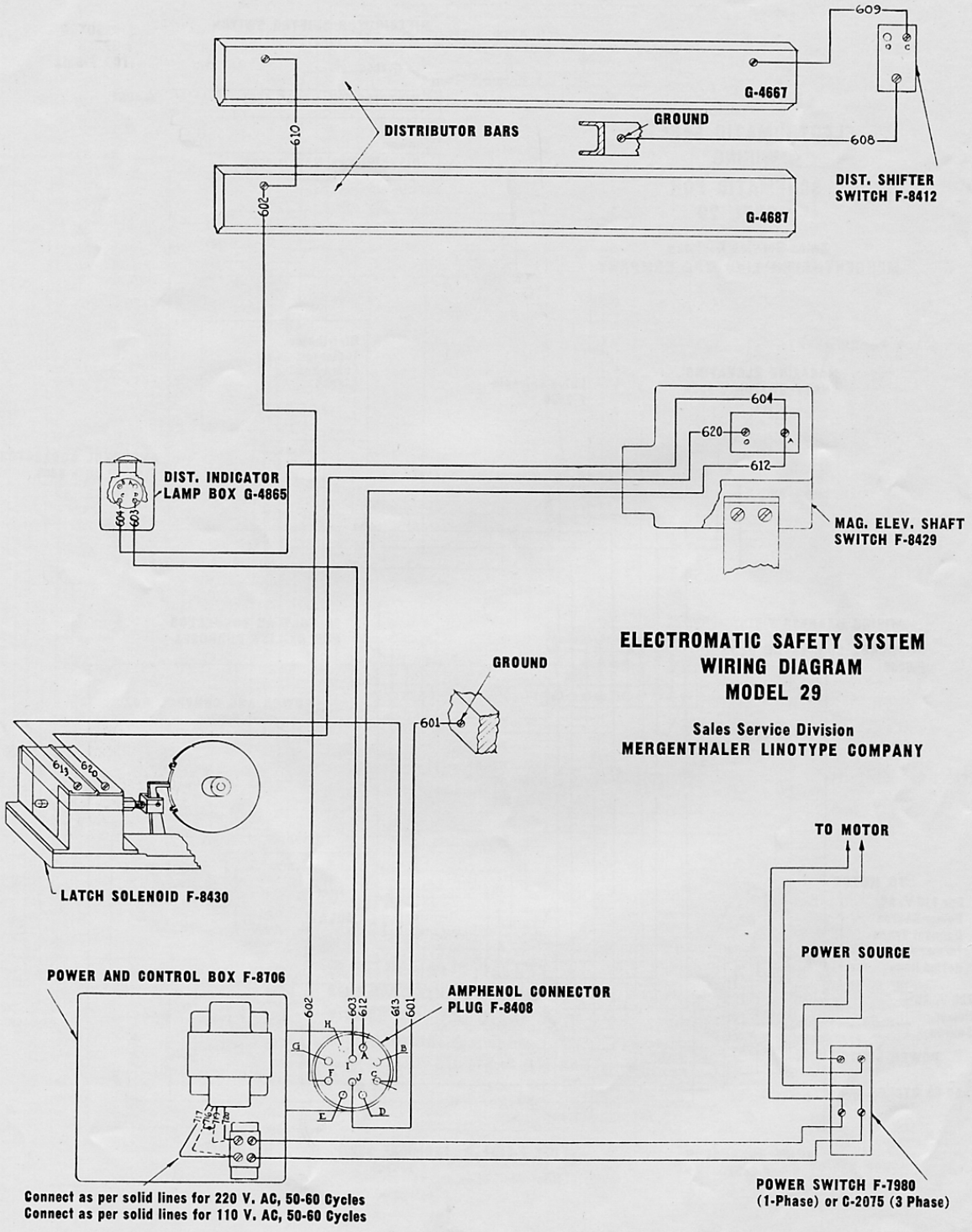
Resistances R1 and R2, F-8382, prevent overloads on the indicating lamps and thus add to their longevity. They are rated at 150 ohms each.

The rectifier is a small selenium rectifier since it is only converting about 24 volts from A.C. to D.C. It may, over a very long period of time, age and require replacing since its D.C. output is then lowered and this affects the operating characteristics of the Thyratron tube. The D.C. output of this rectifier when measured across terminals 6 and 7 of the terminal strip F-8385 must be approximately 10 volts in order for the control grid to allow the Thyratron tube to stop conducting. The difference in voltage in D.C. output as compared to A.C. input to the rectifier is due to internal loss in the rectifier.

ELECTROMATIC SAFETY
MODEL 29 LINOTYPE

Sales Service Division
MERGENTHALER LINOTYPE COMPANY




609
G-4667
GROUND
608
DISTRIBUTOR BARS
610
602
G-4687
DIST. SHIFTER SWITCH F-8412
604
620
612
DIST. INDICATOR LAMP BOX G-4865
MAG. ELEV. SHAFT SWITCH F-8429
ELECTROMATIC SAFETY SYSTEM
WIRING DIAGRAM
MODEL 29
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MERGENTHALER LINOTYPE COMPANY
GROUND
601
613
610
LATCH SOLENOID F-8430
TO MOTOR
POWER SOURCE
POWER AND CONTROL BOX F-8706
602
603
612
613
601
AMPHENOL CONNECTOR PLUG F-8408
POWER SWITCH F-7980
(1-Phase) or C-2075 (3 Phase)
Connect as per solid lines for 220 V. AC, 50-60 Cycles
Connect as per solid lines for 110 V. AC, 50-60 Cycles

ELECTROMATIC SAFETY WIRING SCHEMATIC FOR MODEL 29

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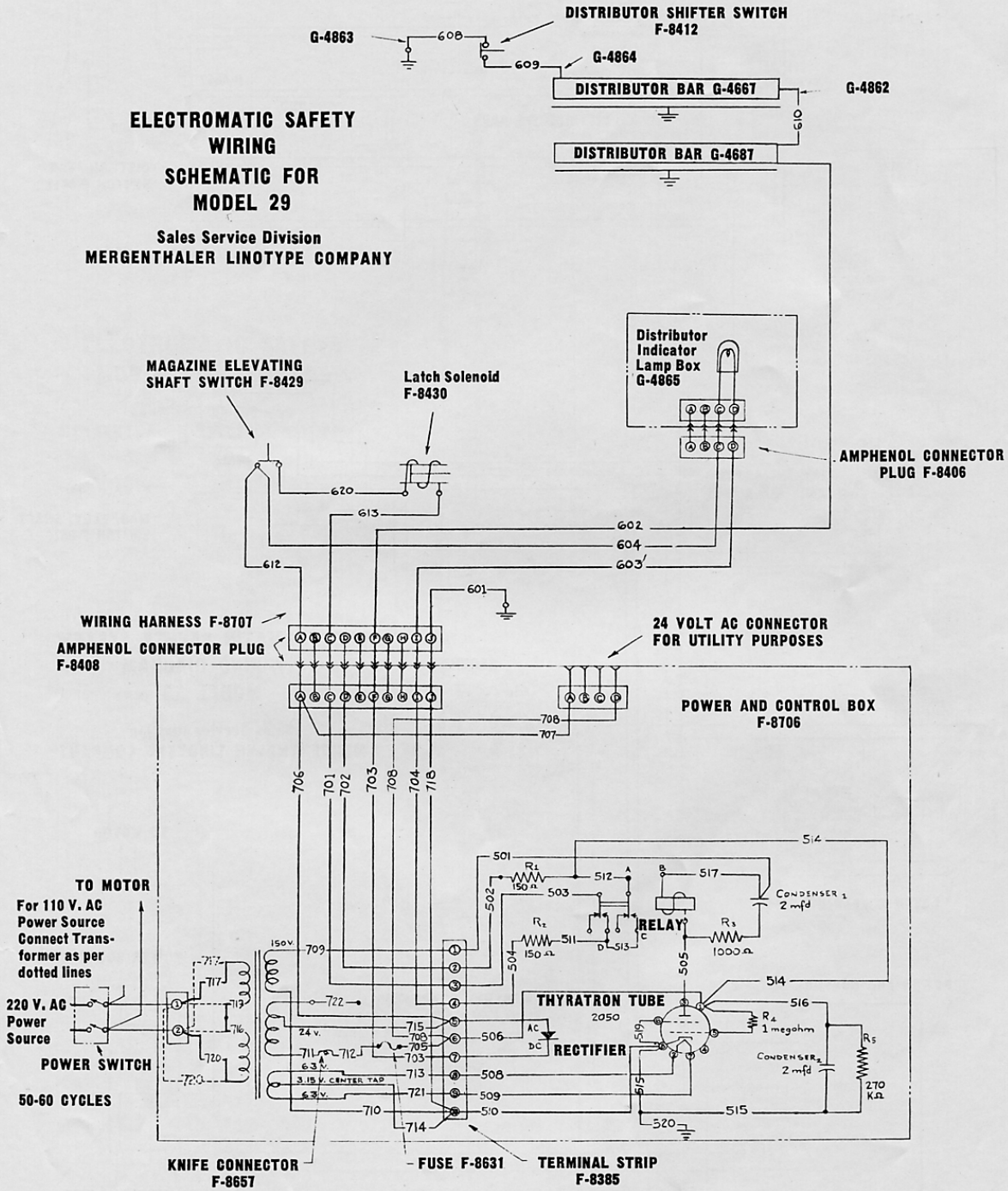

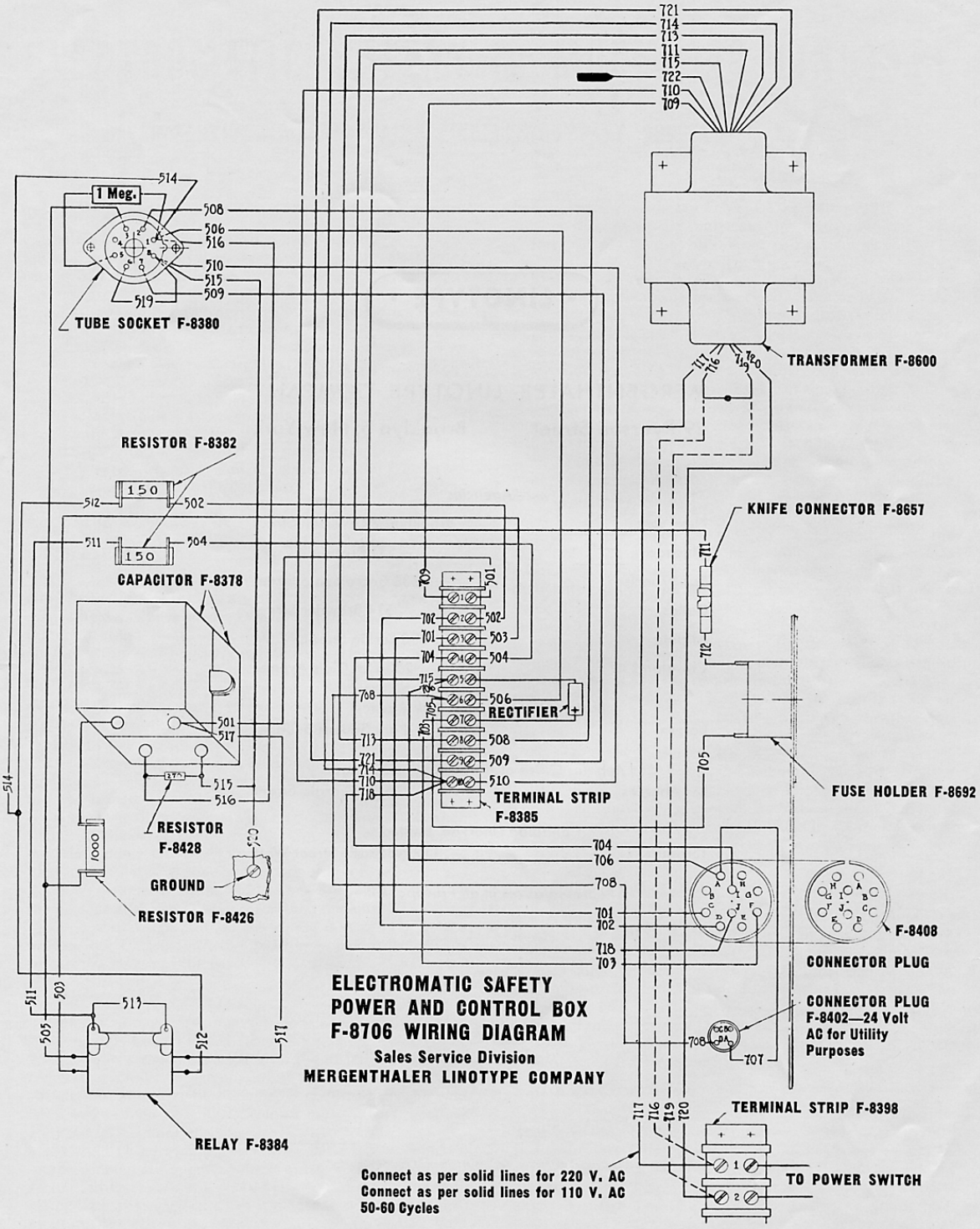

ELECTROMATIC SAFETY POWER AND CONTROL BOX F-8706 WIRING DIAGRAM

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