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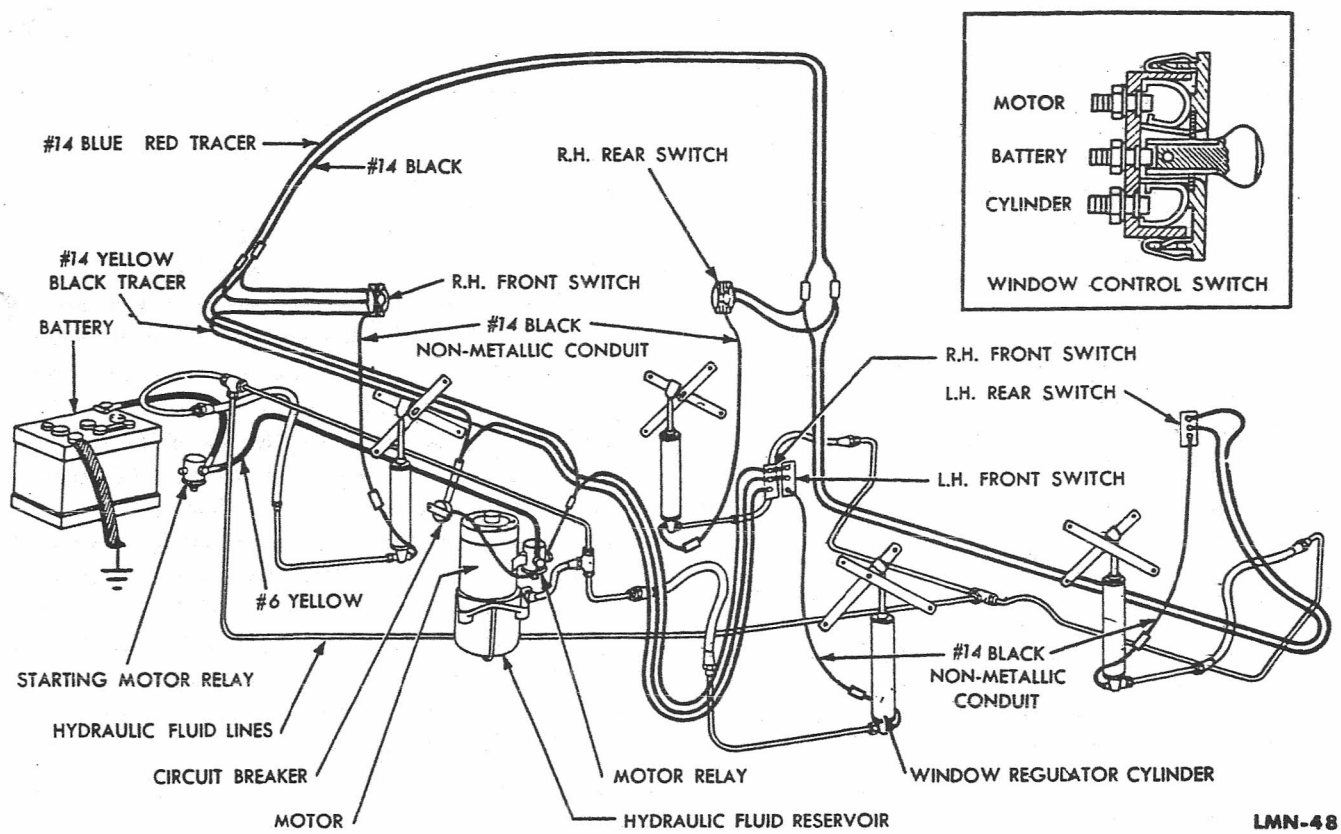

FIGURE 1—HYDRAULIC WINDOW LIFT SYSTEM 1946-7—LINCOLN

HYDRAULIC WINDOW LIFT SYSTEM

The Hydraulic Window Lift System uses fluid pressure generated by a power unit to lift windows, while a spring is used to lower the windows. The windows are held in any position by the fluid which is trapped in the cylinders by a magnetically operated, normally closed valve.

Power Unit

The Power Unit consists of an electric motor, the operation of which is controlled by a Relay through the Window Control Switch. At the lower end of the motor is an aluminum die cast pump which houses the internal gear rotors.

The pump is provided with a combination spring loaded maximum Pressure Relief Valve of piston type which is factory adjusted to a maximum fluid pressure of 210 pounds per square inch. This pressure is governed by the amount of Spacers under the relief valve hex head plug as shown in illustration figure 2, and in no case should any of the spacers be removed to provide a higher pressure.

A unit of two pressed-in steel tubes extend downward from the pump into the fluid reservoir. At the lower end of the tubes, a cup fluid diffuser assembly is fitted to prevent agitation of any abrasive sludge which may settle in the reservoir, and to retain a small amount of fluid around the lower end of the tubes to prevent air getting into the lines or fluid draining from the system when the Reservoir is removed. The reservoir is vented to the atmosphere through a hole in the pump casting near the relief valve plug.

The Power Unit is mounted on flexible synthetic rubber mountings and is **electrically grounded to the body by a Ground Strap.** Flexible hose lines connect the pump to the metallic fluid lines.

Window Regulator Cylinder

The Window Regulator Cylinder as illustrated in figure 2, consists of a tubular cylinder, closed at the upper end by a crimped in formed cup which houses a saturated felt to lubricate the piston rod, and to prevent the entry of dirt or water to the upper portion of the cylinder. Within the cylinder is the piston and rod assembly.

The lower end of the cylinder is closed by a spring seated, normally closed, Solenoid operated valve, which, when electrically energized through the Window Control Switch, the valve opens to allow fluid to flow in or out of the cylinder moving the window up or down as desired. When the valve is closed, fluid is trapped in the cylinder and the window will remain in that position until movement is again desired by operating the Window Control Switch. The piston in its extreme lower position is stopped on the solenoid sleeve to limit the movement of the window when fully lowered.

A short wire lead extending from the lower end of the cylinder is provided with a bullet type connector to which an electrical connection is made from the lower terminal of the Window Control Switch to operate the Solenoid. A boss with 1/8" internal pipe threads for the hydraulic line connection is formed at the lower end of the solenoid sleeve.

Window Regulator Frame Assembly

The Window Regulator Frame Assembly shown in figure 2, is designed as a unit, to provide a mounting for the Cylinder, Retracting Spring, and for the Cross Arms which operate the window and hold it in alignment.

The cylinder is mounted at its lower end on a spherical seat formed in the Expansion Arm and held in place by a Spring Retaining Clip. The upper end of the piston rod is mounted likewise, in a Cross Arm.

The Retraction Spring is connected between the Expansion Arm at the lower end of the cylinder, and one of the cross arms at the upper end of the cylinder. The purpose of this arrangement is as follows: In operation, when the window has been lifted to its upper limit and fluid has been trapped within the cylinder to hold it in closed position, expansion of the fluid may occur due to the trapped fluid being heated. Obviously, the piston rod being rigidly connected to the glass through the medium of the regulator assembly, cannot move. So under these circumstances, the cylinder instead moves the Expansion Arm downward, the spring tension and leverage having been so chosen that the tension of the spring in its extended position just overbalances any normal thrust of the cylinder.

This should make clear one reason why it was previously mentioned that the pump pressure should not be raised beyond 210 pounds per square inch. If the fluid pressure were too high, the Expansion Arm would be moved down in normal operation, thus possibly damaging the regulator in the event the window is closed at low temperatures and the fluid expands in the cylinder due to heat.

As mentioned previously, the cylinder assembly is held in position in the spherical seats formed in the Expansion Arm and the Cross Arm by Spring Retaining Clips.

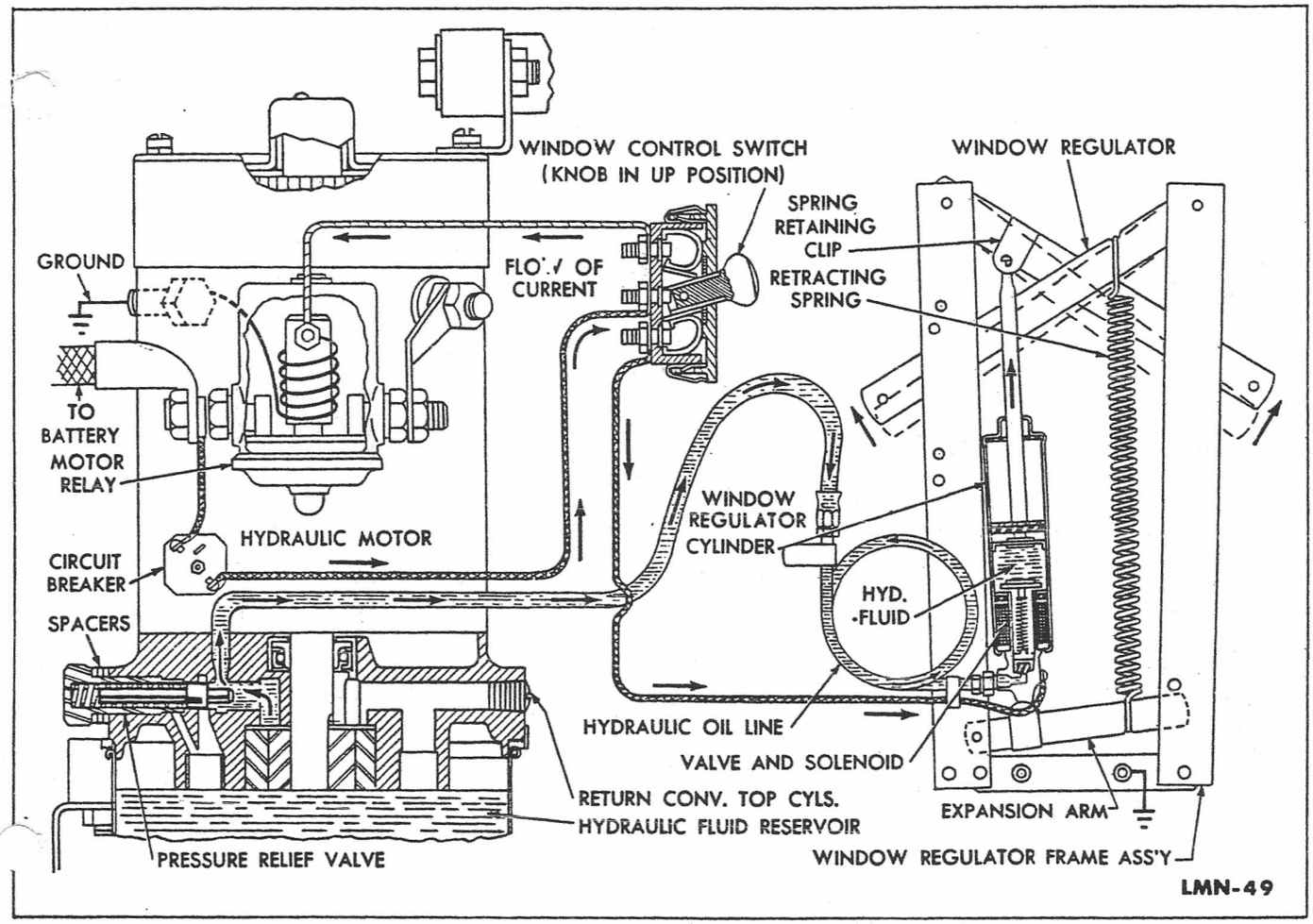

FIGURE 2—HYDRAULIC FLUID BEING PUMPED FROM RESERVOIR TO WINDOW REGULATOR CYLINDER

1. Window Control Switch Knob on door in up position.
2. Window Regulator Cylinder Valve open and Pump operating.
3. Hydraulic fluid entering cylinder and window is being lifted.

Window Switch Electrical Connections

The electrical connections and wiring are simple, there being a battery wire which connects to each Window Control Switch at the center or "BAT" terminal and which is fed from the "hot" or large battery terminal on the Motor Relay. Another wire connects from the upper or "MOT" terminals of all Control Switches which lead to the small terminal or solenoid winding of the Motor Relay.

From the lower or "CYL" terminal on the Control Switch, a wire leads to the bullet type connector on the Window Regulator Cylinder.

In order to provide remote control, a wire from a lower terminal of an additional switch may be connected to this same bullet type connector on the Window Regulator Cylinder. The other switch terminals will be connected as previously described.

A Circuit Breaker located on the rear side of the instrument panel is connected in the battery circuit between the hot or large terminal of the Motor Relay and center or "BAT" terminal of all Switches. This is to protect the system against short circuits.

Cleaning Pressure Relief Valve

In cases of improper Pressure Relief Valve operation, the valve may be removed and cleaned. However, care must be exercised when the relief valve plug is removed that the Spacers are not mutilated and that the same number are installed as were removed. Removing Spacers will increase operating

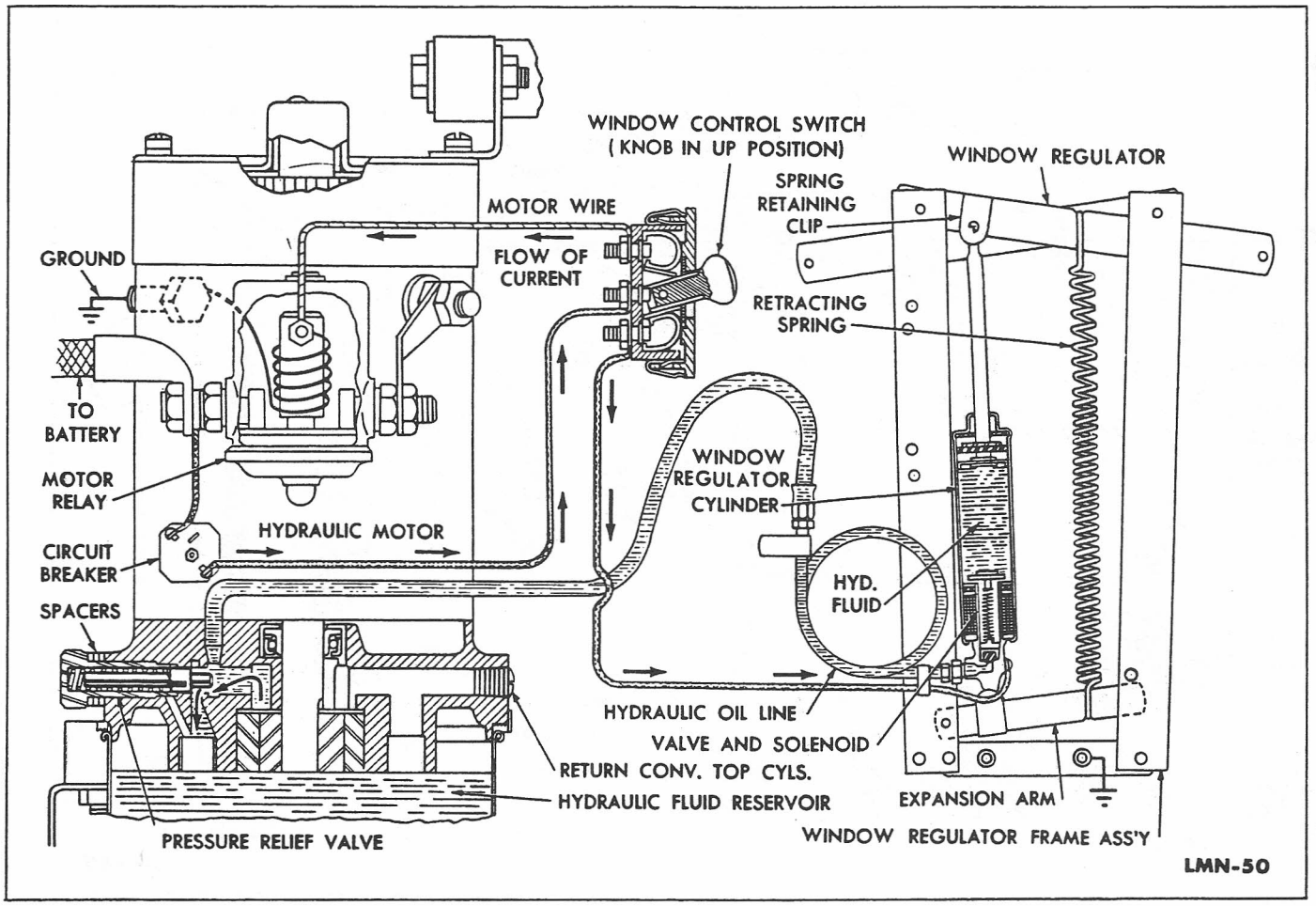

FIGURE 3—HYDRAULIC FLUID PRESSURE TO WINDOW REGULATOR CYLINDER (210 psi maximum)

1. Window Control Switch Knob on door in up position.
2. Window Regulator Cylinder Valve open and Pump operating.
3. Window fully closed and hydraulic pressure has reached 210 psi.
4. Hydraulic fluid is by-passed through Pressure Relief Valve back to Reservoir.

pressure while the addition of Spacers will lower operating pressure.

Service Suggestions

In order to insure satisfactory window operation, it is absolutely necessary that attention be given to the proper alignment of glass and other parts.

Slow and unsatisfactory operation will result if:

The glass will not move freely by hand from side to side.

The glass is misaligned during the assembly of the regulator to the glass.

The felt on the garnish moulding causes excessive friction.

It is desirable to check window alignment before starting to adjust or disassemble any part of the automatic regulator system.

Each fall all windows should be lowered and the reservoir on the Power Unit removed, cleaned out with alcohol, then refilled with Factory Specified Brake Fluid, M-3833-L. At this time or every 5000 miles which ever comes first, 3 to 5 drops of light engine oil should be put in the oil hole at the top motor bearing.

Disconnect battery before attempting to disconnect any fluid lines. This is to prevent accidental pumping of brake fluid on finished surfaces or upholstery. Brake fluid will damage lacquer finishes.

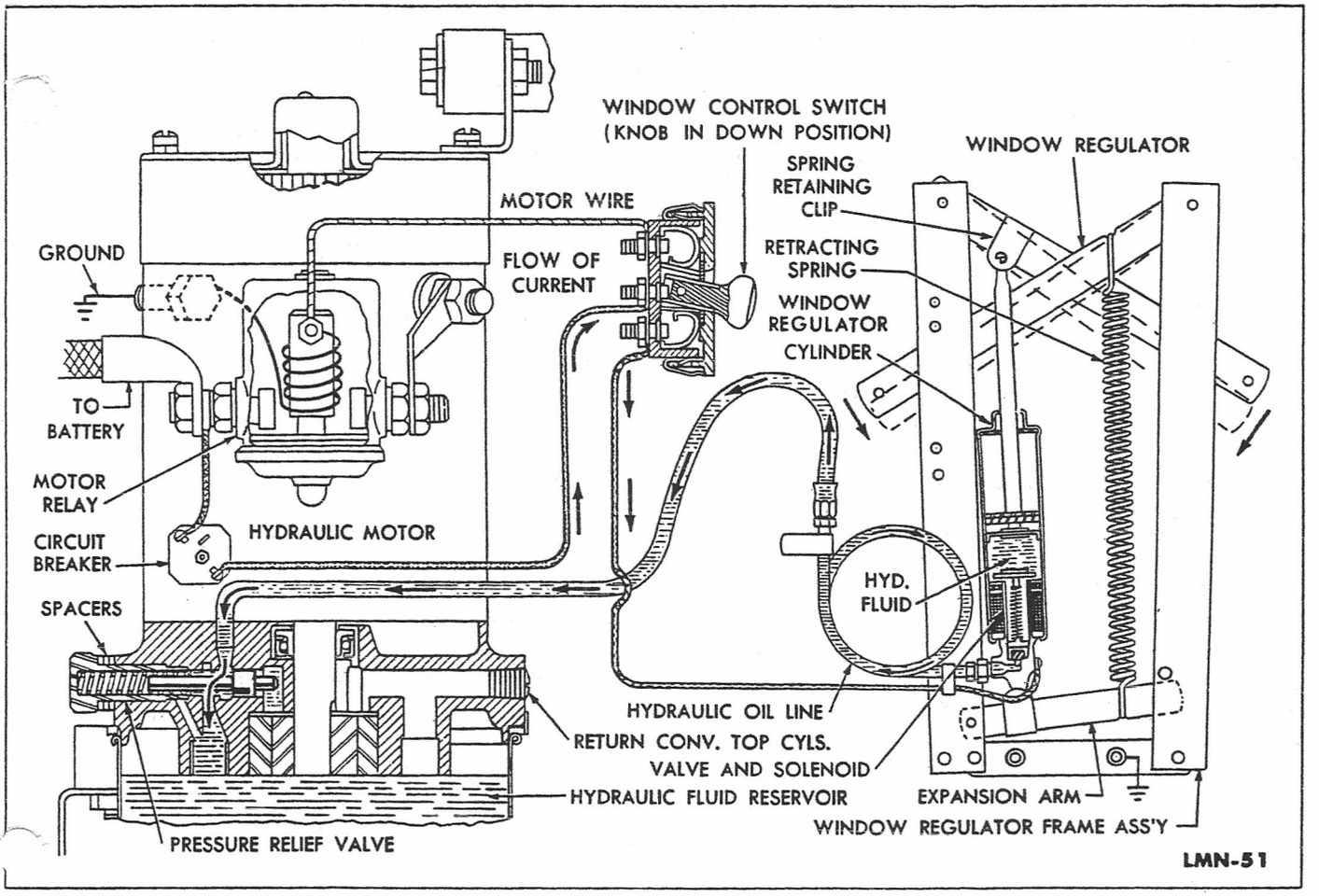

FIGURE 4—HYDRAULIC FLUID BEING RETURNED TO RESERVOIR FROM WINDOW REGULATOR CYLINDER

1. Window Control Switch Knob on door in down position.
2. Window Regulator Cylinder Valve open.
3. Retracting Spring across Window Regulator Cylinder is lowering window and forcing fluid back to Reservoir.

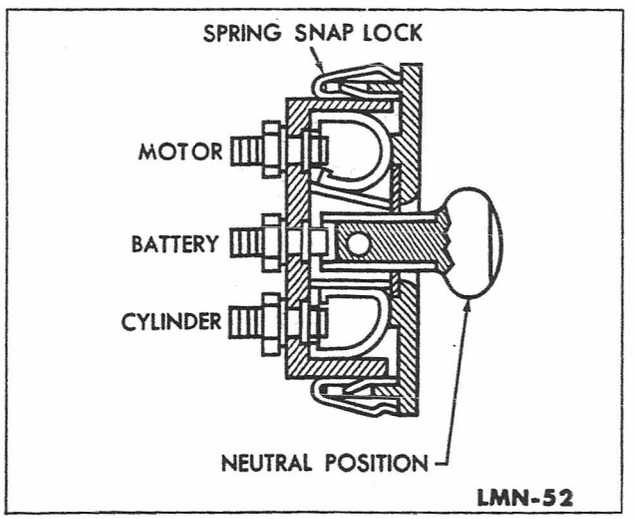

FIGURE 5—WINDOW CONTROL SWITCH—NEUTRAL POSITION

When a unit is removed or a tube disconnected, screw threaded plugs or caps to the hose or pipe if the battery is to be reconnected for any reason; also, tape any loose wires.

Window Operating Switch

One or more double acting Window Control Switches as shown in illustration figure 5, are provided for each window to be operated. The operating Knob is self-centering and must be mounted so that nothing interferes with its free movement.

The switches are provided with three terminal posts marked to indicate the correct wire connections. Spring Snap Locks at either end of the switch housing serve to hold the switch together and to retain the switch in position when mounted. To re-

move the switch assembly from the door, attach tool as shown in figure 8, Vol. 1, No. 4, of the "News," or facsimile, to depress the Spring Snap Locks and withdraw.

Since the switch housing is made of plastic, care should be taken when removing.

To disassemble the switch, press a pointed object into the hole provided in each end of the switch, and pull out each Spring Snap Lock. Push out pivot pin from center of switch assembly and disassemble.

SERVICE DIFFICULTIES AND POSSIBLE CAUSES

SYMPTOM: Windows fail to operate.

PROBABLE CAUSE AND REMEDY:

Battery Failure.—

Make hydrometer check—charge, or replace battery.

Loose Connections or Circuit Breaker.—

Loose connections at circuit breaker or any connection between battery and hydraulic motor.

Check, clean, tighten connections or replace circuit breaker.

Hydraulic Motor Failure.—

If Motor Relay clicks and motor does not run when Window Control Switch Knob is raised, check brushes, clean commutator, repair or replace unit.

Window Control Switch or Cylinder Solenoid Failure.—

If Motor Relay does not click when Window Control Switch Knob is raised, check for loose connections at switch, or check for a inoperative switch by connecting together the terminals marked "MOT" and "BAT" on the switch. If motor runs, connect terminals marked "CYL" and "BAT" together and simultaneously listen for a click at cylinder solenoid. If click is heard, it indicates that switch is at fault. If no click is heard, it indicates the cylinder solenoid is at fault or a faulty connection in wire extending from switch to solenoid located at lower end of Window Regulator Cylinder. See figure 4.

Repair wire connections or replace cylinder assembly.

SYMPTOM: Window will not fully close.

PROBABLE CAUSE AND REMEDY:

Fluid low in reservoir.—

Lower all windows and replenish fluid supply in reservoir. Check all connections for leaks.

Binding or damaged felt in guide channels, or binding Window Regulator Assembly.—

Carefully check for free movement of windows. Repair or replace any damaged parts.

SYMPTOM: Window will not stay closed.

PROBABLE CAUSE AND REMEDY:

Valve located at bottom of Window Regulator Cylinder open, or not properly seating.—

Wire from "CYL" terminal or Window Control Switch making contact with "hot" battery wire.

SYMPTOM: More than one window closes from one switch.

PROBABLE CAUSE AND REMEDY:

Valve located at bottom of Window Regulator Cylinder open, or not properly seating at windows not desired for operation.—

Wire from "CYL" terminal on Window Control Switch making contact with "MOT" wire.

SYMPTOM: Windows operate slowly.

PROBABLE CAUSE AND REMEDY:

Fluid congealed.—

Low temperature or fluid not having been changed at regular intervals.

Pump pressure low or Pressure Relief Valve stuck.—

Install pressure gauge calibrated to 250 psi at pump outlet. The maximum operating pressures should not exceed 210 psi. However, the minimum operating pressure is approximately 150 psi.

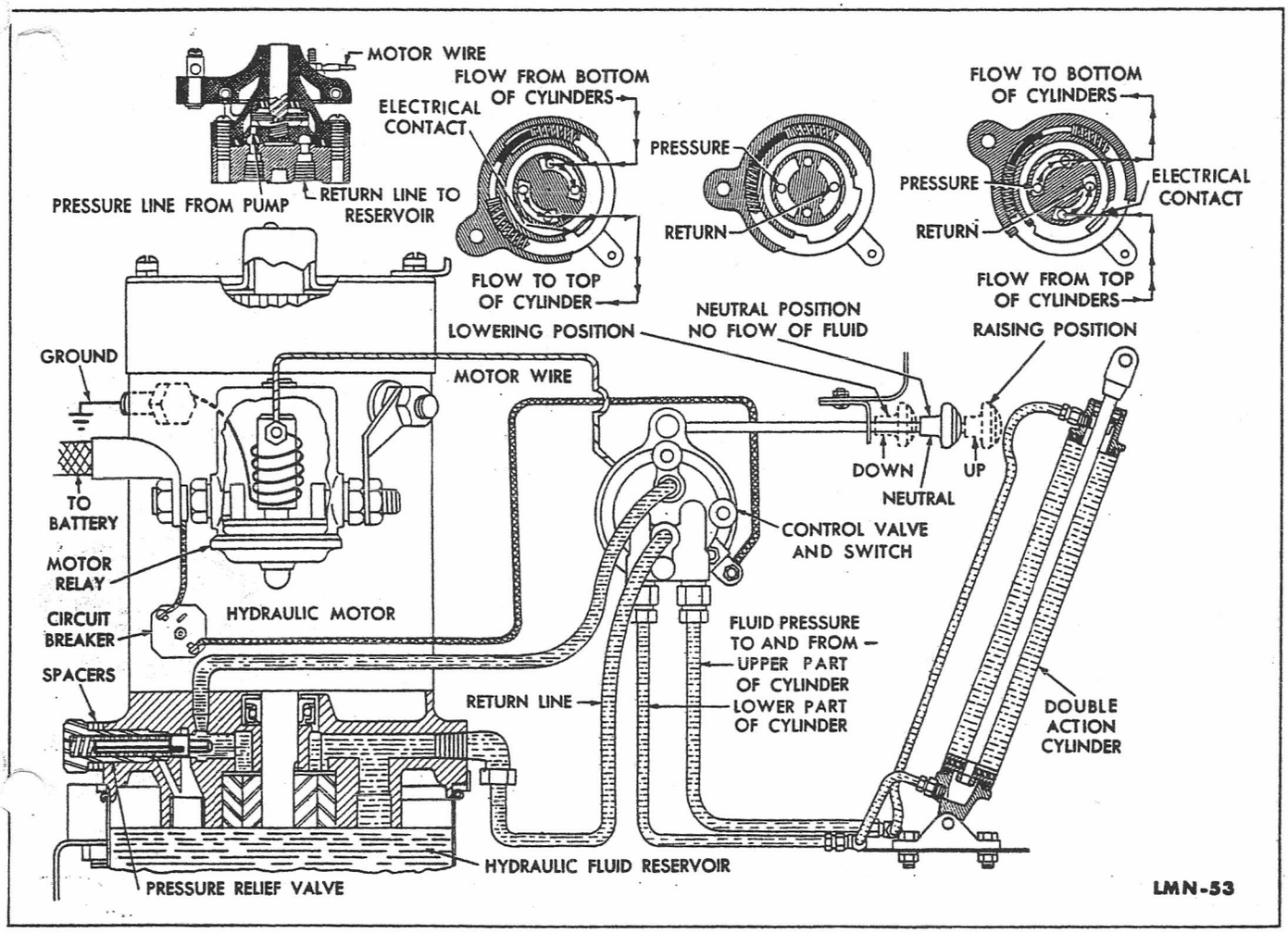

FIGURE 6—HYDRAULIC CONVERTIBLE TOP OPERATING SYSTEM

Should the pressure exceed the maximum or be below the minimum, remove Pressure Relief Valve and check parts to be free moving and not injured from corrosion. Clean or replace. When reinstalling Pressure Relief Valve make certain that the same number and same thickness spacers are used. Recheck pressure.

With the Pressure Relief Valve operating freely, pressure may be raised by removing spacers located under the Pressure Relief Valve hex head plug on pump casting, or the pressure may be lowered by adding spacers.

Hydraulic Convertible Top Operating System

This system uses fluid pressure generated by a power unit to raise and lower the convertible top. The pressure fluid from the pump passes through a manually controlled valve which directs it to a pair of double action cylinders which operate the top. The fluid enters one end of the cylinders while the fluid from the other end flows back through the valve to the fluid reservoir, an integral part of the power unit.

Top Operating Valve and Switch

The Top Operating Valve-Switch mounted beneath the instrument panel is controlled by a push and pull knob. The function of the Valve-Switch when the knob is **pulled out and held** will make electrical contact for the operation of the pump motor and direct the pressure fluid through the valve to the bottom of the Double Action Cylinders for raising the top, and to direct the return fluid from the top of the cylinders through the Valve-

Switch to the reservoir. When the knob is pushed in and held for lowering the top, the flow of fluid between the Valve-Switch and cylinders is reversed. The Valve-Switch is self-centering when the knob is released and all operation ceases.

Care should be taken when replacing this assembly to see that the Control Rod is adjusted so as to provide at least one-eighth inch overtravel when pushed in, in order to insure that the electrical switch makes positive contact.

The Control Rod must be free from binding so as to insure a positive return of the Valve-Switch to neutral position.

Poor operation of the entire system can be caused by scored faces on the Valve-Switch mating surfaces and allow leakage from one port to another which will result in loss of pump pressure. The pressure may be checked with a gauge connected at any convenient point in the fluid system.

Top Operating Double Action Cylinders

The top operating Double Action Cylinders as illustrated in figure 6, are provided with fluid line connections at each end. The only replaceable parts of the cylinders are the piston rod, fluid seal and felt, otherwise the cylinders must be replaced as a unit.

SERVICE HINTS

New Piston Ring Break-In Procedure

The proper break-in procedure following piston ring installation is extremely important. After engine assembly, set the carburetor and ignition timing as accurately as possible. **Start the engine and accelerate it immediately to a speed comparable to a road speed of not less than 25 miles per hour and maintaining this speed until the engine temperature reaches 160 to 180 degrees.**

The failure of a ring job to stop excessive oil consumption is caused by the common practice of starting an engine and letting it idle slowly during the first warm up period immediately following the assembly of the engine.

At idle speeds, there is insufficient oil thrown on the rings, pistons and cylinder walls to lubricate them properly during the break-in period. The recommended engine speed of 25 to 35 miles per hour will insure proper lubrication to prevent scuffing during this critical period.

After the engine is properly warmed up, recheck the carburetor, ignition timing and retorque cylinder head bolts. Then accelerate the car on the road from 25 to 35 miles per hour for a short period.

At time of delivery, the customer should be advised that rapid acceleration or running the car at high speeds during the first 200 miles will likely damage the rings. For best results, the engine should be driven not over 35 miles per hour for the first 200 miles.

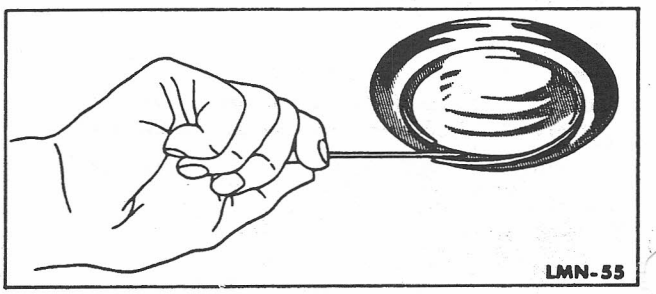

FIGURE 7—REMOVING DOME LIGHT LENS SPRING WIRE RETAINER—LINCOLN

Removing Dome Light Lens—Lincoln

The dome light lens is retained in position by a split ring spring wire retainer located under the circular edge of the lens against the rim of the reflector. It can be removed by prying one end free with a small pointed tool. See figure 7.

Due to a close color similarity between the spring wire retainer and the reflector, its presence is not immediately detected.

High Resistance Circuits

Loose or dirty connections have been the actual cause of many electrical failures which have been attributed to faulty parts.

High resistance is a direct result of loose or dirty connections which obviously would impair the normal operation or the life of the electrical system or its component parts such as; the battery, voltage regulator, breaker points, light bulbs, etc.