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Correction of Reverse Gear Lock-Up On Clippers Equipped with Overdrive

NEW SWITCH DESIGNED TO ELIMINATE TROUBLE

A trouble which occasionally arises, and one which is not always correctly diagnosed, is that of a locked condition in the overdrive unit after the transmission has been shifted into reverse gear and engine power applied.

The source of this trouble usually may be traced to a non-standard condition in the overdrive electrical system. However, this trouble also may be caused by faulty mechanical operation of parts within the overdrive itself or in units incorporated in the overdrive system. In either event, if enough engine power is applied in an attempt to force the car to move in reverse while the overdrive is locked, the overdrive unit may be seriously damaged.

Description

To explain what actually takes place inside the overdrive unit when this lock-up occurs, we will first trace the transmission of engine power through the overdrive unit when the entire overdrive system is operating normally. The four mechanisms in which we are interested are: (1) the overdrive solenoid; (2) the planetary gear train; (3) the over-running clutch, or in other words the free wheel cam, rollers, and tail shaft; and (4) the clutch sleeve.

The function of the solenoid is to engage or disengage, by means of a sliding pawl, the planetary gear train when the car reaches or drops to a predetermined speed.

The function of the planetary gear train, which comprises a stationary sun gear and hub, a pinion and cage assembly, and a ring gear, is to provide a means of increasing the speed of the tail shaft over that of the transmission driving shaft.

The over-running clutch provides the two-speed driving connection to drive the tail shaft at engine speed at one time and at an increased speed at another. This unit incorporates a free wheel cam with twelve ramps on the part

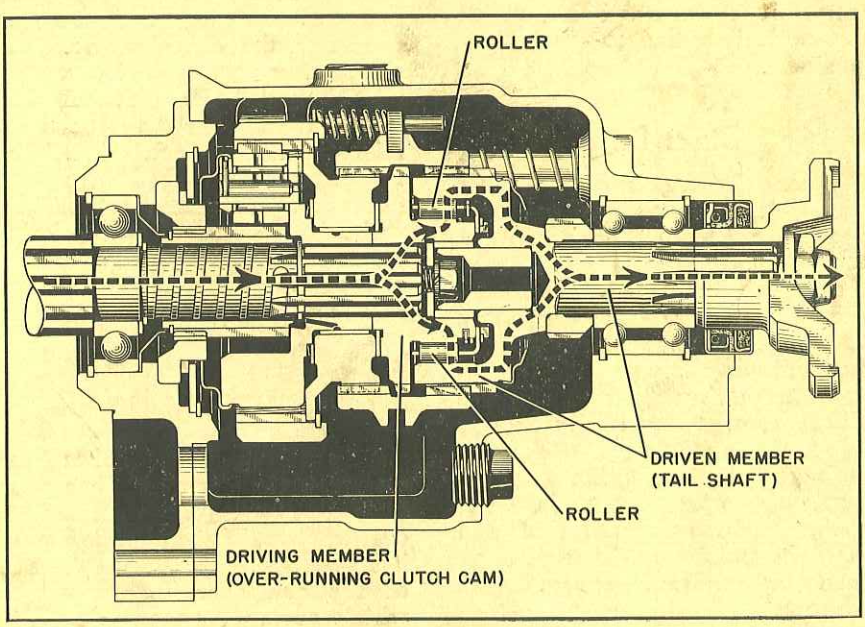


Figure 1—Transmission of Power in Direct Drive

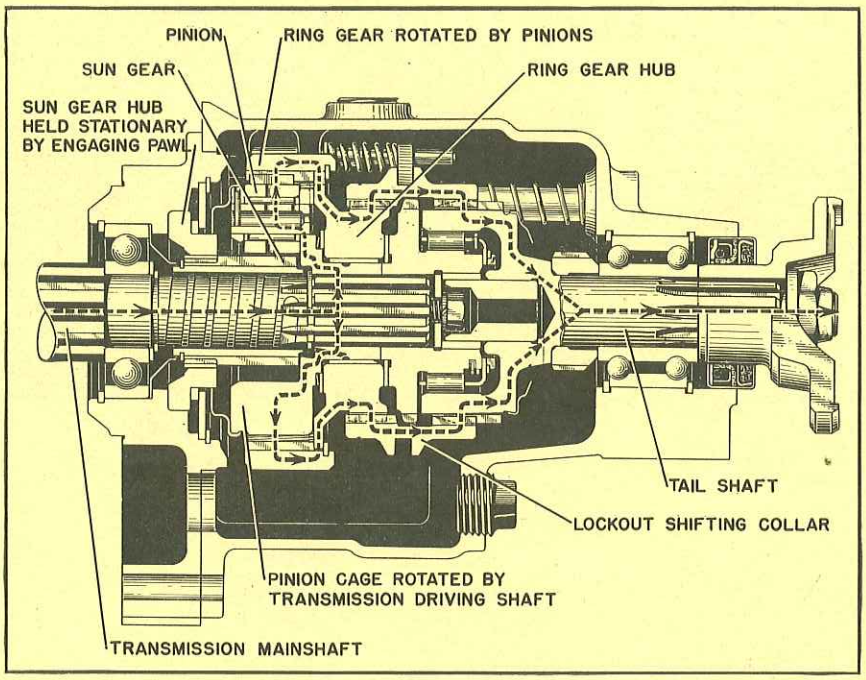


Figure 2—Transmission of Power in Overdrive

which forms the hub and a gear which is integral with the hub, twelve rollers, and the tail shaft.

The internally-splined clutch sleeve forms a connecting link to transmit power from the planetary gear train to the tail shaft when the car is operating in overdrive. This sleeve also locks the over-running clutch into a single driving unit when the transmission is shifted into reverse gear or when the lock-out cable is pulled to the lockout position.

Direct Drive

When the car is operating in direct drive, above the governed speed, the solenoid is de-energized, the sliding pawl has not entered the slotted hub of the stationary sun gear, and the sun gear is free to rotate. Engine power then is transmitted through the transmission driving shaft to the free wheel cam. The twelve rollers which ride on the ramps of the cam then act as wedges between the cam and the inner race of the tail shaft, and both the tail shaft and the transmission driving shaft rotate at the same speed. (See figure 1.)

Overdrive

When the accelerator pedal is released, the solenoid becomes energized, the sliding pawl is moved into the slotted hub of the sun gear, and the sun gear is held stationary. Engine power then is transmitted through the transmission driving shaft to the pinions which revolve around the sun gear. The pinions then drive the ring gear at a speed above that of the transmission driving shaft. This increased speed then is transmitted from the ring gear to the clutch hub which meshes with the ring gear and the clutch sleeve. The clutch sleeve in turn also meshes with the tail shaft and the tail shaft then rotates faster than the transmission driving shaft. (See figure 2.) Since the tail shaft rotates faster than the free wheel cam which is splined to the transmission driving shaft, no wedging action of the rollers can take place and the rollers merely slide on their ramps.

Normal Functioning

When the car, which has been operating in overdrive, has been brought to a stop, the solenoid is de-energized and the sliding pawl has been withdrawn from the hub of the sun gear. An interlock which moves between detents in the sliding pawl and the shifter rail then is in a position which will permit the shifter rail to move the clutch sleeve to the lockout position. (See figure 3A.)

When the transmission is shifted into reverse gear, the free wheel cam and the tail shaft are locked into a single unit by means of the splined clutch sleeve which is actuated through a plunger and spring by the low and reverse shifter fork. The internal splines of the sleeve mesh with the external splines of both the tail shaft and the gear which is integral with the free wheel cam. Engine power then is transmitted through the transmission driving shaft to the free wheel cam gear which is integral with the cam, then through the clutch sleeve to the tail shaft. Both the transmission driving shaft and the tail shaft then rotate at the same speed.

Reverse Lock-Up

When a non-standard condition exists in the overdrive electrical system whereby the solenoid remains energized when the car has been brought to a stop, engine power will be transmitted through the planetary gear train with the following results.

If the car is to continue on in a forward direction, no trouble will be experienced when the transmission is shifted into first gear and engine power applied. However, there will be a decided loss in acceleration due to the fact that the overdrive gears are operating in the overdrive position instead of in the direct drive position. The ratio differential of the gears in the two positions accounts for this loss in acceleration.

On the other hand, if the transmission is shifted into reverse gear and engine power applied, the overdrive unit will become locked in the following manner. The sliding pawl holds the interlock plunger up into its detent in the shifter rail. (See figure 3B.) This prevents the shifter rail from moving and the clutch sleeve in turn cannot engage the free wheel cam and the tail shaft and lock the two into a single unit. Engine power is transmitted from the transmission driving shaft, through the sun gear and planetary gear train, the clutch sleeve, and then to the tail shaft. Since the planetary gear train increases the speed of the tail shaft, the tail shaft rotates faster than the free wheel cam and causes the rollers to lock the cam

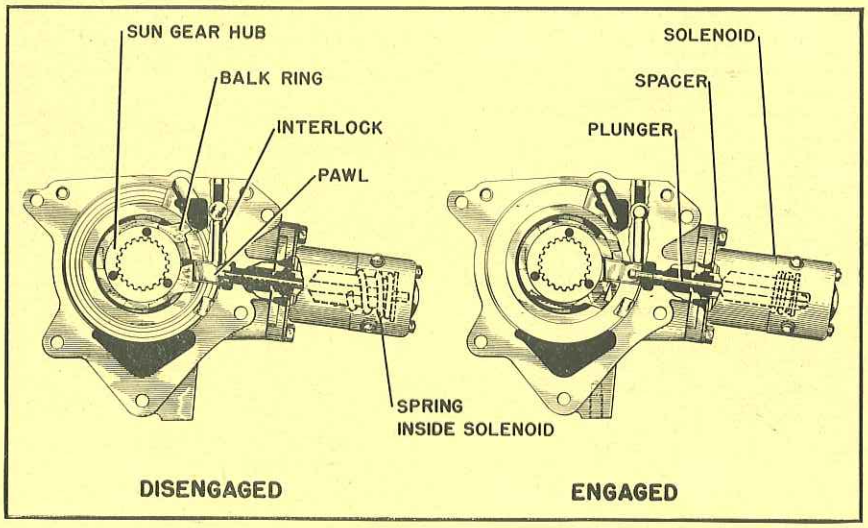


Figure 3A—Overdrive Solenoid Disengaged

Figure 3B—Overdrive Solenoid Engaged

and the tail shaft into a single unit. But, since the free wheel cam is splined to the transmission driving shaft, the cam and the tail shaft cannot rotate faster than the transmission driving shaft and the overdrive becomes locked.

Possible Electrical Troubles

As previously stated, this reverse lock-up usually is the result of a non-standard condition in the overdrive electrical system and it is suggested that the electrical system first be checked since the trouble may be attributed to any one or combination of the following:

1. Governor assembly contact points closed or sticking.
2. Lockout switch grounded.
3. Kick-down switch grounded.
4. Kick-down switch relay contact points closed or sticking.
5. Electrical wiring shorted to ground.

As you will note in the schematic wiring diagram (See figure 4.) the governor switch, kick-down switch, and the lockout switch are connected in series and are located between the relay and ground. Therefore, it is possible for the solenoid to remain energized due to any one of the five reasons listed.

Possible Mechanical Troubles

If the electrical system is found to be functioning properly, the lock-up may be caused by one of the following:

1. Stationary gear pawl sticking, due to gum formation
2. Clutch sleeve and shifter rail sticking, due to gum formation.
3. Governor assembly flyweights sticking.
4. Burred or worn teeth on free wheel cam, clutch sleeve, or tail shaft.

New Switch Available

To safeguard against the possibility of this reverse lock-up being caused by a non-standard electrical condition in 22nd Series cars, a switch has been added in the overdrive electrical system. An Equipment Kit, which includes the new switch, is available for Service under part number 394484—Overdrive Reverse Lockout and Backing Light Switch Equipment. These kits may be used on all earlier model Clippers and it is suggested that one of these kits be installed whenever a car is serviced to correct this locked condition in order to prevent a recurrence of the same trouble.

The new switch (See figure 5.) is attached over the gear shifter shaft housing bracket and is operated by the first and reverse lever when the lever is shifted into the reverse position. When the switch is opened by the first and reverse lever, the circuit between the battery and the relay is broken and the solenoid is de-energized. Since this switch functions independently of any other unit in the system, the circuit still would be broken even though a non-standard condition existed anywhere between the relay and ground.

Installation of New Switch

The switch may be installed as follows:

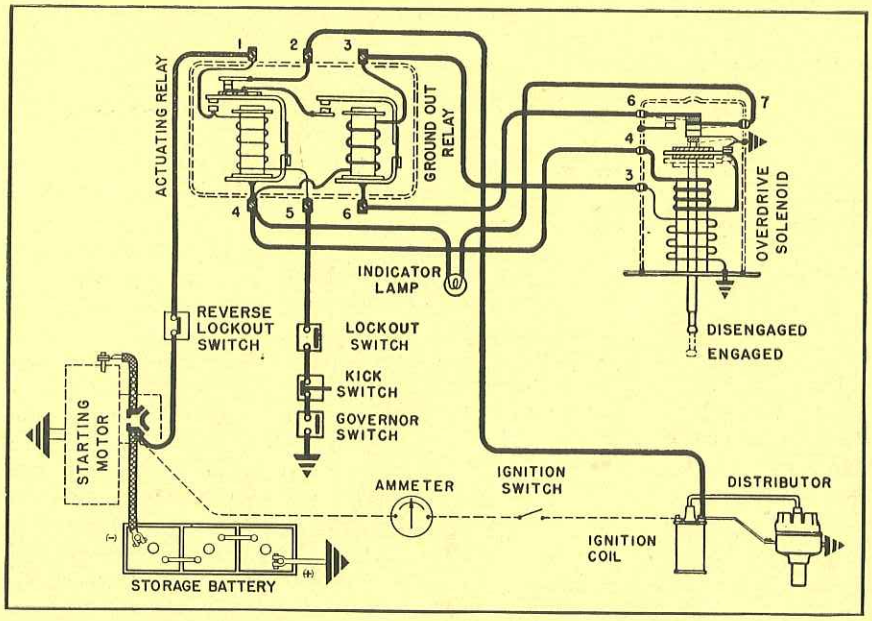
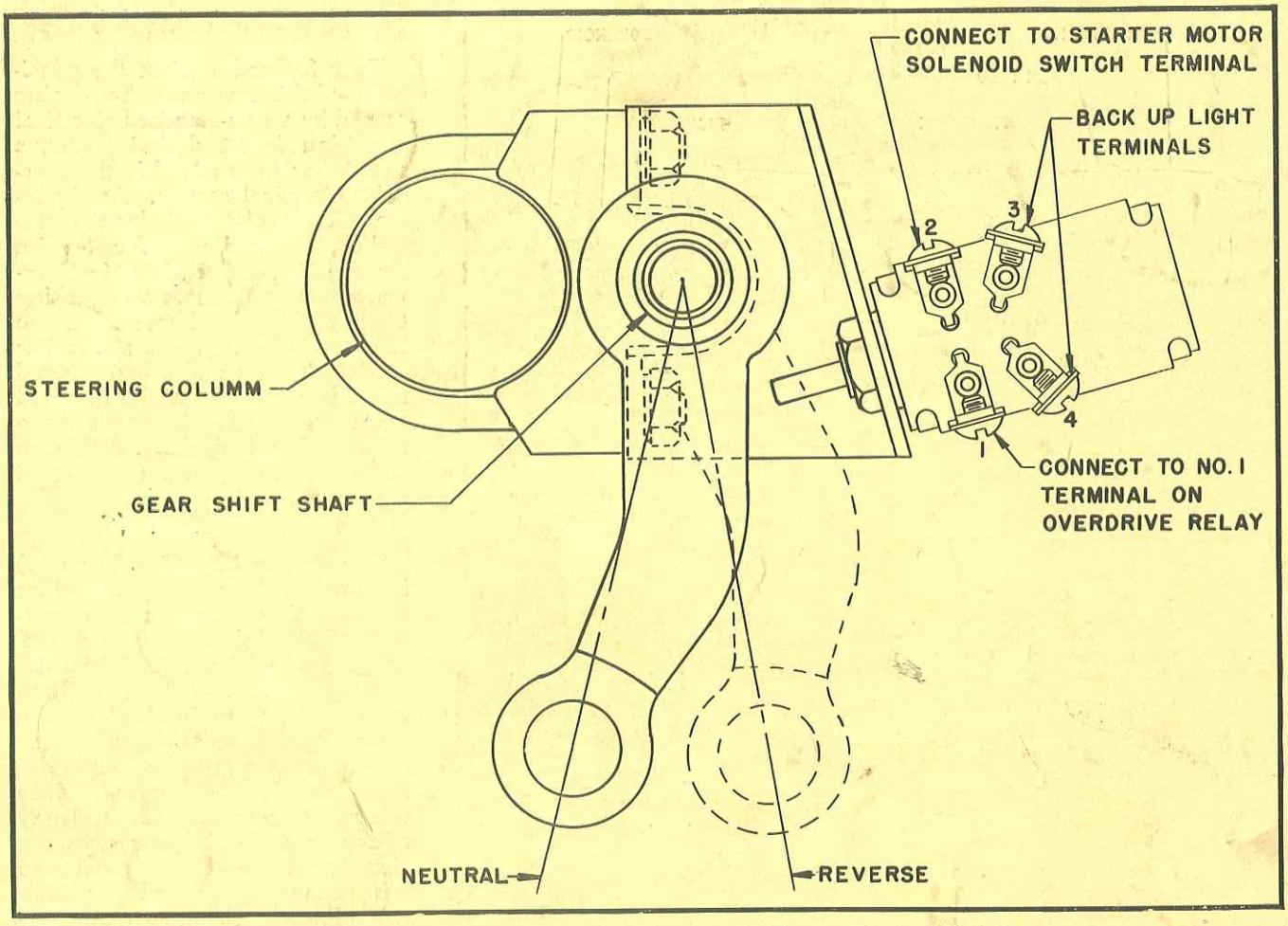


Figure 4—Schematic Wiring Diagram of Overdrive Circuits



Firgure 5—Schematic Drawing of New Overdrive, Reverse Lockout and Backing Light Equipment
Switch Shown Out of Position To Show Location of Terminals

Attach the switch and bracket over the gear shaft housing bracket as shown in figure 2. Position the switch so the wire terminals are pointing up.

Disconnect the fuse container in the cable between the starting motor solenoid and the overdrive relay. Cut the cable off flush with braid on body wiring harness.

Disconnect cable from the No. 1 terminal of overdrive relay. (See figure 4.) Cut cable off flush with braid on body wiring harness.

Connect the long cable furnished in the kit to the No. 1 terminal of the overdrive relay.

Run the cable along the body wiring harness to starter motor by means of clips and then across to the safety switch. Connect the cable to the No. 1 terminal. (See figure 5.)

Connect the short wire with the fuse container plug furnished in the kit to the No. 2 terminal on the safety switch. (See figure 5.)

Insert the fuse and connect the fuse container. Strap the wire to the negative battery cable with metal clips.

Move the shifter lever into reverse position and check the switch operation. If necessary, loosen the switch retaining nuts and adjust the position of the switch on the bracket until correct position is obtained.

The two rear terminals (No. 3 and No. 4, figure 5) are used only when backing light equipment is installed. The switch included in the Backing Light Kit may be discarded when a backing light is installed on a car having the new overdrive safety switch.

* * *

RUST AND SCALE

An important item which does not always receive the attention it should receive is that of keeping the engine cooling system free from scale and rust.

Owners should be advised that preventive measures taken early, at small expense, will save the greater expense of a repair job at a later date.

Rust preventive should be used in the cooling system at all times for two reasons:

First, it prevents the formation of scale and rust which in time becomes detrimental to efficient cooling.

Second, it acts as a lubricant in the water pump. The tendency for water pump seals to become noisy will be materially reduced if the cooling liquid contains rust inhibitor.

All good anti-freeze solutions contain a rust inhibiting agent. However, when the system is filled with water, ¼ pint of rust preventive should be added.

Packard Rust Preventive may be ordered under number PA 98737—½ pint, PA 98319—1 gal., PA 98320—5 gal.

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