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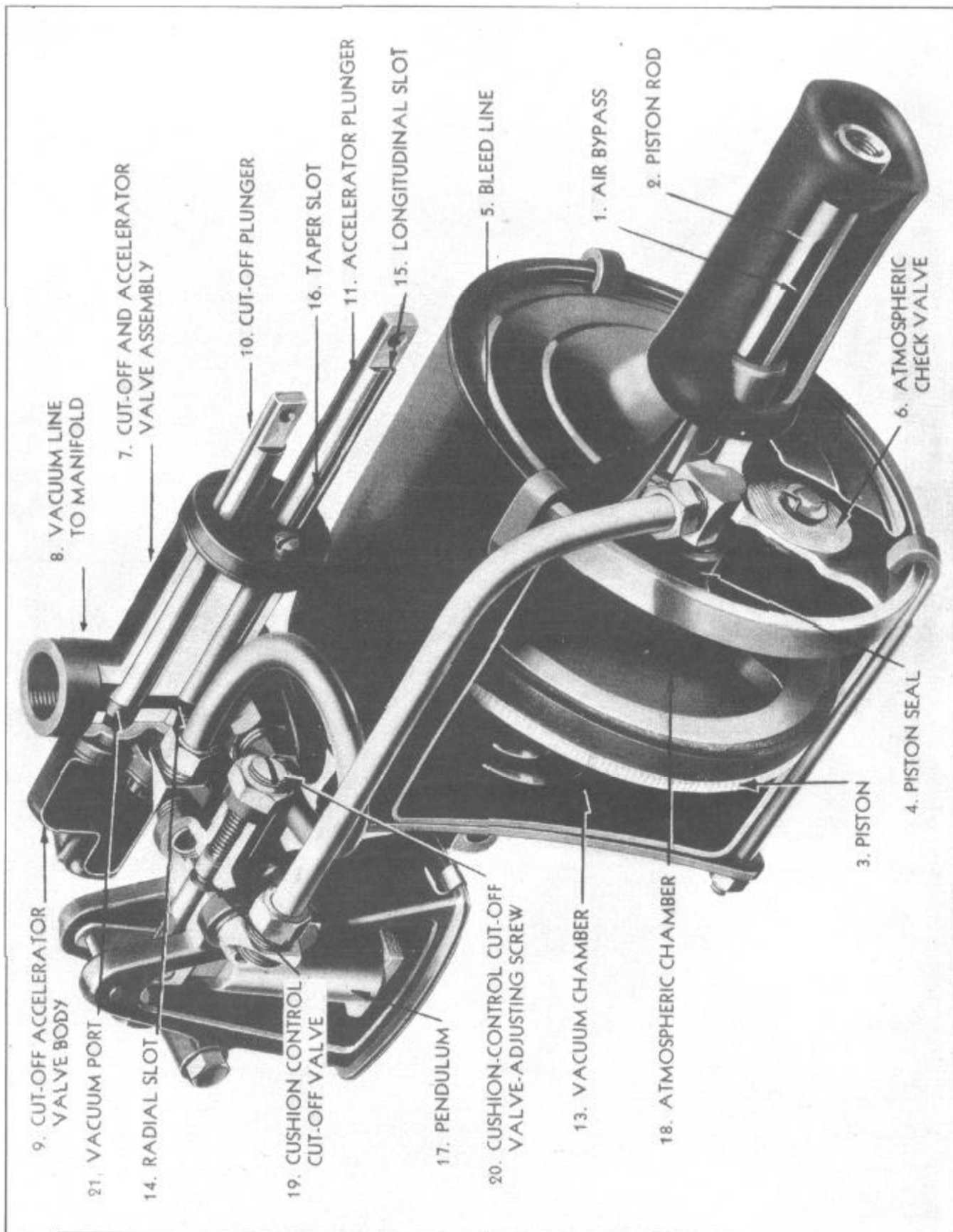
Automatic Clutch Control

HUDSON and TERRAPLANE
1935 MODELS

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ADJUSTMENT *and*
MAINTENANCE
INSTRUCTIONS

Bendix Products Corporation
South Bend, Indiana



9. CUT-OFF ACCELERATOR VALVE BODY

8. VACUUM LINE TO MANIFOLD

7. CUT-OFF AND ACCELERATOR VALVE ASSEMBLY

21. VACUUM PORT

14. RADIAL SLOT

10. CUT-OFF PLUNGER

19. CUSHION CONTROL CUT-OFF VALVE

16. TAPER SLOT

11. ACCELERATOR PLUNGER

15. LONGITUDINAL SLOT

17. PENDULUM

5. BLEED LINE

20. CUSHION-CONTROL CUT-OFF VALVE-ADJUSTING SCREW

13. VACUUM CHAMBER

1. AIR BYPASS

18. ATMOSPHERIC CHAMBER

2. PISTON ROD

3. PISTON

6. ATMOSPHERIC CHECK VALVE

4. PISTON SEAL

How Automatic Clutch Control Operates

The principle of operation is very simple. The accelerator is permitted to overtravel its idle, or release position. This overtravel opens the valve 11, creating a direct vacuum passage 14 from the power cylinder to the engine intake manifold causing the piston to be drawn forward which disengages the clutch. Since the clutch is not disengaged until after the accelerator has passed its idle position, it is still possible (1) to use the engine compression for braking purposes and (2) to drive normally with clutch engaged and engine running at idling speed.

The accelerator must be relieved of all pressure before clutch disengaging action will take place. As the accelerator is depressed to speed up engine, the valve is again closed, cutting off the vacuum connection, and the clutch returns to engagement through the force of the clutch springs as with foot usage of the clutch. The speed of the engagement travel of the clutch, however, is automatically controlled by the cushion control; a rapid movement is allowed up to the point where the clutch starts to take up the load of the car. From this point until the moment of full engagement, the speed is slowed down—perfectly controlled—to effect a smooth, ideal engagement. The desirability of this velvety engaging action is always stressed by car makers, but seldom accomplished by the use of the unsteady human foot and leg.

A very apt comparison with the Bendix Clutch Control action is that of the common pneumatic door check which allows the door to start its return rapidly but then checks its speed and gently closes the door. A cut-off plunger 10 is included in the control valve. This is connected to a cut-off button conveniently mounted on the dash or toe board. When the plunger is pushed in the clutch control system is completely cut out and the clutch is operated physically in the conventional manner.

Power Cylinder

The Power Cylinder has a conventional piston 3 which divides the housing into two chambers. The rear or atmospheric chamber 18 is open to the atmosphere through three passages: (1) the by-pass 1 in the piston rod (2), the bleed line 5 through the cushion control valve 19 to the accelerator valve and, (3) the atmospheric check valve 6 in the cylinder head.

The air by-pass in the piston rod is formed by slots milled in opposite sides of the piston rod. The by-pass permits a rapid discharge of air from beneath the piston during the initial movement of clutch engagement, before the clutch plates have come into actual contact. This point of contact or initial engagement, is known as the cushioning point. The power cylinder is so designed and installed that the end of the by-pass reaches the piston rod seal, just at the point of initial clutch plate contact, so that all further air escape from beneath the piston must be accomplished through the bleed line. This entrapped volume of air beneath the piston serves as a perfect check or cushion, against which the clutch is being engaged by the action of the clutch springs.

The atmospheric check valve is a small spring loaded poppet valve located in the cylinder head which permits a free access to the atmosphere when the piston is drawn into the vacuum chamber, during clutch disengagement.

Cutoff and Accelerator Valve

The cutoff and accelerator valve 7 is interposed in the vacuum line

between the intake manifold and the power cylinder and consists of a valve body with three connections and two valve plungers. The cutoff plunger 10 is operated by a suitable control as previously described. Its function is to completely connect or disconnect the power system from the intake manifold.

The accelerator plunger 11 is connected to the foot accelerator and is operated positively therefrom. It performs two functions, (1) opens the vacuum chamber to the intake manifold by means of a radial slot 14, or to the atmosphere through a longitudinal slot 15, (2) regulates the amount of air bled out of the air chamber after the cushioning point has been reached. The air is bled through a tapered slot 16 which is proportioned to accelerator pedal travel and increases in area as the accelerator is depressed.

Cushion Control

The cushion control which is included in some installations is essentially a very simple cutoff valve, operated by a pendulum 17, and inserted in the bleed line from the atmospheric end of the clutch control cylinder. With the car standing still, the pendulum hangs approximately 12° ahead of the vertical position, and the piston type of cut-off valve, which it controls, is wide open. When the driver steps on the accelerator to start the car, the clutch can be allowed to move into engagement at a more rapid rate than would normally be permissible for an easy start. As soon as the plates make initial contact, the car begins to move forward, the slight initial acceleration, which is of so small a magnitude as to hardly be noticeable, causes the pendulum to swing toward the rear, completely closing the valve, and arresting the movement of the clutch operating lever at a point corresponding to a partial clutch engagement.

As soon, of course, as the car stops accelerating, and attains any uniform speed, the pendulum operating valve immediately is returned, by gravity, to its wide open position. The engagement of the clutch is completed gently and positively, and any pressure is relieved from the throw out bearing or clutch collar just as before the installation of the cushion control valve. Adjustment of the cushion control is provided for by means of a light adjustable spring and screw 20 incorporated in the body of the valve.

Adjustment

Before attempting automatic clutch control adjustment the engine should be adjusted to proper idling speed, and must idle smoothly. Clutch adjustment should also be checked for normal backlash or pedal play. There are three possible adjustments on the automatic clutch control, (1) piston rod length, which synchronizes the cushioning point of the piston stroke with initial contact of the clutch plates, (2) lost motion, which synchronizes clutch engagement with engine speed, (3) cushion control valve which synchronizes clutch engagement with car acceleration.

Piston Rod Adjustment

If piston rod is too long, clutch plates will engage before cushioning point of stroke is reached, and clutch engagement will be rough or harsh. If piston rod is too short, cushioning point will be reached before initial contact of clutch plates, and clutch engagement will lag with excessive slippage regardless of other adjustments.

This adjustment is most readily accomplished by shortening

piston rod, by means of adjustable clevis, one turn at a time, until rough engagement of clutch with low throttle is just eliminated. Lock nut should be tightened after adjustment.

Lost Motion Adjustment

Normal setting of the accelerator valve is 7/32" lost motion measured at the valve from its full open position to the point where the carburetor just picks up. This will usually provide smoothest operation.

Too much lost motion is indicated by full clutch engagement before engine speed picks up, resulting in stalling or jerky start. Too little lost motion will prevent driving with clutch engaged at closed throttle, and may also cause excessive clutch slippage, since engine speed becomes too high in comparison with clutch engagement. Correct lost motion is essential to smooth operation. Usually lost motion just sufficient to permit closed throttle driving will be found most satisfactory.

Cushion Control Valve Adjustment

The effect of the cushion control valve is most noticeable on fast starts, and it should be adjusted last after normal adjustments have been made. With car in first gear make a wide open start. If too much slippage is noted, tighten adjusting screw, which increases spring pressure against closure of pendulum valve. If start is rough and jerky, loosen adjusting screw. Tighten lock nut after adjustment.

Lubrication

All clevis pins, and accelerator control valve plungers should be kept clean and lubricated with light oil periodically.

The cylinder should be lubricated with approximately one ounce Bendix Vacuum Cylinder Oil every 5000 miles, introduced by removing the bleed tube connection in the cylinder head.

The cushion control valve should be lubricated at 5000 mile intervals with light oil, introduced by removing the adjusting screw and spring,

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MAINTENANCE

Power Cylinder

Any leakage of air around the leather piston packing or around the small leather piston rod seal (4) in the end plate will cause the piston to move the full length of the cylinder on the clutch engagement stroke without stopping at the cushioning point, that point where the end of the slot in the piston rod just passes the leather piston rod seal in the end plate. This condition may also be caused by the small poppet valve in the end plate not seating properly. Grit or sand may be under the leather holding it open and allowing air to escape.

To properly service the Power Cylinder it should be dismantled as follows: Remove the hook bolts clamping the end plate to the cylinder. Remove end plate from cylinder. Check piston leather for wrinkles or distortions. The piston assembly is furnished complete for service, and any replacement of the piston leather will require a new piston assembly.

See that piston rod leather seal in end plate is snug around the piston rod and spring band is around leather. Lubricate the leather with Bendix Vacuum Cylinder Oil before reassembly of unit. Any distortion of the leather, causing a leakage of air will require replacement of the end plate assembly which includes the leather and the retainer, which is assembled under pressure and peened or staked in place.

The small spring steel band around piston rod leather seal is not a part of the end plate assembly. When replacing this band for service, insert FORM E-1-BPC SPI

the piston rod through leather seal before placing the band around the leather. Care should be taken so as to not distort the leather.

Parts of the poppet valve are furnished separately for service and replacement of the leather washer under the head of the valve is necessary if any leak is noticed and not attributed to sand or foreign particles. The fine screen over the poppet valve holes should be cleaned.

Other parts, including the piston rod guard, the dust cover over the end plate and the felt and felt retainer are furnished separately for service, and may be ordered accordingly.

The felt piston rod wiper on outer end of end plate should be checked for fit. The function of this wiper is to keep piston rod free from grit which would wear the leather piston rod seal, causing leaks and grabbing condition of the clutch.

Check rubber piston rod guard to see that it fits properly in grooves and that there are no torn places in the rubber. Any guard which becomes hard and is full of small cracks should be replaced.

In the reassembly of the cylinder to the end plate, use a new gasket and permatex or paste sealing compound. There should be no leaks here. The hook bolts should be drawn up snug, but without excessive straining of the end plate. Lubricate cylinder with one ounce Bendix Vacuum Cylinder Oil when reassembling.

Accelerator Control Valve

Little, if any, trouble in the clutch control unit should be attributed to the Accelerator Control Valve. However, care should be taken to see that both the cut-off and the control plungers are free and work smoothly. Remove and wipe off all grit or foreign accumulations when servicing any other portion of the clutch control unit.

If clutch will not hesitate momentarily at the cushion point and the cylinder has been checked and found OK it may be that the accelerator plunger is badly worn, allowing rapid escape of air, causing clutch to engage too severely. A leak around the plungers may also create an uneven idle of the engine. Owing to the close fits necessary, a complete new valve will be required for service.

Cushion Control Valve

Any valve which does not choke off the supply of air thru the bleeder line, long enough to slow the clutch action at the cushioning point of the clutch, should be replaced. Test for leakage may be made by removing cover plate on bottom of bell and swinging pendulum over enough to slide plunger across the bleeder ports. Now with one of the fittings in the mouth, draw or suck in and place the tongue across the opening, next try to pull away from the tongue. A slight pull will be noticed if the plunger has the proper fit in the bore. If valve pendulum swings hard, the plunger is probably sticking, due to some accidental distortion of the valve body. A new Cushion Control valve will be required as the close fits required in the machining of plunger bore in the valve make it necessary that a complete valve assembly be furnished for service.

General

Remember that satisfactory operation of the Clutch Control Unit depends on the care with which it was serviced.

See that all moving parts are well lubricated and working properly. This applies to the cylinder as well as the cushion control valve and the accelerator control valve.

If these instructions are followed carefully and also those regarding the adjustments of the unit, Clutch Control operation should be very satisfactory.