Nov. 28, 1933. G. W. LAMPMAN 1,936,678

HYDRAULIC VALVE GEAR

Filed June 11, 1932

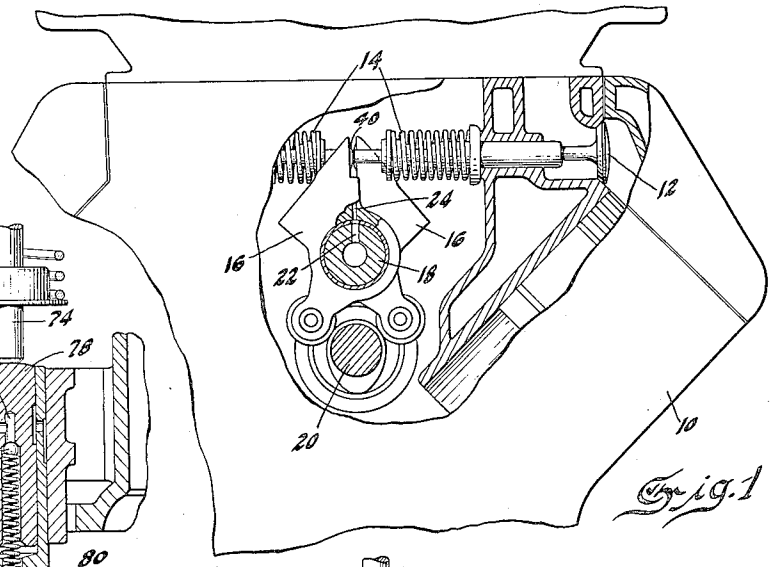


Fig. 1

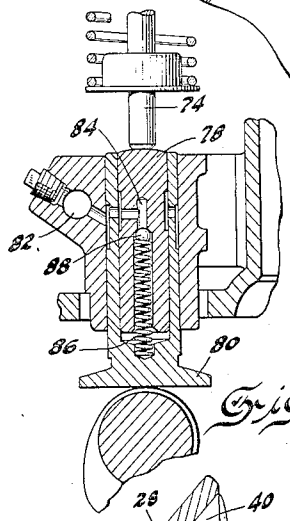


Fig. 6

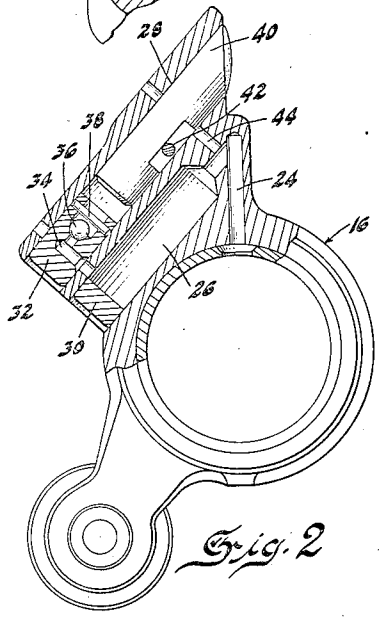


Fig. 2

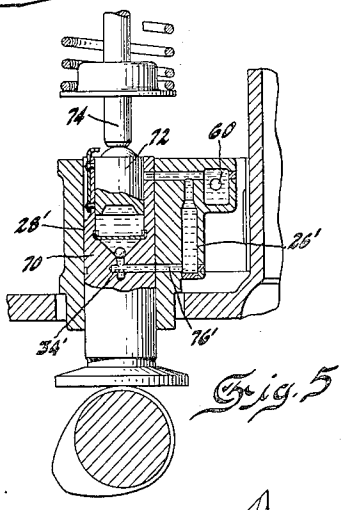


Fig. 5

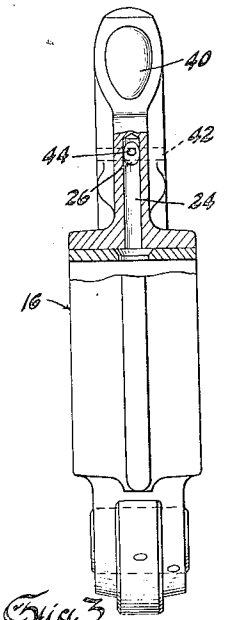


Fig. 3

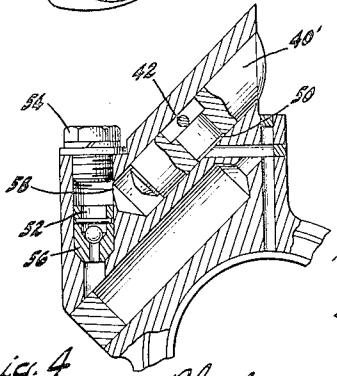


Fig. 4

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HYDRAULIC VALVE GEAR

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6 Claims. (Cl. 123—90)

This invention is an improvement upon the type of hydraulic slack adjuster described and claimed in Patent No. 1,784,767, granted to C. E. Summers on December 9, 1930.

In the application of this type of slack adjuster to V-type engines in which the valves are horizontally mounted and are actuated by rocker arms engaged by the camshaft the Summers' design is not entirely satisfactory for with the cylinders horizontally arranged oil would leak past the pistons when the engine stood idle rendering the engine noisy at starting. To overcome this objection, I have arranged the cylinders at a downward inclination. This not only removes the gravity head and retains the oil, but also permits the air to readily escape in the form of an emulsion working between the piston and cylinder.

Another improvement consists in the provision of means to prevent the entrance of oil into the cylinder. This is accomplished by connecting the oil supply to the cylinder at a point within the stroke of the piston so that an oil seal is provided about the piston effectively preventing the admission of air.

Other objects of the invention will be pointed out in the course of the following description:

Figure 1 is a fragmentary view of an automobile engine having my improved hydraulic valve mechanism applied to it.

Figure 2 is an enlarged view, partly in section, of one of the rocker arms in which my invention is embodied.

Figure 3 is an end view, partly in section, of the rocker arm of Figure 2.

Figure 4 illustrates a slight modification.

Figure 5 shows the application of my invention to a reciprocating valve tappet.

Figure 6 shows a modification of the design of Figure 5.

At 10 I have shown a portion of an internal combustion engine of known type provided with horizontally extending valves 12 held on their seats by springs 14. The valves are actuated by tappets 16 pivoted on a hollow rocker shaft 18 supplied with oil from the pressure lubricating system of the engine. The rockers carry rollers at the lower ends actuated by cams on the camshaft 20.

The pivot shaft 18 is provided with the duct 22 through which oil may pass from the hollow rocker shaft into the passage 24 provided in the hollow rocker arm. It will be noted that the passage 24 extends in a substantially vertical direction, and at its upper end communicates with a downwardly inclined bore 26 which serves as a separating or settling chamber. The rocker is also provided with a bore 28 parallel with the bore 26. For convenience in manufacture the lower ends of the bores 26 and 28 are closed by plugs 30 and 32, respectively, but other methods of forming may be employed, if desired. In the plug 32 are formed passages 34 which are in communication with the lower end of the bore 26 as shown. In the passage 34 is provided a check valve 36 held in position by a suitable stop 38 and resting upon a conical seat when in closed position. Within the bore 28 is slidably mounted the piston 40 which is restrained from both rotation and expulsion from the chamber by pin 42 passing through the walls of the cylinder and through a slot formed in the piston. A passage 44 establishes communication between the slot in the piston and the upper end of the passage 24.

In the operation of the device oil from the engine lubricating system passes from the interior of the pivot shaft 18, through passages 22, 24, 26 and 34, and past ball check valve 36 into the cylinder forcing the piston 40 outwardly so that it engages the end of the valve stem. This operation, of course, can only take place when the valve 12 is on its seat, and the system thereby relieved from the pressure of the spring 14. When the cam begins to rock the rocker 16 the check valve 36 is immediately seated by the pressure of the piston 40 on the oil, and the oil acts as a rigid abutment or seat for the piston 40 causing it to force the valve off its seat. This action continues until the rollers again engage the base circle of the cam, and the valve is seated. The oil pressure is then again effective to raise the valve 36, and supply the deficiency of oil which may have been produced by leakage past the piston 40.

Not only is oil supplied to the cylinder 28 through the passage 34 but through the passage 44 the oil pump pressure is applied to the periphery of the piston 40 producing an oil seal which prevents passage of air into the cylinder. It will be noted also that any air that may have come with the oil into the bore 26 will naturally gravitate upwardly into passage 44, and be forced out between the piston and its cylinder. The upward inclination of the bore 28 likewise facilitates the escape of entrained air between the cylinder and piston in the form of an emulsion.

As a result of the inclined arrangement of the bores 26 and 28, and the fact that their connection with the oil supply is above the lower end of the piston, the hydraulic chamber beneath the piston will remain filled with oil however

long the engine may stand unused. Should the oil supply fail however, the engine will operate although noisily by engagement of the plug 32 with piston 40.

In Figure 4 I have shown a slight modification. Here the piston 40' is provided with an annular groove 50 in addition to the notch to receive the pin 42 which holds the piston against rotation and expulsion from the cylinder. In this construction, also, the drilled passages are somewhat differently arranged. Attention is particularly called to the passage 52 closed by a screw plug 54. Within this passage there is provided the plug 56 carrying the ball check valve as before. The passage 52 communicates with the cylinder containing the piston, as indicated at 58. This arrangement simplifies manufacture somewhat in that the machining of the plug 56 is simpler than the machining of plug 32. However, the hydraulic chamber is somewhat enlarged, and this may lead to slightly more trouble with air.

In Figure 5 I have shown the application of my invention to a conventional form of tappet. Here the oil supply comes through passage 60, and is fed by suitable passages to the bores 26' and 28'. The tappet 70 is in the form of a cylinder in which is slidably mounted the piston 72 engaging the end of the valve stem 74. Oil is supplied to the cylinder 70 through passages 34' which may either continuously or intermittently align with passage 76'. Here the passage 26' likewise acts as a settling chamber, and also provides a head of fluid to keep the hydraulic chamber filled at all times.

In Figure 6 I have shown a further modification. Here the piston 78 is slidably mounted in tappet 80. Oil is fed to the space between the piston and tappet from passage 82 through communicating passages in the walls of the tappet and piston, as shown, to the passage 84 extending centrally through the piston. The lower portion of the passage 84 is enlarged, as shown, and contains a spring 86 yieldingly holding ball check valve 88 on its seat. The advantage of this construction resides in the fact that foreign matter tending to lodge between the valve 88 and its seat will be forced out of place by the entering oil stream, and will settle down to the bottom of the tappet where it will not interfere with operation.

I claim:

1. In a valve slack adjuster the combination of a cylinder, a piston in the cylinder adapted to engage a part of the valve gear, a source of supply of oil under pressure, a passage outside of said cylinder and piston leading from said source to the cylinder below said piston, a non return valve in said passage, a passage leading from said source to the piston above its plane of contact with the liquid to prevent the passage of air into the cylinder and a channel connecting said passages so that air entrained with the liquid is delivered to the second named passage.

2. In a valve slack adjuster, the combination of a rocker arm having a hollow hub adapted to be connected with a source of oil under pressure, said rocker arm being formed to provide a cylinder, a piston in the cylinder, a passage outside of said cylinder and piston leading from said hub to said cylinder adjacent its lower end, a non-return valve in said passage, a piston in the upper portion of the cylinder, a passage connecting said hub with the upper portion of the cylinder to prevent the passage of air into the cylinder.

3. In a valve slack adjuster, the combination of a rocker arm having a hollow hub adapted to be connected with a source of oil under pressure, said rocker arm being formed to provide a cylinder, a piston in the cylinder, a passage outside of said cylinder and piston leading from said hub to said cylinder adjacent its lower end, a non-return valve in said passage, a piston in the upper portion of the cylinder, a passage connecting said hub with the upper portion of the cylinder to prevent the passage of air into the cylinder a passage connecting said first-named passages so that entrained air will be discharged through said second-named passage.

4. A valve rocker arm having a pivot receiving bore and a pair of substantially parallel bores extending at an angle to the first named bore, a passage connecting said pivotal bore with one of said parallel bores, a piston in the other of said parallel bores, passages connecting said parallel bores adjacent the tops and bottoms thereof, a non-return valve in the lowermost passage.

5. The combination of a substantially horizontal reciprocating part, a movable member having a downwardly inclined bore therein, a piston in said bore engaging said reciprocating part, and a body of fluid in said bore, the inclination of said bore preventing escape of said fluid by action of gravity.

6. In a valve operating mechanism, the combination of a substantially horizontal reciprocating actuated part, a rocker for actuating said part having a downwardly inclined bore therein, a piston in said bore engaging said actuated part, and a body of fluid in said bore, the inclination thereof preventing escape of fluid by action of gravity.

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