March 16, 1937. C. R. PATON 2,073,709

INTERNAL COMBUSTION ENGINE

Filed April 2, 1934

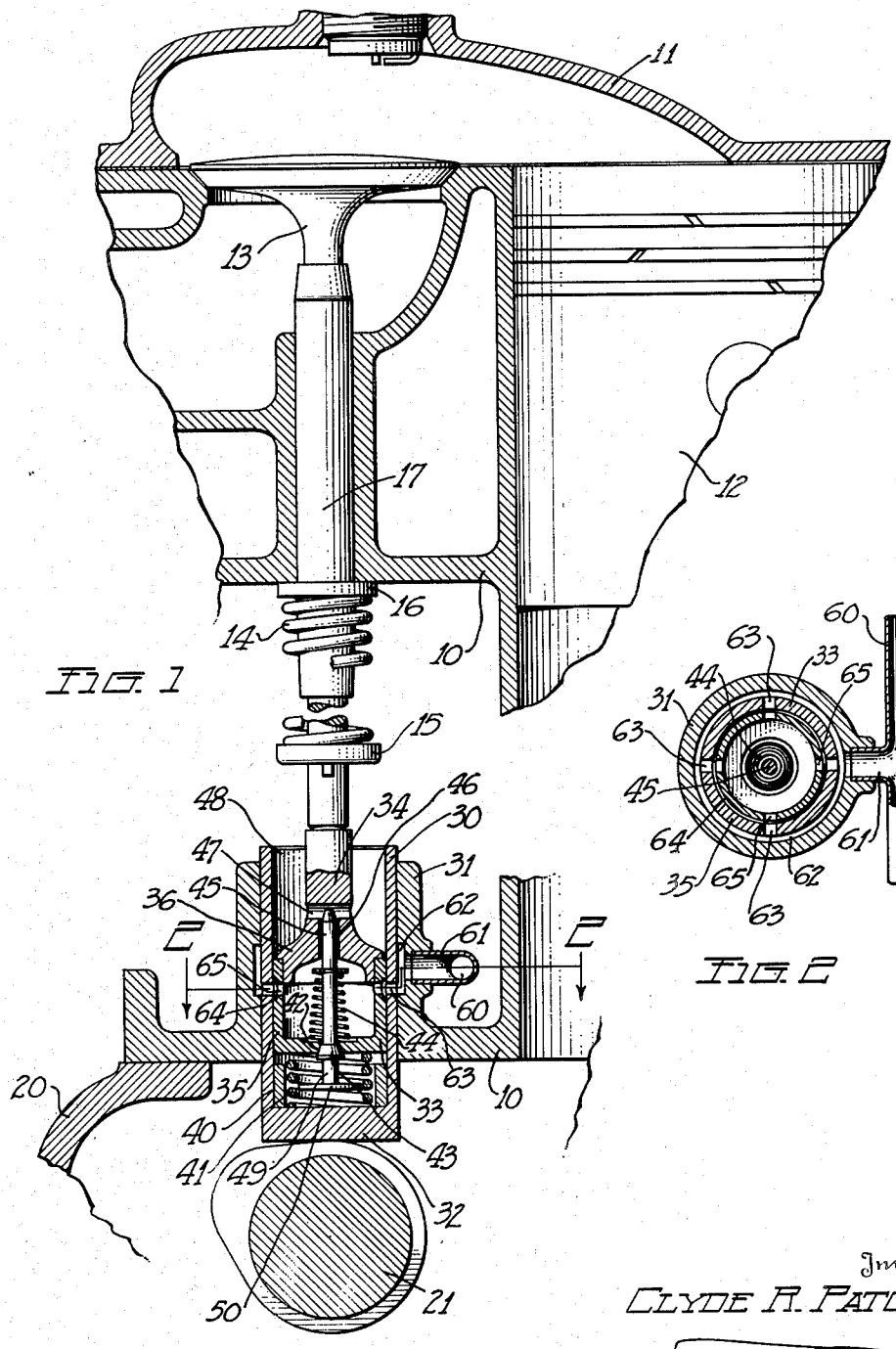


FIG. 1

FIG. 2

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Patented Mar. 16, 1937 2,073,709

UNITED STATES PATENT OFFICE

2,073,709

INTERNAL COMBUSTION ENGINE

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Application April 2, 1934, Serial No. 718,588

4 Claims. (Cl. 123—90)

This invention relates to internal combustion engines and particularly to the valve operating mechanism thereof. It especially relates to hydraulic clearance take-up mechanism as applied to the push rods of an engine.

One of the objects of the present invention is to simplify the take-up mechanism while retaining its reliability and quick action on starting.

Another object is to provide a device that will operate on a small volume of oil in the reciprocating parts.

Another object is to provide means insuring the positive and quick elimination of air from the working chambers.

Other objects of the invention will appear from the following description taken in connection with the drawing, which form a part of this specification, and in which:

Fig. 1 is a fragmentary sectional view of an internal combustion engine embodying the invention, and

Fig. 2 is a section on the line 2—2 of Fig. 1.

Referring to the drawing, 10 represents the cylinder block of an internal combustion engine and 11 is the detachable head therefor. 12 is the engine piston operating in the cylinder, and 13 is one of the valves of the engine. 14 is the valve spring surrounding the stem of the valve and 15 is a detachable washer forming an abutment for the lower end of the spring 14. The upper end of the spring 14 rests against a flange 16 on a guide 17 in which the stem of the valve operates.

The cylinder block 10 rests on the engine crank case 20 and in the crank case is the usual cam shaft 21 suitably connected for operation by the engine crank shaft. Between the cam shaft 21 and the valve 13 is mounted the push rod with the automatic clearance take-up mechanism of this invention. This push rod comprises a hollow cylinder 30 of elongated form, mounted for reciprocation in an upright boss 31 shown as formed as an integral part of the cylinder casting. Thus, there is provided a large sliding surface for the push rod in its support. This is very desirable on account of the side thrust caused by the cam operating on the push rod.

The cylinder 30 is closed at its lower end as at 32 and is in contact with the cam shaft 21 so that the rotation of the latter will cause a reciprocation of the push rod.

Within the cylinder 30 is a hollow piston or plunger 33 which is considerably shorter than the cylinder and is formed with a contracted stem 34, most of which is surrounded by the upper part of the hollow cylinder 30. The upper end of the stem 34 extends slightly above the upper end of the cylinder 30 and into contact with the lower end of the stem of the valve 13 and thus as the piston 33 is reciprocated through its connection with the cylinder 30 the valve 13 is lifted from its seat. It is, of course, returned to its seat by its spring 14. The piston 33 is shown as formed in two parts, the lower part 35 and the upper part 36, these parts being secured together by any suitable means such as by a tight pressed fit.

In the lower end of the cylinder 30 is a sleeve 40 which limits the downward movement of the piston 33 in the cylinder, and a spring 41 is provided to constantly press the piston 33 upwardly away from the lower end of the cylinder.

In the lower face of the piston 33 is a port 42 which is closed by a valve 43 having a spring 44 to keep it yieldingly on its seat. The valve stem 45 of this valve 43 extends upwardly through the piston and into a passage 46 which is slightly larger than the stem 45 of the valve so that there may be provided an air bleed from the upper end of the interior of the piston. The passage 46 terminates in a cross passage 47 into the chamber 48 formed by the extended portion of the wall of the cylinder 30. It will be understood that the space between the stem 45 of the valve and the passage 46 is somewhat exaggerated in the drawing.

The valve 43 also has a downward extension 49 upon which is a disk 50 within the coils of the spring 41, this disk acting as a damper or dashpot to prevent fluctuations of the valve 43.

Oil is fed to the interior of the piston 33 and through the port 42 to the interior of the lower part of the cylinder 30, by means of an oil line 60 which may lead from the oil circulation system of the engine. Preferably this oil is fed at a predetermined constant pressure, say ten pounds per square inch.

A pipe 61 leads to the boss 31 in which there is an annular channel 62 in communication with a series of ports 63 through the wall of the cylinder 30. The channel 62 extends longitudinally sufficiently to be in constant communication with the ports 63 during reciprocation of the cylinder 30.

Between the interior wall of the cylinder 30 and the outer wall of the piston 33 there is an annular passage 64 which is in constant communication with the ports 63 and with a series of ports 65 in the piston 33. Thus as long as there

is oil in the pipe 60 there will be a constant pressure thereof in the interior of the piston 33 and any air therein will escape through the passage 46. Of course a small quantity of oil will also escape through that passage into the chamber 48 but this surplus oil will be thrown out of that chamber by the rapid reciprocation of the cylinder 30 in its operation. Oil from the piston 33 will open the valve 43 and fill the lower portion of the cylinder 30 so that this body of oil will act as a substantially solid wall in the reciprocation of the cylinder and consequently operation of the valve 13. The slight amount of oil that escapes past the piston wall will be replenished at the moment of closure of the valve 13 so that the clearance that might otherwise be found between the various operating parts will be constantly taken up.

While I have herein described in some detail a specific embodiment of my invention, which I deem to be new and advantageous and may specifically claim, I do not desire it to be understood that my invention is limited to the exact details of the construction, as it will be apparent that changes may be made therein without departing from the spirit or scope of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In valve operating mechanism, the combination with a valve and a cam shaft, of a hydraulic take-up push rod between said valve and shaft comprising a hollow cylinder having a closed end in contact with the cam shaft, a relatively movable hollow plunger in the cylinder in contact with the valve, said plunger having ports in the upper and lower ends thereof, a valve for the lower port having a stem guided by and nearly closing the upper port, and means for feeding oil to the interior of the plunger during the operation of the mechanism.

2. In valve operating mechanism, the combination with a valve and a cam shaft, of a hydraulic take-up push rod between said valve and shaft comprising a hollow cylinder having a closed end in contact with the cam shaft, a relatively movable hollow plunger in the cylinder in contact with the valve, said plunger having ports in the upper and lower ends thereof, a valve for the lower port having a stem guided by and nearly closing the upper port, a damper disk for said valve, and means for feeding oil to the interior of the plunger during the operation of the mechanism.

3. In valve operating mechanism, the combination with a valve and a cam shaft, of a hydraulic take-up push rod between said valve and shaft comprising a hollow cylinder having a closed end in contact with the cam shaft, a relatively movable hollow plunger in the cylinder in contact with the valve, said plunger having ports in the upper and lower ends thereof, a valve for the lower port having a stem guided by and nearly closing the upper port, a damper disk mounted in the cylinder below the plunger and connected to said valve, and means for feeding oil to the interior of the plunger during the operation of the mechanism.

4. In a valve operating mechanism, the combination of a valve and a cam shaft, of a hydraulic take-up push rod between said valve and shaft comprising a hollow cylinder having a closed end in contact with the cam shaft, a relatively movable hollow plunger in the cylinder in contact with the valve, a port in the lower end of said plunger, a valve for said port, means forming a bleed opening in the upper part of said plunger, means connected to the latter valve and extending into said air bleed, and means for feeding oil to the interior of the plunger during the operation of the mechanism.

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