Dec. 11, 1934. H. DOCK 1,983,744

RECIPROCATING VALVE

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Fig. 1

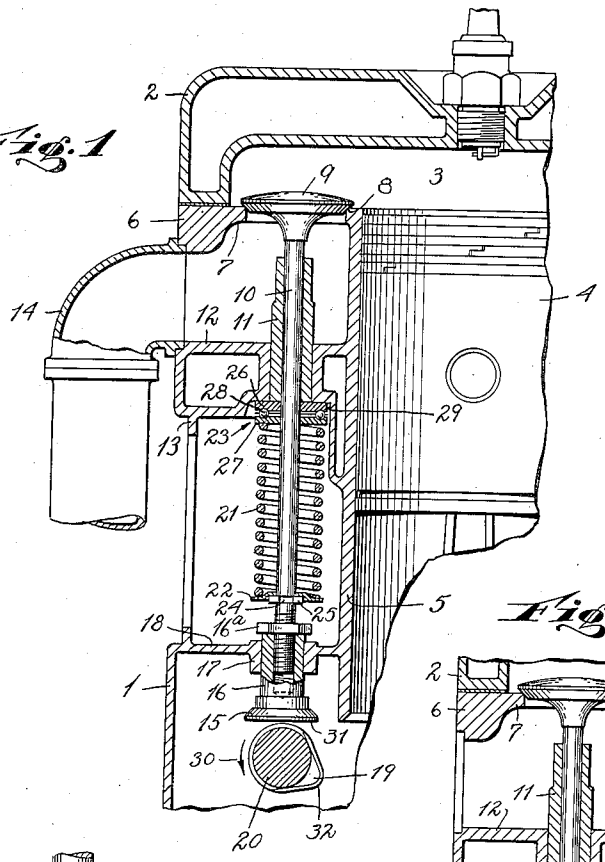


Fig. 2

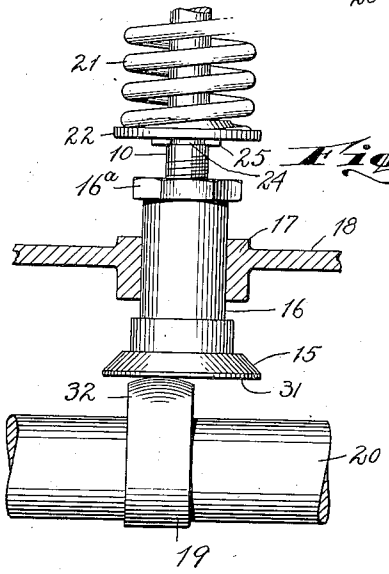
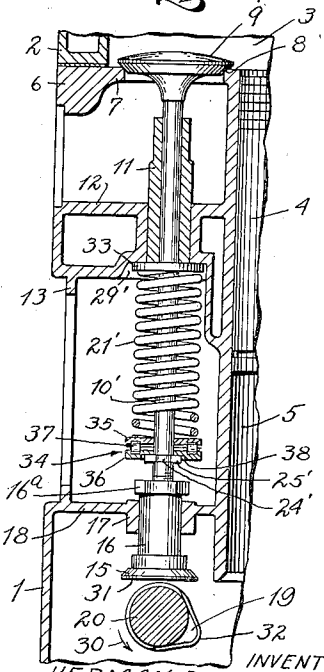


Fig. 3



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RECIPROCATING VALVE

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2 Claims. (Cl. 74—55)

This invention relates to valves in general and more especially to reciprocating valves for internal combustion engines.

Among the objects of the present invention, it is aimed to provide an improved reciprocating valve structure including means for rotating the same during action thereby continuously to change the contacting faces of the valve during action and especially the position of the valve head relative to the valve seat in order to effect an even wear of the active parts and to reduce the collection of carbon to a minimum.

It is still another object of the present invention to provide an improved rotatable reciprocating valve which will not only effect an even wear of the several contacting surfaces but also serve continuously to grind the valve head and valve stem relative to one another thereby to dislodge or liberate the carbon deposits as quickly as formed.

It is still another object of the present invention to effect the rotation of a reciprocating valve by positioning the actuating cam eccentric to the valve without the addition of any separate rotation effecting means.

It is still another object of the present invention to provide an improved rotatable reciprocating valve structure, the rotatable mounting of which and the rotation effecting means of which embrace a minimum number of parts, can be produced and assembled at low cost and can be equipped on existing structures without radical reconstruction if any.

These and other features, capabilities and advantages of the invention will appear from the subjoined detail description of specific embodiments thereof illustrated in the accompanying drawing in which

Figure 1 is a fragmental view in section of part of an internal combustion engine equipped with one embodiment of the present invention.

Fig. 2 is a fragmental side elevation of a portion of the valve structure shown in Fig. 1; and

Fig. 3 is a fragmental view in section of part of the internal combustion engine equipped with another embodiment of the present invention.

In the embodiment shown in Figs. 1 and 2, there is provided an engine casing 1 having a head 2 forming a firing chamber 3 above the piston 4 travelling within the cylindrical member 5.

The cylindrical member 5 is connected to the annular enlargement 6 at the upper end of the casing 1 on which the head 2 rests by the web 7 which is provided with an inlet having a valve seat 8 to receive the valve head 9 which is secured to the upper end of the valve stem 10.

The valve stem 10 is reciprocably mounted in the bushing 11 extending through and positioned in the chambered web portion 12 connecting the cylindrical wall 5 with the outer wall 13 of the casing 1.

The wall 13 of the casing 1 is preferably provided with an opening to receive the manifold conduit 14. The lower end of the valve stem 10 is preferably threaded to receive the shoe or tappet 15 which is provided with a cylindrical body 16 reciprocably guided in the enlargement 17 formed in the web 18 connecting the cylindrical wall 5 with the outer wall 13 of the casing 1.

In the present instance, the valve structure is caused to be reciprocated by a cam 19 engaging the lower face of the shoe 15, although it will be obvious that so far as concerns the present invention, the actuating means could just as well engage the upper end of the valve structure.

The cam 19 is adjustably mounted on the cam shaft 20 extending horizontally relative to the valve stem 10 for yieldably maintaining the valve head 9 in position on the valve seat 8, there is provided a tension spring 21 which is tensed between the disc 22 adjacent to the shoe 15 and a suitable rotatable bearing, such as a ball bearing or roller bearing, the ball bearing unit 23 being shown in the present instance.

For anchoring the disc 22 in place, the stem is preferably recessed at 24 to receive the split spring washer 25. The ball bearing unit 23 consists essentially of the two retaining plates 26 and 27 between which there are disposed the ball bearings 28.

The plate 26 in the present instance is disposed in the annular depression 29 formed at the lower end of the chambered web portion 12 while the plate 27 is engaged by the upper end of the spring 21.

From the foregoing it will be seen that if a rotative force is imparted to the lower end of the stem 10, the resistance offered by the pressure of the spring 21 through the ball bearing unit 23 on the fixed web portion 12 will be compensated by the ball bearing unit 23.

The shoe 15 in the present instance is screw threadedly connected to the lower end of the stem 10 and preferably has a lock nut 16a also screw threadedly connected to the lower end of the stem 10 which is positioned to engage the upper end of the shoe 15 and thereby determine its position.

For imparting a rotative force to the stem 10,

the cam 19 is disposed eccentric to the axis of the shoe 15 and therefore of the stem 10, see Fig. 2. It will also be seen that when the cam 19 is rotating in the direction of the arrow 30 indicated in Fig. 1 and the thread at the lower end of the stem 10 is a right handed thread as indicated, the cam 19 preferably engages the lower face 31 of the shoe 15 beyond the axis of the shoe 15 when looking at Fig. 1, or to the left of the axis of the shoe 15 when looking at Fig. 2.

The raised portion 32 of the cam 19 also is preferably convex as shown in Fig. 2 in order to accurately determine the point of contact of the cam 19 with the face 31 of the shoe 15. The angular velocity of the shoe 15 and therewith of the valve head 9 can with facility be regulated by changing the position of the cam 19 relative to the axis of the shoe 15 to effect a point of contact at various distances from the axis of the shoe according to the speed required.

From the foregoing, it will be seen that by merely positioning the cam 19 to effect a point of contact eccentric to the shoe 15 a rotative force may be imparted to a reciprocating valve without any additional parts, thereby in turn effecting an even distribution of wear on the active parts of a reciprocating valve and in turn also effecting a grinding action of the valve head 9 on the valve seat 8 to dislodge any carbon deposits as quickly as formed.

Preferably of course a rotatable bearing, such as a roller bearing or a ball bearing is used, see the ball bearing unit 23. The position of the same will of course depend upon the valve structure used.

In the embodiment illustrated in Fig. 3, a roller bearing unit is used instead of a ball bearing unit and is disposed below instead of above the tension spring.

In this second embodiment, the parts are substantially identical to similar parts of the embodiment of Fig. 1 with the exception of the following:—in the annular depression 29', there is located a single disc 33 to engage the upper end of the tension spring 21', the lower end of which engages the roller bearing unit 34 which consists essentially of an upper plate 35, a lower plate 36 and roller bearings 37 disposed therebetween, the lower plate having a recess 38 in the present instance to receive the split spring washer 25' which is disposed in the annular recess 24' in the valve stem 10'.

In this embodiment, it will of course be obvious that the spring 21' will tend to remain stationary while the stem 10' rotates with the lower plate 36 of the roller bearing unit 34 while in the embodiment illustrated in Fig. 1, the spring 21 will tend to rotate with the stem 10 and the lower plate 27 of the roller bearing unit 23.

It is obvious that various changes and modifications may be made to the details of construction without departing from the general spirit of the invention as set forth in the appended claims.

It is claimed:

1. A valve structure including a rotatably mounted valve tappet having a lower face, a cam shaft below said tappet, and a cam on said cam shaft offset longitudinally of the shaft from the center of the axis of the tappet and having a transversely arcuate periphery, the arc of the periphery being central of the width of the cam, said cam contacting with said tappet.

2. A valve structure including a rotatably mounted valve tappet having a lower face forming a plane surface at right angles to the axis of rotation of the tappet, a cam shaft below said tappet, and a cam on said cam shaft offset longitudinally of the shaft from the center of the axis of the tappet and having a transversely arcuate periphery, the arc of the periphery being central of the width of the cam, said cam contacting with said tappet.

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