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I. E. COFFEY

2,590,686

VALVE DEVICE

Filed Oct. 24, 1947

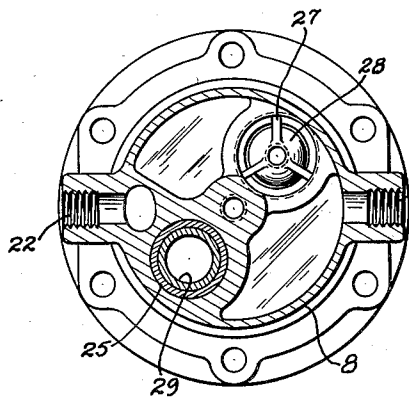


FIG. 2.

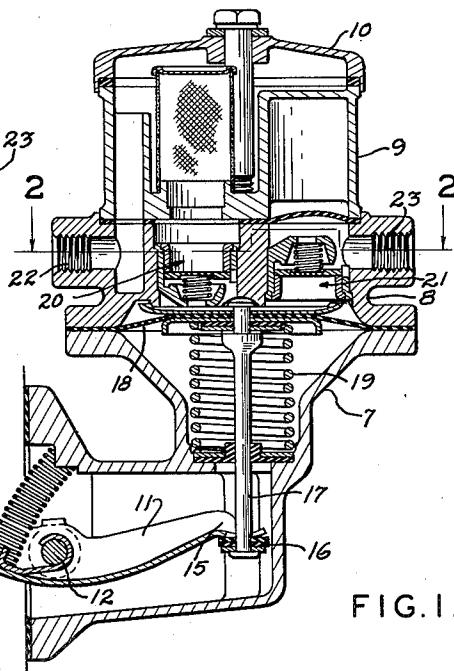


FIG. 1.

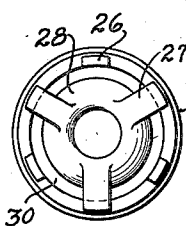


FIG. 3.

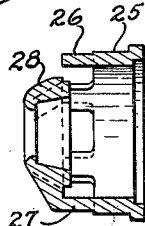


FIG. 4.

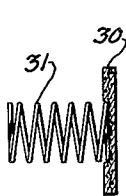


FIG. 5.



FIG. 6.

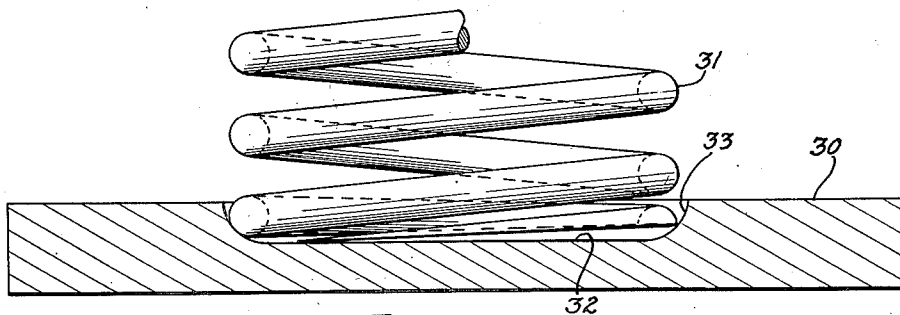


FIG. 7.

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2,590,686

VALVE DEVICE

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2 Claims. (Cl. 251—129)

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This invention relates to valve devices particularly of the type adapted for use with internal combustion engine fuel pumps.

Such pumps of the reciprocating type are provided with inlet and outlet check valves subject to rapid operation and hard usage. Light valve disks of hard plastic material have proven the most satisfactory, but with previous valve designs, the valves and valve seats, particularly on the inlet side, have been subject to uneven wear which seriously affects the operation of the pump. I have found that the life of this type of valve can be greatly increased by constructing the valve so as to utilize the torsional flexing of the valve seating spring to produce valve rotation and thereby distribute valve wear evenly upon the valve and seat.

Consequently, the main object of the present invention is to provide means for reducing the wear on the valve and valve seat.

Another object is to provide means for setting up rotational movement of the valve disk so as to distribute wear evenly thereabout.

These objects and other more detailed objects hereafter appearing are attained by the device illustrated in the accompanying drawing in which:

Fig. 1 is a vertical section through an automotive fuel pump embodying the invention.

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

Fig. 3 is a plan view of one of the valve devices disassembled.

Fig. 4 is a section through the valve cage, with the valve, spring, and seat removed.

Fig. 5 is a view of the valve and its operating spring disassembled.

Fig. 6 is a view of the valve seat disassembled.

Fig. 7 is an enlarged section illustrating the abutting portions of the valve and its operating spring.

The pump herein illustrated is further described and claimed in my Patent No. 2,426,965 and certain features of the valve construction are disclosed and claimed in my application Serial No. 610,526, filed August 13, 1945. The pump is of the reciprocating automotive type including casings 7, 8, and 9, and a cap 10 bolted to the latter. A lever 11 is pivoted at 12 to casing 7 and has an extremity 13 normally bearing against a cam 14 on the engine cam shaft. The other end of the lever is forked, as at 15, and bears against snubber structure 16 at the bottom of a stem 17 depending from and secured to diaphragm 18 for operation thereof. The diaphragm

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is constantly urged upwardly in the discharge direction by a coiled spring 19 seating within casing 7. Intermediate casing 8 houses inlet check valve 20 and outlet check valve 21 and is provided with inlet fitting 22 and outlet fitting 23. Upper casing 9 forms inlet and outlet air domes, as better illustrated in the above mentioned Patent No. 2,426,965.

The inlet and outlet valves are identical and only one will be described. Each includes a circular die cast member 25 having annularly arranged valve guides 26 and struts 27 supporting a valve stop and spring seating member 28. Valve seating element 29, conveniently of brass, is press fitted within circular member 25 and secures in position valve disk 30, of hard plastic material, and its operating spring 31 which, at its upper end, seats against stop 28.

The valve disk is provided with a spring seating central recess 32 having its circumference 33 curved about a radius substantially greater than the determining radius of the spring wire so that this circumference forms, in effect, an inclined surface against which spring 31 seats. During each opening of the valve disk, the abutting coil of spring 31 wedges against surface 33 and adheres thereto.

In operation, rotation of cam 14 causes sharp, intermittent downward movements of the diaphragm in the charging direction with intervening upward diaphragm movements in the discharging direction under the influence of spring 19. Each charging motion is accompanied by opening of inlet valve 20 compressing its spring 31 and each discharging motion causes opening of outlet valve 21.

Since spring 31 is subjected to slight torsional flexing during each compression, such flexing is transmitted as rotation to the valve disk. On the other hand, as the valve starts to close, the inertia of the spring relaxes the adherence between the disk and the lowest spring coil so that the return flexing of the coil spring is not transmitted to the disk.

This results in intermittent rotation of the valve disk, always in the same direction, so that wear is evenly distributed about the abutting surfaces of the valve disk and its valve seating member 29.

As a result, these surfaces will be perfectly flat and true after long service. In fact, I have observed valve seats worn as much as .080 against which the valve disk still seats perfectly.

The principle of the invention may be otherwise embodied as will occur to those skilled in the art and the exclusive use of all modifications as

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come within the scope of the appended claims is contemplated.

I claim:

1. A check valve assembly comprising a flow operated check valve and a valve seat therefor, a helically coiled spring compressed against said valve for urging the same against said seat, and a depression in the face of said valve for receiving said spring, said depression forming an annular surface directly engaging the end coil of said spring and inclined to the spring axis for wedging adherence to said spring during opening of said valve by flow pressure against said spring whereby the torsional flexing of said spring is transmitted to said valve.

2. A check valve assembly comprising a fluid pressure operated, light plastic valve and a valve seat therefor, a coil spring of uniform diameter compressed against said valve for urging the same against its seat, and an annular seat on said valve for said spring, said seat including a spring engaging surface of annular form with its circumference curved about a radius greater than the seating portion of said spring to form an inclined

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surface against which said spring seats, whereby said spring will engage said seat with a wedging adherence and transmit to said valve rotational movement due to torsional flexing.

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