Sept. 4, 1951 I. E. COFFEY 2,567,055

PUMP DIAPHRAGM ASSEMBLY

Filed Feb. 3, 1947

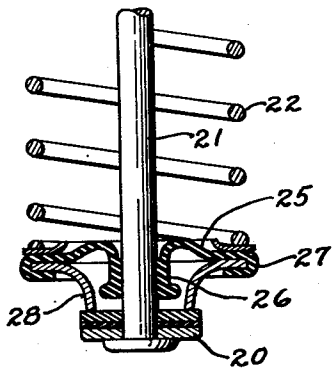


FIG. 2.

FIG. 1.

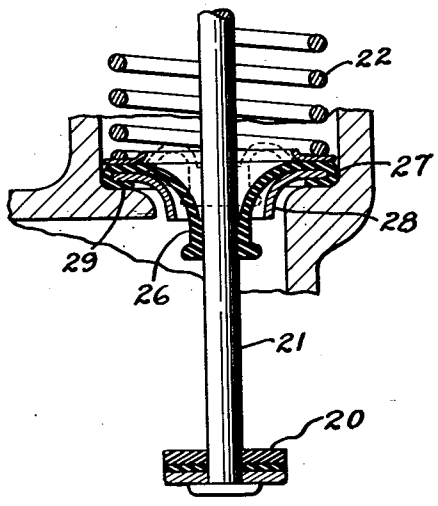


FIG. 3.

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Patented Sept. 4, 1951 2,567,055

UNITED STATES PATENT OFFICE

2,567,055

PUMP DIAPHRAGM ASSEMBLY

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Application February 3, 1947, Serial No. 726,186

4 Claims. (Cl. 103—150)

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This invention relates to fuel pumps of the reciprocating type for internal combustion engines and consists particularly in novel means for sealing the diaphragm chamber.

A familiar form of engine fuel pump has a reciprocating pressure producing diaphragm which is intermittently operated in the charging direction by a leverage arrangement actuated from the engine cam shaft and operated in the discharge direction by a spring so as to limit the discharge pressure in accordance with the spring tension. An opening must be provided in the wall of the engine crankcase for the actuating lever and the problem of sealing this opening to prevent the loss of oil from the engine and the entry of foreign matter into the engine has presented some difficulty. Furthermore, the diaphragm should be arranged for ready replacement.

Consequently, it is the main object of the present invention to provide novel means for sealing the diaphragm chamber from the engine.

Another object is to provide such a seal which does not interfere with or complicate the actuating leverage or diaphragm stem.

Another object is to provide a seal for the pump casing passage through which the actuating stem extends, which seal flexes in normal operation with the stem and diaphragm and which can readily adjust its position on the actuating stem so that the seal is not strained or slid along the stem during normal operation.

Another object is to provide a novel diaphragm assembly including a seal for the stem which also serves as a seat for the discharge spring.

Another object is to provide a novel diaphragm assembly which can be commercially distributed as a unit for ready replacement into a fuel pump.

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

Fig. 1 is a side view, partly sectioned, illustrating an automotive fuel pump embodying the invention.

Fig. 2 is an enlarged detail of the structure in Fig. 1.

Fig. 3 shows the detail in Fig. 2 but with the sealing collar adjusted toward its normal working position.

The fuel pump illustrated is, in general, of the type described and claimed in detail in a copending application, Serial No. 536,162, filed May 18, 1944, now Patent No. 2,426,965, in the name of the present inventor. The pump includes an

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upper casing 5 which encloses the inlet and outlet domes and is attached to an intermediate body member 6 provided with threaded inlet and outlet connections 7 and 8. An inlet check valve 9 and outlet check 10 are mounted adjacent these connections within passages leading to pump pressure chamber 11. A flexible diaphragm 12 is mounted between body member 6 and a lower body or casing 13 of elbow shape.

The lower arm of bottom casing member 13 is secured to the engine crankcase, indicated at 14, adjacent cam shaft 15. An operating lever 16 is pivoted at 17 to casing member 13 and has its left hand arm urged against a cam 18 formed on the cam shaft by a coiled spring 19. The opposite arm of lever 16 normally rests against an annular shoulder or anvil 20 at the lower extremity of an actuating stem 21 rigidly connected to the center of diaphragm 12 and depending through casing 13. The arrangement is such that lever 16 is alternately tilted in the clockwise direction by cam 18 so as to move diaphragm 12 downwardly or in the charging direction. The discharge movement of the diaphragm is produced by a coiled spring 22 bearing against the under surface of the diaphragm.

The lower extremity of coiled spring 22 seats against a collar 25 of generally conical form, conveniently of synthetic rubber, having a central nipple 26 which sealingly fits stem 21 but is slidable therealong. The periphery of collar 25 is folded over, as at 27 and is attached to a flared sleeve, housing, or open-bottom cup element 28 of rigid material. In the assembly view, Fig. 1, the outer edge of collar 25 rests against an internal, annular shoulder or ledge 29 formed in casing 13 between lower diaphragm chamber 30 and horizontal portion 31 provided for lever 16.

The diaphragm subassembly including the diaphragm, actuator stem, spring 22, and the sealing collar form a unit which may be readily removed from and applied to the pump. When the assembly is removed, spring 22 urges collar 25 downwardly so as to cause sleeve or cup 28 to bear against anvil 20 at the bottom of actuating stem 24, as indicated in Fig. 2. Thus, the assembly is maintained so that this part may be distributed commercially and handled as a unit by the servicing mechanic as well as in originally assembling the pump. When the unit is applied to the pump, collar 25 is applied against shoulder 29 and spring 22 compressed, sliding stem 21 downwardly through nipple 26 and causing the latter to assume its normally operating position. Thereafter, the nipple remains fixed on the stem and

the body portion of the collar flexes to accommodate the stem and diaphragm movements. Fig. 3 shows in solid lines the collar being slid along the stem to its working position and, in dotted lines, the collar flexed. With lever 16 in position, as indicated, the pump may then be affixed to the side of the engine in the usual manner.

Resilient collar 25, accordingly, tightly seals the restricted space in casing 13 to prevent the loss of oil from the engine and the entry of foreign material into the engine. Moreover, since nipple 26 remains seated when once adjusted, the seal is not affected by frictional wear nor does it interfere with the operation of the diaphragm or actuating lever nor with the ready assembly of these parts.

The invention may be modified in various respects as will occur to those skilled in the art and the exclusive use of all modifications as come within the scope of the appended claims is contemplated.

I claim:

1. In a fuel pump, a casing having a restricted portion with an internal ledge, a diaphragm extending across the casing at one side of said ledge, an actuator lever extending into said casing at the other side of said ledge, an actuating stem operatively connecting said diaphragm and said lever and having an enlarged extremity, a collar of resilient material sealingly fitting but slidable on said stem and with its periphery resting against said ledge, a coiled spring received about said stem and compressed between said collar and said diaphragm, and a flared sleeve secured to the periphery of said collar for engagement with the enlarged extremity of said stem to maintain the diaphragm and stem assembly when removed from the pump.

2. A diaphragm assembly for a fuel pump comprising a diaphragm, an actuator stem projecting therefrom, an actuating shoulder at the free end of said stem, a resilient collar sealingly but slidably received on said stem, a rigid flared sleeve with its outer edge secured to the outer edge of said collar, and a coiled spring compressed between said collar and said diaphragm and normally maintaining said sleeve seated against said actuating shoulder.

3. A diaphragm assembly for a fuel pump comprising a flexible diaphragm, an actuator stem rigidly attached to the center thereof and having an annular shoulder at its free end for cooperation with the pump actuator, a collar of resilient material slidably but sealingly received on said stem, a rigid cup also received about said stem and secured to the periphery of said collar, and a coiled spring compressed between said diaphragm and said collar and normally maintaining said cup in engagement with said annular shoulder whereby the assembly of said diaphragm stem and spring is maintained.

4. A diaphragm assembly for a fuel pump comprising a diaphragm, an actuator stem projecting therefrom, an actuating shoulder at the free end of said stem, a generally conical collar sealingly received on said stem but slidable therealong for self-adjustment in case of abnormal shifting of said stem relative to said collar, said collar having a flexible intermediate portion permitting normal stem actuation while said collar continues to grip said stem, a relatively rigid housing member arranged about said stem and fixed to the periphery of said collar and normally enclosing the base portion of said conical collar, said housing member being adapted to receive the reduced portion of said conical collar when the intermediate portion of the latter is flexed, and a coil spring arranged between the outer marginal edge of said collar and said diaphragm.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
2,057,624	Burkhart	Oct. 13, 1936
2,426,965	Coffey	Sept. 2, 1947