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FUEL PUMP WITH LOST MOTION LEVER

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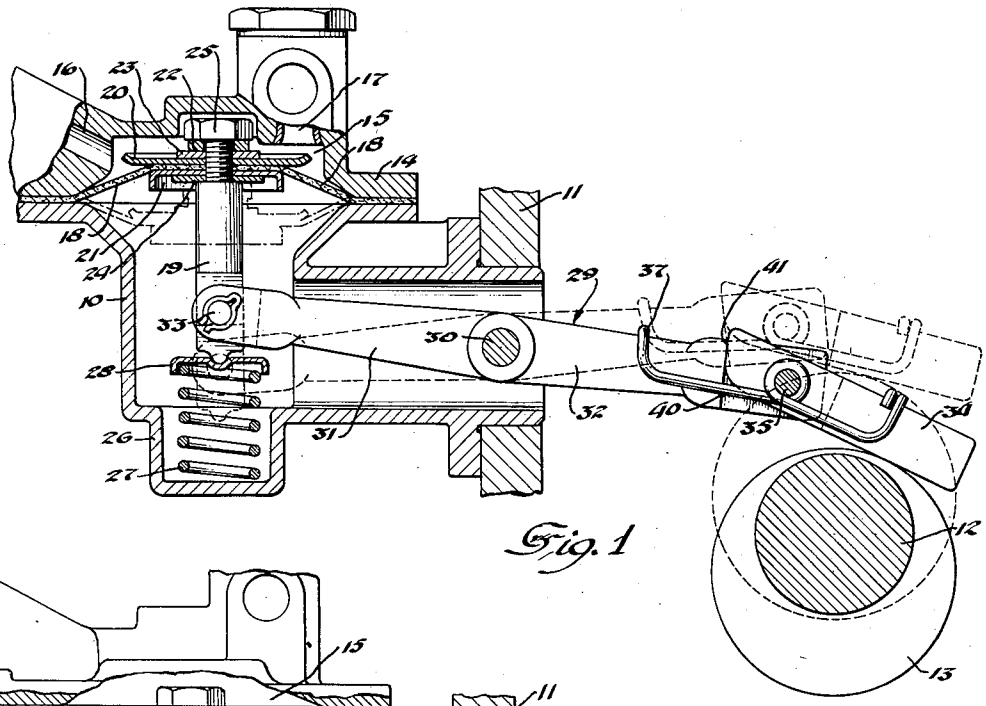


Fig. 1

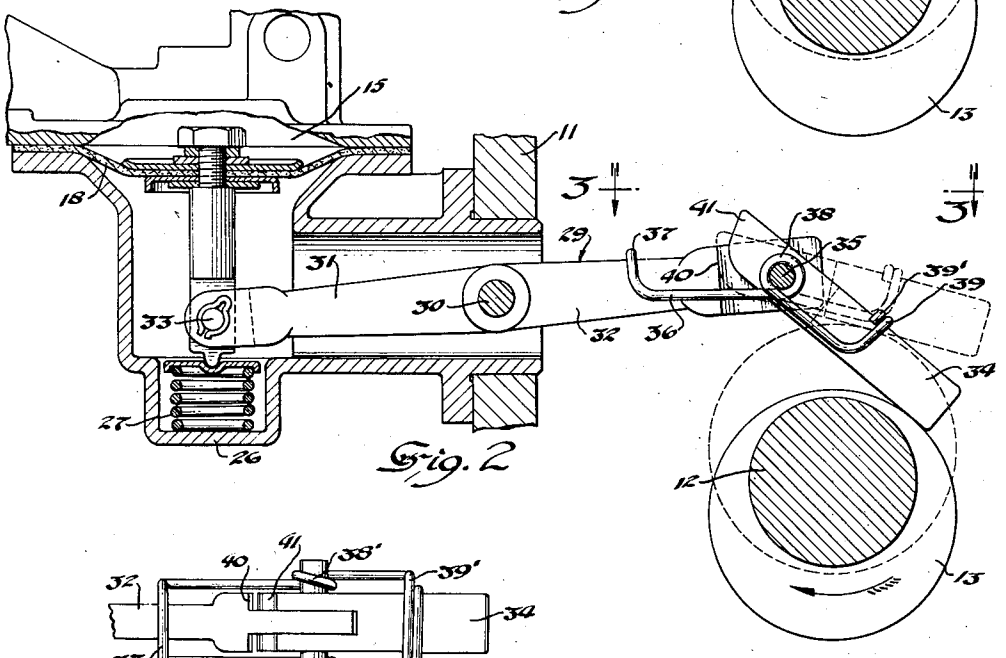


Fig. 2

Fig. 3

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FUEL PUMP WITH LOST MOTION LEVER

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As may be inferred from the above title, this invention relates to variable-stroke fuel pumps, preferably of diaphragm type, in which provision is made for the resilient advance of a reciprocatory pumping element,—the extent of a fuel-expulsive advance of said pumping element being dependent upon pressure conditions within a pump chamber, and the intake strokes thereof being produced by means including a special lever, whose ends are engaged by unequal springs of opposite tendency, or a lever provided with a special extension, as hereinafter described.

It is an object of this invention to simplify or shorten the main or engine-attached casting used in pumps corresponding in type to that disclosed in my pending application Serial No. 123,370 filed July 19, 1926; in preferred embodiments of this invention, dispensing with any thrust-refusing linkage between an actuating lever and a diaphragm stem, or the like, resilient advancing means for the mentioned diaphragm may be so employed as to act also upon said lever; and said lever may be so constructed or equipped as to avoid production of contact noises even during those periods wherein said diaphragm and said spring are held down by pressure built up within said pump chamber,—said lever comprising or being provided with a flexible section or extension which is pivoted to one arm thereof and is biased toward such a position as assures its remaining constantly in contact with any cyclically moving driven engine part from which pumping power or motion may be derived.

In pumps of the general character herein referred to, it has been common to employ a constantly reciprocated actuating lever, receiving motion from a cam and transmitting motion to a thrust-refusing linkage within the pump; but the present invention aims to reduce or obviate a futile rocking of any actuating lever, this object being effected, as above indicated, by interposing the lost-motion device between an arm of said lever and the constantly rotated cam, eccentric or other cyclically moving engine part suitable for conditionally actuating said lever.

Other objects of this invention, including simple but effective means for biasing a lever extension toward such flexure as assures constant engagement of a cam thereby, and including special stop means for providing a limit to a relative straightening movement between said lever and said extension, may be best appreciated from the following description of an illustrative embodiment of this invention, taken in connection with the appended claims and the accompanying drawing.

Fig. 1 may be referred to as a substantially median vertical section through a pump embodying the present invention,—this view showing, in full lines, the relative positions of parts upon completing an expulsion stroke during full-stroke operation.

Fig. 2 is a view similar to Fig. 1, but showing a pump diaphragm as held down by pressure within a pump chamber, lost motion then occurring between the extension upon the end of the actuating lever and a cyclically rotating cam element.

Fig. 3 is a detail view, taken substantially as indicated by line 3—3 of Fig. 2.

The illustrated pump comprises a main structural element 10, adapted to be secured to the casing 11 of an engine provided with a cyclically moving part,—such as a shaft 12 carrying a cam 13; and the main structural element 10 may cooperate with a subsidiary structural element 14 (shown as providing a pump chamber 15, an inlet passage 16 and an outlet passage 17) in the retention of a pump diaphragm member 18. The diaphragm 18 is shown as secured to a handling member in the form of a so-called diaphragm stem 19, by oppositely convex gripping elements 20 and 21, these being retained by means comprising washers 22, 23 and 24, and a nut 25; but these details are of very subordinate importance in connection with the present invention.

The main structural element 10 is shown as comprising, in the present instance, a single integral cup 26, for the reception of a compression spring 27, surmounted by a plate 28 and so engaging the diaphragm stem 19 as conditionally to impart expulsion strokes to the diaphragm 18; and, in order

to impart thereto variable intake stroke (the length of said strokes being dependent upon the pressure built up within the pump chamber 15) means such as a special actuating lever 29, shown as pivoted at 30 and as comprising arms 31 and 32, extending oppositely from said pivot, may be connected therewith,—as by means of a pivot pin 33.

In order to transmit motion from some suitable cyclically moving part, such as the cam 13, to the motion-receiving lever arm 32, the present invention contemplates the flexible connecting of a rigid extension 34 to the arm, as by means of a pivot pin 35,—this pin being preferably of such length as to project laterally in the general manner best shown in Figure 3; and, in order to bias the extension 34 toward flexure, resilient means, such as a spring 36 (shown as comprising a central loop 37, coils 38, 38′ surrounding the pin 35, and rebent terminal portions 39, 39′) may be so employed as to hold the free end or an intermediate portion of the extension 34 constantly in engagement with the cam 13, or its equivalent.

Interengaging portions of the lever arm 32 and the extension 34 being provided with cooperating stop elements such as a flat or slightly concave transverse surface 40 and a slightly convex or rounded surface 41, these stop elements may be so related as to predetermine a maximum angle between arm 32 and extension 34 and to prevent the mentioned parts from assuming a co-axial relationship. It will be accordingly seen that (assuming the spring 27, at the motion imparting end of arm 31, to be more powerful than the spring 36) during full-stroke operation, the extension 34 may be swung into and held in that angular relationship to the lever 29 whcih is shown in Fig. 1,—the stop surfaces 40 and 41 then remaining continuously in contact.

On the other end, whenever the pressure within pump chamber 15 rises to such a value as to hold the diaphragm 18 depressed, thereby retaining the lever 29 in the position in which it is shown in Fig. 2, continued rotation of the cam 13, or continued cyclical movement of any analogous driven part, can be effective only to oscillate the extension 34, or any corresponding element of a sectional lever 29, between such a position as that in which it is shown in full lines in Fig. 2 and such a position as that suggested by dotted lines in said figure; and any partial depression of the diaphragm 18 will be understood to produce an intermediate effect,—the length of the stroke imparted to the lever 29, and thereby to the stem 19 and the diaphragm 18 being thus dependent upon the level to which said diaphragm may have been depressed.

Although the foregoing description has included but one complete embodiment of this invention, it will be understood not only that various features thereof might be independently employed but also that numerous modifications of said features might easily be devised, without involving the slightest departure from the spirit and scope of this invention, as the same is indicated above and in the following claims.

I claim:

1. In combination with a fuel pump having a reciprocable pumping member resiliently advanced in one direction, means for conditionally imparting movement thereto from a rotating cam in the opposite direction comprising a lever operably connected at one end to said pumping member, and a cam-engaging extension pivotally connected to the other end of said lever with resilient means to hold said extension in constant engagement with said cam and means to limit pivotal movement of said extension relative to said lever.

2. In combination with a fuel pump having a reciprocable pumping member resiliently advanced in one direction, means for conditionally imparting movement thereto from a rotating cam in the opposite direction comprising a lever operably connected at one end to said pumping member, and a cam-engaging extension pivotally connected to the other end of said lever with resilient means to hold said extension in constant engagement with said cam and means to limit pivotal movement of said extension relative to said lever, comprising interengaging portions so located as to prevent said lever and extension from assuming a co-axial relationship.

3. In combination with a fuel pump having a reciprocable pumping member resiliently advanced in one direction, means for conditionally imparting movement thereto from a rotating cam in the opposite direction comprising a lever pivoted intermediate its ends with a motion-imparting arm operably connected to said pumping member and a motion-receiving arm, and a cam-engaging extension pivotally connected to said motion-receiving arm and limited in its pivotal movement relative thereto with spring means interposed between said motion-receiving arm and said extension to maintain constant engagement of the latter with said cam.

4. In combination with a fuel pump having a reciprocable pumping member resiliently advanced in one direction, means for conditionally imparting movement thereto from a rotating cam in the opposite direction comprising a lever pivoted intermediate its ends with one end operably connected to said pumping member and the other end provided with a rigid cam-engaging extension having limited movement relative to said end with resilient means to maintain said extension in constant engagement with said cam.

In testimony whereof I affix my signature.

ABRAHAM M. BABITCH.