July 18, 1933. E. A. ROCKWELL 1,919,040

FUEL PUMPING DEVICE FOR INTERNAL COMBUSTION ENGINES

Filed July 2, 1928

Fig. 1.

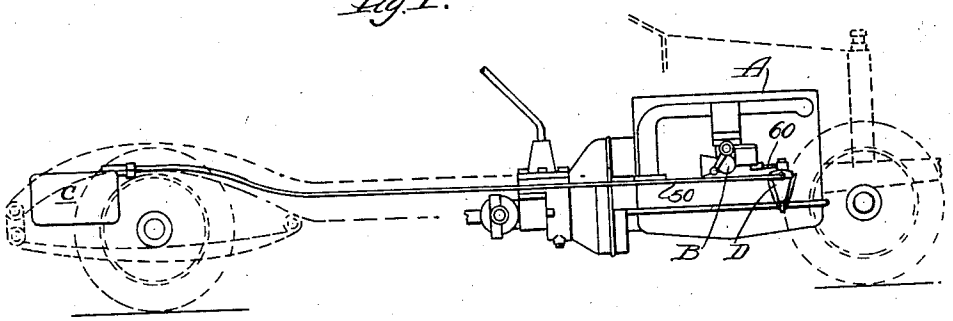
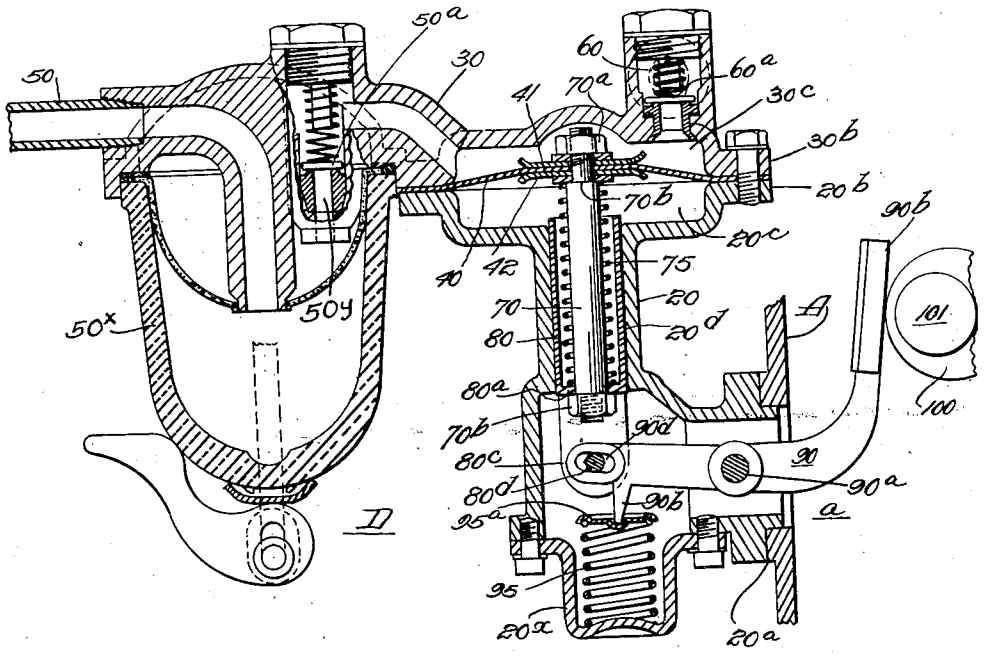


Fig. 2.



Witness.

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Patented July 18, 1933 1,919,040

UNITED STATES PATENT OFFICE

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FUEL PUMPING DEVICE FOR INTERNAL COMBUSTION ENGINES

Application filed July 2, 1928. Serial No. 289,694.

The purpose of this invention is to provide an improved construction of a pumping device for supplying fuel to the carbureter of an internal combustion engine. It consists in the elements and features of construction shown and described as indicated in the claims.

Mechanically driven fuel pumps have been designed for feeding fuel at a constant pressure from the supply tank to the carbureter in which the pumping element, generally in the form of a diaphragm, is given a substantially positive suction stroke to produce the high suction required to draw the fuel from the supply tank and a resiliently produced discharge stroke which may be variable in accordance with the flow permitted by the action of the delivery pressure opposing the force of the resilient discharge means, and such pumps have included a pump casing adapted to be mounted on an engine casing adjacent an aperture thereof in a simple and efficient manner so that the pump may be operated through a constant stroke reciprocable lever carried by the pump casing arranged to have a protruding arm thereof in thrust engagement with an engine driven cam within the engine casing with a lost motion connection between the other arm of the lever and a stem connected to the diaphragm. It is also old in a pump construction to use an interposed spring in the operating connection which, upon yielding, will limit the discharge impulse subjected to the pumping element.

It is a purpose of the present invention to provide a fuel pump construction in which the diaphragm is given a positive suction stroke and a resiliently limited discharge stroke through the use of an interposed compression spring and to additionally employ a second compression spring acting upon the operating lever in such a manner as to maintain the lever in thrust engagement with the engine driven cam for its full stroke during the inactive phase of the cam and arranged to produce the discharge stroke of the pumping diaphragm by acting through the interposed compression spring. In the operation of a pump of this type, the suction will always be produced positively while the discharge will be produced resiliently by a first compression spring and resiliently limited by a second compression spring. It is also desirable to so arrange the discharge limiting spring that the friction of the part guided by the pump casing will not detract from the force of the limiting spring.

In the drawing:

Figure 1 is a diagrammatic view showing the location of the pumping device with respect to the engine carbureter and the fuel source on an automobile.

Figure 2 is an axial section of the pumping device, this section extending to include the adjacent portion of the engine body upon which the pumping device is mounted.

In the construction shown in the drawing, the engine body is indicated at A, the carbureter at B, the fuel source at C, and the pumping device in its entirety at D.

The pumping device comprises a casing structure consisting of two members, 20 and 30. The member, 20, is adapted to be mounted upon the body of the engine to be served, as seen at 20^a, having its cavity communicating with the cavity, *a*, of the engine body. Said member, 20, and the member, 30, are formed with mated flanges, 20^b and 30^b, encompassing cavities, 20^c and 30^c, of said casing members respectively, said flanges being adapted for clamping between them a flexible diaphragm, 40, which constitutes a moving wall of the chamber formed by the cavity, 30^c, hereinafter referred to as the pumping chamber. Said pumping chamber is connected for receiving fuel supply from the fuel source by a conduit, 50, which as shown comprises a sediment cup, 50^x, of well understood construction not a part of this invention and requiring no specific description, in which conduit, and as shown in the outflow passage, 50^y, of the sediment cup,—there is interposed a check valve, 50^a, opening for inflow to the pumping chamber and seating against reverse flow. The pumping chamber is further connected by a pipe, 60, leading to the carbureter in which there is interposed a valve, 60^a, opening for outflow from the pumping chamber and seating against re-

verse flow. For operating the diaphragm, 40, to flex it alternately in the directions for enlarging and reducing the pumping chamber, said diaphragm is provided with a two-membered stem, of which one member, 70, is positively connected to the diaphragm at the center thereof where said stem serves also for clamping a central area of the diaphragm between disks, 41 and 42, the clamping being effected by a nut, 70^a, screwed onto the end of the stem member, 70, above the disk, 41.

The other stem member, 80, is tubular, that is, axially hollow, and is afforded slide bearing at 20^d in the casing member, 20. This stem member is connected at its lower end, as seen at 80^c, with the inner end of a lever, 90, fulcrumed at 90^a, in the casing member, 20, and protruding from the casing member into the engine casing where its terminal, 90^b, is positioned for actuation by a cam, 100, on a rotating shaft, 101, of the engine. The stem member, 70, is telescoped within the stem member, 80, the latter having inwardly struck stop lugs, 80^a, past which the lower end of the stem member, 70, protrudes, and below which said stem member, 70, is furnished with a stop nut, 70^b, co-operating with the lugs, 80^a, of the stem member, 80, for limiting the extension of the total stem consisting of said two members. Within the stem member, 80, and around the stem member, 70, there is positioned a coil spring, 75, which is initially conditioned by compression for reacting at its upper end against the under side of the diaphragm, 40, and at its lower end against the stop lugs, 80^a, for holding the two-membered stem extended to the limit determined by the co-operating stops, 80^a and 70^b.

It will be understood from the foregoing description that the lever, 90, is actuated positively by the cam, 100, in the direction for flexing the diaphragm, 40, downwardly, that is, for giving said diaphragm its pumping-chamber-enlarging movement; and that for communicating this pumping chamber-enlarging movement, the two-membered stem is positively actuated in the direction for extending the stem to the limit determined by the co-operating stops, 80^a and 70^b, to which limit, however, the stem is already extended by the reaction of the spring, 75, conditioned in the assembling of the parts by compression for thus reacting with predetermined force; so that in the chamber-enlarging movement of the diaphragm the two-membered stem operates as a rigid unit, its two members and the spring which reacts between them for holding the stem extended being all moved together positively by the positively actuated lever, 90.

For giving the lever, 90, its return movement there is provided a spring, 95, seated in a cap, 20^x, removably secured at the lower end of the casing member, 20, and having at its upper end a cap, 95^a, for seating a downwardly extending projection, 90^b, of the lever, 90, said spring being conditioned by compression for normally reacting upwardly against the arm of the lever which engages the diaphragm stem, with predetermined force in excess of that needed to give the diaphragm its chamber-reducing movement for feeding the fuel to the carbureter. For accommodating the arcuate movement of the lever at the end which engages the diaphragm stem, the lever is slotted, as seen at 90^d, for engaging the pivot pin, 80^d, by which it is connected to the sleeve member, 80.

From the foregoing description it may be understood that the spring, 95, is conditioned by compression for reacting with greater force than the spring, 75, which normally holds the two-membered stem extended to the limit of the stops; but that the force with which the diaphragm performs its chamber-reducing fuel feeding movement is determined by the reaction for which the spring, 75, is conditioned by its initial compression in the assembling of the parts; so that when the carbureter float bowl and the connections thereto from the pumping chamber are filled, preventing the feeding movement of the diaphragm, the spring, 75, yields, permitting the stem members to telescope with each other for reducing the effective length of the stem, in which operation the reaction of the spring, 75, against the diaphragm becomes the limit of the force by which the fuel is fed to the carbureter.

I claim:

1. In a pumping device for supplying fuel to an internal combustion engine, a pumping element and operating connections thereto comprising a lever arranged for positive actuation in one direction only at one end, and connections from the other end to the pumping member, said connections comprising a spring by which the connections are normally extended to a predetermined limit, said extension being in the direction from the point of engagement of the lever corresponding to the feeding movement of the pumping member, and a spring reacting on the lever in the opposite direction from its positive actuation and in the direction for said feeding movement of the pumping member, the last mentioned spring being constructed for reacting on the lever and through the lever on the first mentioned spring and through said first mentioned spring on the pumping member, the second mentioned spring being conditioned for reacting more forcibly than the first mentioned spring.

2. A fuel pump for internal combustion engines comprising a pump casing adapted to be mounted on an engine casing adjacent an aperture thereof, a pumping diaphragm within said casing adapted to cooperate with a pumping chamber on the upper side there-

of, a depending stem secured to said diaphragm, an operating lever pivotally carried by said pump casing, said lever having an intermediate fulcrum on said pump casing, said lever having one arm arranged to extend into said engine casing and engage an engine driven cam, a lost motion connection between the other lever arm and said depending stem, said connection operating positively to produce a positive suction stroke of said diaphragm when said lever is positively moved by said cam, an interposed spring between said lost motion connection and said diaphragm for limiting the discharge impulse by allowing a variable discharge stroke through compression of said spring, a second compression spring supported by the bottom of said pump casing and acting upwardly upon said last mentioned lever arm with an effective force sufficient to overcome said interposed spring for producing the discharge stroke of said diaphragm through said interposed spring and maintaining the thrust engagement between said lever and the engine driven cam.

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