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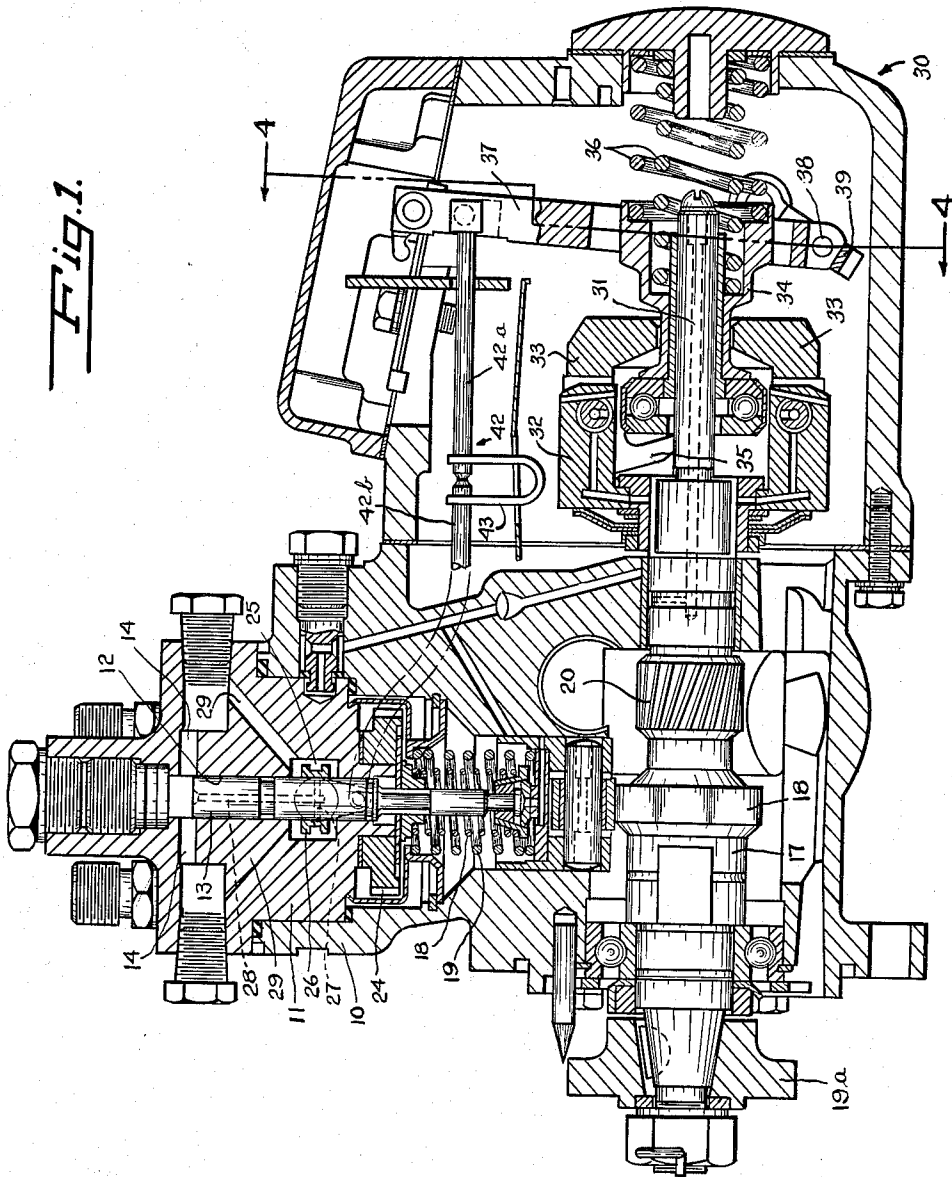
3,096,716

CONTROL ROD FOR FUEL INJECTION PUMP

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3 Sheets-Sheet 1

Fig. 1.



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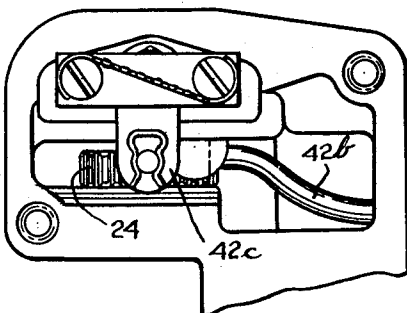
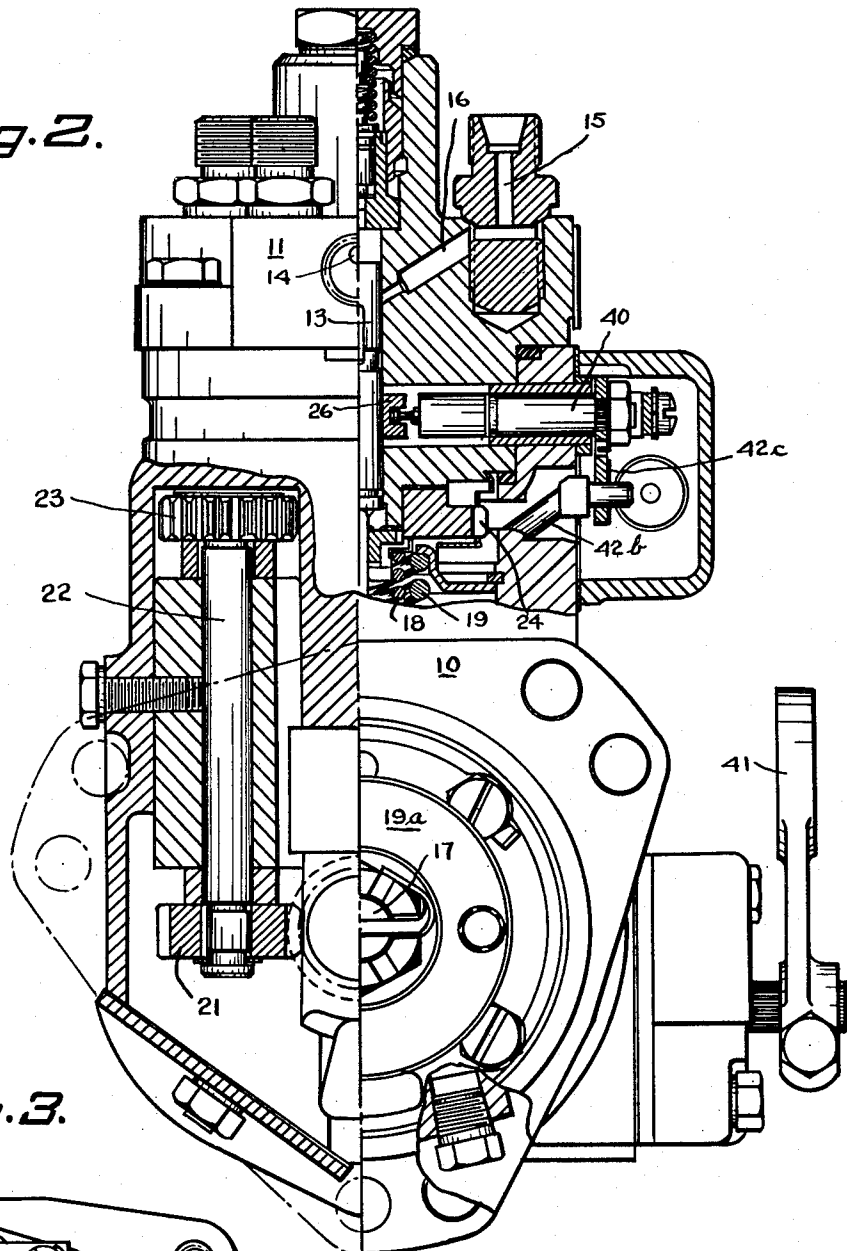
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

Fig. 5.

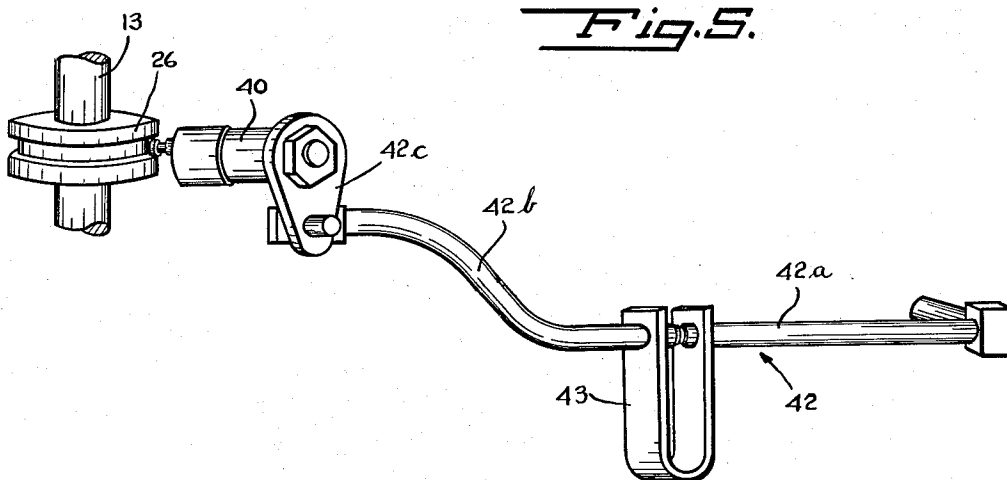
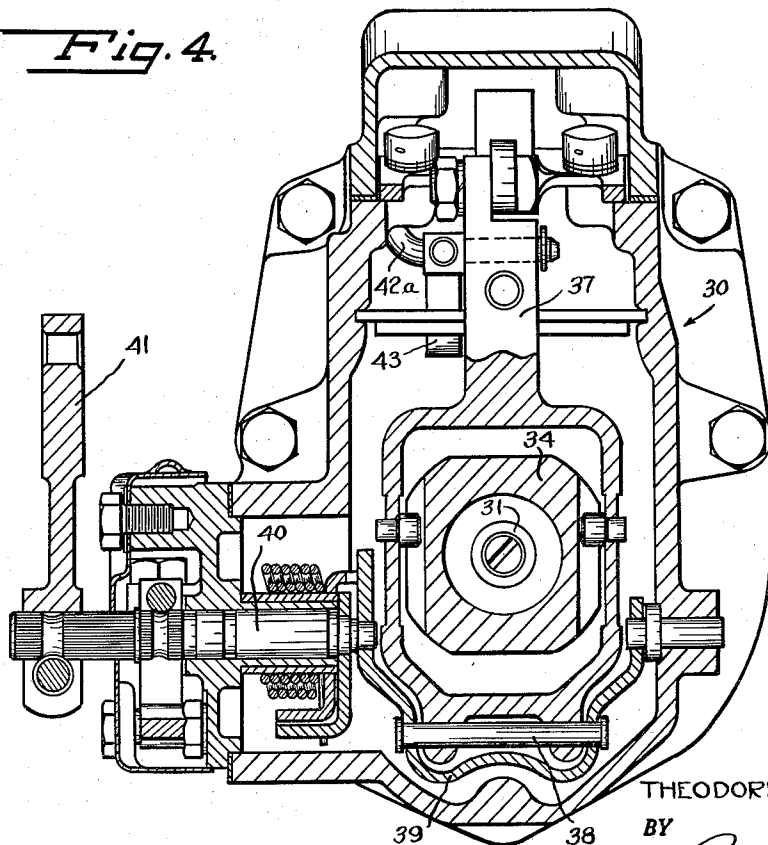


Fig. 4.



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1

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CONTROL ROD FOR FUEL INJECTION PUMP

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3 Claims. (Cl. 103—37)

This invention relates to fuel injection pumps and has particular reference to the provision of a new and improved fuel injection pump having means for increasing fuel delivery by the pump as the fuel temperature increases. An object of the invention is to provide a fuel injection pump having temperature compensating means for controlling the fuel delivery according to pump and/or fuel temperature.

Another object is to provide a new and improved device of the type set forth which is relatively simple and economical in construction, yet efficient in operation.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings, wherein the invention has been shown applied to a distributor-type pump for the purpose of illustration only.

Referring to the drawings:

FIG. 1 is a longitudinal sectional view of a distributor-type fuel injection pump embodying the invention;

FIG. 2 is an end view thereof, partially in section;

FIG. 3 is a fragmentary view thereof;

FIG. 4 is a sectional view taken on line 4—4, looking in the direction of the arrows; and

FIG. 5 is a fragmentary view showing the temperature compensating means employed.

Referring more particularly to the drawings wherein similar reference characters designate corresponding parts throughout, the pump shown embodying the invention is of the distributor type wherein a single pumping element is employed together with a distributor for pumping and distributing fuel to a plurality of outlets and combustion chambers successively. While the invention has been shown applied to such distributor-type pump for the purpose of illustration, it is understood that the invention could be applied to other forms of injection pumps, such as that shown in Patent No. 1,944,858 of January 23, 1934 to Baur, with equal effectiveness.

The form of the pump shown embodying the invention comprises a housing 10 in which is positioned a hydraulic head 11 having a bore 12 containing the pumping and distributing member 13.

The hydraulic head 11 is also provided with the fuel inlet passages 14 for supplying fuel to the bore 12, and said bore 12 communicates with each of the outlets 15 by means of a fuel passage 16, whereby fuel pumped and distributed by the pumping and distributing member 13 will be supplied through the outlets 15 to each of the combustion chambers of an internal combustion engine successively.

In the housing 10 beneath the pumping and distributing member 13 is journaled the cam shaft 17 having the gear 19a for operative connection to the engine for driving the pump, and said cam shaft 17 is provided with the cam lobes 18 for urging the pump and distributing member 13 on its pumping stroke and the suction or return stroke of said pumping and distributing member 13 is effected by means of the springs 18 and 19.

The pumping and distributing member 13 is, therefore, reciprocated upon rotation of cam shaft 17 and is adapted to be rotated simultaneously with said reciprocation through the gear 20 which meshes with gear 21, which is keyed on shaft 22 and which is provided with gear 23 which, in turn, meshes with gear 24, which is keyed to pumping and distributing member 13.

2

The hydraulic head 11 is provided with the spill sump 25 in which is positioned the sleeve 26 surrounding pumping and distributing member 13 and controlling the spilling of fuel through radial spill passages 27, which communicate with bore 12 through axial fuel passage 28.

The quantity of fuel injected by the pump is controlled through control of the quantity of fuel spilled through passages 27 into sump 25, from which said spilled fuel returns through passages 29 to the fill ports 14.

The speed of operation of the pump and the engine supplied thereby is controlled through the governor designated generally at 30, and which comprises governor shaft 31 on which is mounted a spider 32 having the centrifugal weights 33 pivotally connected thereto, with said spider 32 and weights 33 adapted to be rotated upon rotation of said shaft 31.

On shaft 31 is provided the governor sleeve 34, which is adapted to be moved in one direction by the fingers 35 on the weights 33 and in the opposite direction through governor springs 36, which oppose the movement of said sleeve 34 through the weights by centrifugal force.

The governor lever 37 is connected to governor sleeve 34 and is also connected through pivot 38 to yoke 39.

The setting of the governor is controlled through shaft 40 and operating lever 41.

The fuel injection pump and governor are generally similar to those shown in Patent No. 2,518,473 to Hogeman et al., to which reference may be made for further details of construction.

The relation between sleeve 26 and radial spill ports 27 is controlled by governor lever 37 through linkage 42, which is connected at its opposite ends to said sleeve through shaft 40 and to said governor lever 37.

Control lever or link 42 is provided in two sections 42a and 42b, with the adjacent ends of said sections being connected to thermostatic or bimetallic member 43. The ends of said sections 42a and 42b preferably extend through openings in said member 43 and are brazed or otherwise secured thereto.

As will be seen from FIGS. 1 and 2, the link 42 is positioned within the pump housing or casing and is, therefore, subjected to the temperature of the pump casing and the temperature of the lubricating oil splashed on to the link 42 during operation of the pump.

The ends of abutting sections 42a and 42b are preferably in abutment or abutting relation, as shown in FIGS. 1 and 5, when the apparatus is subjected to normal room temperatures, such as from 70° F. to 80° F. In this manner, delivery is not affected when the pump is operated in temperatures lower than normal room temperature.

During operation of the pump assume that the temperature of the apparatus and fuel increase above the 70° F. to 80° F. range indicated above as a result, for example, of conducted and radiant heat from the engine and recirculation of the fuel through the pump. Accordingly the member 43 effects a separation of the sections 42a and 42b, thereby changing the effective length of rod or linkage 42 whereby the sleeve 26 is moved axially relative to the pumping member 13 in a direction to increase the total quantity of fuel delivered thereby. This arrangement compensates for reduction in liquid fuel delivered by the pumping member due, for example, to its decreased viscosity at higher temperature which results in increased leakage past pumping member 13.

It is pointed out that the amount of the compensation can be controlled by the type of thermostatic or bimetallic element 43 employed or by other adjustments, such as locating the sections 42a and 42b at various positions on said member 43.

From the foregoing it will be seen that I have provided new and improved means for obtaining all of the objects and advantages of the invention.

I claim:

1. In a device of the character described, a pumping member, means for controlling the fuel quantity delivered from said pumping member, said means including a rod and thermally actuated means for varying the effective length of said rod, said means comprising a pair of separate rod portions and a thermally actuated member connecting said rod portions with the adjacent ends of said rod portions being in abutting relation at a temperature in the range of from about 70° F. to 80° F.

2. In a device of the character described, a pumping member, a governor, a control rod connected to said governor for controlling the quantity of fuel delivered by the pump, said rod comprising a pair of rod sections and thermally actuated means connecting said rod sections and adapted to be thermally actuated to vary the effective length of said rod and the adjacent ends of said rod sections in abutting relation at a temperature in the range of from about 70° F. to 80° F.

3. In a device of the character described, a pumping member, a governor, a control rod comprising a pair of rod sections connected to said governor for controlling

the quantity of fuel delivered by the pump, thermally actuated means connecting the adjacent ends of said rod sections in abutting relation at a temperature in the range of from about 70° F. to 80° F., said thermally actuated means adapted to vary the effective length of said rod to vary fuel delivered by the pump when the temperature is above said range.

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