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FUEL INJECTION SYSTEM FOR COMPRESSION IGNITION ENGINES

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Fig. 1

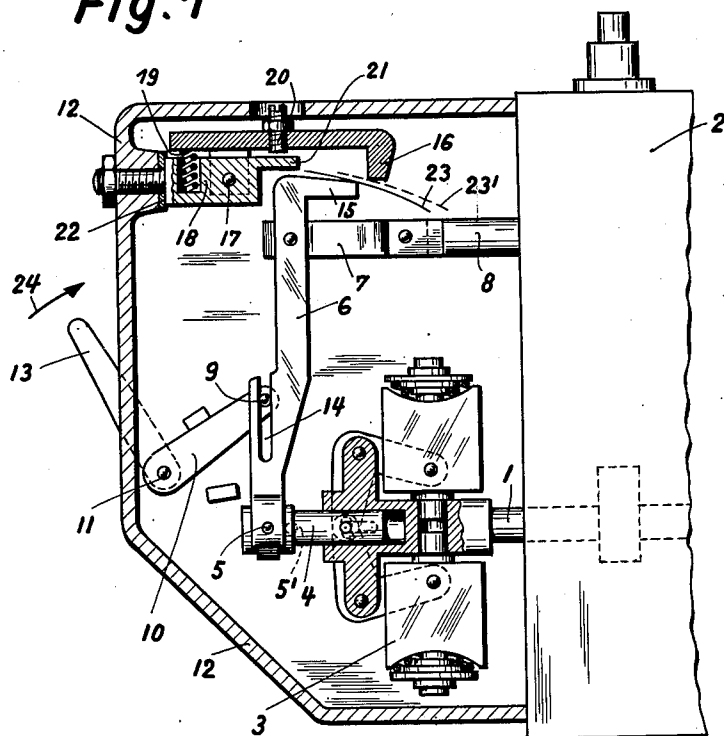
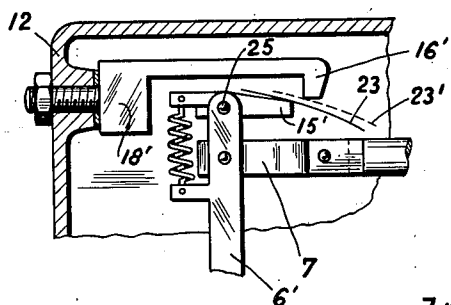


Fig.2



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FUEL INJECTION SYSTEM FOR COMPRESS-
SION IGNITION ENGINESJohannes Weber, Stuttgart-Feuerbach, Germany,
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3 Claims. (Cl. 123-140)

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The invention relates to a fuel injection system for compression ignition engines of the kind embodying a speed governor having an adjustment member or sleeve which with decreasing engine speed tends to move a control rod arrangement, which determines the supply quantity adjustment of the injection pump and which includes an intermediate lever which co-operates with a stop member for limiting the full load fuel quantity, which lever is also engaged by a second optionally actuatable adjustment member for altering the fuel supply quantity such that on movement of either of said adjustment members the point of engagement of the other serves as a fulcrum for the intermediate lever.

The object of this invention is to provide a device for a fuel injection system which limits the full load fuel quantity and which for the purpose of simplifying the starting operation of the compression ignition engine enables a supply of fuel to the engine to be obtained in excess of the full load quantity on the starting operation only and not during the continued operation of the engine. A number of devices are already known which solve this problem. In these devices, however, it is necessary for the driver to carry out a particular manipulation on the installation before the actual starting operation. Therefore, a further object of this invention is to provide a device which makes it unnecessary for the driver to carry out this manipulation as it operates automatically.

According to the invention this problem is solved by so positioning a part of the rod arrangement, which co-operates with the full load stop member, on the intermediate lever and as remote as possible from the point of engagement of the lever with the adjustment member of the centrifugal governor that when moving the optionally actuatable adjustment member to effect a large supply quantity from a position which it assumes only when the engine is at a standstill or is running not faster than starting speed, the part of the rod arrangement co-operating with the full load stop member moves past the latter, thus enabling the adjustment of a supply quantity exceeding that of the full load quantity only in this lower engine speed range.

The invention is further described with reference to the accompanying drawing, which illustrates, more or less diagrammatically, two embodiments of the invention by way of example, and in which

Fig. 1 is a side elevation, partly in section, of one embodiment of the invention, and

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Fig. 2 is a similar fragmentary view of another embodiment.

Referring to the drawings, mounted on the cam shaft 1 of an injection pump 2, which is only partially shown, is a centrifugal governor 3. The sleeve 4 of the governor which acts as an adjustment member is connected to an intermediate lever 6 by means of a pin 5. The lever 6 is flexibly or pivotally connected by means of a lug 7 with the regulating or control rod 8 of the injection pump which serves for varying the quantity of fuel delivered by the pump. When the lever 6 is moved by the displacements of the governor sleeve 4 it turns about a pin 9 which is fixed at one end of a lever 10. This lever is disposed on a shaft 11 mounted in a casing 12 which encloses the entire regulating device. The shaft 11 together with the lever 10 thereon and a hand lever 13, which is mounted on the shaft outside the casing, form an optional adjustment member for use when required for varying the fuel supply quantity. When moving the adjustment lever 13, the pin 9 is displaced in a guide slot 14 of the intermediate lever 6 thereby moving the latter about the pin 5 on the governor sleeve 4.

The end of the intermediate lever 6 remote from the governor sleeve has a projection 15 which co-operates with a stop member 16 for limiting the full load fuel quantity. This stop member 16 is pivotally mounted about a fulcrum 17 in a support 18. A spring 19 tends to urge the stop member 16 about its fulcrum 17 so as to cause an adjustment screw 20 carried by the stop member 16 to abut against an extension 21 of the support 18.

The support 18 is fixed in the casing 12. By placing shims or washers 22 of varying thickness between the support 18 and the casing 12 the position of the support 18 together with the stop member 16 can be altered so as to adjust the maximum full load quantity delivered by the injection pump.

In the drawing, the parts of the fuel regulating device and also the centrifugal governor are shown in the positions they assume when the compression ignition engine is at a standstill. If the actuating lever 13 is moved in the direction of the arrow 24, then the projection 15 of the intermediate lever 6 describes an arc, shown at 23 in full lines, about the pin 5. The projection 15 of the lever can move underneath the stop member 16. Thus, the control rod 8 can be adjusted to a position in which it provides for a

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supply quantity exceeding that of the full load quantity.

During the operation of the compression ignition engine the pin 5 may take up the position indicated, for example, by the dotted circle 5'. On moving the actuating lever 13, the intermediate lever 6 pivots about 5' and the projection 15 of the intermediate lever describes the arc indicated at 23' in dotted lines. As shown in the drawing, this arc 23' intersects the stop member 16, so that the intermediate lever 6 can only be moved up to a position where its projection 15 abuts against the stop member 16, i. e. only to the full load position. The parts of the installation are so dimensioned that the pin 5 assumes the position 5' or a position still closer to the injection pump as soon as the compression ignition engine reaches a speed exceeding the starting speed, that is the position 5' is reached at the latest at idling speed.

The mode of operation is as follows:

In order to start the engine, the driver moves the hand lever 13 in the direction of the arrow 24 and thus adjusts a supply quantity exceeding the full load quantity which is favourable for the starting operation. If the engine has started, the pin 5 assumes the position 5' or a position lying further to the right. Since in this position of the pin, as explained above, the projection 15 moves along the arc 23', the projection will lift the stop member 16 when the engine starts, the stop member turning about its fulcrum 17 against the resistance of the spring 19.

The driver then returns the lever 13 to the no-load position or to an operational position lying below the full load position. Subsequently, the intermediate lever 6 pivots about the pin 5, which is now at least in its position 5', and the projection 15 by lifting the stop member 16 slides under the latter. The spring 19 now returns the stop member 16 downwardly to its operative position in which it limits the full load quantity. The adjusting screw 20 serves the purpose of adjusting the stop member 16 to such an extent that the projection 15, when the engine is running at starting speed, is just able to move under the stop member 16 without touching it.

It is thus impossible, after starting the engine and during its operation, to adjust a supply quantity which exceeds the full load quantity. This can only be carried out after the engine has been stopped.

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Fig. 2 shows a modified form of the invention in which the stop member 16', instead of being pivoted, is made in one piece with the support 18' and firmly secured to the casing 12, and the projection 15' is pivotally mounted about a fulcrum 25 on the intermediate lever 6'.

I claim:

1. In a fuel injection system for compression ignition engines embodying a fuel injection pump, a stop member for limiting the full load fuel supply quantity of the pump, a control rod arrangement which includes an intermediate lever, a speed governor having an adjustment member, such as a sleeve, connected to said intermediate lever and adapted, with decreasing engine speed to move said control rod arrangement towards and against said stop member for limiting the full load fuel quantity, a second adjustment member optionally actuable for varying the fuel supply quantity and also connected to said intermediate lever such that a movement of either of said adjustment members the point of engagement of the other with the intermediate lever serves as a fulcrum for the intermediate lever, the provision of an abutment at the end of the intermediate lever remote from its connection with the speed governor member for co-operation with said full load stop member and arranged so that it can be moved beyond said stop member by actuation of said second adjustment member only when the intermediate lever is in a position corresponding to zero or starting speed of the engine, whereby to effect adjustment of a fuel supply quantity exceeding that of the full load supply quantity.

2. In a fuel injection system according to claim 1, a pivotally mounted full load stop member and resilient means for urging it in the normal full load limiting position for co-operation with the abutment on the intermediate lever.

3. In a fuel injection system according to claim 1, an abutment pivotally mounted on the end of the intermediate lever for co-operation with the full load stop member and resilient means tending to maintain said abutment in the position in which it co-operates with said full load stop member.

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No references cited.