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E. LANZEROTTI-SPINA

OIL FUEL PUMP FOR INTERNAL COMBUSTION ENGINES

Filed June 26, 1926

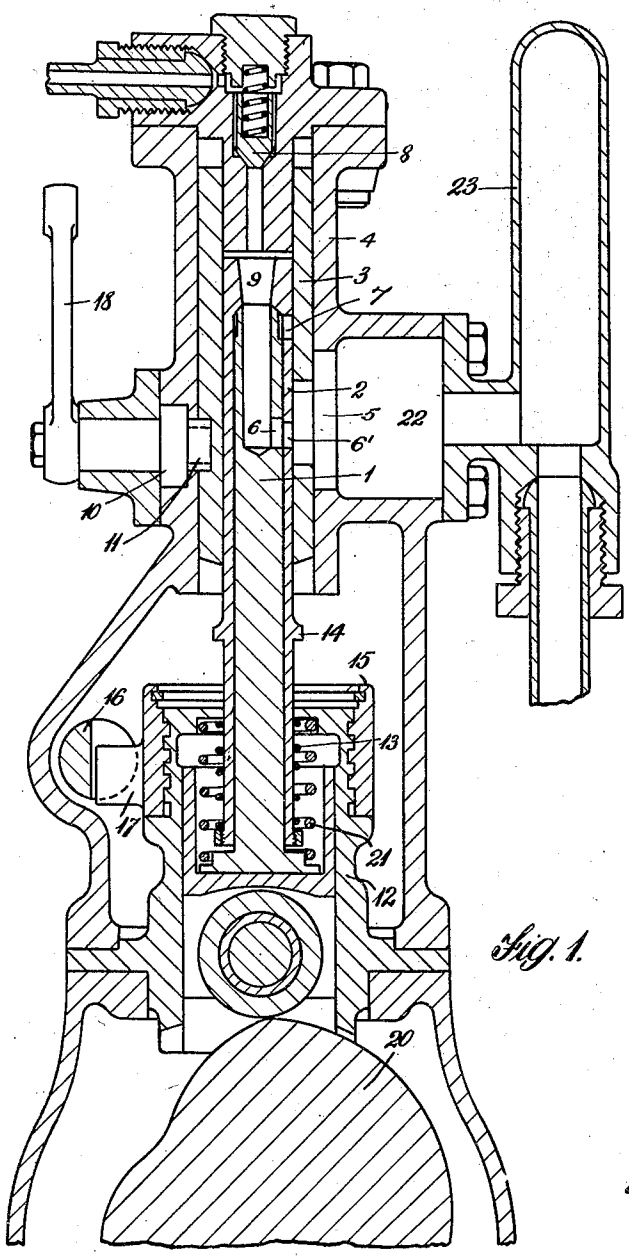


Fig. 1.

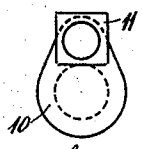


Fig. 2.

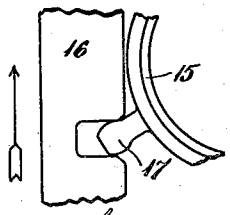
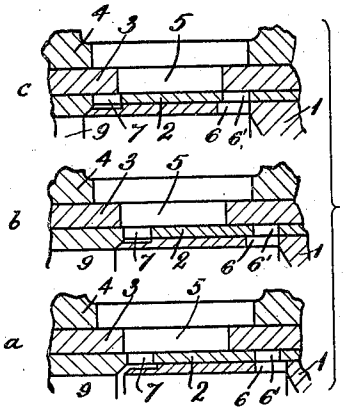


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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OIL-FUEL PUMP FOR INTERNAL-COMBUSTION ENGINES.

Application filed June 26, 1926, Serial No. 118.835, and in Great Britain June 30, 1925.

This invention relates to apparatus for supplying liquid fuel to internal combustion engines comprising a pump and a valve device which bye-passes the pump during a portion of its stroke and can be adjusted to vary the time of injection and the quantity of fuel injected.

The object of the invention is to make an apparatus of this kind of simple and compact form, which shall be light in weight and low in cost, and of higher efficiency than the devices at present in use.

According to the invention the valve device is constituted by the pump plunger and ported sleeves surrounding it, which are adjustable relatively to it, and one of which is engaged and reciprocated by the plunger.

The engagement of the pump plunger with one of the sleeves may cut off the pump chamber from the fuel inlet and so determine the beginning of injection. The movement of the sleeve engaged by the plunger may re-open the pump chamber to the fuel inlet and thereby render the subsequent portion of the plunger stroke inoperative.

In the preferred arrangement the plunger is surrounded by a timing sleeve which it engages and carries with it during part of its stroke, the point of engagement being determined by adjustment of the sleeve which can be effected while the pump is running; the timing sleeve is surrounded by a control sleeve having a single long port adjustable with respect to the timing sleeve in which are two ports suitably spaced apart; of these two ports one is closed by the engagement of the plunger with the timing sleeve and the other is open to the pump chamber so long as the plunger and sleeve are in engagement.

For the purpose of detailed explanation this construction of the invention is illustrated in the accompanying drawings in which:—

Figure 1 is a longitudinal section through the apparatus.

Figures 2 and 3 are details of it, and

Figure 4 shows three further relative positions of the pump plunger and its sleeves.

In these drawings the pump plunger is indicated by 1. It is reciprocated in any suitable way as by a crank or eccentric; in the construction shown its feed stroke is caused by a cam 20 on the shaft of the internal combustion engine or a lay shaft, and its return stroke by a spring 21 engaged between the enlarged end of the plunger and the end of the fixed guide 12. The plunger is surrounded by a timing sleeve 2, the bore of which is reduced at its end 9, providing a conical surface on which the coned end of the plunger 1 can seat. The sleeve is thus moved by the plunger in one direction, and is returned by a spring 13, compressed between a collar on its end and the guide 12. The extent to which the spring can move the sleeve back on the return stroke of the plunger is determined by the collar 14 on the sleeve engaging the abutment 15, which is threaded and screws upon the guide 12. The abutment can be rotated for adjustment, even while the pump is in motion, by the reciprocating rod 16 which is slotted to receive a tooth 17 upon the abutment.

The timing sleeve 2 is in turn surrounded by the control sleeve 3 which forms a liner for the barrel 4 of the pump. In the end wall of the barrel is a spring pressed valve 8 through which the fuel is forced into a passage leading to the engine cylinder. The sleeve 3 can be adjusted, for instance by rotation if it is provided with a helical port; or as shown in the Figure 1 by means of the lever 18 which rocks a crank 10 engaging through the block 11 in a slot in the sleeve. This adjustment also can be carried out while the pump is running.

The end of the plunger 1 is bored, and the bore opens to the surface of the plunger by a port 6. In the timing sleeve are two ports 6^1 and 7 spaced a suitable distance apart.

Oil is supplied by any suitable pump to the cavity 22 in the pump body 4, with which cavity the port 5 at all times registers. The pressure is kept steady by an air chamber 23. Oil can pass from 22 to the pump chamber when the ports 6 and 6^1 are in register with each other and with the port 5, or when the port 7 is in register with the port 5 provided the plunger is not seated upon the timing sleeve.

The sequence of operations may be understood from Figures 1 and 4. Figure 4^a shows the relative position of the ports during an early part of the feed stroke of the plunger. The plunger has not yet engaged the reduced bore of the timing sleeve 2, and therefore the timing sleeve is in its initial position in which its port 7 registers with the port 5

of the control sleeve. The pump chamber is therefore connected with the oil inlet, and the advance of the plunger merely expels oil from the chamber into the cavity 22. When the plunger engages the timing sleeve (Figure 4^b) port 7 is cut off from the pump chamber, and injection of oil past the valve 8 at once begins. The time of this occurrence depends on the resting position of the timing sleeve 2 which is determined by adjustment of the abutment 15. Ports 6 and 6^1 are in register but not yet in register with the port 5. Fuel injunction continues therefore until the ports reach the position shown in Figure 4^c and from then on the further movement of the plunger and timing sleeve merely expels oil from the pump chamber through ports 6, 6^1 and 5, the pressure of oil in the cavity 22 being insufficient to open the valve 8. The position in the stroke at which the ports 6 and 6^1 begin to register with the port 5 depends on the setting of the sleeve 3 which is determined by the lever 18. This setting controls the quantity of fuel injected. On the return stroke, beginning at the position shown in Figure 1, oil is drawn into the pump chamber, at first through the ports 5, 6^1 and 6, and later, when the port 6^1 ceases to register with the port 5, through the ports 5 and 7.

Adjustment of the sleeve 3 does not affect the time at which the plunger 1 engages the timing sleeve 2 and injection begins; and adjustment of the abutment 15 does not affect the time at which the ports 6 and 6^1 register with port 5 and injection ceases. The time of injection and the quantity of fuel injected can therefore be independently adjusted as desired.

If desired the pump may be driven at a higher speed and employed to supply several cylinders through a suitable distributor.

I claim:—

1. A device for supplying liquid fuel to an internal combustion engine comprising a reciprocating plunger and ported sleeves surrounding it, said sleeves being adjustable relatively to the plunger and one of them being engaged and reciprocated by the plunger.

2. A pump for supplying fuel to an internal combustion engine wherein the plunger moves in a ported sleeve, engages it, and thereby closes the pump chamber on the inlet side and reciprocates it, means being provided for varying the engagement position of said sleeve and plunger while the pump is working.

3. A pump according to claim 2 wherein the ported sleeve co-acts with a second ported sleeve surrounding it to open the pump chamber on the inlet side, said second sleeve being adjustable while the pump is working to vary the point in the stroke of the pump at which such opening occurs.

4. A pump for supplying fuel to an internal combustion engine comprising a plunger, a timing sleeve surrounding said plunger and adapted to be engaged and reciprocated by it, means for adjusting the point in the stroke at which such engagement occurs, a control sleeve surrounding said timing sleeve and having a single port adjustable with respect to the timing sleeve, said timing sleeve having two ports suitably spaced apart of which one is closed by the engagement of the plunger with said timing sleeve while the other is connected with the pump chamber so long as the plunger and sleeve are in engagement.

5. A construction according to claim 2 wherein the ported sleeve or timing sleeve is reciprocated in one direction by a spring and its motion under the spring action is limited by a rotatable threaded abutment screwing upon a fixed member.

6. A construction according to claim 4 wherein the ported sleeve or timing sleeve is reciprocated in one direction by a spring and its motion under the spring action is limited by a rotatable threaded abutment screwing upon a fixed member.

In testimony whereof I have signed my name to this specification.

ETTORE LANZEROTTI-SPINA.