

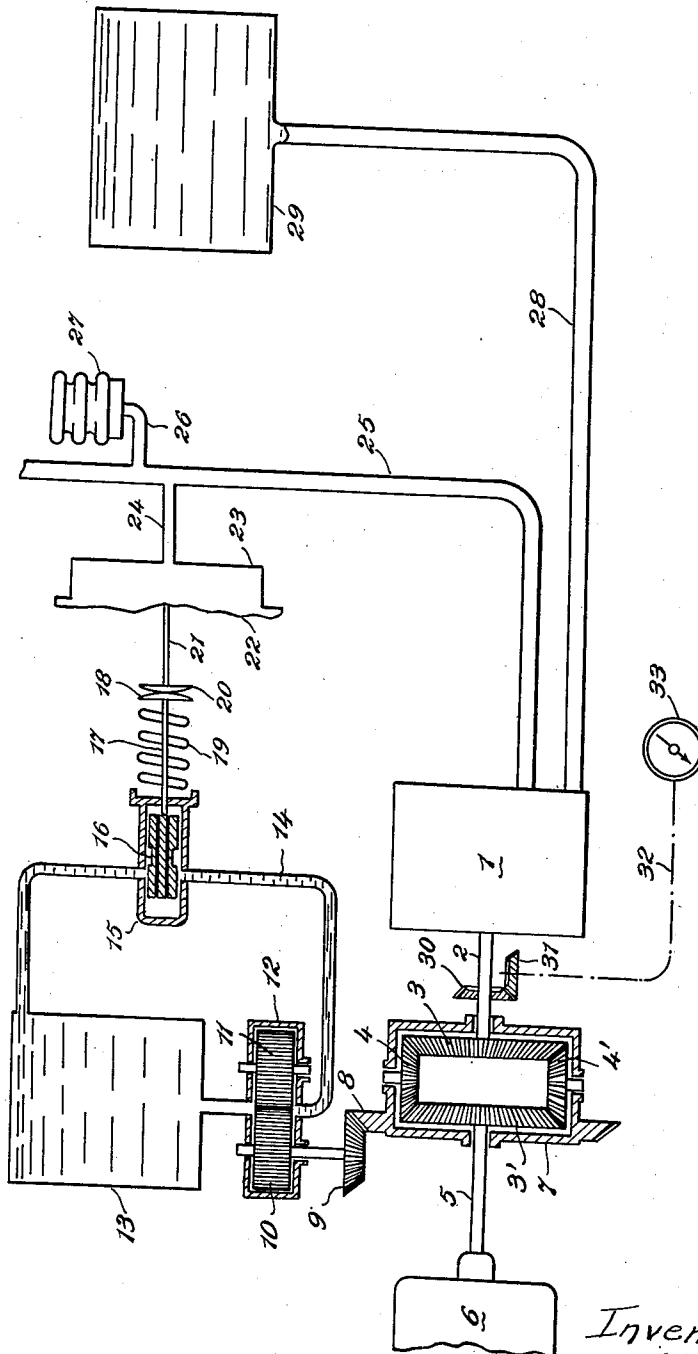
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FUEL FEED CONTROL FOR INTERNAL COMBUSTION ENGINES

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FUEL FEED CONTROL FOR INTERNAL COMBUSTION ENGINES

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The present invention relates to a control for a fuel feed device particularly designed for supplying fuel to internal combustion engines.

In devices of this type the fuel pump generally functions so as to supply an excessive amount of fuel to the motor. Means are then provided for by-passing the excessive quantity of fuel so as to restrict the quantity of fuel fed to the particular requirements of the motor.

This gives rise to various disadvantages. In the first place the speed of rotation of the feed pump is not synchronized with the consumption of the motor, thereby securing a shorter operation of the motor with respect to the fuel supply which is of great importance in the operation of airplanes. It is an object of the present invention to eliminate the above disadvantages.

Furthermore, since the fuel supply at different rotation speeds of the pump shaft cannot be accurately gauged, it is necessary to insert at the inlet of the pump, measuring devices which will secure an accurate control and this requires a complicated arrangement of tubes and piping. Also the necessity of by-passing through the pump the excess quantity of fuel may produce the formation of vapors which will give rise to interruptions in the liquid feed and consequently cause disturbances in the operation of the motor. It is a further object of the invention to provide a construction which will avoid such disadvantages.

An object of the invention is to provide a fuel pump which is not directly driven but is driven through a planetary mechanism which is subjected to a control dependent upon the pressure existing in the suction line of the motor.

A further object of the invention is to provide a closed circuit which exercises a control upon the feed pump in accordance with the pressure existing in the suction line.

A still further object of the invention is to provide a construction wherein when the pressure in the suction line is zero the fuel pump is driven at full speed while if the pressure in the suction line should diminish the rotation of the fuel pump is correspondingly restricted.

With the above and other objects in view, which will become apparent from the detailed description below, the invention is illustrated schematically in the attached drawing.

The figure upon the drawing is a schematic view illustrating the invention with parts in section.

Referring to the drawing, a fuel volumetric pump 1 is driven by the shaft 2. Fixed to the

shaft 2 is a sunwheel 3 which meshes with the two planetary gears 4 and 4' which are pivotally mounted in the casing 7. Also meshing with the planetary gears 4 and 4' is another sunwheel 3' which is fixed to the shaft 5 which in turn is driven by the main motor or as shown, by an auxiliary motor 6 which may be either hydraulically or electrically operated. The casing 7 is provided with a bevelled crown gear 8 which meshes with a bevelled gear 9 which is fixed to a shaft which drives a gear pump 10, 11 located in the casing 12. The pump 10, 11 is located below a small receptacle 13 which is filled with a convenient liquid, preferably oil, and a by-pass pipe 14 interconnects the top of the receptacle 13 with the inlet of the pump 10, 11.

The by-pass 14 is controlled by a slide valve 16 located in the casing 15. The slide valve 16 is fixed to a shaft 17 which is provided with a mushroomlike head 18. A spring 19 encircles the exterior portion of the shaft 17 and bears at one end against the head 18 and at the other end against one end of the casing 15 thereby constantly urging the slide valve 16 to open position, that is, towards the right in the figure.

The elements 9 to 19 inclusive constitute the closed circuit which controls the rotation of the feed pump 1.

The control for the closed circuit above described will now be set forth. In contact with the head 18 there is a similar head 20 provided on a shaft 21 which at the other end is connected to the membrane 22 which closes the casing 23 which is in communication with the suction pipe 25 for the fuel pump 1 by means of the nipple 24. There is also provided on the suction pipe 25 the bellows 27 which is connected thereto by means of the piping 26 which is designed to keep the flow constant in the suction pipe 25.

The fuel pump 1 is connected through the piping 28 to the fuel supply receptacle 29.

There is also provided on the shaft 2 a bevelled gear 30 which cooperates and drives a bevelled gear 31 which rotates a flexible transmission 32 which operates a mechanical tachometer 33. The tachometer 33 may be conveniently gauged in such a way as to indicate the fuel delivery per hour as well as the total fuel delivery.

The operation of the device is as follows: When the pressure in the pipe 25 is zero the slide valve gear owing to the spring 19 is in closed position, thereby cutting off the passage of oil through the by-pass 14. Such being the case the pump 10, 11 is locked and cannot operate, thereby holding

the bevelled gear 9 in fixed position and the bevelled gear 9 prevents the rotation of the casing 7. The rotation of the shaft 5 from the motor 6 therefore is transmitted directly to the shaft 2 through the planetary gears 4 and 4' which rotate in fixed position.

Due to the full operation of the fuel pump 1 a pressure is generated in the pipe 25 which will cause a movement of the membrane 22 to the left as shown in the figure, thereby displacing the slide valve 16 and opening the by-pass 14. The pump 10, 11 is therefore permitted to operate and in operating, the casing 7 rotates. A rotation of the casing 7 carrying the planetary gears 4 and 4' therewith immediately reduces the speed of drive of the shaft 2 from the shaft 5 and this reduction in speed continues until the pressure in the pipe 25 is synchronized with the delivery controlled by the regulation of the spring 19. The pump 1 will, therefore, assume a uniform speed of rotation for every number of revolutions of the prime mover.

By connecting to the shaft 2 of the pump a totalizing tachometer 33 by means of the flexible shaft 22 it is possible to have on the dashboard, conveniently gauged, both the hourly delivery of the pump as well as the total feed of the pump to the motor since such tachometer may be of that type which may be reset to zero.

The feeding system above set forth has the following advantages over the systems at present in use. The entire fuel supply feed is centralized thereby permitting a more direct control. Furthermore any formation of vapor is prevented owing to the fact that the excess of gasoline is not present. Therefore, the motors can operate without any fuel feed supply disturbances. Also the rotational speed of the pump is directly synchronized to the consumption requirements of the motor.

The above description contemplates the feeding of only one motor, but of course, a plurality of motors may be fed from the same control.

It is obvious that various modifications may be made in the construction described and it is the intention to claim all such modifications as will fall within the spirit of the following claims.

I claim:

1. A fuel feed control for internal combustion engines comprising a fuel pump, a drive shaft for said pump, a sun gear mounted on said drive shaft, a second sun gear, a shaft for driving said second sun gear, a casing surrounding said sun gears, planetary gears meshing with said sun

gears mounted in said casing, a crown gear on said casing and means controlled by the pressure of the fuel fed by said pump controlling the rotation of said casing and thereby the speed of rotation of said pump shaft.

2. A fuel feed control for internal combustion engines comprising a fuel pump, a drive shaft for said pump, a sun gear mounted on said drive shaft, a second sun gear, a shaft for driving said second sun gear, a casing surrounding said sun gears, planetary gears meshing with said sun gears mounted in said casing, a crown gear on said casing, a pinion meshing with said crown gear, a liquid pump driven by said pinion, a closed circuit fed by said pump and means controlling said circuit controlled by the pressure of the fuel fed by said first mentioned pump.

3. A fuel feed control for internal combustion engines comprising a fuel pump, a drive shaft for said pump, a sun gear mounted on said drive shaft, a second sun gear, a shaft for driving said second sun gear, a casing surrounding said sun gears, planetary gears meshing with said sun gears mounted in said casing, a crown gear on said casing, a pinion meshing with said crown gear, a liquid fuel pump driven by said pinion, a receptacle for liquid supplied by said liquid pump, a by-pass from said receptacle to the inlet of said liquid pump, a slide valve controlling said by-pass and means controlling said slide valve responsive to the pressure of the fuel fed by said first mentioned pump.

4. A fuel feed control for internal combustion engines comprising a fuel pump, a drive shaft for said pump, a sun gear mounted on said drive shaft, a second sun gear, a shaft for driving said second sun gear, a casing surrounding said sun gears, planetary gears meshing with said sun gears mounted in said casing, a crown gear on said casing, a pinion meshing with said crown gear, a liquid fuel pump driven by said pinion, a receptacle for liquid supplied by said liquid pump, a by-pass from said receptacle to the inlet of said liquid pump, a slide valve controlling said by-pass and a deformable membrane responsive to the pressure of the fuel fed by said first mentioned pump controlling said slide valve.

5. A fuel feed control for internal combustion engines particularly comprising a fuel pump, means for differentially driving said fuel pump and means controlled by the pressure of the fuel fed by said pump controlling said differential driving means of said pump.

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