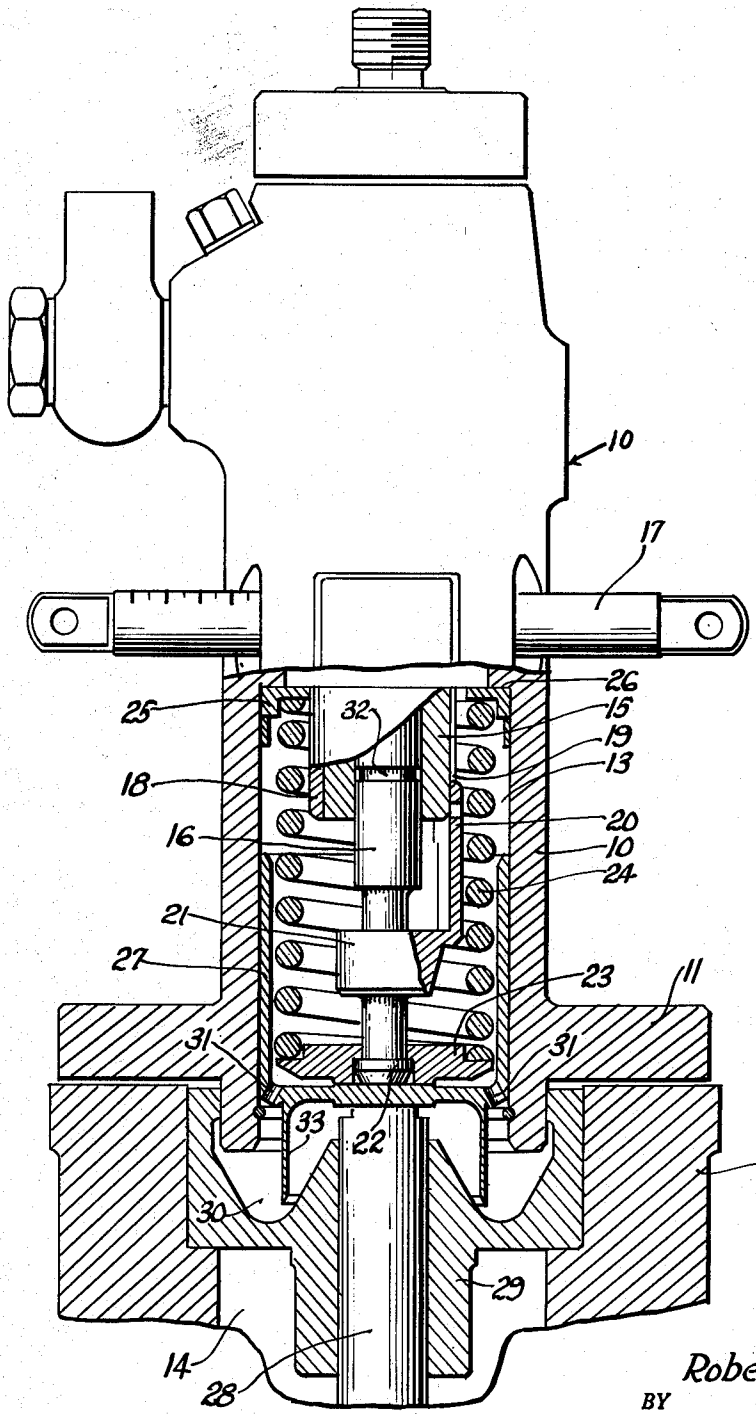
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FUEL INJECTION PUMP

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FUEL INJECTION PUMP

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This invention relates to fuel injection pumps such, for example, as are employed with engines of the compression-ignition type, more particularly to fuel pumps adapted to be mounted on the engine block for operation by an engine driven part and the invention has for an object the provision of improved pump structures of this character.

Engine mounted fuel injection pumps have heretofore been provided having a pump body adapted to be secured to the engine block, the pump body and the block having aligned openings for respectively containing an extending end of the pump piston and an engine driven reciprocating push rod or operating member. In such pump structures a spring cup surrounding the piston in the body-opening and having its bottom wall interposed between the piston and the push rod is provided with vent holes in the bottom wall for preventing compression effects within the pump body-opening upon reciprocation of the piston and spring cup. Due to the high pressures developed in fuel injection pumps of this type, leakage of fuel oil past the piston is inevitable and fuel oil thus leaking from the pump escapes through the vent holes in the spring cup.

In order to prevent objectionable dilution of the lubricating oil of the engine by the fuel oil leakage, attempts have been made to collect the fuel oil as it is discharged from the spring-cup vent-holes in an annular receptacle surrounding the push rod in the engine-block-openings, but such attempts have not met with success due largely to the fact that the high speed reciprocation of the push rod and the pump piston causes the oil leakage to impinge on the push rod and the oil thus collecting on the push rod works its way along the push rod and into the lubricating oil of the engine.

Further attempts to prevent this objectionable condition have involved the use of splash guards or baffles of generally umbrella shape carried by the push rod, but such expedients likewise have not been successful because of the tendency of the leakage-oil collecting on the lower edge of the umbrella to work its way up the under side of the umbrella and onto the push rod during reciprocation of the parts. It is a further object of this invention, therefore, to provide in a fuel injection pump an improved spring cup construction for insuring that the fuel oil leakage from the pump is effectively conducted to the receptacle therefor, whereby dilution of the lubricating oil of the engine is minimized.

In carrying out the invention in one form a

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pump of the class described is provided with a spring cup in which vent holes are formed in the bottom wall immediately adjacent the outer edge thereof and a cylindrical sleeve extending from the bottom wall and disposed inwardly of the vent holes is provided for guiding into a receptacle the fuel oil leakage discharged through the vent holes, the sleeve being of a greater length than the axial displacement of the spring cup during operation of the pump.

For a more complete understanding of the invention, reference should now be had to the drawing in which the single figure is an elevational view of a fuel injection pump embodying the present invention mounted on an engine block, a portion of the pump and the block being sectioned along the axial center line of the pump more clearly to illustrate the construction.

Referring now to the drawing, the invention is shown as embodied in a fuel injection pump having pump body 10 provided with an annular external flange 11 by means of which the pump may be secured to the engine block 12 by suitable cap bolts (not shown), the pump body 10 and the engine block 12 being provided with aligned openings 13 and 14, respectively. The fuel injection pump is of a type generally known in the art and includes a cylinder barrel 15, the lower end of which extends into the opening 13 and a reciprocatable piston 16, the lower end of which extends from the cylinder barrel 15, as shown. The pump is of the type in which the pump function is achieved by the reciprocating movement of the piston 16 and the amount of fuel delivered in each stroke is adjusted by rotation of the piston 16 in the cylinder barrel.

The manner in which the rotation of the piston is utilized to control the amount of fuel delivered by the pump will be well understood by those skilled in the art and no detailed explanation is thought to be necessary other than to point out that a longitudinally movable rack 17 is arranged to effect rotation of a sleeve 18 having a slot 19 adapted slidably to engage an upstanding finger 20 extending from a collar 21 which is rigidly secured to the piston 16. Adjacent its lower end the piston 16 is provided with a head 22 for receiving a spring retainer 23 adapted to be engaged by the lower end of a spring 24, the upper end of which bears against a spring retainer or washer 25 arranged to engage a suitable shoulder 26 formed in the pump body 10.

Surrounding the spring 24 and the lower end of the piston 16 is a spring cup 27 which slidably engages the walls of the pump body forming the

opening 13. The bottom wall of the spring cup 27 engages the lower end of the piston 16 and the spring retainer 23 and is in turn engaged by an operating member or a push rod 28 which is adapted to be reciprocated in timed relation to the engine by suitable engine driven means (not shown). Disposed within the opening 14 in the engine block 12 and surrounding the push rod 28 is a guide 29 which is formed as shown to provide an annular channel or receptacle 30 surrounding the push rod. It will be understood that suitable outlet or drainage means (not shown) are provided for withdrawing from the annular receptacle 30 any fuel oil which accumulates therein.

During operation of the pump piston 16 by the push rod 28 the spring cup 27 reciprocates in the opening 13 at high speed and in order to prevent compression effects within the opening 13 of the pump body the bottom wall of the spring cup 27 must be provided with vent holes. In accordance with the present invention a series of vent holes 31 are provided disposed adjacent the outer peripheral edge of the bottom wall of the spring cup.

Although the piston 16 of the fuel pump is provided, in accordance with the usual practice, with a plurality of sealing grooves 32, it will be understood that oil leakage past the piston is inevitable under the high pressures developed by the pump and it will be apparent that such oil leakage will be discharged through the vent holes 31 in the bottom wall of the spring cup 27. The vent holes 31 are disposed, as shown, immediately above the annular receptacle 30 and in order effectively to guide the oil leakage into the receptacle even though the spring cup is reciprocating at high speed, a cylindrical sleeve 33 is provided, extending downwardly from the bottom wall of the spring cup, the sleeve 33 being disposed inwardly of the vent holes 31. The length of the sleeve 33 exceeds the stroke of the pump and the push rod 28 and consequently oil leakage accumulating on the lower edge of the sleeve 33 cannot work its way up the inner surface of the sleeve 33 to such an extent as to reach the push rod 28. Consequently the fuel oil which leaks from the pump and is discharged through the vent holes 31 will be substantially entirely confined to the receptacle 30 and dilution of the lubricating oil of the engine is avoided. While the sleeve 33 has been shown as having been formed integrally with the spring cup 27 it will, of course, be understood that this sleeve may be made as a separate part if desired and secured to the bottom wall of the spring cup in any suitable fashion.

While a particular embodiment of the invention has been shown, it will be understood, of course, that the invention is not to be limited thereto, since many modifications may be made,

and it is contemplated, therefore, by the appended claims, to cover any such modifications as fall within the true spirit and scope of the invention.

What is desired to be secured by Letters Patent of the United States is:

1. A spring cup for a fuel injection pump of the class described, said spring cup having a vent hole in the bottom wall thereof disposed adjacent the outer edge of said bottom wall and a cylindrical sleeve rigid with said cup extending from said bottom wall and disposed inwardly of said vent hole for guiding fuel leakage from said pump discharged from said cup through said vent hole.

2. A spring cup for a fuel injection pump of the class described, said spring cup having vent holes in the bottom wall thereof disposed adjacent the outer edge of said bottom wall and a cylindrical sleeve rigid with said cup and extending from said bottom wall disposed inwardly of said vent holes for guiding fuel leakage from said pump discharged from said cup through said vent holes, said sleeve being movable with said cup and having a length greater than the axial displacement of said spring cup during operation of said pump.

3. A spring cup for a fuel injection pump of the class described, said spring cup having vent holes in the bottom wall thereof disposed adjacent the outer edge of said bottom wall and a cylindrical sleeve rigid with and extending from said bottom wall immediately adjacent and inwardly of said vent holes for guiding fuel leakage from said pump discharged through said vent holes.

4. A spring cup for a fuel injection pump of the class described, said spring cup having vent holes in the bottom wall thereof disposed adjacent the outer edge of said bottom wall and a cylindrical sleeve rigid with said cup and extending from said bottom wall immediately adjacent and inwardly of said vent holes for guiding fuel leakage from said pump discharged through said vent holes, said sleeve being longer than the stroke of the pump.

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