July 14, 1953 C. A. LOWE 2,645,184

PUMPING APPARATUS

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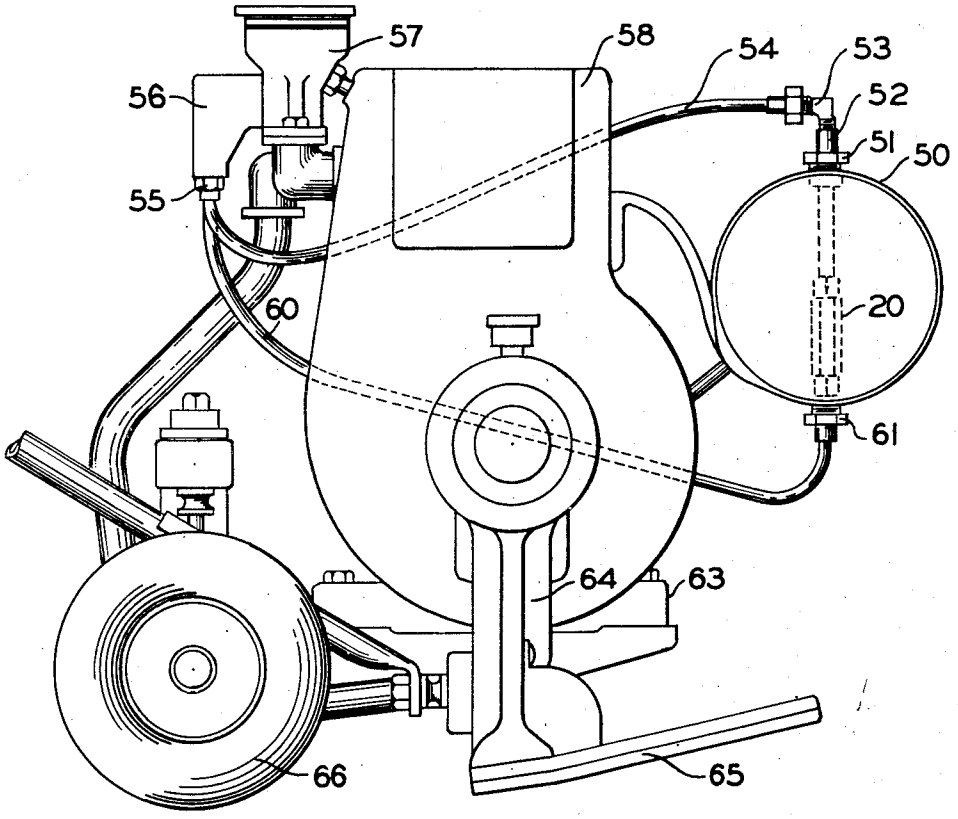


FIG. 1

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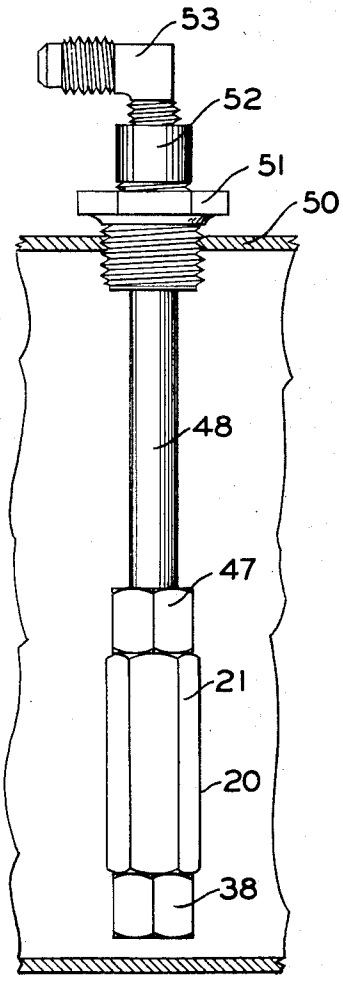


FIG. 2

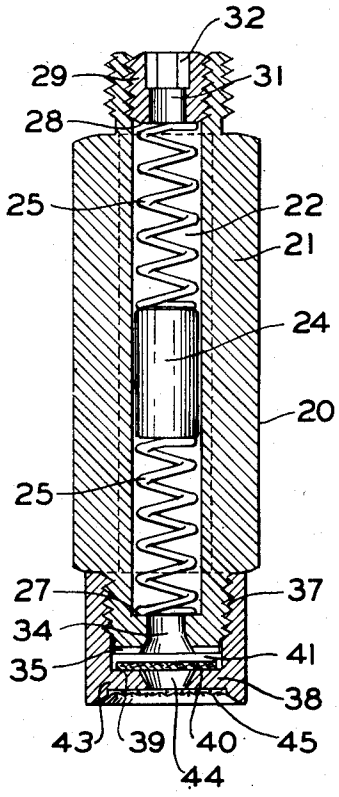


FIG. 3

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PUMPING APPARATUS

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4 Claims. (Cl. 103—208)

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The present invention relates to a pumping apparatus and has particular application to a fuel pumping apparatus for an internal combustion engine wherein fuel is lifted from a fuel tank to a bowl associated with the fuel inlet of the engine.

It is an object of the present invention to yieldingly suspend a piston for relative movement within the bore of a cylinder block and impart reciprocating movement to the cylinder block so as to create relative movement between the cylinder block and the piston and utilize this relative movement for pumping a fluid.

The present invention is particularly applicable to machines operated by an internal combustion engine wherein vibrations are created, and it is a further object of the present invention to utilize the vibration of the engine reciprocating the cylinder block of a fuel pump for the engine.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred form of embodiment of the invention is clearly shown.

In the drawings:

Fig. 1 is a side view of a tamping machine showing one example of use of the improved fuel pumping apparatus,

Fig. 2 is a fragmentary view in section of a fuel tank and showing, in elevation, the fuel pump therein; and

Fig. 3 is a longitudinal sectional view of the fuel pump, the piston being shown in elevation.

Referring to the drawings, particularly Fig. 3, there is shown a pump 20 including a cylinder 21 having a longitudinal cylindrical bore 22. A piston 24 is disposed within the cylindrical bore 22 and yieldingly held in the bore by oppositely disposed coil springs 25, one coil spring abutting the top of the piston and the other the bottom of the piston. The lower end of the lower spring 25 rests upon an abutment or shoulder 27 at the lower end of the bore 22. The upper end of the upper spring 25 abuts the lower end 28 of a bushing 29. Bushing 29 is exteriorly threaded and is fastened in the upper end of the cylinder block 21. Bushing 29 is hollow for the flow of fluid therethrough as shown at 31. The upper part 32 of the hollow 31 is hexagonal in shape for receiving a wrench by which the bushing is tightened or loosened. The lower end of the cylinder block 21 is provided with a central longitudinal passage 34 which merges with transverse grooves 35 at the extreme lower end of the block 21.

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The lower end of block 21 is threaded exteriorly as at 37 for receiving a cap 38. An interior horizontal wall 39 of the cap provides a valve seat for a disc type valve 40, which valve 40 is enclosed within a chamber 41 formed by the interior of the cap 38 and the extreme lower part of the cylinder block 21. The horizontal portion 43 of the cap 38 is provided with a central longitudinal opening 44 for the passage of fluid from the exterior to the chamber 41. A screen 45 is carried at the extreme bottom of the cap 38. The diameter of the bore 22 is somewhat larger than the diameter of the piston 24 to permit the restricted flow of liquid from below the piston to above the same. Thus fluid may flow from the exterior of the pump to the screen 45, passage 44 into chamber 41 when the valve 40 is lifted off its seat 39. From the chamber 41, the fluid flows through the transverse grooves 35 into passage 34 to the lower part of the bore 22, through the bore 22 and through the hollow 31 in the bushing 32.

The upper end of the cylinder block 21 is exteriorly threaded for receiving a pipe coupling 47 which connects the block 21 with a pipe 48. Pipe 48 and the pump 20 are suspended from the upper part of a fuel tank 50 by a coupling 51. This coupling is connected by fittings 52 and 53 with one end of a pipe 54; the opposite end of the pipe 54 is connected by a coupling 55 to a fuel bowl 56. This fuel bowl is connected with a carburetor or other form of fuel control device for an internal combustion engine. In the instant application the bowl 56 is connected with a carburetor 57 of the internal combustion engine 58. Fuel delivered through the pipe 54 to the bowl 56 is in excess of that consumed by the internal combustion engine and a suitable overflow (not shown) is connected by a return pipe 60 to the bottom of the tank 50, there being a coupling 61 provided for connecting the pipe 60 with the bottom of the tank.

In operation, shaking or vibrating movement is imparted to the tank 50. This piston 24 formed of a mass of metal and being suspended between relatively light coil springs 25, lags in its vibration with respect to the cylinder block 21, which latter is fastened to the tank, with the result that relative movement is imparted between the cylinder block 21 and the piston 24. During vibration, as the block 21 moves downwardly relative to the piston 24 a sub-atmospheric pressure is created in the bore 22 below the piston 24, with the result that fuel will be forced through the opening 44, lifting the valve

40 from its seat, and into chamber 41. Then as the cylinder block 21 moves upwardly relative to the piston 24, destroying the suction action, the valve 40 will be seated and the fuel will be trapped in the chamber 41. Upon repeated relative reciprocation between the cylinder block 21 and the piston 24, the entire bore 22 and the fluid line leading to the bowl 56 and the bowl 56 will be filled with fuel. The springs 25 should be sufficiently light so that they merely suspend the piston 24 within the bore 22 and the clearance between the piston 24 and the bore 22 should be such that the passage provided by such clearance offers sufficient resistance to prevent the total destruction of a sub-atmospheric pressure when the block 21 moves downwardly with respect to the piston 24. In a preferred form of the invention, wherein the diameter of the piston 24 is ¼", the diameter of the bore is .265 inch, and the piston is ½" in length. In a large size pump, for example, a pump employing a ½" diameter piston, 1" in length, the bore would have a diameter of .520". In a smaller pump, for example, one in which a piston ⅛" in diameter is employed, ¼" in length, the bore would have a diameter of .135".

The present invention can be applied to any machine in which vibration is imparted to the fuel tank. Obviously, for the greatest pumping capacity, the cylinder bore should be arranged longitudinally of the greatest degree of vibration. For example, if the highest degree of vibration is vertical, then the cylinder block 21 should extend vertically longitudinally. For one illustration of an embodiment of the present invention, I have applied the same to a tamping machine 63 of the type shown and described in my co-pending application Serial No. 644,071, filed January 29, 1946, in which the internal combustion engine 58 and the tank 50 are carried by a frame, part of which is shown at 64. The frame 64 is carried by a tamping shoe 65 and oppositely disposed rear rollers 66. The engine 58 imparts tamping movement of the shoe 65 as the machine moves across the surface being tamped. The engine operated machine 66 causes vertical vibration of the tank 50 to impart the pumping action described hereinbefore.

By virtue of the present invention, a simplified pump has been provided in which vibrations of the machine is used as the sole force for actuating the pump.

While the form of embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

I claim:

1. In a pumping system in which fluid is pumped by vibrations imparted to the pump, in combination a tank which is subjected to vibration; a pump consisting only of a cylinder through which the fluid flows, said cylinder being secured to the tank for vibration with the latter, said cylinder having an inlet at one end communicating with the interior of the tank and having an outlet at the opposite end, a floating piston completely combined within the cylinder, balancing springs on opposite ends of the piston, and a check valve in the inlet for preventing fluid flow from the cylinder back through the inlet; and means for imparting vibratory movement to the tank and the pump cylinder carried by the tank.

2. In a pumping system in which fluid is pumped by vibrations imparted to the pump, in combination a tank which is subjected to vibration; a pump consisting only of a vertically extending cylinder through which the fluid flows, said cylinder being secured to the tank for vibration with the latter, said cylinder having an inlet at one end communicating with the interior of the tank and having an outlet at the opposite end, a floating piston completely combined within the cylinder, means yieldingly urging the piston upwardly, and a check valve in the inlet for preventing fluid flow from the cylinder back through the inlet; and means for imparting vibratory movement to the tank and the pump cylinder carried by the tank.

3. In a pumping system in which fluid is pumped by vibrations imparted to the pump, in combination a tank which is subjected to vibration; a pump comprising only a cylinder through which the fluid flows, said cylinder being secured to the tank for vibration with the latter, said cylinder having an inlet at one end communicating with the interior of the tank and having an outlet at the opposite end, an impervious and floating piston completely combined within the cylinder, balancing springs on opposite ends of the piston, and a check valve in the inlet for preventing fluid flow from the cylinder back through the inlet; and means for imparting vibratory movement to the tank and the pump cylinder carried by the tank.

4. In a pumping system in which fluid is pumped by vibrations imparted to the pump, in combination, a tank which is subjected to vibration; a pump comprising only a vertically extending cylinder through which the fluid flows, said cylinder being secured to the tank for vibration with the latter, said cylinder having an inlet at one end communicating with the interior of the tank and having an outlet at the opposite end, an impervious and floating piston completely combined within the cylinder, means yieldingly urging the piston upwardly, and a check valve in the inlet for preventing fluid flow from the cylinder back through the inlet; and means for imparting vibratory movement to the tank and the pump cylinder carried by the tank.

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