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FUEL PRIMING PUMP

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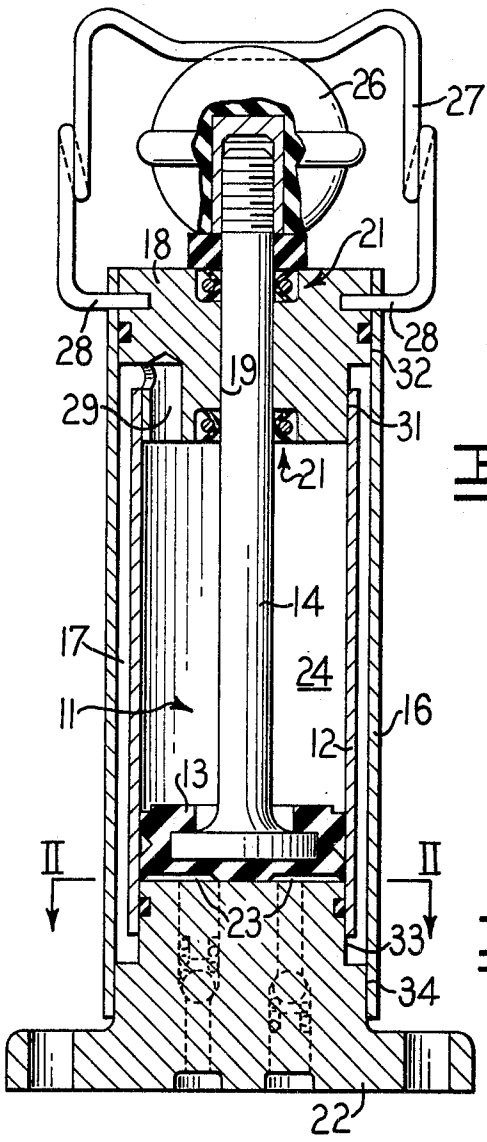


Fig. 1.

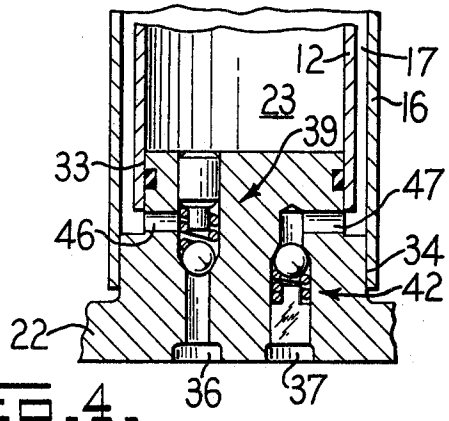


Fig. 4.

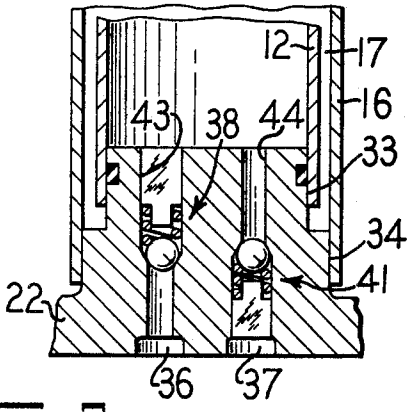


Fig. 3.

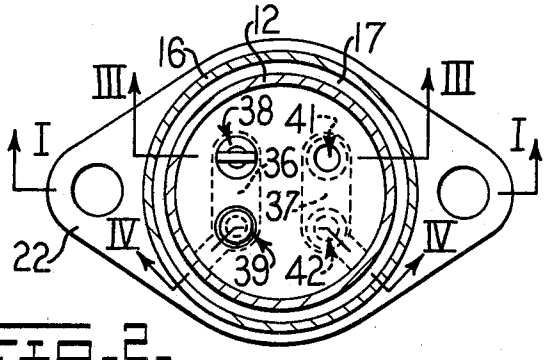


Fig. 2.

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FUEL PRIMING PUMP

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ABSTRACT OF THE DISCLOSURE

A compact fuel priming pump having a reciprocable piston within a first cylinder, a second cylinder concentrically arranged about the first cylinder to form an annular passage in communicatiton with one end of the first cylinder and suitable check valves separately communicating the other end of the first cylinder and the annular passage between the two cylinders with a fluid outlet and a fluid inlet.

Fuel priming pumps are commonly employed with engine fuel systems to deliver a sufficient quantity of fuel for startup of the engine. Many of these priming pumps are of the single action type for example, and while being simple in design, do not have the necessary pumping capacity to permit priming of large displacement engines within a short time. Larger capacity priming pumps, for example those with double action or wobble plate design, generally deliver priming fuel at a higher rate. However, these pumps are generally complex in design and are expensive because of precision machining requirements. The complex construction of the pumps also commonly results in a larger size than is readily compatible with many engine systems.

Accordingly, it is an object of the present invention to provide a compact, high capacity pump. It is also an object to provide such a pump which is further of simple and economical construction.

The present invention fulfills these objects by arranging a reciprocable member within a hollow pump body to form two opposing chambers of variable volume with check valve means for communicating each of the chambers with a fluid inlet and a fluid outlet. Preferably the hollow pump body is a first cylinder having a reciprocable piston disposed therein and having a second cylinder concentrically arranged about the first cylinder with an annular passage formed between the cylinders for communicating a variable chamber at one end of the first cylinder with the check valve means.

Other objects and advantages of the invention are made apparent in the following description having reference to the accompany drawing.

In the drawing:

FIG. 1 is a side view, with parts in section, of a priming pump constructed to the present invention;

FIG. 2 is a view taken along section lines II—II of FIG. 1 illustrating a base member of the pump; and

FIGS. 3 and 4 are views taken respectively along section lines III—III and IV—IV of FIG. 2 to illustrate internal construction of the base member.

A fuel priming pump constructed according to the present invention and illustrated in FIG. 1 comprises a plunger assembly **11** arranged for reciprocable motion within a first cylinder **12**. The plunger assembly **11** comprises an elastomeric piston member **13** in fluid sealing relation with the inside diameter of the cylinder **12** and a rod member **14** upon which the piston **13** is mounted. A second larger cylinder **16** is concentrically spaced apart from the first or inner cylinder **12** to form an annular passage **17** between the two cylinders. The upper

ends of the two cylinders are closed by means of a plug member **18** with the rod member **14** penetrating a bore **19** formed in the plug **18**. Seal means **21** prevent fluid leakage between the plug and the rod **14**. The lower ends of the two cylinders are closed by means of a base member **22** so that a first or lower chamber **23** of variable volume is formed within the inner cylinder **12** by means of the base member **22** and the bottom of the reciprocable piston **13**. An opposing or upper chamber **24** is also formed within the inner cylinder **12** by means of the top of the reciprocable piston **13** and the plug **18**. The extended end of the rod **14** is threaded to a resilient knob **26** to permit manual reciprocable operation of the plunger assembly **11**. The knob **26** is normally secured in a position with the plunger **11** depressed within the pump shown in FIG. 1 by means of a spring lock **27** which is pivoted at **28** to the outer cylinder **16** and the plug **18**. Both of the variable volume chambers **23** and **24** are in communication with a fuel source (not shown) and an engine fuel system (not shown) by means of check valve and internal passages arranged within the base member **22** and described below with reference to FIGS. 2–4. The lower chamber **23** is in direct communication with two of the check valves while the upper chamber **24** is communicated with two additional check valves by means of a passage **29** formed by the plug **18** and the annular passage **17** between the two cylinders.

Simple and economical constructiton of the present priming pump is apparent from consideratiton of the components described above. For example, the cylinders **12** and **16** may be of standard precision tubing while the plug member **18** and base member **22** are preferably formed with concentric, stepped surfaces **31**, **32**, and **33**, **34** respectively of appropriate diameters for press-fit engagement with the ends of the two cylinders **12** and **16**, respectively.

Construction of the base member **22** and the arrangement of check valves therein is more clearly seen in FIGS. 2–4. Referring particularly to FIGS. 3 and 4, the reciprocable piston **13** is in a raised position to simplify the figures and more clearly illustrate the lower variable volume chamber **23**. A recessed inlet **36** is formed at the bottom of the base member **22** for communication with a fuel source (not shown). Another recessed passage **37** is similarly formed for outlet communication with an engine fuel system (not shown). Two inlet ball check valve arrangements **38** and **39** are in communication with the fluid inlet passage **36** to permit fuel to flow into the pump from the passage **36** when pressure behind the check valve is sufficiently reduced. Another pair of outlet ball check valve arrangements **41** and **42** are in communication with the outlet passage **37** to permit fluid flow from the pump into the passage **37** when the check valves experience a sufficient pressure rise within the pump. The inlet check valve **38** and the outlet check valve **41** are in direct communicatiton with the lower chamber **23** by means of respective passages **43** and **44** formed by the base member **22**. The inlet check valve **39** and the outlet check valve **42** are blocked from communication with the lower chamber **23** while being in communication with the annular passage **17** and the upper chamber **24** by means of cross-drilled passages **46** and **47**, respectively, in the base member **22**.

During normal operation while the priming pump is not in use, the spring lock **27** secures the knob **26** and the plunger assembly **11** in place within the pump as shown in FIG. 1. To prime an engine with fuel prior to startup, the spring lock **27** is released and the plunger assembly **11** is manually moved in reciprocable motion by means of the knob **26**. As the piston **13** is raised within the cylinder **12** from its position shown in FIG. 1, pres-

ure in the lower chambers **23** tends to decrease while luid pressure in the upper chamber **24** tends to increase. The decreasing pressure in chamber **23** causes the inlet check valve **38** to open while maintaining the outlet check valve **41** in a closed position. Fuel in the inlet passage **36** is then permitted to flow into and fill the chamber **23**. The upper chamber **24** is normally filled with fuel while the pump is in the position shown in FIG. 1. Simultaneously with the pressure decrease and filling of the lower chamber **23**, increasing pressure in the upper chamber **24** is communicated to the inlet check valve **39** and the outlet check valve **42** by means of the annular passage **17** and the respective passages **46** and **47**. The increased pressure closes the inlet valve **39** and opens the outlet valve **42** so that fuel from a chamber **24** is directed to the passage **37** and the engine fuel system. As the plunger assembly **11** completes its upward stroke and is then moved in a downward stroke, fluid which entered the lower chamber **23** during the upward pump stroke experiences increasing pressure while the upper chamber **24** experiences decreasing pressure. The positions of the check valves are then reversed with inlet valve **38** and outlet valve **42** being closed and inlet valve **39** and outlet valve **41** being opened. During this downward stroke, fuel from passage **36** is drawn through the annular passage **17** to fill the chamber **24** while fuel from the lower chamber **23** is directed to the engine fuel system. This reciprocating operation of the pump is continued to rapidly deliver an adequate amount of priming fuel to insure starting of the engine. Upon completion of the priming operation, the plunger assembly is again secured within the pump by means of the spring lock **27**.

What is claimed is:

1. A fluid priming pump comprising a pair of cylinders including walls free of ports, said cylinders comprising a first inner cylinder surrounded by a second larger diameter cylinder spaced therefrom and of greater length then said first cylinder to define an annular passage therebetween, stepped plugs providing the sole support for said cylinders, said stepped plugs inserted in the respective ends of said cylinders, each said plug including a first surface in press fit engagement with the inner surface of an end portion of the outer cylinder, a shoulder, and a smaller diameter extension terminating in an end

within said first cylinder and including a cylindrical surface the extreme portion only of which is in press fit engagement with the inner surface of an end of the inner cylinder to leave an area of said cylindrical surface between the end of said inner cylinder and said shoulder exposed to said annular passage, one of said plugs including a passage in free communication between said exposed area and said end of said plug, the other of said plugs including two sets of inlet and two sets of outlet passageways including check valves and arranged within the member, one of each set of said passageways communicating with said exposed area and the other of each set communicating with the inserted end of said plug, a reciprocable piston arranged within the inner cylinder and forming opposing chambers of oppositely varying volume during reciprocable motion of the piston, one of the chambers being formed on one side of the piston by the one end of said inner cylinder, the other chamber being formed on the other side of the piston by the other end of the inner cylinder in combination with the annular passage whereby substantially the entire internal volume of the two pistons is available for pumping operation, and rod means for operating the piston in reciprocable motion, the rod means being secured to the piston and slidably extending, in sealed relation, through the plug.

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