Dec. 17, 1940. W. E. HUBBARD 2,225,115

FLUID PUMP

Original Filed Jan. 20, 1939 2 Sheets-Sheet 1

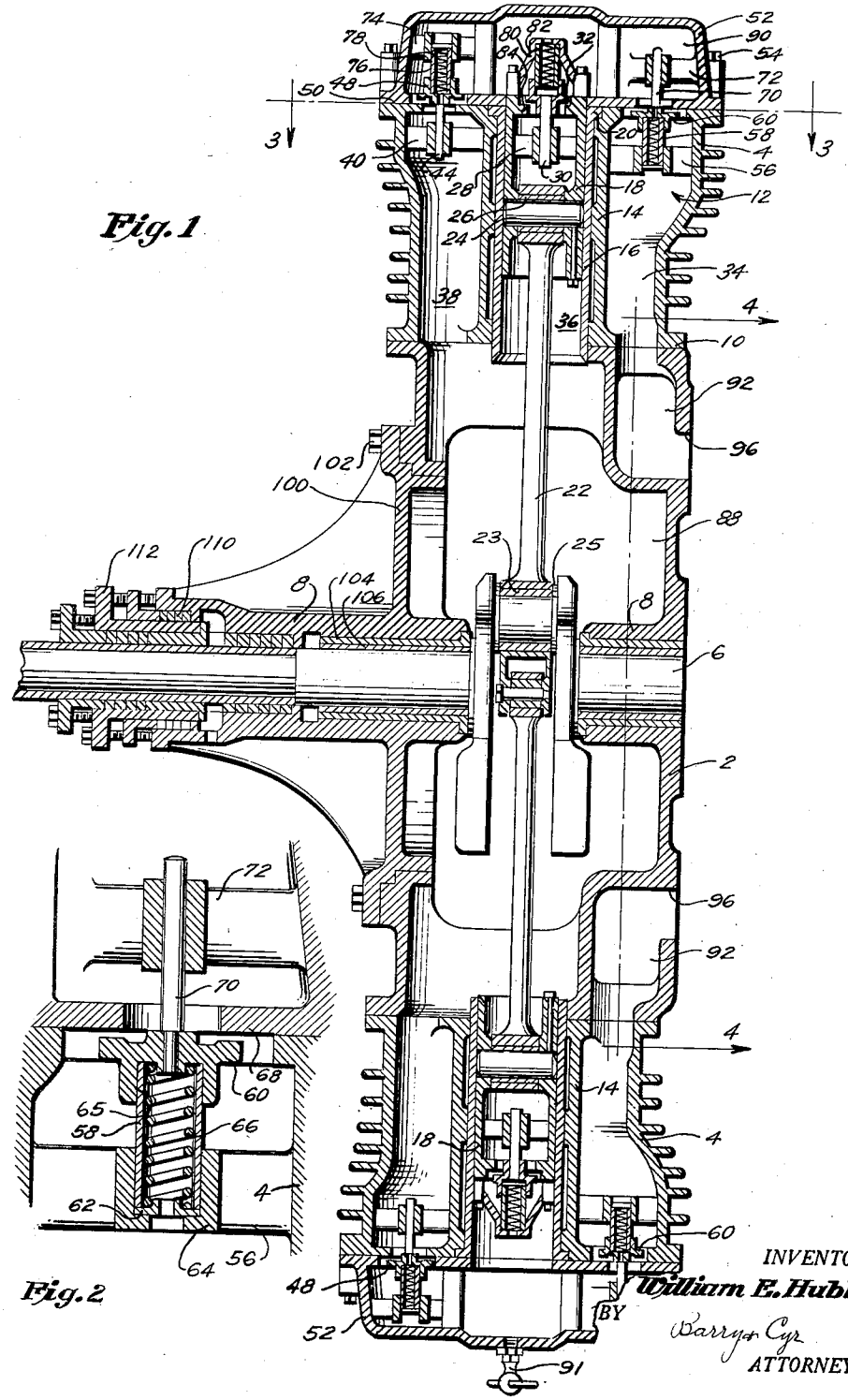


Fig. 1

Fig. 2

INVENTOR.
William E. Hubbard
BY
Barry & Cyr
ATTORNEYS.

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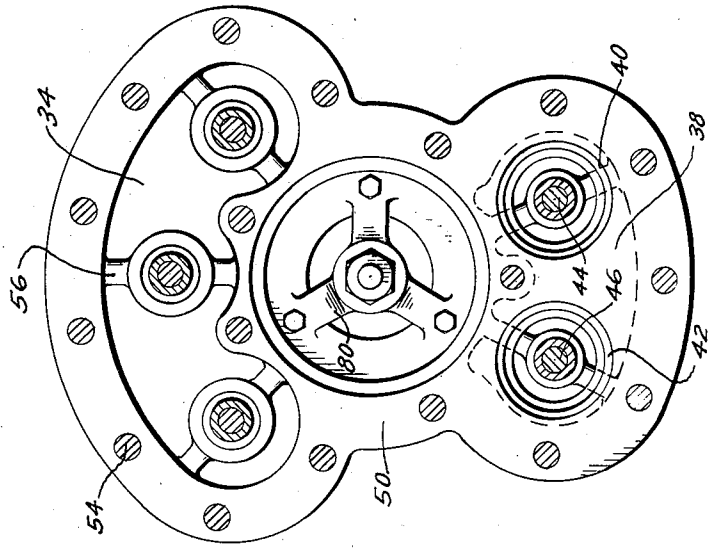


Fig. 3

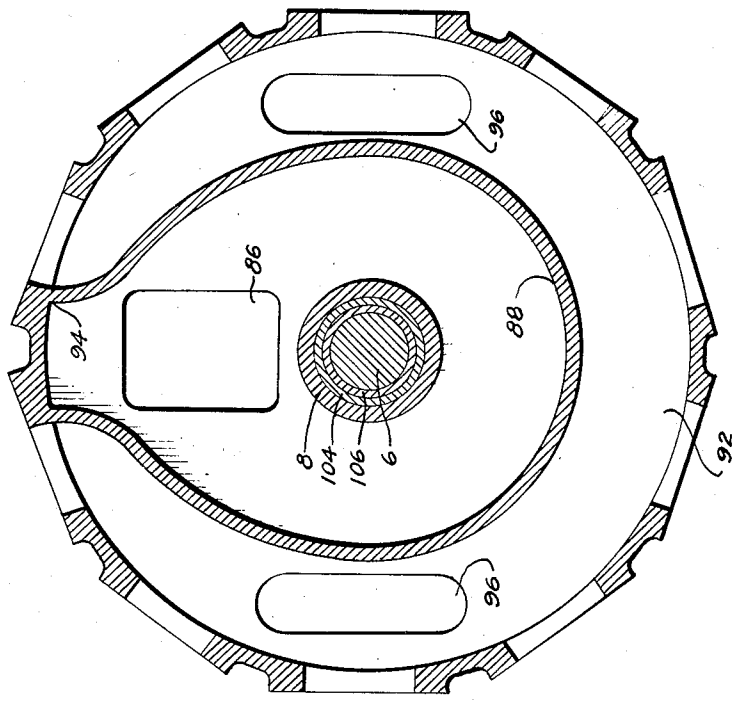


Fig. 4

INVENTOR.
William E. Hubbard
BY
Barry & Ga
ATTORNEYS.

Patented Dec. 17, 1940 2,225,115

UNITED STATES PATENT OFFICE

2,225,115

FLUID PUMP

William E. Hubbard, Tulsa, Okla., assignor to Hydraulic Pumper Incorporated, Tulsa, Okla., a corporation of Oklahoma

Original application January 20, 1939, Serial No. 252,032. Divided and this application January 24, 1939, Serial No. 252,685

10 Claims. (Cl. 103—182)

This invention relates to improvements in fluid pumps with radial arranged cylinders, and more particularly but not by way of limitation to a radial fluid pump for use with a long stroke hydraulic pumping apparatus, and is a division of my copending application Serial No. 252,032, filed Jan. 20, 1939.

An important object of this invention is to provide a fluid pump with radial arranged cylinders which allows the fluid to flow radially from a central position within the pump whereby the connecting rods of the pump in their motion will add impetus to increase the velocity of the fluid flowing thereby to displace the fluid through the cylinders at an increased velocity.

Another important object of this invention is to provide a fluid pump with radially arranged pistons provided with means for directing the fluid from the inlet side of the pump to the discharge side.

And still a further object of this invention is to provide a fluid pump with radially arranged cylinders, and of such construction that the fluid can only flow in one continuous direction.

And an additional object of this invention is to provide a fluid pump with radially arranged cylinders, that is particularly adaptable for pumping purposes where pressure on the inlet side of the pump is required to be increased at the discharge side.

And still a further object of this invention is to provide a fluid pump with radially arranged cylinders having a plurality of inlet and discharge valves disposed inversely to each other, whereas in the opening of one set of valves the other set of valves remain closed.

Other objects and advantages of my invention will be evident from the following detailed description read in conjunction with the accompanying drawings which illustrate one form of my new invention.

In the drawings:

Fig. 1 is a vertical sectional view of the fluid pump.

Fig. 2 is a vertical sectional view showing in detail the arrangement of one of the discharge valves.

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is a vertical sectional view of the pump crank case taken on lines 4—4 of Fig. 1.

Referring to the drawings in detail and more particularly Fig. 1 it will be observed that the radial pump comprises an annular housing or crank case 2 provided at its periphery with radially extending auxiliary housings 4 which contains the radial pump pistons and the cylinders proper. A crank shaft 6 motivated by a power source (not shown) extends through the housing 2, and is guided by a sleeve member 8 as will be hereinafter set forth. The auxiliary housings 4 are preferably ten in number corresponding to the number of cylinders of the fluid pump, and since the construction of each cylinder and its piston, valves, etc., are identical, only one of these assemblies will be described. Each housing 4 is secured to the crank case at 10 by conventional bolts or the like (not shown). The housing 4 has a bore 12 provided internally with a sleeve 14 lined by a cylindrical liner 16 which guides a tubular pump piston 18. The liner is removable to allow for wear, and is shouldered at 20 to the sleeve to prevent movement thereof by hydraulic pressure. The piston 18 is secured to one of a plurality of connecting rods 22 by a wrist pin 24 extending through a bearing 26 and held therein by any suitable means. The connecting rod 22 is secured to a crank bearing 23 surrounding a crank pin 25 of the shaft 6. The piston is provided internally with an apertured guide 28 for the stem 30 of a valve 32. The disposition of the sleeve 14 within the housing 4 provides for three passageways 34, 36 and 38 through the housing, with the piston disposed in the passageway 36.

As will be apparent from Figs. 1 and 3, the passageway 38 which forms one of the fluid inlets, has disposed therein a plurality of apertured spiders 40 and 42 for guiding the valve stems 44 and 46 of a pair of inlet valves 48. Only one of these valves is shown in Fig. 1. At this point it will be understood that the outer face 50 of the housing 4 acts as a seat for the inlet valves 48. The outer end of each housing 4, is closed by a plate or cylinder head 52 which is secured to the housing by bolts 54. A plurality of apertured spiders 56 (preferably three in number), are disposed in the outlet passageway 34 (Figs. 1 and 3) for the mounting of a valve spring container 58 for a discharge valve 60 (Fig. 2). It will be understood from an inspection of Fig. 3 that there are three identical discharge valves, but only one of them is shown in Figs. 1 and 2. Each spring container is anchored on shoulders 62 provided in a liner 64 disposed in the apertured spider 56. The opposite end of the cylindrical spring container 58 is anchored in a recess 65 of the valve and restricts the opening or lift of the discharge valve 60 by a helical spring 66 disposed within the container to provide tension

against one face of the valve to normally hold it in position against its valve seat 68 provided on the lower face of the cylinder head 52. A stem 70 of the valve extends through an apertured plate forming part of the head 52, and into a guide spider 72 secured within the head 52.

Alluding further to the inlet valve 48, the head 52 has an apertured spider 74 secured therein, which receives a spring container 76 identical with the container 58, and containing a helical spring 78 to exert tension against the valves 48 which abut against the seat 50 of the housing 4. From the foregoing, it will be apparent that the structural arrangement of the inlet valves and discharge valves are identical, with the exception that they are disposed in an inverted position with respect to each other.

Secured to the outer end portion of each piston 18 is a spider 80 for anchoring a spring container 82 cooperating with valve 32 in a manner identical with the inlet and discharge valves. From an inspection of Fig. 1, it will be apparent that the valve 32 seats against a shouldered portion 84 of the piston 18. At this point it will be noted that the piston valve is also an inlet valve, so each of the radial cylinder units has three inlet valves and three discharge valves.

The crank case 2 as shown in Fig. 4, is provided with a centrally disposed passageway 86 for the reception of fluid into the inlet chamber 88 provided in the crank case 2. This construction allows the use of the present invention with applicant's copending application above mentioned, however it will be understood that the arrangement or construction of the inlet passageway 86 can be modified to any design adapted for any particular purpose. Fluid coming into the chamber 88 flows through the passageways 36 and 38, past inlet valves 32 and 48, into the chamber 90 of the cylinder head 52. It will be understood that with a plurality of pistons and cylinders in the radial pump, that the rotation of the crank shaft 6 will cause one-half of the pistons to work on a pumping stroke in order to displace fluid from the chamber 90 past the discharge valves 60, while the remaining pistons are being actuated in an opposite direction to allow fluid to be passed by the inlet valves 32 and 48 to fill the chamber 90. A petcock 91 (shown at the lower end of Fig. 1) is provided on each cylinder head 52 to allow dissipation of the fluid from the head in making repairs and the like.

With the flow of fluid into the chambers 36 and 38 and hence to the chamber 90, the valves 60 remain seated to allow filling of the chamber 90. Upon the pumping stroke of the pistons, the fluid acting as a solid, is caused to be discharged past the valves 60 into passageway 34. From an inspection of Figs. 1 and 4 the crank case 2 is provided with a substantially annular passageway 92 in communication with each of the outlet passageways 34. The passageway 92 is blocked off at 94 from the inlet chamber 88 of the crank case 2, and is provided with outlet ports 96 for discharging the pumped fluid to any desired source.

It will be apparent that, due to the construction of the radial pump valves, and the passageways, that the fluid can pass through them only in one continuous direction. Consequently the fluid being pumped always flows through the inlet passageway to the radial pump valves to be discharged through the outlet passageways 92 and 96.

The outer side of the crank case 2 of the pump, Fig. 1, is closed by a plate 100 secured thereto by bolts 102. Said plate has an outwardly extending sleeve portion formed by the guide sleeve 8 of the crank shaft 6. A tubular bushing 104 is disposed in the sleeve 8 and receives a liner 106 forming a bearing for the crank shaft which extends therethrough. A stuffing box 108 is provided on the outer end of the sleeve 8, and comprises a plurality of packing rings 110 and glands 112 to prevent leakage of any fluid from the crank case around the shaft 6.

From the foregoing it will be apparent that this invention provides a radial pump which is adaptable for use in a fluid pressure line, wherein the fluid can be displaced through the pump at any desired velocity within the pump capacity. By using an equal number of inlet and discharge valves, and more particularly having one of the inlet valves cooperating with a fluid displacing piston, an improved compact construction is provided in which a number of pump elements are eliminated. By the particular arrangement of the valves, and the outlet passageway being blocked off from the inlet passageway, the displaced fluid flows in one continuous direction only in accordance with the requirements of the pressure line with which the radial pump may be associated.

Changes may be made in the combination and arrangement of parts as heretofore set forth in the specification and shown in the drawings, it being understood that any modification in the precise embodiment of the invention may be made within the scope of the following claims without departing from the spirit of the invention.

What I claim is:

1. In a fluid pressure pump comprising an annular crank case having an inlet passageway and an outlet passageway, a plurality of housings circumferentially disposed around the crank case, a cylinder head attached to each of said housings, sleeve means provided in each of said housings forming a plurality of chambers, part of said chambers in communication with the inlet passageway of the crank case, a radially arranged piston provided in one of said chambers in each of said housings, a valve provided in each of the pistons, means disposed in said cylinder head and cooperating with the piston valve for directing fluid from the inlet passageway into the cylinder head, means disposed in another chamber formed by the sleeve and cooperating with the outlet passageway for directing fluid from the cylinder head.

2. In a fluid pressure pump comprising an annular crank case having an inlet passageway and an outlet passageway, a plurality of housings circumferentially disposed around the crank case, a cylinder head attached to each of said housings, a sleeve provided in each of said housings forming a plurality of chambers, part of said chambers in communication with the inlet passageway of the crank case, a radially arranged piston provided in one of said chambers in each of said housings, a valve provided in each of the pistons, a plurality of valves disposed in said cylinder head and cooperating with the piston valve for directing fluid from the inlet passageway into the cylinder head, a plurality of discharge valves disposed in another chamber formed by the sleeve and cooperating with the outlet passageway for directing fluid from the cylinder head.

3. In a fluid pressure pump comprising an annular crank case having a plurality of auxiliary housings disposed on its outer periphery, an an-

nular sleeve in each of said housings forming a plurality of chambers, part of said chambers in communication with the crank case, a tubular piston disposed in one of said chambers in each of said housings, rotary driving means for imparting movement to said pistons, a cylinder head secured to each of said housings, a plurality of valves disposed in said cylinder head, a valve secured to the outer end of each of said pistons and cooperating with the valves in the cylinder head to direct fluid from the crank case into the cylinder head, and a plurality of discharge valves disposed in each of said housings and arranged inversely to the first mentioned valves.

4. In a fluid pressure pump comprising an annular crank case having a plurality of auxiliary housings disposed on its outer periphery, an annular sleeve in each of said housings forming a plurality of chambers, part of said chambers in communication with the crank case, a tubular piston disposed in one of said chambers in each of said housings, rotary driving means for imparting movement to said pistons, a cylinder head secured to each of said housings, a plurality of valves disposed in said cylinder head, a valve secured to the outer end of each of said pistons and cooperating with the valves in the cylinder head to direct fluid from the crank case into the cylinder head, a plurality of valves disposed in each of said housings and arranged inversely to the first mentioned valves, a discharge passageway provided in the crank case and cooperating with the last mentioned valves for discharging the fluid directed to the cylinder head.

5. In a fluid propelling mechanism comprising an annular crank case having a plurality of auxiliary housings disposed on its outer periphery, an annular sleeve provided in the auxiliary housings and forming a plurality of chambers, a piston disposed in one of said chambers in each of the housings, a plurality of inlet valves in communication with one of the chambers, a plurality of discharge valves arranged inversely to the inlet valves disposed in another chamber, a cylinder head secured to each of the auxiliary housings, said cylinder head having a lower face forming a valve seat for the discharge valves.

6. In a fluid propelling mechanism comprising an annular crank case having a plurality of auxiliary housings disposed on its outer periphery, an annular sleeve provided in the auxiliary housings and forming a plurality of chambers, a piston disposed in one of said chambers in each of the housings, a plurality of inlet valves in communication with one of the chambers, a plurality of discharge valves arranged inversely to the inlet valves disposed in another chamber, a cylinder head secured to each of the auxiliary housings, said cylinder head having a lower face forming a valve seat for the discharge valves, an annular passageway in the crank case in communication with the discharge valves and forming a discharge outlet for the mechanism.

7. In a fluid propelling mechanism comprising an annular crank case, a plurality of radial reciprocal pistons therein for receiving a fluid under a given pressure and discharging said fluid under another pressure, rotary driving means for imparting movement to said pistons and in continuous contact therewith, a plurality of cylinder heads disposed circumferentially around the crank case, a plurality of inlet valves in said cylinder head and cooperating with a valve attached to each of said pistons for directing fluid into the cylinder heads, a plurality of discharge valves in the crank case and disposed inversely to the inlet valves, an annular passageway provided in the crank case and in communication with the discharge valves to provide an outlet for the fluid on one stroke of the pistons.

8. In a fluid pressure pump comprising an annular crank case having a plurality of auxiliary housings disposed on its outer periphery, a tubular piston disposed in each of said housings, rotary driving means for imparting movement to said pistons, a cylinder head attached to each of said housings, a plurality of valves disposed in said cylinder heads for directing fluid from the crank case to the cylinder head, each of said housings having its outer face provided with a plurality of valve seats adapted to cooperate with the above mentioned valves and a plurality of discharge valves in the housings disposed inversely to the first mentioned valves.

9. In a fluid pressure pump comprising an annular crank case having an inlet passageway and an outlet passageway, a plurality of housings circumferentially disposed around the crank case, a cylinder head attached to each of said housings, means provided in each of said housings forming a plurality of chambers, directing fluid from the inlet passageway to the cylinder head, means for propelling the movement of the fluid to the cylinder head, means for controlling the flow of fluid to the cylinder head, and means controlling the movement of the fluid from the cylinder head, and in communication with the outlet passageway.

10. In a fluid pump, a combination of a crank case having a plurality of auxiliary housings, a plurality of pistons radially reciprocating within the housings, means for reciprocating said pistons, a cylinder head attached to each of said housings, means disposed in said cylinder heads for directing fluid from the crank case to the head, means disposed in the housings for directing fluid from the cylinder heads whereby fluid can be displaced through the cylinder head equal to the pump capacity.

WILLIAM E. HUBBARD.