Jan. 16, 1945. F. WHEATLEY, SR 2,367,452

FLUID PUMP

Filed Sept. 1, 1943 2 Sheets-Sheet 1

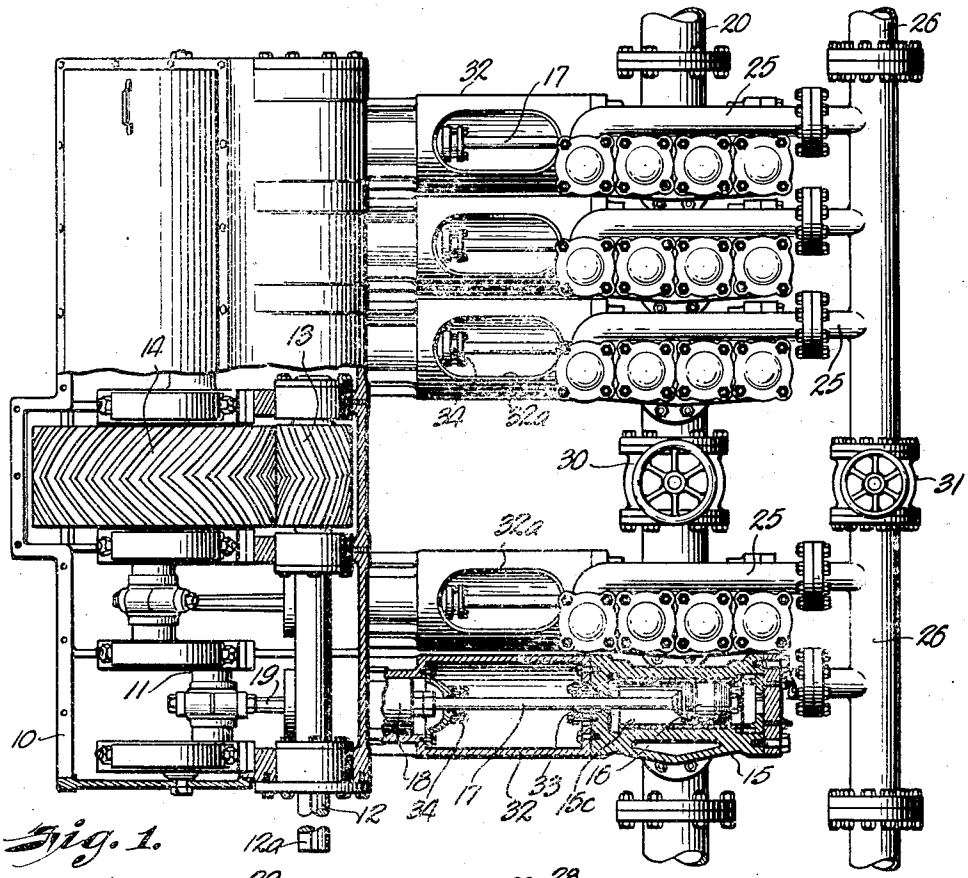


Fig. 1.

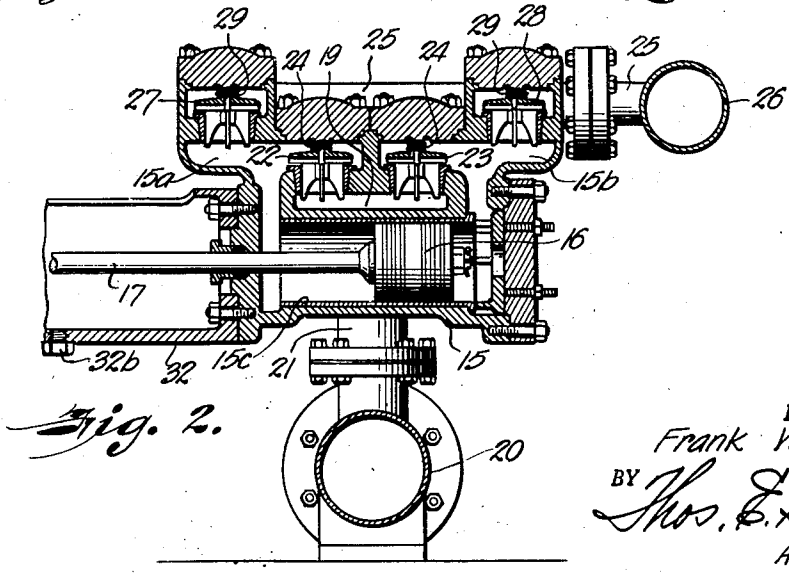


Fig. 2.

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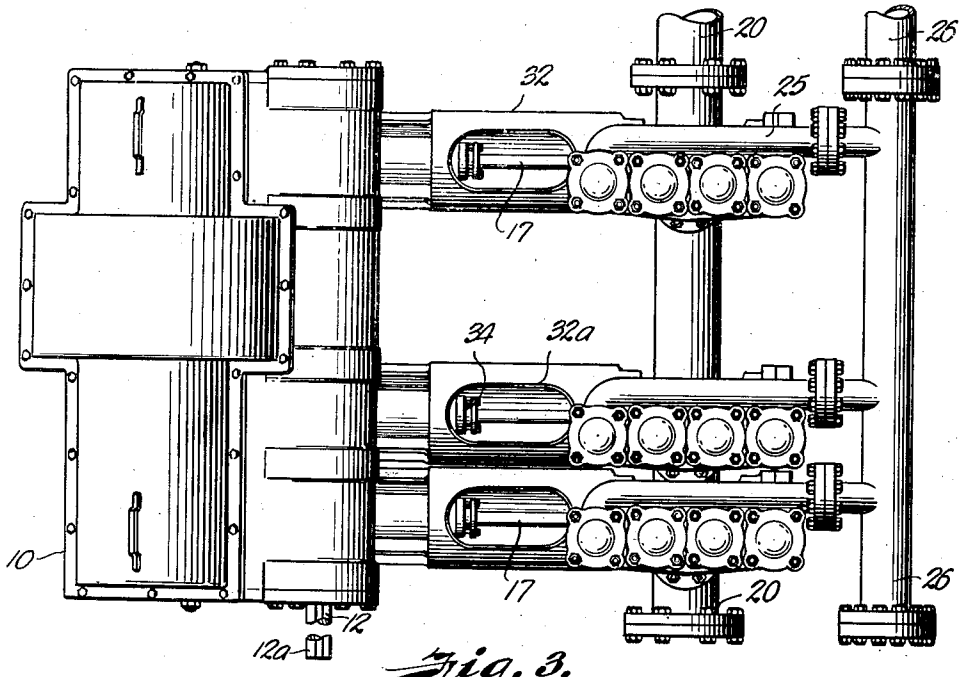


Fig. 3.

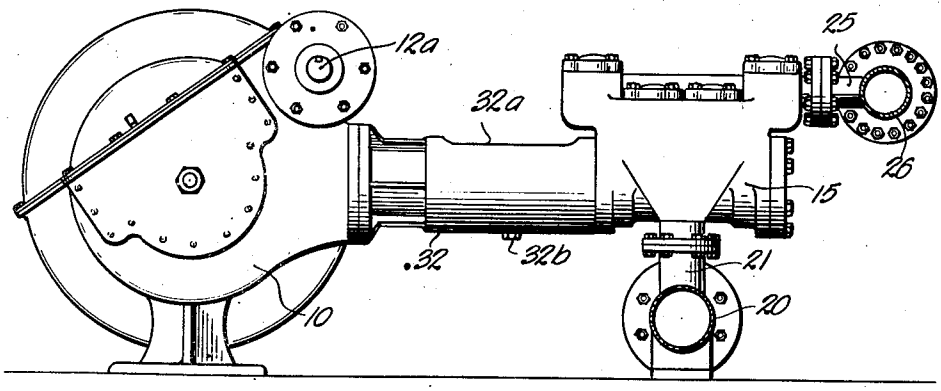


Fig. 4.

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UNITED STATES PATENT OFFICE

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FLUID PUMP

Frank Wheatley, Sr., Tulsa, Okla.

Application September 1, 1943, Serial No. 500,765

1 Claim. (Cl. 103—10)

My invention relates to new and useful improvements in fluid pumps.

The pump construction shown herein is an improvement over that disclosed in abandoned application Serial No. 326,985, filed March 30, 1940.

There has been considerable demand in various industries for a fluid pump that is sturdy and compact, that has great power and maneuverability and that is capable of handling enormous volumes of fluids at high pressure with little or no surge.

I have incorporated all of the above characteristics in a fluid pump by providing the pump with a plurality of cylinders and mounting in the cylinders double acting pistons operated from a single crank shaft. The double acting pistons provide for maximum capacity and minimum weight. When the conventional single acting or duplex pumps are used, spaced and distinct impulses are imparted to the fluid being pumped. This causes the fluid to surge in the pipelines, weakening and otherwise damaging joints, valves and other parts and adjuncts of the line. By operating a plurality of pistons from the same crank shaft, a sufficient number of impulses is imparted to the fluid during each revolution of the crank shaft to practically eliminate surge.

Moreover, I have grouped the cylinders in such a way that if desired, two different fluids can be pumped at different volumes and under different pressures.

An important object of my invention is to provide a pump having a large capacity.

Another object of my invention is to provide a pump that is light in weight and easily maneuverable.

Still another object of my invention is to provide a pump that imparts little or no surge to the fluid being pumped.

Yet another object of my invention is to provide a fluid pump that is capable of simultaneously pumping a plurality of fluids in different volumes and under different pressures.

Other objects and advantages of my invention will be apparent during the course of the following description.

In the drawings forming a part of this specification and wherein like numerals are employed to designate like parts throughout the same,

Fig. 1 is a top plan view of a fluid pump embodying my invention, parts being broken away to more clearly illustrate the internal mechanism of the pump,

Fig. 2 is a fragmentary vertical sectional view through one of the pump pistons and its appurtenances,

Fig. 3 is a top plan view of a modified pump, and

Fig. 4 is an end elevation of the pump shown in Fig. 3.

Referring to the form of the invention shown in Fig. 1, the numeral 10 designates a crank case in which the crank shaft 11 is rotatably mounted. The crank shaft is driven through the medium of a countershaft 12 and gears 13 and 14. Any suitable prime mover (not shown) can be drivingly connected to the projecting end 12a of the countershaft. Extending laterally from the crank case 10 and in horizontal alignment with the crank shaft is a plurality of cylinders 15. The cylinders correspond in number to the cranks on shaft 11 and each cylinder is in alignment with its respective crank. Mounted for reciprocation in each of the cylinders 15 is a piston 16 which is operatively connected to its respective crank by a piston rod 17, crosshead 18 and connecting rod 19. From the foregoing it will be obvious that the countershaft 12 drives crank shaft 11 which in turn reciprocates the pistons 16 in cylinders 15.

In the form of the invention shown in Fig. 1, I have provided five cylinders, two of the cylinders being grouped on one side of the transmission gears and three of the cylinders grouped on the opposite side. This unique grouping of the cylinders better balances the power and pump thrust distributing the work load more uniformly throughout the length of the crank shaft. The five cranks actuating pistons 16 are equally spaced 72° apart about the crank shaft so that each piston is in a different stage of operation at any selected piston of the shaft. This arrangement is largely responsible for the elimination of surge in the pipeline. Ten distinct and equally spaced impulses are imparted to the fluid for each revolution of the crank shaft 11 and these impulses are so closely spaced that wave-like surges of the fluid are substantially eliminated.

Each of the cylinders 15 is provided with an intake or suction manifold 19 which communicates with the fluid inlet pipe 20 via a separate vertical branch pipe 21. Manifolds 19 are continuously filled with fluid by pressure in pipe 20. Passage of fluid from each intake manifold 19 to its respective cylinder 15 is controlled by a pair of valves 22 and 23 which seat downwardly under the action of springs 24. Valve 22 opens into a passage 15a which communicates with the cylinder 15 behind piston 16 and valve 23

opens into a passage 15b which communicates with cylinder 15 in front of the piston. Fluid from cylinder 15 is delivered through passages 15a and 15b into an exhaust manifold 25 through discharge valves 27 and 28, thence into discharge pipe 26. Both valves 27 and 28 seat downwardly and springs 29 thereabove maintain them normally closed. When piston 16 is retracting a suction is created in the portion of cylinder 15 ahead of the piston which draws discharge valve 28 downwardly against its seat and lifts inlet valve 23 against the action of springs 24 to permit fluid in the intake manifold 19 to flow into the cylinder through passage 15b. Simultaneously a zone of increased pressure is created in the portion of the cylinder 15 behind the piston which seats intake valve 22 and opens valve 27 against the action of spring 29 to permit fluid in the cylinder to be discharged into the exhaust manifold 25 and thence into discharge pipe 26. The reverse action occurs when the piston 16 advances in the cylinder 15. A suction is created behind the piston which seats valve 27 and opens inlet valve 22 to permit fluid in manifold 19 to flow into the cylinder behind the piston. Pressure of the piston against the fluid in the cylinder creates a zone of pressure ahead of the piston which seats valve 23 and opens discharge valve 28 to discharge fluid into manifold 25 and to pipe 26.

Thus each piston injects fluid into the discharge pipe 26 twice during each revolution of the crank shaft 11. Consequently, the five pistons inject fluid into the discharge pipe ten times during each revolution of the crank shaft. These ten impulses occurring at regularly spaced intervals maintain a steady flow of fluid in the discharge pipe and substantially eliminate the damaging surges which occur when the conventional one cylinder or duplex fluid pumps are used.

By arranging the cylinders in spaced groups on opposite sides of the driving gears and placing valves 30 and 31 in the inlet and discharge pipes 20 and 26 between the groups of cylinders there is provided a pump construction that is capable of pumping two fluids under different pressures and in different volumes while uniformly distributing the load along the crank shaft. When valves 30 and 31 are opened all five cylinders are used to pump a single fluid supplied through pipe 20. However, when valves 30 and 31 are closed one fluid can be delivered to the group of two cylinders through the portion of pipe 20 at one side of valve 30 and a different fluid can be delivered to the group of three cylinders through the portion of pipe 20 at the other side of valve 30. Since valve 31 is also closed the fluid delivered by the group of two cylinders does not mingle with the fluid delivered by the group of three cylinders and the two fluids flow in opposite directions through the discharge pipe. A pump of this character which can be converted to pump either one or two fluids by the simple expedient of opening or closing a couple of valves has utility for many purposes not possessed by any other fluid pump construction within my knowledge.

As shown in Fig. 1 each of the cylinders 15 is provided with a removable inner lining 15c. By this arrangement liners and pistons having different diameters can be employed in the pump cylinder to regulate the volume and pressure of the fluid being pumped.

To assure that the fluid being pumped does not become contaminated with the lubricant in crank case 10, and to avoid contamination of the lubricant with the pumped fluid, a hollow cylindrical crosshead barrel 32 is provided between the crank case and each cylinder 15. Also piston rods 17 passing through stuffing boxes 33 and 34 are sufficiently long to avoid overlap of the rod into the crank case and cylinders. Openings 32a in the top of the barrels permit ready access to the stuffing boxes 33 and 34 when it is necessary to tighten the stuffing glands or to repack the same. The barrels 32 form a sump for fluid or lubricant that leaks through the stuffing boxes. Fluid accumulated in the barrels is drained by removing drainage plugs 32b.

The form of the invention shown in Fig. 3 is identical with the form of the invention hereinabove described except that three instead of five cylinders are provided. A smaller pump of this character is adaptable for many uses although fewer impulses are imparted to the fluid during each revolution of the shaft.

In general, the object of my invention is not achieved if less than three cylinders are used, although obviously pumps having more than five cylinders can be employed if desired. The greater the number of cylinders used, the less surge occurs. However, even the simpler model shown in Fig. 3 can be used to pump either one or two fluids and since the cylinders are identical with those described in connection with the pump shown in Fig. 1, the two fluids may be pumped in different volumes and under different pressures. The three cylinder pump is considerably lighter in weight than the five cylinder pump and consequently possesses greater maneuverability. Further, it has a common advantage with the five cylinder pump in that it has a relatively greater capacity for its size and weight.

It is to be understood that the forms of the invention herewith shown and described are to be taken as preferred examples of the same and that various changes in the size, shape and arrangement of parts may be resorted to without departing from the spirit of my invention or the scope of the appended claim.

Having thus described my invention, I claim:

A cylindrical double acting pump unit comprising in combination an enclosed crank shaft having a plurality of cranks thereon and a driving gear mounted on the shaft between selected groups of the cranks, horizontally positioned cylinders corresponding in number to the crank groupings, double acting pistons in the cylinders, means comprising connecting rods, cross heads and piston rods for connecting said pistons to the crank shaft, said cylinder groupings being located on opposite sides of the driving gear to distribute the load on the crank shaft, suction and discharge manifolds connected to the respective cylinders, suction and discharge valves for controlling the fluid flow through the cylinders, a single fluid supply line for simultaneously charging the suction manifolds, a valve in the fluid supply line between the groups of cylinders adapted to be closed so as to provide a separate supply line for each of the groups, a single fluid discharge line and a valve in the fluid discharge line between the groups of cylinders adapted to be closed so as to provide a separate fluid discharge line for each of said groups.

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