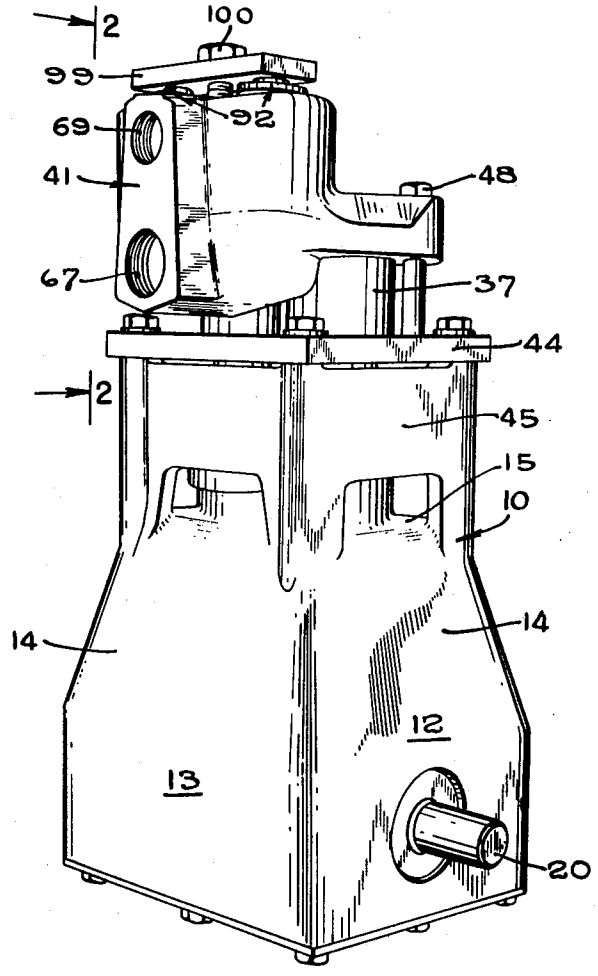
April 24, 1962 C. J. GRIFFITH ETAL 3,030,978

PUMP VALVE STRUCTURE

Original Filed Oct. 13, 1954 2 Sheets-Sheet 1

FIG_1



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FIG. 2

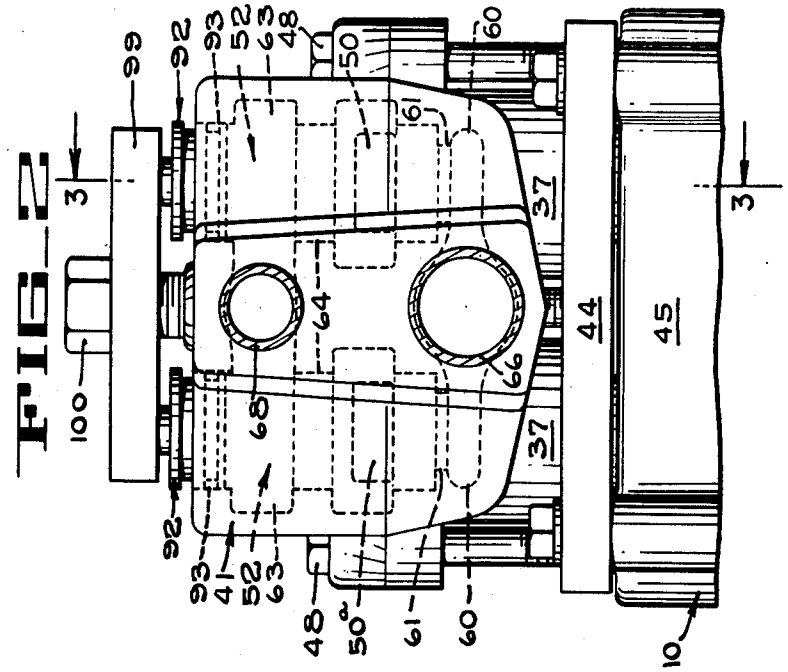
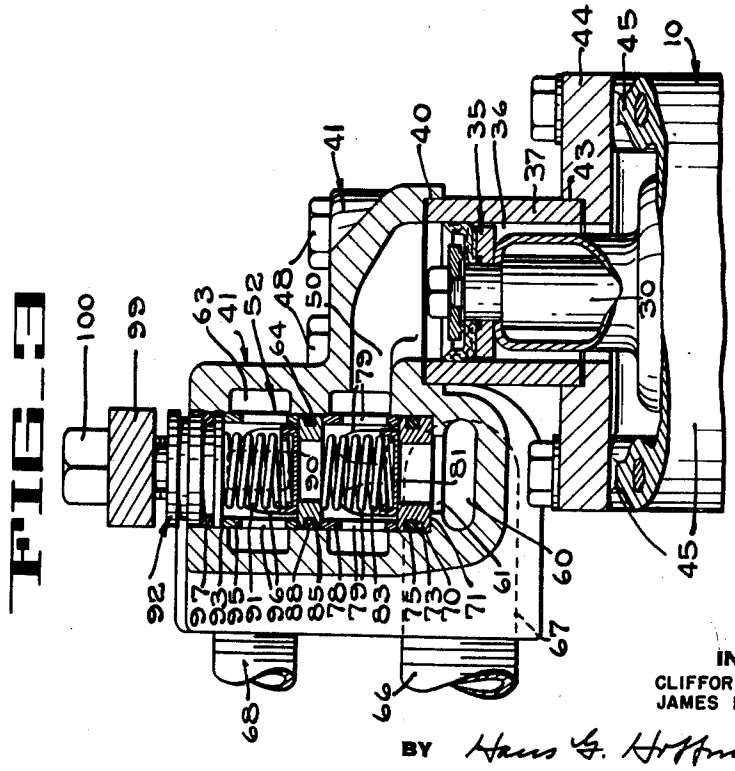


FIG. 3



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PUMP VALVE STRUCTURE

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Original application Oct. 13, 1954, Ser. No. 462,002, now Patent No. 2,857,219, dated Oct. 21, 1958. Divided and this application Aug. 27, 1958, Ser. No. 757,587
2 Claims. (Cl. 137—512)

This invention relates to pumps and more particularly to improved means for controlling the flow of fluid through a reciprocating pump.

This application is a division of applicants' copending application Serial No. 462,002, filed October 13, 1954 which issued October 21, 1958, as U.S. Patent No. 2,857,219, and is entitled "Pump."

It is an object of the present invention to provide an improved valve arrangement for a reciprocating pump.

Another object of the invention is to provide a valve assembly for a reciprocating pump, which valve assembly is simple in construction.

Another object is to provide a valve assembly for a reciprocating pump, which valve assembly is unusually efficient in operation.

These and other objects and advantages of the present invention will become apparent from the following description, read in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective of a pump incorporating the valve arrangement of the present invention.

FIG. 2 is an enlarged elevation taken along the lines 2—2 of FIG. 1, inlet and discharge conduits for the valve structure being shown in section.

FIG. 3 is a vertical section taken along the lines 3—3 of FIG. 2.

In FIGURE 1, the reference numeral 10 indicates a hollow pump housing having opposed side walls 12 and opposed end walls 13 (only one side wall and one end wall being shown). All four of the walls of the housing are integrally formed and have upper, inwardly inclined portions 14 connected at their upper ends by an integrally formed top wall 15. Mounted within the housing 10 is a reciprocating pumping mechanism which is disclosed in the aforementioned copending application Serial No. 462,002. The pumping mechanism is driven by a crank shaft 20 journaled in the lower ends of the housing walls 12.

The pumping mechanism is provided with two identical vertically extending piston rods 30, the upper end of one of said rods being shown in FIG. 3. A piston assembly 35 is mounted at the upper end of each piston rod and is arranged for sliding movement in contact with a cylinder 36 provided by the internal surface of a sleeve 37. Each sleeve 37 is disposed at its upper end in a recess 40 in a pumping head 41, and at its lower end in a recess 43 in a mounting plate 44 supported on and secured to the upper surface of a wall 45 which is integrally formed on the housing and extends around the upper portion of the pump mechanism (FIG. 1).

When the crank shaft 20 is rotated by a power mechanism (not shown), the piston assemblies 35 are reciprocated within the cylinders 36. The pistons are 180° out of phase, so that one piston will be in its suction stroke while the other is in its discharge stroke.

The pumping head 41 is secured on the upper end of the pump housing by bolts 48 (FIG. 2) that extend through suitable openings in the pumping head and are threaded into tapped openings in the mounting plate 44. The pumping head 41 has two flow passages or pumping

chambers 50 and 50*a* (FIGS. 2 and 3), each of which extends between one of the pump cylinders 36 and a respective cylindrical valve chamber 52. Each valve chamber 52 is in flow communication with an inlet passage 60 through a port 61 and with a discharge passage 63 through a port 64. Both of the inlet passages 60 (FIG. 2) are in communication with a common inlet conduit 66 through an internally threaded opening 67 (FIG. 1) which receives one end of the conduit. Similarly, both discharge passages 63 communicate with a common discharge conduit 68 through an opening 69 (FIG. 1) in which the conduit 68 is threaded.

A novel valve assembly is provided for controlling the flow of liquid from each inlet passage 60 to the associated discharge passage 63. Inasmuch as the two valve assemblies are identical in structure, only one is shown (FIG. 3) and described. This valve assembly comprises an annular inlet valve seat 70 arranged to fit snugly in a recess 71 in the pumping head 41. The valve seat has an outer annular groove 73 in which a resilient O-ring 75 is disposed in sealing engagement between the walls of the groove 73 and the wall of the recess 71. Resting on top of the seat 70 is a cylindrical cage 78 which has a plurality of vertical slots 79 through which fluid may pass. A solid valve disk 81 is positioned over the central opening of the annular valve seat 70 to close the passage formed therein. A coil spring 83 is seated at its lower end in a recess formed in the valve disk 81 and bears at its upper end against an annular discharge valve seat 85 which is snugly disposed in the port 64 formed in the pumping head. An O-ring 88 is disposed in an annular groove in the discharge valve seat 85 in sealing engagement between the outer surface of the valve seat 85 and the inner surface of the port 64. A solid valve disk 90 is positioned over the central opening of the annular valve seat 85 to close the passage formed therein. A coil spring 91 is seated at its lower end in a recess formed in the valve disk 90 and bears at its upper end against a cylindrical cover 92 which is disposed in a cylindrical opening 93 provided in the pumping head. A discharge cage 95 rests on top of the discharge valve seat 85 with its lower end extending into the port 64 in the pumping head 41. The cage 95 has a plurality of slots 96 through which liquid may pass. A resilient O-ring 97 is disposed in an annular groove in the cover 92 in sealing engagement between the cover and the pumping head. A bar 99 (FIG. 2) extends across the top of the pump housing and bears against both valve covers 92 to hold the two valve assemblies in place. The bar 99 is locked in position by a capscrew 100 which extends through the bar and is threadedly received in the pumping head 41.

Referring to FIG. 3 it will be seen that when the piston 35 moves downwardly in its suction stroke, the inlet valve disk 81 is lifted from the seat 70, permitting liquid to enter the cage 78 and pass through the slots 79 of the cage 78 into the flow passage 50 and then into the cylinder 36. When the piston moves upwardly in its discharge stroke, the valve disk 81 is forced down onto its seat 70, while the discharge valve disk 90 is forced off its seat 85, permitting the liquid to be forced through the slotted discharge cage 95 and out through the discharge conduit 68.

From the foregoing description it will be evident that there is provided in the present invention a simple, effective valve arrangement for controlling the flow of liquid through a pump.

It will be understood that modifications and variations of the embodiment of the invention disclosed herein may be resorted to without departing from the scope of the novel concepts of the invention.

The invention having thus been described, what is

claimed as new and desired to be protected by Letters Patent is:

1. A valve for a reciprocating pump comprising a valve housing having a cylindrical bore therein of uniform diameter, means defining an inlet and a discharge passage in communication with the bore at spaced points along the length thereof, a first symmetrical annulus disposed in said bore and peripherally sealed thereto for defining an inlet port from said inlet passage into the middle region of said bore, an inlet valve disk disposed over said inlet port, a first cage disposed in said bore middle region with one end thereof abutting said first symmetrical annulus, a second symmetrical annulus disposed in said bore and peripherally sealed thereto for defining a discharge port from said bore middle region into said discharge passage, said second symmetrical annulus being disposed in abutting relation with the other end of said first cage, a first spring disposed between said inlet valve disk and said second symmetrical annulus for urging the inlet disk to close the inlet port, a discharge valve disk disposed over said discharge port, a second cage disposed in said bore with one end thereof abutting said second symmetrical annulus, a cover member disposed over said bore and abutting the other end of said second cage and rigidly connected to said housing for positively locating said first and second cages and said first and second symmetrical annuli within said bore, and a second spring disposed between said discharge valve disk and said cover for urging the discharge valve disk to close the discharge port, whereby fluid flows from the inlet to the discharge passage in response to a fluid pressure differential which causes said valves to open between the bore middle region.

2. In a pump valve structure, the combination comprising a housing with a cylindrical valve chamber of uniform bore open at one end having a coaxial inlet port of smaller diameter at the other end and with flow passage and discharge ports located therebetween, an inner valve structure inserted through said open end and stacked in operative position, said inner valve structure comprising a symmetrical annulus fitting around said inlet port in sealable relationship with the periphery of said cylindrical valve chamber forming an inlet valve seat, an inlet valve disk resting upon said inlet valve seat covering said inlet port, a spring resting on said inlet valve disk, a slotted cylindrical cage surrounding said spring and disk resting on said inlet valve seat, a discharge valve seat formed by a symmetrical annulus sealably engaging the periphery of said cylindrical valve chamber above said flow passage and resting upon said slotted cylindrical cage thus compressing said spring, a discharge valve disk resting on said discharge valve seat, a spring resting on said discharge valve disk, a slotted cylindrical cage resting upon said discharge valve seat surrounding said spring and disk, and a valve cover sealing the open end of said cylindrical valve chamber and holding said inner valve structure in a compressed operating relationship, said inner valve structure being readily removable upon removal of said valve cover.

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