June 15, 1954 W. C. HACKMAN 2,681,012

GRAVITY DISPLACEMENT PUMP

Filed Aug. 21, 1951

Fig. 1

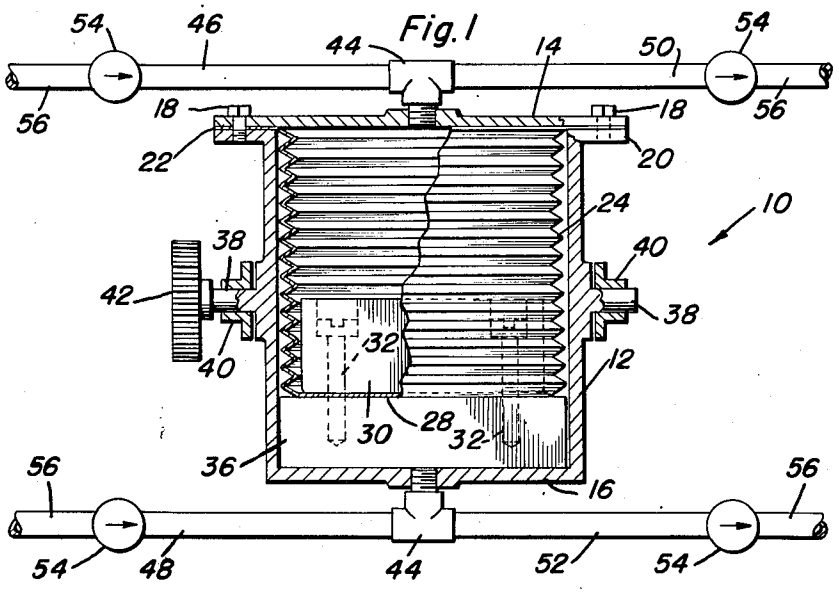


Fig. 2

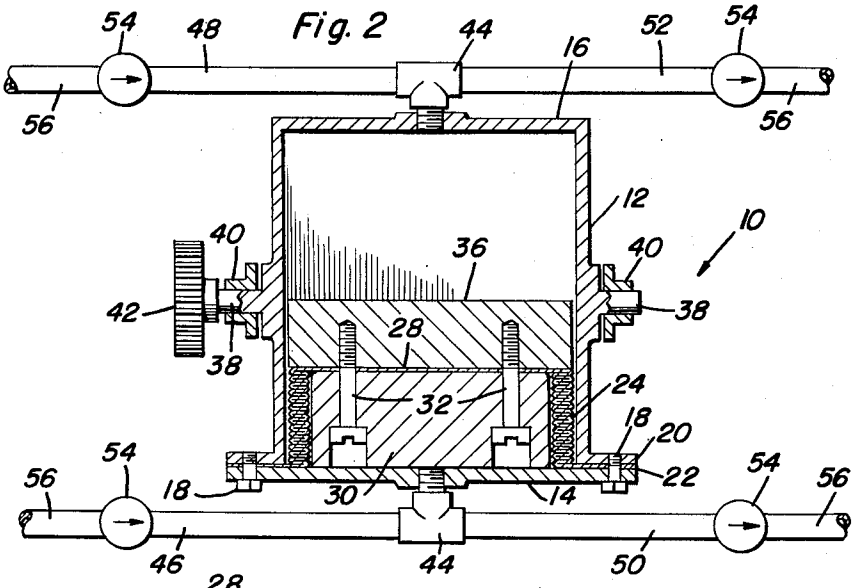
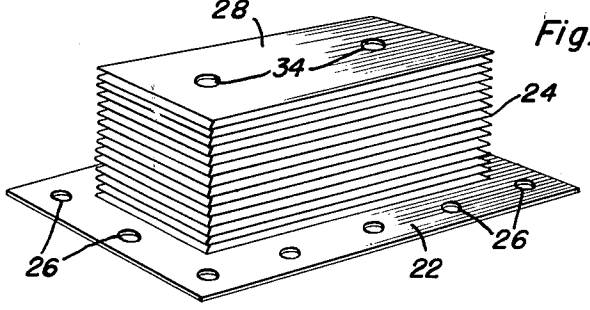


Fig. 3



William C. Hackman
INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

Patented June 15, 1954 2,681,012

UNITED STATES PATENT OFFICE

2,681,012

GRAVITY DISPLACEMENT PUMP

William C. Hackman, Silver Spring, Md.

Application August 21, 1951, Serial No. 242,862

3 Claims. (Cl. 103—148)

1

This invention relates to new and useful improvements and structural refinements in pumps, and the principal object of the invention is to provide a dependable pump of the character described, which may be conveniently and effectively employed for delivering fluid in a "double acting," pulsating manner, the operation of the pump being responsive to the effect of gravity rather than to a direct, mechanical pressure.

Some of the advantages of the invention lie in its simplicity of construction, in its dependable and efficient operation, and in its adaptability to economical manufacture.

With the above more important objects and features in view, and such other objects and features as may become apparent as this specification proceeds, the invention consists essentially of the arrangement and construction of parts as illustrated in the accompanying drawings, in which:

Figure 1 is a sectional view of the invention in its initial position;

Figure 2 is a sectional view, similar to that shown in Figure 1, but illustrating the invention in an inverted position; and

Figure 3 is a perspective view of the bellows used in the invention.

Like characters of reference are employed to designate like parts in the specification and throughout the several views.

Referring now to the accompanying drawings in detail, the invention consists of a double acting pump which is designated generally by the reference character 10 and embodies in its construction a casing 12 having closed ends 14 and 16. If desired, the end 14 may be in the form of a removable cover plate secured by studs 18 to an outturned flange 20 on the casing 12, a gasket 22 being interposed, of course, between the cover plate and the flange, for obvious reasons.

If desired, this "gasket" may assume the form of an outturned, marginal flange provided at one end of a bellows 24 and formed with apertures 26 to receive the studs 18, as shown in Figure 3.

The bellows 24 is disposed within the casing 12 and while the flanged end of the bellows is open, the other end of the bellows is closed, as illustrated at 28. The closed end 28 of the bellows is movable toward and away from the end wall 16 of the casing and a gravity responsive weight 30, contained within the bellows, is secured to the bottom of the bellows by suitable screws 32, extending through apertures 34 with which the bottom 28 is formed, into a second weight 36 disposed in the casing 12 exteriorly of the bellows, as shown.

2

The casing 12 is provided intermediate its ends with a pair of coaxial trunnions 38 which are journaled in suitable bearings 40, one of the trunnions 38 carrying a suitable drive element 42 whereby the entire casing may be oscillated or swung from an initial position shown in Figure 1 to an inverted position shown in Figure 2, and vice versa.

The ends 14, 16 of the casing 12 are provided with T's 44, having connected thereto pairs of fluid inlet ducts 46, 48 and 50, 52, respectively, each of these ducts being equipped with a check valve 54 of any conventional type whereby flow of fluid is permitted in one direction only, that is, from the inlet ducts 46, 48 to the outlet ducts 50, 52, respectively.

Assuming the pump to be in operation and in the position shown in Figure 1, fluid delivered by gravity through the duct 46 has entered the interior of the bellows 24 while fluid in the interior of the casing 12 exteriorly of the bellows 24 has been expelled through the outlet duct 52. In this connection, it is to be noted that the ducts 46, 50 communicate through the medium of the associated T with the interior of the bellows 24, while the ducts 48, 52 communicate with the interior of the casing 12 exteriorly of the bellows, as will be clearly apparent.

When the pump casing 12 is oscillated through the medium of the means 42, 38 to an inverted position, the end 16 of the casing will be uppermost and, by virtue of the weights 30, 36, the bellows 24 will be compressed, as illustrated in Figure 2 and, as a result, fluid will be expelled from the interior of the bellows 24 through the duct 50 while at the same time fluid is drawn into the interior of the casing 12, exteriorly of the bellows, through the duct 48. Subsequent inversion of the casing through 180 degrees will revert the casing to its initial position wherein fluid in the interior of the casing exteriorly of the bellows will be expelled through the duct 52 while fluid is drawn into the bellows through the duct 46.

In this manner, alternate swinging of the casing through an arc of 180 degrees will result in a double acting pulsating charge of fluid being delivered through the ducts 50, 52, and if desired, several pumps constructed in accordance with the invention may be coupled together in a "bank" and appropriately synchronized to deliver continuous rather than pulsating pressure.

Connections 56 to the check valves 54 may assume the form of flexible hoses which would permit oscillation of the pump casing without twisting or tangling the connections, and while in the

accompanying drawings the casing 12, the bellows 24 and the weights 30, 36 have been shown as substantially rectangular in configuration, these elements may be of a circular form, if preferred.

It is believed that the advantages and use of the invention will be readily understood from the foregoing disclosure and accordingly, further description thereof at this point is deemed unnecessary.

While in the foregoing there has been shown and described the preferred embodiment of this invention, it is to be understood that minor changes in the details of construction, combination and arrangement of parts may be resorted to without departing from the spirit and scope of the invention claimed.

Having described the invention, what is claimed as new is:

1. A double acting gravity displacement pump comprising a casing having closed ends, means for suspending said casing for oscillation about a transverse axis intermediate the ends of the casing, a single bellows disposed in the casing and secured at one end thereof to one end of the casing, the other end of the bellows having a wall movable toward and away from the corresponding other end of the casing, a first gravity-responsive weight carried by said wall and secured on one side thereof, a second gravity-responsive weight carried by said wall and secured on the other side thereof, a fluid inlet duct and a fluid outlet duct connected to one end of the casing in communication with the interior of said bellows, a second

fluid inlet duct and a second fluid outlet duct connected to the other end of the casing and communicating with the interior of the latter but exteriorly of said bellows, check valves provided in said ducts for permitting flow of fluid from the respective inlet to the respective outlet ducts only, and means for oscillating the casing between initial and inverted positions.

2. The apparatus as defined in claim 1 wherein said bellows conforms substantially to and is slightly smaller than the transverse section of said casing.

3. A double acting gravity displacement pump comprising a casing having closed ends, means for suspending said casing for oscillation about a transverse axis intermediate the ends of the casing, a single bellows disposed in the casing and secured at one end thereof to one end of the casing, the other end of the bellows having a wall movable toward and away from the corresponding other end of the casing, a first gravity-responsive weight disposed interiorly of said bellows adjacent said wall, a second gravity-responsive weight disposed exteriorly of said bellows adjacent said wall, means securing said weights to said wall, inlet and outlet means disposed on each closed end of said casing.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
316,434	Annibale	Apr. 28, 1885