

June 22, 1965

E. V. NIELSEN

3,190,230

PUMPING APPARATUS

Filed Nov. 1, 1963

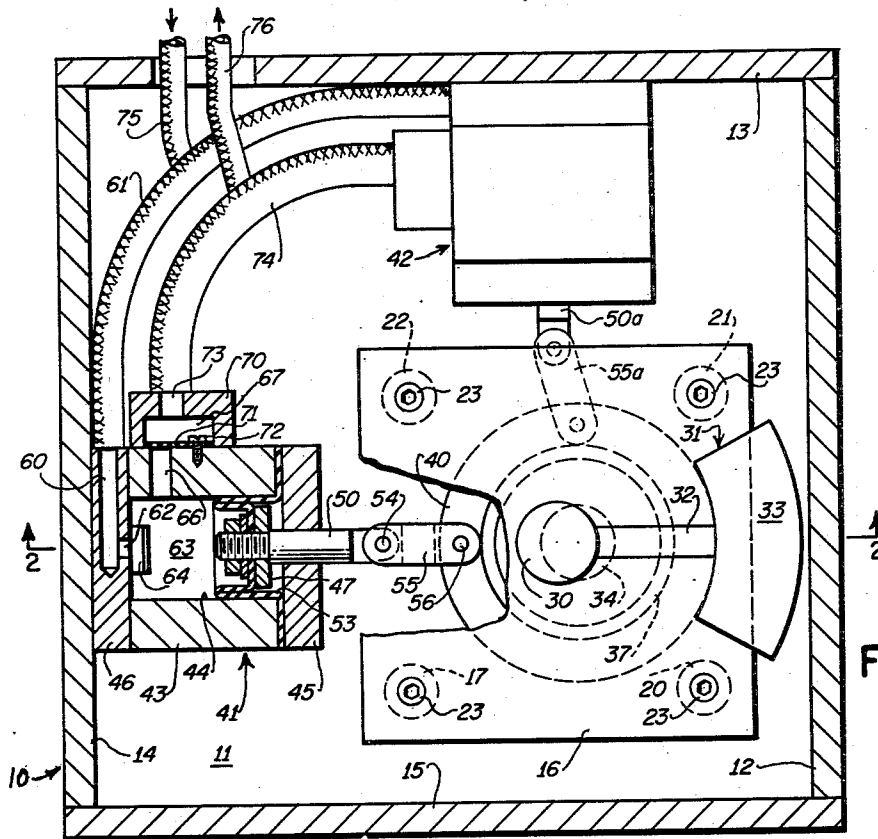


Fig. 1

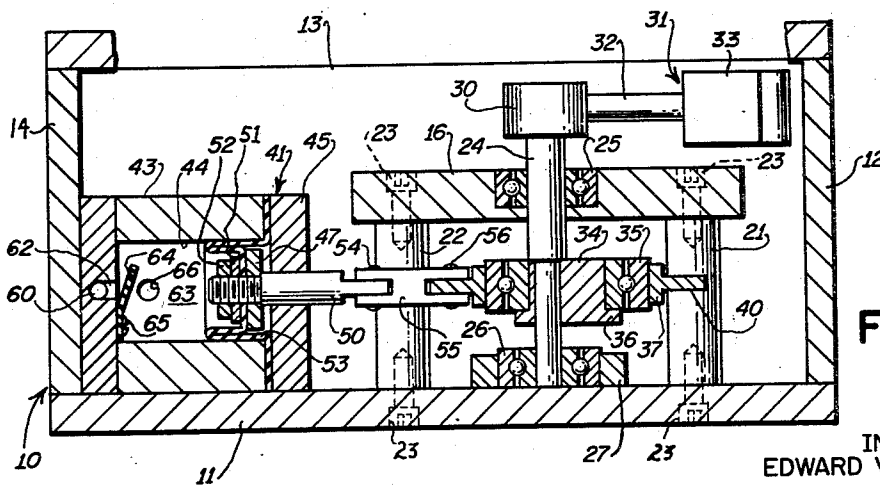


Fig. 2

INVENTOR
EDWARD V. NIELSEN

BY *Albert W. Scribner*

ATTORNEY

1

3,190,230

PUMPING APPARATUS

Edward V. Nielsen, Darien, Conn., assignor to
Nicholas J. Totolo

Filed Nov. 1, 1963, Ser. No. 320,769

5 Claims. (Cl. 103-152)

This invention relates to a novel gravity actuated pump. More particularly, the invention relates to an improved construction and arrangement for the pump actuating linkage and the several pumping units operated by said linkage.

The various gravity actuated pumps previously proposed for removing bilge water from boats employ relatively expensive actuating means for operating the various pumping units of the pump. Such actuating means have included vertical type pendulums, rolling weights, etc. In those devices that have utilized a horizontal type pendulum as the actuating means, a relatively complex means has in most cases been required for supporting the several pumping units and/or for obtaining the efficient valving of the latter.

One object of the instant invention is to provide a novel gravity actuated device for pumping bilge water from a boat whereby a very simple reliable and direct means is provided for efficiently supporting, valving and actuating several individual pumping units.

Another object of the invention is to provide an improved bilge pump having a horizontal actuating pendulum and which has several pumping chambers and novel interconnecting linkages between the pendulum and the several pumping chambers respectively.

Another object of the invention is to provide an improved bilge pump having a plurality of radially disposed pumping units that are coupled in a novel manner to an annular member that is rotatably mounted on an eccentric portion of a vertical main drive shaft.

A further object of the invention is to provide a novel bilge water pump having a plurality of individual pumping units actuated by a horizontal pendulum, the pumping units having each a novel valving arrangement which will permit the lodging of foreign particles such as sand in the valve members without causing a malfunction of the latter.

Other objects of the invention will become apparent as the disclosure progresses.

In the drawings:

FIG. 1 is a plan view in partial section illustrating one embodiment of the instant invention.

FIG. 2 is a vertical sectional view taken along section line 2-2 of FIG. 1.

Referring to the drawings, there is shown a pump frame 10 which is adapted to be suitably mounted in a boat and which comprises a horizontal rectangular base 11 having four upstanding sides 12, 13, 14 and 15 secured thereto. A horizontal shaft supporting bearing or plate 16 is fixedly mounted on base 11 by means of four vertical columns 17, 20, 21 and 22 and associated Allen type screws 23. A vertically disposed main shaft 24 is rotatably mounted on the base 11 and plate 16 by means of suitable bearings 25 and 26, bearing 26 being retained in an annular member 27 secured to base 11. The upper end of shaft 24 is formed with a head 30 to which is fastened what will be referred to here as a horizontal pendulum 31 that includes a radial arm 32 and an actuator weight 33. As will be apparent when the pump frame 10 is tilted from a horizontal condition by a rocking motion of the boat, the pendulum 31 will swing through an arc to a low point determined by the direction of tilt and in so swinging will correspondingly rotatably actuate the main shaft 24. Rotatably fixed to an

2

intermediate portion of the main shaft is a collar 34 that is eccentrically disposed with respect to the main shaft. Rotatably mounted on the cylindrical outer surface of collar 34 is a bearing 35, the flanged portion 36 of the collar serving to vertically support the bearing 35. Fixed to the outer portion of bearing 35 is a connecting ring 37 having a radially outer flanged portion 40 formed thereon.

The instant bilge pump is provided with a pair of pumping units 41 and 42, and in that the construction and operation of each of the units is similar, a detailed description of one thereof will suffice here. The pumping unit 41 comprises a main radially disposed cylinder block 43 which is secured to the base 11 and which is formed with a cylindrical bore 44 therethrough. End sealing plates 45 and 46 are secured by any suitable means to the respective inner and outer ends of cylinder block 43. Mounted for reciprocating movement in the cylinder bore is a piston 47 that is fastened to a piston rod 50 by means of a washer 51 and a nut 52, FIG. 2. A sealing connection is provided between the piston and the cylinder block, such connection comprising a flexible telescoping tubular element 53 that may be made of rubber, plastic or a similar material. One end of the tubular element 53 is clamped in sealed relation between the inner end of the cylinder block and the plate 45 while the other end thereof is clamped in sealed relation between the washer 51 and the piston 47. The inner end of the piston rod 50 is articulately connected by means of a pin 54 to the outer end of a connecting link 55. The inner end of the link 55 is in turn articulately coupled by means of a pin 56 to the adjacent portion of said flanged portion 40 of ring 36. As may be readily seen when shaft 24 is caused to rotate by reason of a swinging movement of the horizontal pendulum 31, the eccentric collar 34 will cause ring 36 to partake of an accurate precessional type movement which in turn will produce through the articulate link 55 a reciprocatory motion of the piston 47 in the pumping cylinder.

Suitable valving and fluid conducting lines are provided in the pumping unit 41. These include a water inlet passage 60 formed in the outer cylinder plate 46, said passage communicating at one end with the plastic water inlet hose or line 61 and at the other end with a bore 62 which opens into the pumping cylinder or chamber 63. A one way flapper valve member is operatively disposed between the inlet passage 62 and the pumping chamber 63, said member comprising a rubber like pad 64 mounted at one side thereof by a screw 65 to the inner face of plate 46. The flexible valve pad 64 is swingable towards and away from an inlet passage blocking position by differential fluid pressures. An outlet passage 66 formed through the wall of cylinder block 43 communicates with a valve chamber 67 formed by the recess in the cap member 70 that is sealingly fastened to the outside of the block 43. A one way flapper valve member is operatively disposed between the outlet passage 66 and the valve chamber 67, said member comprising a rubber like pad 71 mounted at one side thereof by a screw 72 to the outer surface of the cylinder block 43. The flexible valve pad 71 is swingable towards and away from an outlet passage blocking position shown in FIG. 1 by differential fluid pressures. Through the outer wall of the cap member 70, there is formed an outlet bore 73 which operatively communicates with a suitable exhaust hose or line 74. The inlet and outlet lines 61 and 74 are operatively coupled to those fluid conducting passages in the pumping unit 42 which respectively correspond to passages 60 and 73 of the pumping unit 41. Lines 61 and 74 are also operatively coupled to the main inlet and outlet lines 75 and 76 respectively, the remote end of line 75 being disposed in the

3

region where the boat bilge water has collected and the remote end of the line 76 being disposed over the side rail or rear transom of the craft.

In the operation of the instant device, an intake stroke (a displacement to the right as seen in FIG. 2) of the piston 47 will lower the fluid pressure in the pumping chamber 63 and such will cause valve 64 to open and valve 71 to close as shown. This action will cause water to be drawn into chamber 63 through lines 75, 61 and passages 60 and 62. When the piston 47 is displaced in the opposite direction through a pumping stroke, the pressure in chamber 63 will increase so as to cause valve 64 to close and valve 71 to open. This action will cause the water in chamber 63 to be forced out through passages 66, 67, 73 and lines 74 and 76. By the repeated reciprocary strokes of piston 47 caused by arcuate oscillations of the horizontal pendulum 31, water will be repeatedly pumped from the main intake line 75 into the main exhaust line 76. In this way the rocking motion of the boat effectively operates the instant pumping device and thus prevents any appreciable amount of bilge water from accumulating in the bottom of the boat.

It will be understood that the piston rod 50a of the pumping unit 42 is articulately connected to the ring 36 by means of a link 55a, this arrangement being similar to that described above for piston rod 50 and link 55, and that the operation of pumping unit 42 will lag or lead the operation of pumping unit 41 by 90 degrees depending on which direction the horizontal pendulum 31 happens to be swinging.

It should be understood that the foregoing disclosure relates only to the preferred embodiment of the invention and that it is intended to cover all changes and modifications of the example of the invention herein chosen for illustrative purposes and which do not constitute departures from the spirit and scope of the invention.

The invention claimed is:

1. A gravity actuated pump: comprising

a main housing;

a substantially vertically disposed shaft rotatably mounted in said main housing;

a substantially horizontally disposed pendulum secured to said shaft, said pendulum being free to swing under the action of gravity when said housing is tilted thereby rotatably actuating said shaft;

crank means connected to said shaft;

at least one pumping unit disposed in said housing and operatively coupled to said crank means so as to be actuated in response to the rotational movement of said shaft;

said pumping unit comprising a resilient diaphragm that

4

sealingly covers one end of a bore formed in said housing, and a connecting rod secured at one end to the central portion of said diaphragm and coupled at the other effective end thereof to said crank means; said housing having inlet and outlet fluid conducting passages formed therein each communicating with said pumping unit;

a first one way flapper valve member attached at one side thereof to said housing and adapted to swing towards and away from an inlet passage blocking position so as to permit only a fluid inlet flow through said inlet passage to said pumping unit; and

a second one way flapper valve member attached at one side thereof to said housing and adapted to swing towards and away from an outlet passage blocking position so as to permit only a fluid outlet flow through said outlet passage from said pumping unit.

2. Apparatus as defined by claim 1 wherein each of said flapper valve members comprises a flexible pad that is adapted to seat against an annular face which is formed in said housing so as to surround the associated one of said passages whereby any foreign matter moving through said pump and lodging between said pad and face will not cause a malfunction of said flapper valve members.

3. Apparatus as defined by claim 2 wherein said inlet passage communicates with that end of the said pumping unit bore that is disposed opposite from said diaphragm; and wherein said outlet passage communicates with the side of the said pumping unit bore.

4. Apparatus as defined by claim 1 wherein said crank means includes a collar which is eccentrically secured to said shaft and a connecting ring rotatably mounted on said collar.

5. Apparatus as defined by claim 2: additionally comprising at least one additional pumping unit, similar to the first mentioned pumping unit, and disposed in said housing and operatively coupled to said crank means for pumping actuation thereof in predetermined phase relation to the pumping action of said first mentioned pumping unit in response to the rotary oscillation of said pendulum and shaft.

References Cited by the Examiner

UNITED STATES PATENTS

45	1,442,478	1/23	Keddy	103—71
	2,493,050	1/50	Weir	103—71

FOREIGN PATENTS

20,696	2/36	Australia.
--------	------	------------

50 LAURENCE V. EFNER, *Primary Examiner*.