Jan. 6, 1953 W. W. HERRICK ET AL 2,624,305

AUTOMATIC BOAT PUMPING DEVICE

Filed Oct. 6, 1947 2 SHEETS—SHEET 1

Fig. 1.

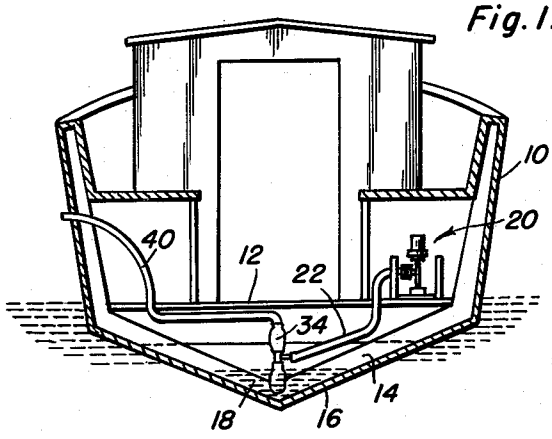

Fig. 4.

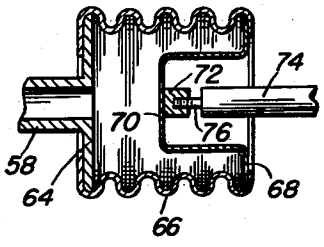

Fig. 3.

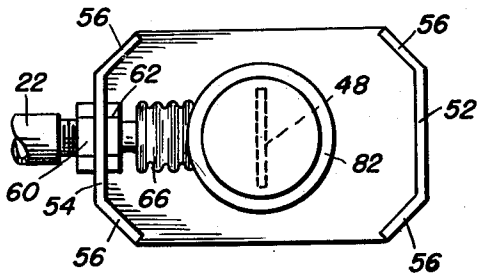

Fig. 2.

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Fig. 6.

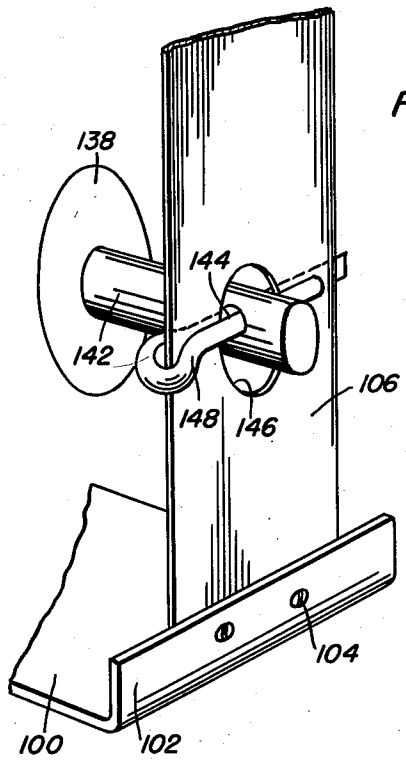
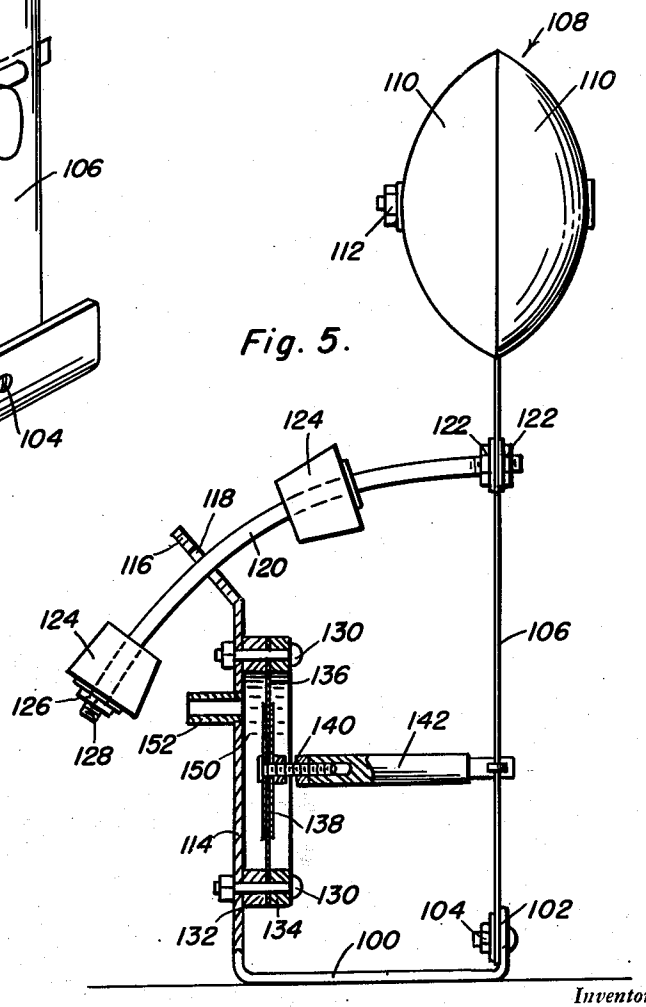


Fig. 5.



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AUTOMATIC BOAT PUMPING DEVICE

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11 Claims. (Cl. 114—183)

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This invention comprises novel and useful improvements in an automatic boat pumping device, and more specifically pertains to a bailing pump for boats which is automatically operable by the rocking motion of a boat to pump the water from the bilge thereof.

The principal object of this invention resides in providing a means for automatically discharging leakage and other water accumulating in the bilge of a boat by means of a rocking motion of the boat, however slight.

The invention is characterized by the provision of a combined pump and pump actuating mechanism unit which may be readily applied to various constructions of boats and which is operable by the rocking motion of a boat to automatically discharge water accumulating in the bilge thereof.

A further feature of the invention resides in providing an improved construction of pump actuating mechanism which is especially sensitive and susceptible to a very slight rolling or rocking motion of the boat for effecting the intended pumping operation.

Yet another feature of the invention resides in providing an improved construction of pump, in conjunction with the above mentioned operating mechnaism, wherein the operating efficiency of the pump is greatly increased and the effectiveness of the device as a whole is thereby augmented.

Further features of the invention, together with other objects, will later become apparent as the following description proceeds, and are attained by this device, the preferred embodiment of which has been illustrated, by way of example only in the accompanying drawings, wherein:

Figure 1 is a vertical transverse sectional view through the hull of a boat of suitable construction and showing the present invention applied thereto;

Figure 2 is a fragmentary enlarged vertical transverse sectional view similar to Figure 1, parts of the apparatus being broken away and shown in section, and alternative positions of the operating mechanism of the pump being indicated by dotted lines therein;

Figure 3 is a fragmentary top plan view of the pump and pump-actuating unit;

Figure 4 is an enlarged fragmentary vertical sectional view, parts being shown in elevation, of the novel pump forming a part of this invention;

Figure 5 is a side elevational view, parts being shown in section of a modified construction of the pump and actuator; and

Figure 6 is an enlarged fragmentary perspective view of a portion of the embodiment of Figure 5.

Referring now more specifically to the accompanying drawings, wherein like numerals designate similar parts throughout the various views, attention is directed first to Figures 1 and 2 wherein there is disclosed at 10 a portion of the hull of a boat which may be of any suitable construction, size or type, and which is preferably provided with a platform 12 beneath which is disposed a bilge 14 below the platform and above the inclined hull 16 of the boat. As indicated at 18, the bilge is shaped and adapted to retain at the lower portion thereof a quantity of water 18 which accumulates therein either by seepage, by rain, or the like.

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In accordance with the principles of this invention, a combined pump and pump actuating unit, indicated generally at 20, is mounted in any suitable position preferably upon the platform 12 and disposed in any convenient and unobtrusive space. Connected to the pumping unit 20 is a conduit 22 which constitutes the intake and discharge line of the pump and which is connected at its other extremity of a T-shaped coupling member 24, as shown in Figure 2, and which is mounted in any suitable manner in the bilge of the boat.

The coupling member 24 is provided at its lower extremity with a housing 26 detachably connected thereto, which housing encases a ball check valve 28 cooperating with a valve port or seat 30 formed within the casing member 26 while an inlet opening 32 is disposed in the lower end of the casing. Preferably, the valve inlet casing 26, or if desired, a tail pipe or other suction inlet extension thereof is positioned adjacent the lowermost portion of the bilge and immersed in any water 18 accumulating in the hull of the boat.

At its upper extremity, the T-shaped connecting member 24 detachably receives a housing 34 forming a casing within which is seated a ball check valve 36 cooperating with a valve seat or port 38. As will be noted, both of the valves are closed when in their lowermost position and open when raised from their seats.

The valve casing 34 constituting a valve outlet or discharge casing of the device is detachably engaged by a flexible or other conduit 40 whose outer extremity extends through or over any suitable portion of the hull 10 of the boat, for discharging the liquid 18 from the bilge exteriorly from the hull of the boat.

The pump and operating mechanism unit 20 is preferably formed of a base or head plate 42 which may be anchored in any suitable manner to the platform 12, such, for example, as by the fastening means 44 extending therethrough, this base plate having an upwardly extending boss or lug 46 provided with a recess or slot within which is seated a flexible leaf spring 48 constituting a pendulum, and retained as by a fastening means 50.

As shown more clearly in Figures 2 and 3, the

base plate at its opposite side relative to the pendulum 48 is provided with parallel, upwardly extending, preferably integral side walls or extensions 52 and 54, having angularly disposed end portions 56, and comprising a pair of shields or guard members partially surrounding the pump and its operating mechanism to be now set forth.

Detachably secured in the side wall 54 is a tubular bushing 58 externally screw-threaded and secured adjustably to the side wall as by exterior and interior fastening and locking nuts 60 and 62, respectively. The outer extremity of this tubular bushing is detachably engaged by the above mentioned conduit 22, while the other end of the bushing is formed with an integral annular flange 64 which is embraced by a tubular, cylindrical bellows 66. This bellows may be attached to the flange in any suitable manner as by welding, brazing or the like, and as shown in Figure 4 has its other end secured to an annular flange 68 from which extends inwardly of the bellows 66 a cylindrical, cup-shaped member 70. The member 70 may be of any suitable size and construction, and in the interest of economy of construction, may be of sheet metal.

An axially extending boss 72 is attached to the bottom of the cavity of the member 70 and is internally threaded to detachably receive the terminal of a push rod 74, this terminal being externally threaded and of reduced diameter as shown at 76. The outer end of push rod 74 has a threaded cavity 78. The latter is detachably secured as by a fastening means 80 to the pendulum 48 intermediate the ends thereof, whereby, when the pendulum is oscillated as indicated in dotted lines in Figure 2, the bellows 66 may be alternately compressed and expanded, with a resultant increase and decrease in the contained volume. During this expansion and contraction of the bellows, free communication is established between the bellows, conduit 22 and fitting 24, whereby an alternate suction and compression is created in the fitting 24.

This sucking and pumping action in conduit 22 is communicated to the valve casings 26 and 34, whereby on the suction stroke, the valve 36 is maintained on its seat while the valve 28 is lifted and water is drawn in through the inlet port 32 into the casings 26 and 24. On the compression stroke of the pump, valve 28 is urged to its seat while valve 36 is lifted and the fluid entrapped in the casing 26 and the T-shaped coupling 24 is forced upwardly through the discharge pipe 40. Obviously, a continuation of this operation results in discharging the accumulation of water 18 from the bilge of the boat.

Suitably secured to the upper end of the spring leaf pendulum 48 is a weight 81 of any suitable construction and attached in any suitable manner, this weight having a resilient buffer 82, such as sponge rubber or the like, suitably secured thereto for a purpose to be now set forth. Preferably, the mass of the weight 81 and the stiffness of the flexible leaf spring pendulum 48 is such that when the hull of the boat is stationary, the inverted pendulum consisting of the mast 81 and stem 48 will be in its perpendicular, full line position shown in Figure 2. However, upon the slightest rolling of the boat or inclination of the support upon which the device is mounted, the mast 81 will be inclined to one of the dotted line positions 84 or 86, thereby oscillating the flexible pendulum correspondingly, and thus causing expansion or contraction of the bellows pump. As the pendulum approaches the end of its oscillation, the buffer 82 strikes one of the guard members 52 or 54, thereby stopping the stroke of the pendulum and causing, by this rebound of the buffer, the return of the pendulum.

It will be apparent that the parts may readily be so proportioned that the inverted pendulum will be very sensitive to the slightest inclination of the boat to thereby operate the pump; but obviously supplementary spring means may be employed to assist in returning the pendulum to its neutral position, to assist in effecting the rebound of the pendulum, and in distending the bellows to its expanded position, if desired.

In order to increase the effective compression pressure of the pump, the cup-shaped member 70 serves to diminish the dead air or residual volume in the bellows, and to increase the ratio of the change in volume to the minimum volume of the pump, to thereby increase its effective pressure.

It has been known heretofore that weighted pendulums can be employed to operate a pump for discharging the accumulation of water in the bilge of a boat; but such devices have generally been ineffective in that the pendulum was limited in the amplitude of its stroke by the extent of rolling of the boat. In the present embodiment, the pendulum is assured of a large stroke if the inclination of the boat is shifted enough to cause any movement of the pendulum at all.

It will be noted that the guards or shields 52 and 54 serve the dual function of enclosing the pump and its operating mechanism and also of limiting the operative stroke of the pendulum. Moreover, the construction is such that a self-contained unitary pump and operating mechanism has been provided which may be readily positioned at various places in a boat as convenience dictates. Moreover, although the device has been shown as applied to a boat, it is obvious that it may be employed upon any suitable support or platform whereby the tilting thereof is desired to be utilized to constitute the motive power for operating the pump.

Referring now to Figures 5 and 6, there is disclosed a modified form of the pump and actuator unit. A supporting base 100, preferably metallic, is provided with a flange 102 to which is detachably secured, as by fastening screws 104, a flexible leaf spring pendulum member 106. A pendulum bob or weight 108 of any suitable construction is secured to the upper end of the member 106 and one satisfactory construction may embody a pair of weights secured to opposite sides of member 106 by a fastening bolt 112. If desired, this bolt can extend through a longitudinal slot in member 106 to adjust the bob 108 with respect thereto. Obviously, numerous equivalent weight fastening and/or adjusting means could be utilized without departing from the scope of the inventive concept.

The base 100 is further provided with an upstanding wall 114 which has an outwardly and angularly disposed flange 116, apertured as at 118. An arcuate guide rod 120 is reciprocable through aperture 118 and is terminally adjustably secured to member 106 by lock nuts 122 on opposite sides of said member, adjustably threaded upon rod 120. As the pendulum oscillates about its fastening flange 102, it is guided and restrained to curvilinear reciprocation by movement of rod 120 in aperture 118, and the amplitude of oscillation is regulated by adjustable buffers or cushions 124, each adjustably secured, as by nuts 126, on an appropriate screw threaded portion 128 of rod 120.

The buffers 124 are positioned on opposite sides of the flange 116 which constitutes a stop for the pendulum. The engagement of the resilient buffers therewith not only limits the pendulum oscillation but also gives a rebound impulse to the pendulum on its return stroke. Obviously, a pair of coil springs or any other resilient buffer construction could be substituted for the members 124.

Conveniently and detachably mounted on the inner surface of wall 114 as by bolts 130 is the pump unit, consisting of a pair of rings 132 and 134 of any suitable shape such as annular, between which is secured a flexible diaphragm 136 having a clamping plate 138 secured thereto. A bolt 140 detachably assembles the diaphragm and plate and removably unites this assembly to a pump rod 142. The rod has a diametrical bore 144 and is loosely received in and extends through an aperture 146 in the pendulum spring 106. For quickly detachable and sliding engagement, a cotter pin 148 or similar fastener straddles the leaf spring 106 and extends through bore 144, thereby retaining the push rod and pendulum in operative engagement. This cotter pin securing means can of course be utilized with the embodiment of Figures 1–4 in place of the elements 78 and 80.

A pump chamber 150 is thus formed between the wall 114, ring 132 and diaphragm 136, this chamber being in continuous open communication with the above mentioned conduit 22 by means of the tubular boss 152.

The modified form of unit is employed in the same assembly set forth above and functions in a similar manner.

From the foregoing, it will be seen that the principles of the invention are adapted to a variety of uses and may be employed in diverse ways, and accordingly it is not intended to limit the invention to the exact construction shown and described, but all suitable modifications and equivalents may be resorted to falling within the scope of the appended claims.

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

1. In combination with a boat hull having a bilge, an automatic bailer comprising a pump having a horizontal, reciprocating actuating member, conduit means communicating said pump to the interior of the bilge and to the exterior of the hull during its intake and delivery strokes respectively, an operating means oscillatable in a vertical plane in response to the rocking of the hull, means connecting said operating means to said actuating member for imparting positive substantially rectilinear horizontal reciprocation in both directions to said actuating member upon oscillation of said operating means, said operating means comprising an inverted pendulum fixedly anchored at its lower end, said connecting means engaging the shaft of said pendulum.

2. In combination with a boat hull having a bilge, an automatic bailer comprising a pump having a horizontal, reciprocating actuating member, conduit means communicating said pump to the interior of the bilge and to the exterior of the hull during its intake and delivery strokes respectively, an operating means oscillatable in a vertical plane in response to the rocking of the hull, means connecting said operating means to said actuating member for imparting positive substantially rectilinear horizontal reciprocation in both directions to said actuating member upon oscillation of said operating means,

said operating means comprising an inverted pendulum fixedly anchored at its lower end, said connecting means engaging the shaft of said pendulum, the shaft of said pendulum comprising a strip of flexible spring material.

3. In combination with a boat hull having a bilge, an automatic bailer comprising a pump having a horizontal, reciprocating actuating member, conduit means communicating said pump to the interior of the bilge and to the exterior of the hull during its intake and delivery strokes respectively, an operating means oscillatable in a vertical plane in response to the rocking of the hull, means connecting said operating means to said actuating member for imparting positive substantially rectilinear horizontal reciprocation in both directions to said actuating member upon oscillation of said operating means, said operating means being rigidly secured to and supported by the hull at a position which is laterally remote from the longitudinal axis of the hull whereby said operating means will be subjected to the maximum rocking effect of the hull.

4. In combination with a boat hull having a bilge, an automatic bailer comprising a pump having a horizontal, reciprocating actuating member, conduit means communicating said pump to the interior of the bilge and to the exterior of the hull during its intake and delivery strokes respectively, an operating means oscillatable in a vertical plane in response to the rocking of the hull, means connecting said operating means to said actuating member for imparting positive substantially rectilinear horizontal reciprocation in both directions to said actuating member upon oscillation of said operating means, said operating means comprising an inverted pendulum fixedly anchored at its lower end, said connecting means engaging the shaft of said pendulum, the shaft of said pendulum comprising a strip of flexible spring material, said operating means being rigidly secured to and supported by the hull at a position which is laterally remote from the longitudinal axis of the hull whereby said operating means will be subjected to the maximum rocking effect of the hull.

5. In combination with a boat hull having a bilge, an automatic bailer comprising a pump having a horizontal, reciprocating actuating member, conduit means communicating said pump to the interior of the bilge and to the exterior of the hull during its intake and delivery strokes respectively, an operating means oscillatable in a vertical plane in response to the rocking of the hull, means connecting said operating means to said actuating member for imparting positive substantially rectilinear horizontal reciprocation in both directions to said actuating member upon oscillation of said operating means, a stop member carried by and movable with said operating means and limiting the oscillation of the latter in opposite directions.

6. In combination with a boat hull having a bilge, an automatic bailer comprising a pump having a horizontal, reciprocating actuating member, conduit means communicating said pump to the interior of the bilge and to the exterior of the hull during its intake and delivery strokes respectively, an operating means oscillatable in a vertical plane in response to the rocking of the hull, means connecting said operating means to said actuating member for imparting positive substantially rectilinear horizontal reciprocation in both directions to said

actuating member upon oscillation of said operating means, a stop member carried by and movable with said operating means and limiting the oscillation of the latter in opposite directions, said stop member including a rod extending laterally from said operating means, a pair of spaced abutment members on said rod, a fixed abutment disposed between and alternately engageable by said spaced abutments.

7. In combination with a boat hull having a bilge, an automatic bailer comprising a pump having a horizontal, reciprocating actuating member, conduit means communicating said pump to the interior of the bilge and to the exterior of the hull during its intake and delivery strokes respectively, an operating means oscillatable in a vertical plane in response to the rocking of the hull, means connecting said operating means to said actuating member for imparting positive substantially rectilinear horizontal reciprocation in both directions to said actuating member upon oscillation of said operating means, a U-shaped supporting bracket having a pair of upstanding legs, said pump and said operating means being each supported by one of said legs.

8. In combination with a boat hull having a bilge, an automatic bailer comprising a pump having a horizontal, reciprocating actuating member, conduit means communicating said pump to the interior of the bilge and to the exterior of the hull during its intake and delivery strokes respectively, an operating means oscillatable in a vertical plane in response to the rocking of the hull, means connecting said operating means to said actuating member for imparting positive substantially rectilinear horizontal reciprocation in both directions to said actuating member upon oscillation of said operating means, a U-shaped supporting bracket having a pair of upstanding legs, said pump and said operating means being each supported by one of said legs, said legs being of unequal length, a fixed abutment carried by the longer leg, a stop member carried by said operating means and cooperating with said fixed abutment to limit oscillation in opposite directions of said operating means.

9. In combination with a boat hull having a bilge, an automatic bailer comprising a pump having a horizontal, reciprocating actuating member, conduit means communicating said pump to the interior of the bilge and to the exterior of the hull during its intake and delivery strokes respectively, an operating means oscillatable in a vertical plane in response to the rocking of the hull, means connecting said operating means to said actuating member for imparting positive substantially rectilinear horizontal reciprocation in both directions to said actuating member upon oscillation of said operating means, a U-shaped supporting bracket having a pair of upstanding legs, said pump and said operating means being each supported by one of said legs, said legs being of unequal length, a fixed abutment carried by the longer leg, a stop member carried by said operating means and cooperating with said fixed abutment to limit oscillation in opposite directions of said operating means, said stop member including a rod extending laterally from said operating means and having a pair of spaced abutment members thereon disposed on opposite sides of said fixed abutment and for alternate engagement with the latter.

10. In combination with a boat hull having a bilge, an automatic bailer comprising a pump having a horizontal, reciprocating actuating member, conduit means communicating said pump to the interior of the bilge and to the exterior of the hull during its intake and delivery strokes respectively, an operating means oscillatable in a vertical plane in response to the rocking of the hull, means connecting said operating means to said actuating member for imparting positive substantially rectilinear horizontal reciprocation in both directions to said actuating member upon oscillation of said operating means, a U-shaped supporting bracket having a pair of upstanding legs, said pump and said operating means being each supported by one of said legs, said legs being of unequal length, a fixed abutment carried by the longer leg, a stop member carried by said operating means and cooperating with said fixed abutment to limit oscillation in opposite directions of said operating means, said stop fixed abutment comprising an angularly disposed projecting flange on said longer leg.

11. In combination with a boat hull having a bilge, an automatic bailer comprising a pump having a horizontal, reciprocating actuating member, conduit means communicating said pump to the interior of the bilge and to the exterior of the hull during its intake and delivery strokes respectively, an operating means oscillatable in a vertical plane in response to the rocking of the hull, means connecting said operating means to said actuating member for imparting positive substantially rectilinear horizontal reciprocation in both directions to said actuating member upon oscillation of said operating means, a U-shaped supporting bracket having a pair of upstanding legs, said pump and said operating means being each supported by one of said legs, said legs being of unequal length, a fixed abutment carried by the longer leg, a stop member carried by said operating means and cooperating with said fixed abutment to limit oscillation in opposite directions of said operating means, said stop member including a rod extending laterally from said operating means and having a pair of spaced abutment members thereon disposed on opposite sides of said fixed abutment and for alternate engagement with the latter, said fixed abutment comprising an angularly disposed projecting flange on said longer leg, said flange being apertured and embracing said rod.

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