Jan. 31, 1961 R. K. YOUTIE 2,969,761

PUMP

Filed Jan. 31, 1958

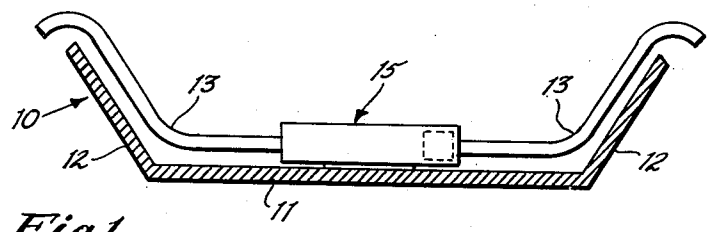

Fig. 1.

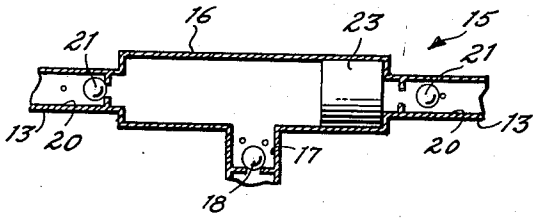

Fig. 2.

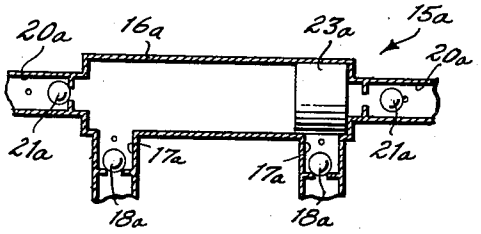

Fig. 3.

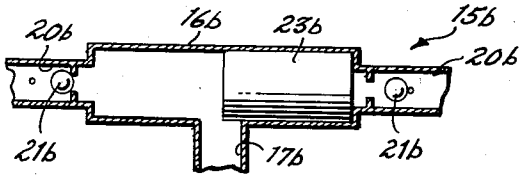

Fig. 4.

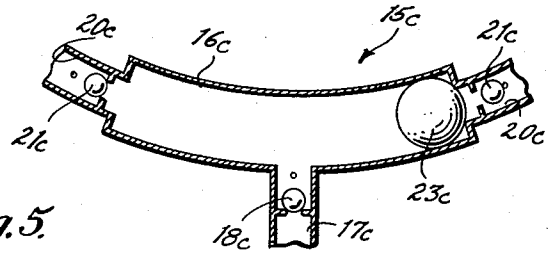

Fig. 5.

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3 Claims. (Cl. 114—183)

This invention relates generally to pumps, and is especially concerned with pumps of the oscillating cylinder type.

One object of the present invention is to provide a pump including a casing or housing containing a reciprocable piston and adapted to be mounted for oscillating motion wherein one casing end is alternately raised and lowered to cause reciprocation of the piston by its own weight, so that fluid is drawn into and expelled from the piston upon its back and forth movement in the casing.

It is another object of the present invention to provide the novel combination of a pump of the type described arranged and mounted in a navigable vessel or boat so that the natural rocking of the vessel in the water causes the up and down oscillation of the casing.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings, which form a material part of this disclosure.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, which will be exemplified in the construction hereinafter described, and of which the scope will be indicated by the appended claims.

In the drawings:

Figure 1 is a sectional view taken through a vessel or boat having installed therein a pump of the present invention;

Figure 2 is a longitudinal sectional view showing the pump of Figure 1 apart from the boat;

Figure 3 is a longitudinal sectional view similar to Figure 2, but showing a slightly modified pump construction of the present invention;

Figure 4 is a longitudinal sectional view similar to Figures 2 and 3, but showing still another modification of the present invention; and

Figure 5 is a longitudinal sectional view similar to Figures 2–4, but showing yet another embodiment of the present invention.

Referring now more particularly to the drawings, specifically to Figure 1 thereof, there is illustrated therein a boat hull, generally designated **10**, including a bottom wall **11**, and a pair of laterally spaced, upstanding sides **12**. While the boat hull **10** is illustrated as having a flat bottom, it is, of course, appreciated that a round bottom hull may also be used, if desired.

Interiorly of the boat hull **10**, and preferably arranged to extend laterally thereof along the bottom **11**, is a pump, generally designated **15**. The pump may be provided, as illustrated, with a pair of outlet conduits **13** each communicating between the pump proper and the exterior of the vessel or hull **10**, as by opening over or through the boat sides **12**.

The pump **15** is shown in greater detail in Figure 2, as including an elongate hollow casing or housing **16**, which may be a cylinder and is preferably arranged laterally of the boat so as to have rotary oscillating motion about an axis transverse of the cylinder upon natural lateral rolling or rocking of the boat in the water. More specifically, the casing **16** is preferably located with its medial region along the longitudinal center line of the boat so as to have its rotary oscillation about a transverse axis extending through the medial region of the casing. In this way, the opposite casing ends will alternately move up and down, or raise and lower upon rolling of the boat. However, it is essential that at least one end of the casing move up and down upon rocking of the boat, for reasons appearing presently, so that the casing may have its medial region off-set from the longitudinal center line of the boat, if desired. As illustrated, the casing **16** includes an inlet port **17** opening into the casing at a medial region thereof and provided with a one way valve **18** arranged to pass liquid into the casing and prevent the passage therethrough of liquid from within the casing. The one way valve **18** may be of any suitable construction, a ball valve being illustrated for clarity of understanding. The inlet port **17** communicates between the lower interior region or bilge of the vessel **10**, and the interior region of the casing **16**.

At opposite ends of the casing **16** are provided a pair of outlet ports **20**, each including a one way valve **21** adapted and arranged to pass liquid from the interior of the casing to the exterior thereof. That is, each of the outlet ports **20** communicates from the interior of the casing **16**, at one end thereof, and is connected to a respective outlet conduit **13** for communication therethrough with the exterior of the vessel **10**.

Interiorly of the casing **16**, and slidable therein for reciprocatory or back and forth movement longitudinally thereof, is a piston **23**. That is, the piston **23** is movable between opposite ends of the cylinder or casing **16**; and, moves therein by its own weight upon oscillation of the cylinder due to rocking action of the boat. The outlet ports **20** are thus located adjacent to opposite extremities of back and forth movement of the piston **23**, while the inlet port **17** is located medially of the path of piston reciprocation.

In operation, bilge water will pass into the casing **16**, between the piston **23** and the remote casing end, as seen in Figure 2, through the inlet port **17**; and, upon rocking movement of the boat to raise the right-hand end of the casing, the piston will gravitationally slide toward the left-hand piston end of the casing. This gravitational piston movement forces the liquid contained in the casing to pass outward therefrom through the left-hand outlet port **20**, as no liquid can pass outward through the port **17**. The liquid thus expelled cannot return to the casing by reason of the one way valve **21**. As the piston **23** slides gravitationally downward and to the left, passing the inlet port **17**, the valve **18** of the inlet port opens, both by the low pressure created in the casing **16** to the right of the piston and by the force of the external water, to pass water into the casing between the piston and the right-hand casing end. The above described operation is, of course, repeated upon piston movement in the opposite direction resulting from upward oscillating movement of the left-hand end of casing **16**. Hence, the pump **15** as illustrated is double acting, but may of course be single acting, if desired, by the mere permanent closure of one casing end.

The embodiment of Figure 3 shows a pump **15***a* substantially identical to the pump **15** of Figure 2, but provided with a pair of inlet ports **17***a*, each located adjacent to a respective end of the casing **16***a*, in place of the medially located inlet port **17**. Each of the inlet ports **17***a* may be provided with a one way valve **18***a* permitting the ingress of liquid from the bilge of boat **10** to the interior of the casing **16***a*, but preventing the egress of liquid therefrom. The inlet port **20***a* having

one way valve 21*a* at opposite ends of the cylinder 16*a* are substantially identical to the inlet port of the pump 15.

In operation, the pump 15*a* is similar to that of Figure 2, except that each inlet valve 18*a* opens earlier in the stroke of piston 23*a* away from the respective port to provide a longer intake period and insure filling of the casing upon each stroke. The pump 15*a* is also double acting, but may be single acting, if desired, by closing a pair of inlet and outlet ports 17*a* and 20*a* adjacent to one end of the casing.

In Figure 4 is illustrated a valve generally designated 15*b*, which is substantially the same as the valve 15 in Figure 1, but wherein the piston 23*b* is of greater length and serves as a closure for the inlet port 17*b*, thereby eliminating the need for a one way valve in the inlet port. Thus, upon movement of the piston 23*b* to one extremity of its reciprocatory path of motion in the casing 16*b*, as illustrated in Figure 3, the inlet port 17*b* is open to receive liquid from the bilge of the vessel. Upon rocking of the vessel to oscillate the right-hand end of casing 16*b* upward, the piston 23*b* gravitationally shifts downward and to the left, quickly closing the inlet port 17*b*, and during the remainder of its stroke expelling the liquid from the casing through the outlet port 20*b* and its valve 21*b*. Of course, operation of the pump 15*b* is the same upon upward oscillating movement of the left-hand end of the casing 16*b*; and, the pump 15*b* may also be converted to single action, if desired.

In the embodiment of Figure 5, wherein a pump is generally designated 15*c*, the elongate casing 16*c* is of slightly arcuate configuration, as for better conforming arrangement in a round bottom or V-hull boat. The arrangement of inlet port 17*c* and outlet ports 20*c*, and their respective valve 18*c* and 21*c* is substantially identical to that of the pump 15 of Figure 2. In place of the conventional sliding pistons 23, 23*a* and 23*b* of Figures 2, 3 and 4, the piston 23*c* of Figure 5 is defined by a rolling element, sphere or ball. While the piston 23*c* rolls, rather than slides, for lower frictional resistance to its back and forth movement, it functions in substantially the same manner as the aforementioned piston. Indeed, a spherical piston may be substituted satisfactorily in the pumps of Figures 2, 3 and 4, if desired; or, a piston having the configuration of a sector of a toroid may be substituted in the embodiment of Figure 5 if it is preferred to obtain sliding rather than rolling action.

Although the present invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be made within the spirit of the invention and scope of the appended claims.

What is claimed is:

1. A bilge pump for a vessel adapted to navigate in water and be rocked thereby, said pump comprising an elongate casing mounted in said vessel for rocking movement with the vessel about an axis transverse of said casing to alternately raise and lower opposite ends of said casing, a single inlet port medially of said casing for communication between the interior thereof and the lower interior region of said vessel for passing liquids only from the latter into said casing, outlet ports at opposite ends of said casing for passing liquid only from the interior to the exterior of said casing, a pair of conduits connected to said casing each with one end communicating through a respective one of said outlet ports with the interior of said casing and the other end communicating with the exterior of said vessel, and a rigid piston movable by its weight back and forth in said casing upon said rocking movement, movement of said piston in opposite direction enabling liquid to pass through said inlet port into said casing alternately on opposite sides of said piston and effecting delivery of liquid from said casing alternately through said outlet ports and conduits for removing liquid from said vessel.

2. A pump according to claim 1, wherein said piston is slidable in said casing.

3. A pump according to claim 1, wherein said piston is rollable in said casing.

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