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[54] BILGE PUMP HAVING SNUBBING ACTION

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[51] Int. Cl. B63b 13/00

[58] Field of Search ..... 114/183 R, 183 A, 184, 114/185, 230, 213–216; 417/478

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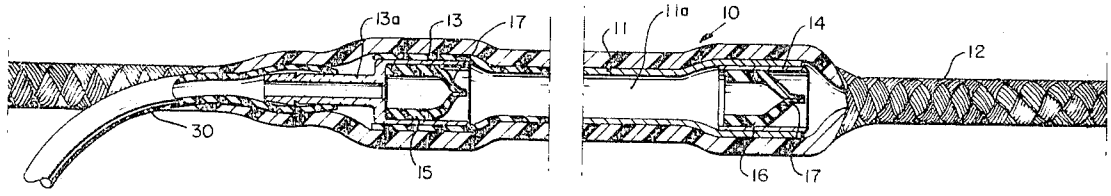
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Attorney, Agent, or Firm—Seed, Berry, Vernon & Baynham

[57] ABSTRACT

A bilge pump for a boat operated by wave action upon the boat also provides snubbing action to the mooring lines and comprises a pump chamber of elastic, flexible material connected in the mooring line which expands and contracts as the mooring line is tensed and relaxed due to wave action upon the boat. The pumping chamber has inlet and outlet check valves therein. A line runs from the bilge of the boat to the inlet valve of the pump chamber. Expansion and contraction of the pumping chamber, together with action of the check valves, draws water from the bilge of the boat and discharges it overboard.

6 Claims, 4 Drawing Figures



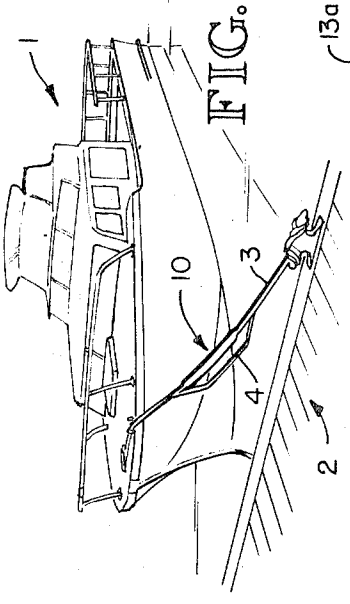


FIG. 1

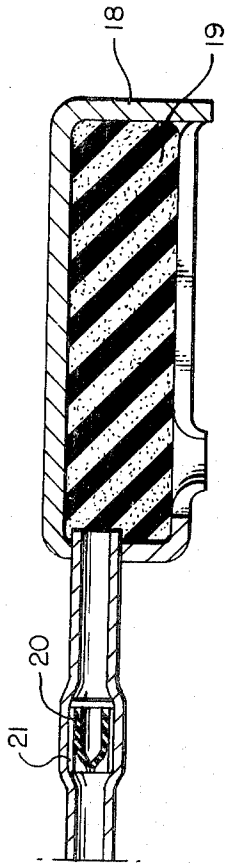


FIG. 3

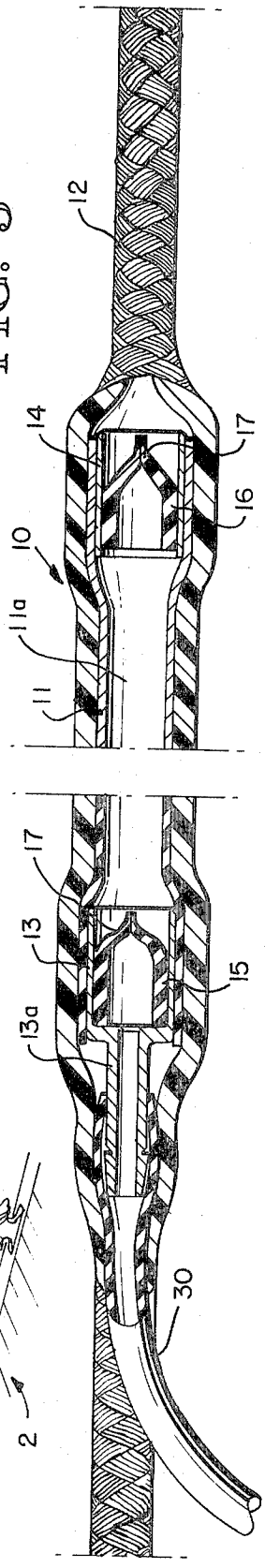


FIG. 2

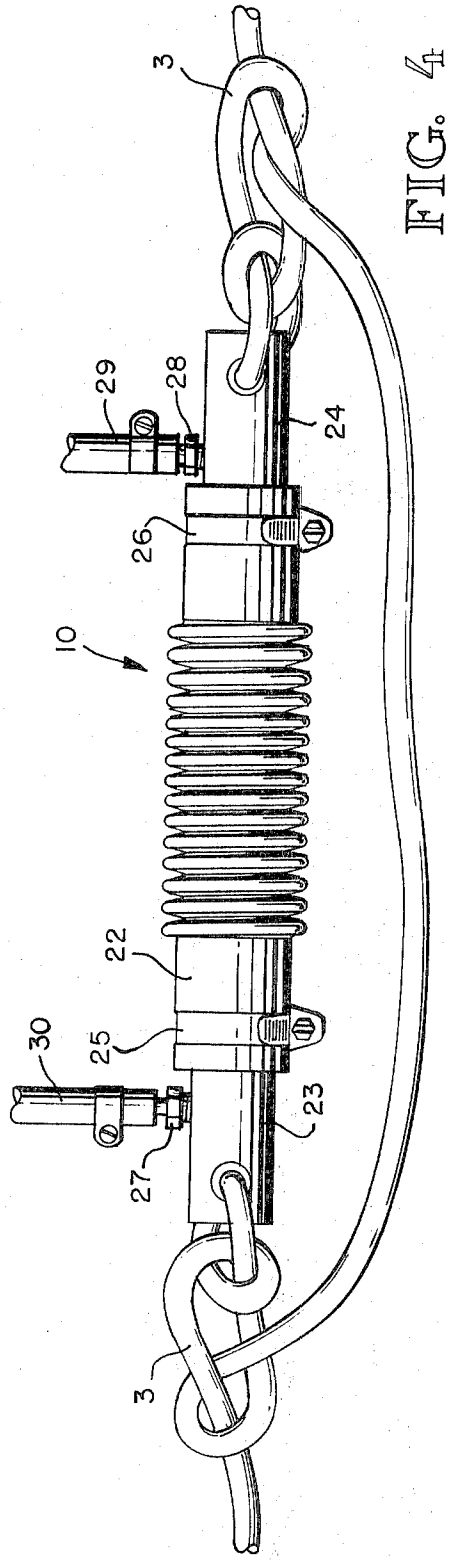


FIG. 4

BILGE PUMP HAVING SNUBBING ACTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a combination bilge pump and snubber, and snubber design.

2. Prior Art Relating to the Disclosure

Bilge pumps have been developed which utilize wave action upon a boat, or apparent changes in the direction of gravity when a boat rocks, to operate a pump. Breneman, U.S. Pat. No. 3,007,430, discloses a buoy pump which rocks in response to wave action. A pendulum within the buoy responds to the rocking motion by a swinging motion which operates the pump. Delaney, U.S. Pat. No. 3,120,212, discloses a wave-actuated pump wherein a plunger of the pump is connected to a float in such a manner that the plunger is reciprocated by the float due to wave or boat movement. Tumba, U.S. Pat. No. 3,586,905, discloses a pump utilizing wave action to operate a float which is connected to a pump piston to pump water out of the bilge of a moored boat. Huff, U.S. Pat. No. 3,062,152, discloses an expansible and collapsible dome-like bulb which, by reciprocating of a handle, expands and collapses the bulb to pump water out of the bilge of a boat. Patents to Kafka and Noe, U.S. Pat. Nos. 3,362,336 and 3,532,440, also disclose wave-actuated pumps operating in a similar manner to those described previously.

SUMMARY OF THE INVENTION

The objects of this invention are (1) to provide a wave-actuated bilge pump which uses wave movement of a boat upon its mooring line to pump water from the bilge and, at the same time, provide a snubbing action to the mooring line or lines; (2) to provide a bilge pump having snubbing action utilizing convoluted tubing which is a part of the mooring line and has an inherent shock absorbing or snubbing action; and (3) to provide a bilge pump having snubbing action utilizing a flexible tubing section extending inside a portion of braided mooring line which changes volume when the mooring line is tensed and relaxed to pump water from the bilge and provide snubbing action to the mooring line.

These and other objects are accomplished by provision of a combined mooring line and pumping device for a boat utilizing wave action upon the boat to achieve pumping action to pump out the bilge of the boat. The pumping device is a section of flexible material connected in the mooring line extending between the boat and a mooring station having inlet and outlet check valve ends thereof, the pumping section expanding and contracting its volume as the mooring line is tensed and relaxed due to relative motion between the surface of the water and the boat. A conduit connecting the inlet end of the pump has its free end placed in the bilge of the boat. Relative motion between the surface of the water and the boat causes repeated tensing and relaxing of the mooring line resulting in expansion and contraction of the volume of the pumping chamber with expansion of the chamber creating a partial vacuum drawing water from the bilge into the chamber through the conduit with the inlet check valve inhibiting return flow of the bilge water. Contraction of the pump chamber reduces the volume of the chamber and pressurizes the water therein causing it to discharge through the outlet check valve, the outlet valve, on subsequent expansion of the chamber, inhibiting flow of air therethrough to the pump chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a boat moored to a dock illustrating the position of the pump device in this invention;

FIG. 2 is a vertical, longitudinal cross-sectional view of one form of the pumping device of this invention;

FIG. 3 is a vertical, longitudinal cross-sectional view of the free end of the pipe secured in the bilge of the boat; and

FIG. 4 is a side elevational view of a second type of pumping device.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates a boat 1 secured to a dock 2 by a mooring line 3. Spliced in the mooring line is a pumping device 10 of the type illustrated by FIGS. 2 or 4. A safety auxiliary line 4 may be provided, by-passing the pumping device, in the event the pumping device is severed.

The pumping device may be a section of convoluted tubing, accordion-like configuration, as illustrated by FIG. 4, or an elongated section of elastic tubing inserted inside a section of braided rope, as illustrated in FIG. 2. Referring to FIG. 2, the pumping device 10 includes an elongated section of flexible elastic tubing 11, of fiber-reinforced synthetic rubber, or rubber alone inserted inside a section of braided rope 12. The braided rope may be the mooring line or spliced into the mooring line. Braided ropes of the type employed are commercially available and are generally of braided material having a low coefficient of friction such as polyethylene strands or nylon strands. The section of tubing 11 should have a wall thickness in relation to its diameter so that it doesn't collapse during utilization. The tubing is generally of a low durometer material, such as from 40 to 60 durometer, having a wall thickness ranging from 1/16 inch to 1/8 inch and an internal diameter ranging from 1/4 inch to 3/4 inch (ID). Valve housings 13 and 14 of plastic, metal, or other suitable material, are inserted in the inlet and outlet ends of the tubing, respectively. The diameter of the valve housings is large enough so that they are held within the tubing by friction and the compressive force of the tubing or they may be adhesively held in place. The inlet valve housing 13 includes an integral stem portion 13a for connection to a conduit 14 having its opposite end placed in the bilge of the boat. One-way check valves 15 and 16 are inserted in the respective valve housings, as illustrated in FIG. 2 or inserted in the tubing without housings. The check valves are preferably "flutter"-type valves, as illustrated, having flexible lips 17 which are normally closed but which open to allow flow of a fluid therethrough in one direction and close to inhibit or prevent flow of fluid therethrough in the opposite direction.

FIG. 3 illustrates a filter means inserted over the free end of the conduit 14 placed in the bilge of the boat to prevent passage through the conduit of debris which would plug or block action of the check valves 14 and 15. The filter means includes a housing 18 of metal, plastic, or other suitable material of cup-shaped configuration having a filter material 19 secured therein, such as open-cell polyurethane foam, glass fiber batt, metal

screening or other suitable filter material which will allow water to pass but not oil. The free end of the conduit 14 is inserted through the side wall of the housing so water will be drawn through the filter 19. The housing 18 is laid or secured in the bilge of the boat by suitable retaining means. Water in the bilge is sucked through the filter 19 and conduit 14 into the pump chamber of the pumping device 10. Check valve 20, held within housing 21, may be inserted at some point in the length of conduit 14 to prevent backflow of bilge water should the pumping device break and the conduit 14 fall into the water adjacent the boat and, by siphoning action, siphon water back into the bilge.

As the braided rope 12 of FIG. 2 surrounding the section of plastic or rubber tubing 11 is tensed, it reduces the volume and cross-sectional area of the tubing 11. When the tension on the rope 12 is relaxed, the tubing 11 expands by its own elastic memory to substantially its original configuration. This creates a partial vacuum within the pumping chamber 11a of the section of tubing and draws water through conduit 14 and valve 15 into the pumping chamber 11*a*. When the braided rope 12 is tensed due to wave action, the cross-sectional area and volume of the tubing are reduced, pressurizing the water in the pumping chamber 11*a*, closing or allowing the lips 17 of valve 13 to close and causing the water to be discharged through valve 16. The repeated tensing and relaxing of the rope 12 surrounding the section of tubing 11 due to relative motion between the surface of the water and the boat pumps sufficient water to keep the bilge of the boat substantially free from water at all times. The section of tubing within the braided rope also exerts a snubbing or shock-absorbing action on the mooring line to check or restrain motion of the boat relative to the mooring station and to reduce the force resulting in the mooring line from the motion of the boat, a decided advantage.

FIG. 4 illustrates a modified pumping device, utilizing a section of convoluted tubing 22 having an accordion-like configuration. Valve housings 23 and 24 are inserted in the respective open ends of the section of convoluted tubing 22 and secured therein by suitable clamps 25 and 26. Each of the housings includes a stem portion 27 and 28, respectively, connecting with conduit 14 leading from the bilge of the boat and to a discharge line 29 discharging water overboard. The valve housings also include provisions for splicing the pump device in the mooring line 3. Each of the valve housings has a one-way check valve therein of the same type described with reference to FIG. 2. The section of convoluted tubing may be of fiber-reinforced synthetic rubber or other suitable material. In operation, as the mooring line is tensed, the section of convoluted tubing 22 is expanded, creating a partial vacuum in the interior or pumping chamber thereof causing water from the bilge to be sucked into the pumping chamber through the valve in the inlet end of the tubing section. As the mooring line is relaxed, the section of convoluted tubing tends to return to its original configuration, thus decreasing the volume of the pumping chamber. This pressurizes the water contained therein, closes the inlet valve, and causes the water to flow through the outlet valve overboard.

Example 1

A convoluted section of fabric-reinforced synthetic rubber tubing about 1 inch in diameter was wrapped with a flexible rubber sheet and clamped at each end to valve housings incorporating flutter valves of the type illustrated by FIG. 2, the valve housings also including means of tying into a mooring line extending between a boat and a dock. A 1/4 inch ID rubber hose about 10 feet in length was connected to the inlet port 27 of the inlet valve housing. The free end of the hose was connected through a metal housing containing an open-cell polyurethane foam of the type illustrated by FIG. 3. When the moorage line was tensed due to wave action upon the boat expanding the convoluted section, water in the bilge of the boat was sucked up and, on relaxation of the moorage line and convoluted section, the water sucked into the pumping chamber of the convoluted section was expelled overboard. The check valve at the inlet end of the convoluted section prevented bilge water from returning to the bilge. The pump also provided a snubbing action to the mooring line. When the bilge of the boat was completely pumped dry, the pumping device pumped air until more water was available in the bilge of the boat.

Example 2

A 1/2 inch, polyethylene braided rope was expanded locally to allow insertion of a 5/8 inch outer diameter, 1/2 inch inner diameter, neoprene tube fitted with valve housings having rubber flutter valves at the inlet and outlet ends thereof. The inlet end of the tube was also fitted with a 3/8 inch outer diameter, 1/4 inch inner diameter, rubber tube about 12 feet long having its free end extending into the bilge of the boat and into a filter housing of the type illustrated by FIG. 3. As the braided rope constituting the mooring line of the boat was tensed by wave action upon the boat, the volume of the interior of the tubing was reduced. This action of the braided rope upon the section of tubing provided pumping action and also provided snubbing action for the mooring line of the boat.

Example 3

A pumping device similar to that described in Example 1 was constructed using a convoluted rubber tube without reinforcing. This tube pumped bilge water from the bilge without the rubber sleeve for return of the section to the compressed state. The convoluted rubber itself had sufficient elastic memory to discharge water overboard and to take up slack in the mooring line on relaxation thereof.

Example 4

Pumps similar to those described with respect to Example 2 were fabricated using 1/4 inch, 5/16 inch, 3/8 inch, and 3/4 inch braided ropes together with appropriate tubing and valve sized for insertion in the various tubing. Valves and bilge lines of various sizes were used which were appropriate for the various pump purposes.

Example 5

It was found that a section of resilient elastic tubing inserted inside a section of braided rope serving as a mooring line would act as a snubber. This makes it possible to impart snubbing action to any braided line by insertion of a flexible filler in the core of the line.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A combined mooring line, snubber and pumping device for the bilge of a boat utilizing wave motion upon the boat to pump out the bilge of the boat, comprising:

a mooring line connected between the boat and a mooring station with at least a portion of the mooring line incorporating a length of tubular, braided rope having a hollow interior and which contracts in diameter on application of tension thereto,

an open-ended, elongated, tubular section of elastic tubing having a wall thickness relative to its diameter sufficient to prevent collapse thereof during pumping action inserted in the hollow interior of the braided rope,

a flexible inlet check valve disposed in one of the open ends of the elongated section of elastic tubing for connection to an intake hose, and

a flexible outlet check valve in the other end of the elongated section of elastic tubing for connection to a discharge hose, the cross-sectional area of the elastic material decreased by squeezing action of the braided rope surrounding the elastic tubing on application of tension thereto and, on release of tension, returning to substantially its original cross-sectional area because of its elastic memory, the alternate squeezing and release action due to wave action upon a boat sucking water into the section of elastic tubing on release of tension on the mooring line and discharging the water held by the elastic tubing on application of tension to the mooring line.

2. The pump of claim 1 wherein the elastic tubing is a material of 40 to 60 durometer having a wall thickness ranging from 1/16 inch to 1/8 inch and an internal diameter ranging from 1/4 inch to 3/4 inch, and the braided rope is a material having a low coefficient of friction, such as polyethylene or nylon.

3. The pumping device of claim 1 wherein the mooring line is a braided polyethylene rope.

4. The pumping device of claim 1 including a second section of mooring line spliced around the pumping device to act as a mooring line in the event the pump device is severed.

5. The pumping device of claim 1 including filter means on the free end of the intake hose preventing suction of material into the hose which would plug or inhibit action of the check valves in the pumping device.

6. The pumping device of claim 1 including a check valve in the intake hose to eliminate the possibility of water feed-back into the bilge.

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