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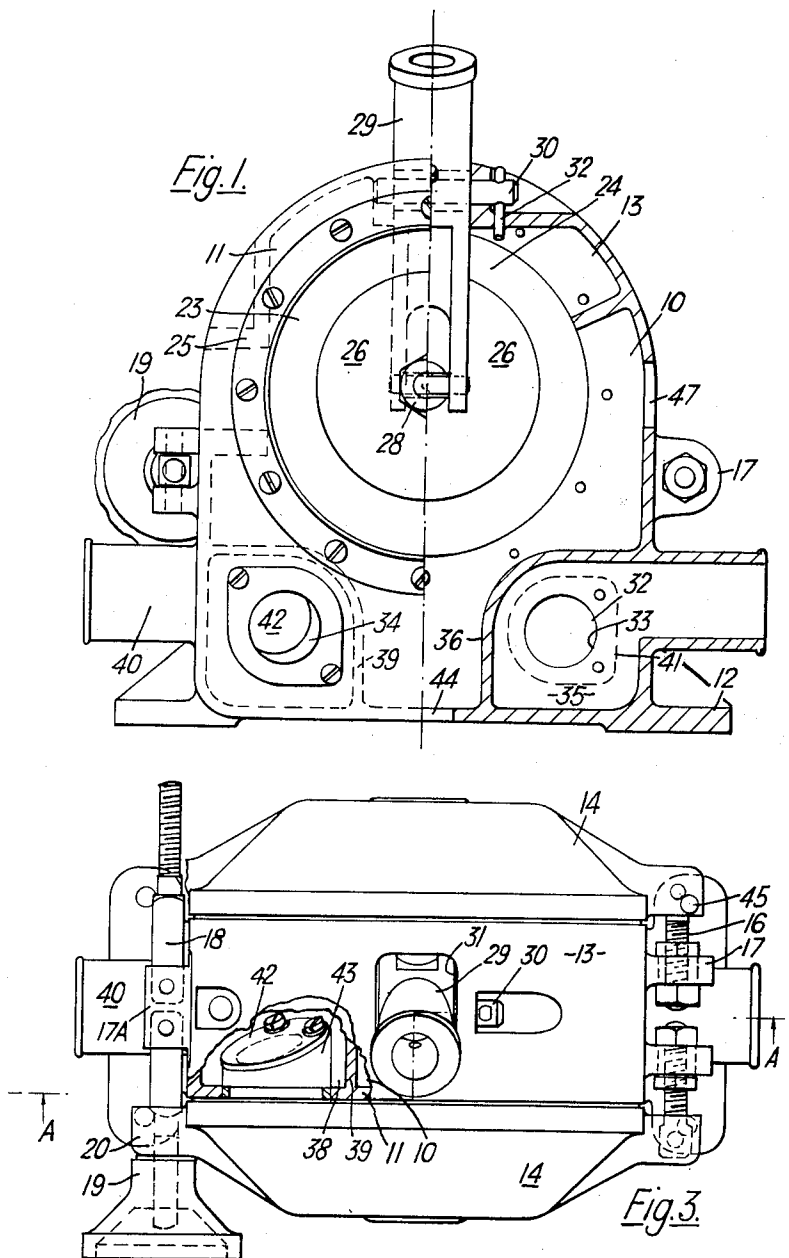
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DIAPHRAGM PUMPS

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2 Sheets-Sheet 1



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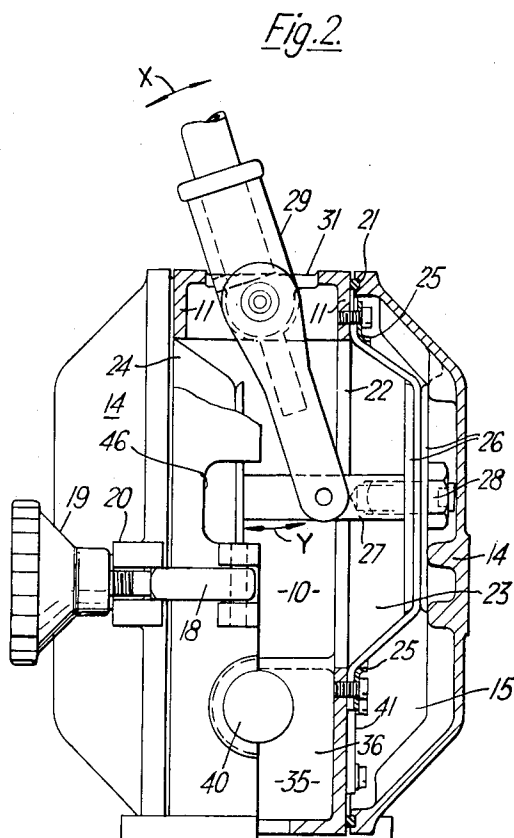
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1

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DIAPHRAGM PUMPS

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2 Claims. (Cl. 103—150)

This invention relates to diaphragm pumps, especially, but not exclusively, for use in sailing craft, caravans or the like, hereinafter referred to simply as diaphragm pumps.

The present invention is a diaphragm pump comprising a casing forming a pair of chambers, diaphragm means located therebetween and forming at least part of a wall separating said chambers, means for moving the diaphragm means into and out of the chambers, respectively to contract and expand the volumes of the chambers, and non-return inlet and outlet apertures communicating with said chambers.

Preferably, the chambers are spaced apart by a central chamber and preferably also, the diaphragm means comprises a pair of diaphragms spaced apart in a common axis.

Preferably also, the diaphragms each consist of a flexible member and a central rigid member and, preferably, said rigid members are connected together by a reciprocable tie bar to which is connected means for actuating same thereby to cause the diaphragms to move together.

Preferably also, the diaphragms move together in the same direction so that one outer chamber is expanded while the other is contracted.

The arrangement is such that actuation of the diaphragms causes a suction in the expanding outer chamber so that said chamber fills with liquid via the respective inlet aperture while the other outer chamber is contracted, thereby forcing the liquid therein through the respective outlet valve.

Preferably also, the means for actuating the tie bar is a handle secured to the tie bar and pivotally mounted on the casing, through which it projects.

Preferably also, the non-return inlet and outlet apertures are covered on one side by a movable flap of resilient water proofed material, for example synthetic resin such as neoprene.

Preferably also, the non-return inlet and outlet apertures are located on the inner wall which separates the outer chambers from the central chamber, said inlet apertures being connected to a common inlet conduit and said outlet apertures being connected to a common outlet conduit, said conduits being separated from the central chamber by partitions.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a half-sectional side elevation of a diaphragm pump according to the invention;

FIG. 2 is a half sectional end elevation; and

FIG. 3 is a plan, partly cut away.

Referring to the drawings, the diaphragm pump consists of a casing having a central inner chamber 10 formed of a pair of transversely spaced side walls 11 mounted on a base plate 12 and having a U-shaped transverse wall or rim 13, located between the other three edges of the side walls and secured thereto, the edges of the side walls remote from the base being rounded. The casing also has a pair of removable domed members 14 which are mounted against the side walls of

2

the central chamber to form a pair of side or outer chambers 15. The domed members 14 are pivotally mounted on bolts 16 which are carried by brackets 17 at one end of the central casing rim 13. At the other end of the rim 13 a pair of horizontally pivotal locking arms 18 are mounted on brackets 17A and have threaded outer ends which carry tightening knobs 19. The dome members carry C-shaped brackets 20 through which the arms 18 project in the transverse direction and against which the knobs 19 abut to hold the domes closed. Rubber O-rings 21 are provided between the domes 14 and inner side walls 11.

The side walls 11 of the central chamber have large co-axial circular through apertures 22 and a pair of diaphragms 23, 24, extend one across each of the through apertures being secured to the side walls around said apertures by clamping rings 25. The diaphragms 23, 24 are formed of a water-proofed flexible material, for example synthetic resin such as neoprene and have central rigid members 26 for example, a pair of metal discs sandwiching each flexible member.

A transversely reciprocable tie bar 27 is mounted in the central chamber 10 and is connected at its ends by screws 28 to the rigid member 26 of each diaphragm 23, 24. The inner end of a handle 29 is attached to said tie bar 27, and the handle 29 is pivotally mounted on a fulcrum pin 30 which is located in a transverse slot 31 in the rim 13 of the casing. The fulcrum pin 30 is removably located by a split pin 32. The handle 29 projects outwards through slot 31.

A rocking movement of the handle 29 as most clearly illustrated by arrow X in FIG. 2 causes the tie bar 27 to reciprocate transversely (arrow Y) so that the diaphragms 23, 24 are moved together one way or the other during which, one side chamber 15 is expanded as the diaphragm 24 moves away therefrom while the other chamber 15 is contracted as the diaphragm 23 moves thereinto.

Non-return inlet and outlet apertures 33, 34, are located in each of the side walls 11 of the central chambers 10 which are also of course, the inner walls of the side chambers 15, said apertures being located adjacent the base and at the ends of said walls. The inlet apertures 33 are co-axial and separated by a passageway 35 which is sealed off from the central chamber by a wall 36 and which has a common inlet conduit 37.

The outlet apertures 34 are similarly arranged with a passageway 38 (FIG. 3), wall 39, and outlet conduit 40 (see FIG. 3).

The apertures 33, 34 have water-proofed resilient flaps 41, 42, secured thereover, formed for example of synthetic resin such as neoprene. The flaps 40, 41 over the inlet apertures 33 are located on the outside surface of the side walls 11 and can be easily installed, but the flaps 42 on the outlet valve 34 are located on the inner sides. To simplify ease of mounting these inner flaps 42, the side walls 11 have substantially circular apertures and insert pieces 43 are inserted therein. The insert pieces 43 contain the outlet apertures 34 and corresponding flaps 42.

A drainage slot 44 is provided in the base plate 12 whereby water which passes into the central chamber 10 will run off.

In use the diaphragm pump is secured to a rigid member via bolt holes 45 in the baseplate 12 and the inlet conduit 37 is connected to a pipe (not shown) which leads to the supply of liquid for example bilge water, fresh water or the like. The outlet conduit 40 may be connected to a pipe, nozzle or the like which leads to a sink or other receptacle or simply allows the water to run off.

The handle 29 is actuated to move the diaphragms and this movement causes a suction in one side chamber which expands so that water is drawn thereinto. Meanwhile the contracting chamber forces the water therein through its outlet aperture.

The action is repeated for any desired length of time, and it will be appreciated that water is being continually forced from the pump casing, either from one or other of the chambers.

The pump may be located in the upright or "deck-mounting" position as shown in the drawings, that is with the base plate 12 horizontal and the handle 29 projecting upwards.

However, the pump may alternatively be located in a "bulkhead-mounting" position, that is with the base plate 12 vertical. In the latter position, the handle 29 is preferably mounted in a second transverse slot 46 (FIG. 2) which is provided adjacent the outlet end of the casing so that the handle 29 is again upward projecting. In order to change the handle from one slot 31 to the other slot 46:

- (1) Remove the screws 28 on both sides,
- (2) Remove the clamping ring 25 on one side only,
- (3) Remove the diaphragm 23 or 24 with its discs 26—this gives access to the central chamber 10,
- (4) Remove the split pin 32 and fulcrum pin 30—this allows handle 29 and tie bar 27 to be removed,
- (5) Insert handle and tie bar into the second mounting slot 46,
- (6) Replace fulcrum pin 30 and secure with spit pin 32,
- (7) Re-assemble discs 26, screws 28 and clamping ring 25.

A drainage hole 47 is provided in the inlet end of the casing rim 13 whereby water which passes into the central chamber 10 will run off.

A pump as hereinbefore described may be mounted in sailing craft, caravans or the like, and a pump of a size suitable for use therein will deliver in the region of 15 to 20 gallons per minute.

In a modification, the central chamber may be omitted and one diaphragm located between the two outer chambers, forming at least part of the wall separating said chambers. The diaphragm may be operated, for example by a rod passing transversely through the chambers, said rod being connectable externally of the casing to the handle or other means for moving the rod.

We claim:

1. A diaphragm pump comprising a casing forming a pair of pumping chambers, diaphragm means located between the pumping chambers and forming at least part of a wall separating the chambers, a central chamber interposed between the pair of pumping chambers and formed by the diaphragm means, the diaphragm means comprising a pair of diaphragms spaced apart in a common axis, each diaphragm comprising a flexible member and a central rigid member and the diaphragms being joined together by a reciprocable tie bar, means for moving the diaphragms into and out of the pumping chambers concurrently so that the volume of one chamber is contracted while the volume of the other chamber is expanded, said means for actuating the diaphragms comprises a selectively positionable handle extending through the casing and connected to the tie bar, the handle being selectively positionable through the casing in one of a plurality of apertures and pivotally mounted therein upon the pump casing to permit mounting the pump casing upon selected horizontal and vertical locations, each of the pumping chambers having non-return inlet and outlet apertures communicating therewith and each inlet and outlet including a one-way valve mechanism, the inlet and outlet apertures being connected to a common inlet conduit and a common outlet conduit respectively, the conduits being separated from the central chamber by partitions.

2. A diaphragm pump, the combination recited in claim 1 wherein the pumping chambers have access doors upon the casing for direct communication between the pumping chambers and the exterior of the casing, said doors being pivotally interconnected to the casing and having quick-release locking means for securing the doors to the casing.

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