Oct. 4, 1960 C. GARLAND 2,954,736

LOW-LIFT PUMP

Filed July 1, 1958

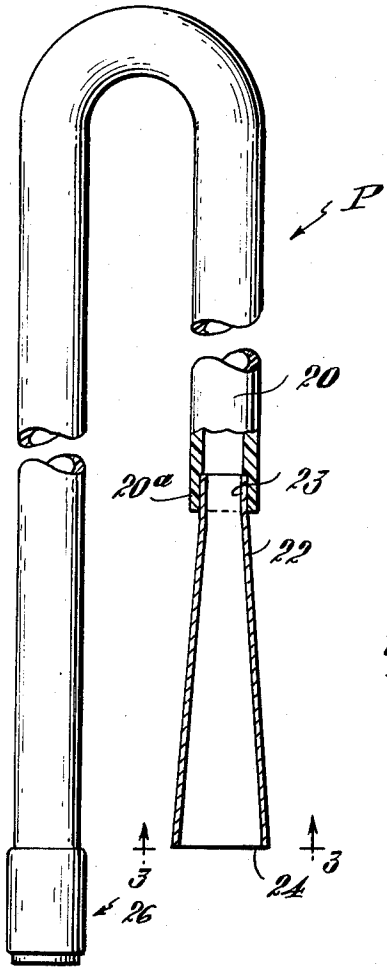

Fig. 1

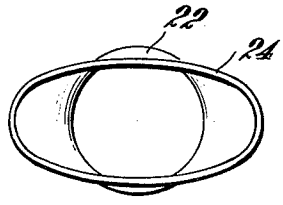

Fig. 3

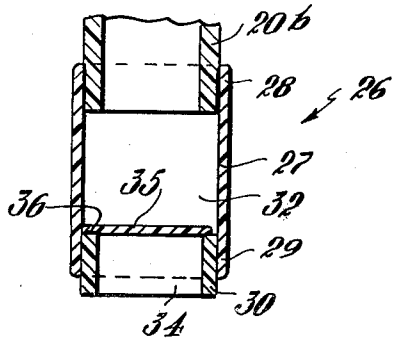

Fig. 2

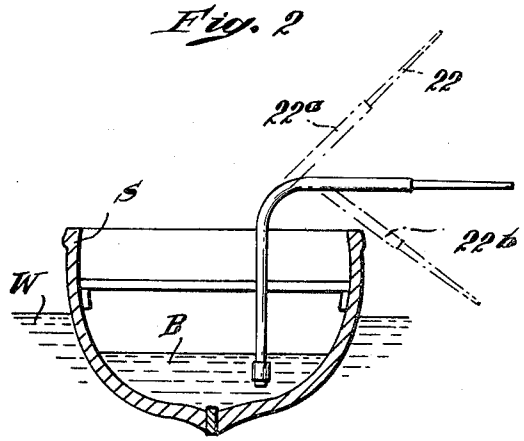

Fig. 4

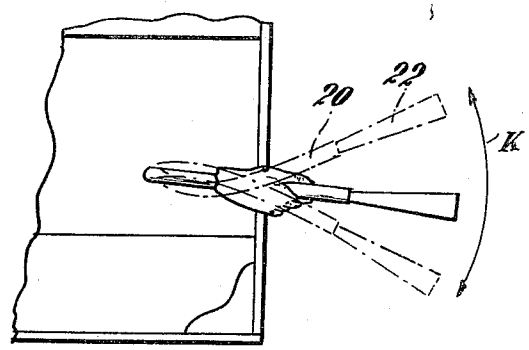

Fig. 5

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LOW-LIFT PUMP

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3 Claims. (Cl. 103—1)

This invention pertains to pumps, more especially to a low-lift pump which is primarily designed for use in pumping bilge water from a small boat, although it is of more general utility, the present invention constituting an improvement upon the pump disclosed in the co-pending application for Letters Patent, Serial No. 639,437, now abandoned, filed February 11, 1957, by Charles Garland.

The pump disclosed in said application, and which is employed in the practice of a novel method of pumping (which is claimed in said application) consists of a single length of tubing, a portion at least of which is flexible, but having a rigid delivery nozzle at one end, and is completely devoid of valves or other movable internal parts. The present invention concerns a pump of the same general type as that first above referred to, and the method of using it is substantially the equivalent of that which is claimed in the aforesaid co-pending application. However, the priming of a pump, such as that above referred to, requires a certain degree of skill, although it is entirely practical once such skill has been acquired.

The principal object of the present invention is to provide a pump useful in the practice of a method substantially the equivalent of that claimed in the aforesaid application, but which is so devised that no special skill is required in priming it or in its operation. A further object is to provide a pump of the above general type having a simple form of valve at its intake end so as to make unnecessary the stopping of the intake end of the pump by the user preparatory to the start of the pumping operation. Other and further advantages and objects of the invention will be pointed out in the following more detailed description and by reference to the accompanying drawings wherein

Fig. 1 is a side elevation of the pumping device of the present invention, with parts broken away, and with the delivery end in diametrical section;

Fig. 2 is a diametrical section through the intake portion of the pumping device to larger scale than Fig. 1 and showing the valve and its seat;

Fig. 3 is a section, on the line 3—3 of Fig. 1, through the delivery end of the device, but to larger scale than Fig. 1;

Fig. 4 is a diagrammatic transverse section through a small boat floating upon a body of water, and showing how the pumping device of the present invention may be employed in pumping out the boat; and

Fig. 5 is a fragmentary plan view to somewhat larger scale than Fig. 4, showing how the handle of the pump may be grasped in the performance of the pumping operation.

Referring to the drawings, the character P indicates the pump as a whole, this pump consisting of a length of tubing whose mid-portion **20** at least is flexible. This mid-portion may be a length of ordinary garden hose, although a more flexible, lighter weight tubing such as commercial neoprene tubing is preferable. However,

other types of flexible tubing may be employed, providing it be such as will not collapse due to atmospheric pressure during the pumping operation.

The delivery end or nozzle portion **22** of the pumping device is made stiff enough to serve as a handle. As here shown, it comprises a piece of thin-walled but rigid tubing **22**, having its end portion **23** fitted within one end **20***a* of the flexible tubing **20**, and secured thereto leak-tight in any suitable manner, for example, by the employment of a waterproof cement. This length of tubing **22** may be, for example, of corrosion resistant metal, or a synthetic plastic, and is freely open throughout its entire length. For example, this nozzle portion may be a piece of hard brass tubing approximately twelve inches long and of an outside diameter at the end **23** which is fitted within the end of the hose of a size such that the hose must be slightly expanded in introducing the nozzle tube into the hose. If desired, an appropriate adhesive may be introduced between the nozzle and hose in order to insure against their separation during use. Since commercial garden hose, which may be employed as the flexible tubing **20**, has an internal diameter of approximately ⅝ of an inch, the outside diameter of the nozzle tube may exceed the internal diameter of the hose, for example, by a little less than 1/16 of an inch, so that the tube (of circular transverse section as initially provided) may be of an outside diameter of approximately 11/16 of an inch. However, if the flexible tubing be of a different internal diameter, the nozzle tube will be correspondingly chosen as to size. To avoid undue weight, it is desirable, if it be of metal, to use tubing having a wall thickness of the order of 0.025 inch. Other materials may be used if preferred, for example, copper, anodized aluminum, stainless steel or hard synthetic plastic, it being desirable in any event to employ some material which is not readily subject to corrosion. For making the nozzle, a twelve-inch length of metal tubing, which is initially of circular transverse section has been found useful. As suggested in the aforesaid copending application, this tubing is flattened, except for a short portion, for example, two inches in length, at the end **23** which is to be inserted in the hose. Beginning at approximately two inches from the end **23**, the tubing is flattened gradually so that at its extreme end **24** (which is the delivery end of the nozzle) its cross section is that of an ellipse having its major axis approximately one inch in length and its minor axis approximately ⅜ of an inch in length. In thus flattening the metal tubing, it is caused gradually to change from the circular form at the end **23** to the elliptical form at the end **23** to the elliptical form at the end **24** by the proper application of pressure. To insure that the change in shape will be gradual and that the walls will be smooth and without re-entrant portions, a yieldable filler, such as is commonly employed in bending metal pipe, may be inserted during the flattening operation, and the flattening may be accomplished by the use of suitably shaped rigid dies.

While a delivery orifice of the shape and dimensions above suggested is desirable, it is within the purview of the invention to flatten the delivery end of the tube more or less. This flattening is merely for the purpose of making it easier to oscillate the nozzle while immersed in water, as will hereinafter be described. Obviously, the flatter the discharge end of the tube, the more readily the nozzle may be swung through the water (in the plane of the major axis of the ellipse). While the side edges of the nozzle could be sharply acute, the practical arrangement is such that at the ends of the major axis of the ellipse, the wall of the tube is curved to a small radius. Although, for ease in oscillating the tube in the water, the delivery end of the tube should be flattened, undue flattening results in reducing the delivery capacity of the

nozzle. The end portion 24 of the tubing 22 constitutes a delivery nozzle, while the tubing 22 itself constitutes a handle by means of which the pump is manually actuated.

The intake portion 26 of the pumping device is also here shown, by way of example, as comprising a length 27 of rigid tubing having one end 28 fitting over the other end 20*b* of the flexible portion 20 of the pumping device and secured therein leak-tight, for example, by means of suitable cement. Within the opposite or free end 29 of this length 27 of tubing, there is fitted leak-tight a short sleeve member 30 of an internal diameter substantially like that of the tubing 20. The tubing 27 and sleeve 29 provide a housing defining a chamber 32, the upper edge of sleeve 29 constituting an annular valve seat which defines a central inlet orifice 34. A flexible flap valve 35 is arranged within the chamber 32 above the seat, and as here shown, is secured at one side to the upper surface of the seat by cement 36. This flap valve may be of sheet rubber, or similar resiliently flexible material, and normally tends to rest upon the seat, as shown in Fig. 2, thus preventing liquid from escaping downwardly through the inlet orifice 34. While the housing here shown is desirable, since it provides ample space for the valve without seriously restricting the size of the inlet orifice 34, this particular shape or construction is not an essential feature of the invention.

Merely by way of example, but without limitation, the length of the flexible tubing 20 may be of the order of eighteen inches, and the length of the handle, or delivery portion 22, of the order of twelve inches. However, these lengths are merely such as have been found desirable in making the device convenient for use in bailing out a small boat, but it is to be understood that these dimensions may be varied as may be found desirable.

In the operation of this device, it is first necessary to prime the pump, that is to say, to establish, within the tubing, a solid column of water, substantially free from air, extending from the intake end of the tubing, at least through the major part of the length of the flexible portion of the tubing and preferably to the end of the delivery nozzle. This priming of the pump may be accomplished by following the same procedure as is described in the aforesaid co-pending application, that is to say by immersing the entire device in the water outside of the boat and then reciprocating it lengthwise until it is completely filled with water and all air has been expelled. Because of the presence of the valve, it is not necessary to close the inlet with the finger when priming the pump as is described in the aforesaid application, and thus less skill is required in the operation of pumping. Obviously, water for priming the pump may be introduced into the tubing in other ways, for instance by pouring water into the delivery opening at the end of the nozzle while the nozzle is held upright, or by forcing water into the intake end. Having primed the pump, it may be manipulated for pumping in exactly the same way as is described in the aforesaid application, although because of the valve, it is not so essential to hold the delivery end of the nozzle below the surface of the water in the initial stages of the operation, or when pumping slowly. Thus in using the pump here disclosed, it is preferred, after having primed the pump, to keep the nozzle end directed upwardly so that no water will spill out, and the inlet end 26 is placed in the bilge water B in the boat S, the parts then being as illustrated in Fig. 4 with the nozzle 24 directed upwardly. Preferably, to facilitate the initiation of the pumping operation the operator then quickly swings the handle downwardly to some such position as indicated at 22*b* in Fig. 4, where the delivery nozzle 25 is near the surface of the water W, and then rapidly swings the handle portion in a wide arc, for example, as shown at K, Fig. 5. If the angular velocity of oscillation of the handle portion be sufficiently rapid, the column of water within the flow passage will be discharged by centrifugal action from the delivery nozzle with the result that atmospheric pressure will cause water to enter the chamber 32. Continued oscillation of the handle will now maintain an uninterrupted stream discharging from the delivery nozzle so that the bilge water B within the boat is soon pumped out. It will be noted that, as contrasted with a reciprocating pump, in which much of the force exerted is expended in friction in moving the piston up and down, and wherein only in the upstroke does any actual lifting of water take place, the pump of the present invention wastes no power in mechanical friction, while the discharge of water is continuous and not intermittent. Thus, the labor of pumping out a boat is substantially less than that by the use of an ordinary reciprocating pump, and the pumping operation takes much less time than with the usual hand-operated pumps.

Since the pump consists of lengths of tubing united end-to-end, the flow passage is continuous and the only movable internal part is the flap valve 35 at the intake end. Moreover, throughout its entire length the flow passage is symmetrical in transverse section and the peripheral wall of the flow passage is wholly devoid of openings through which fluid could pass either inwardly or outwardly. While, as above noted, the pump herein described is primarily intended as a boat pump, it is obvious that it may be useful for pumping water from any body of water, or for pumping other liquids than water, or, in fact, for pumping any fluent material. Since, as above noted, the flattening of the nozzle tube is merely to lessen resistance to motion of the nozzle when immersed in liquid, such flattening may obviously be dispensed with if, during the pumping operation, the nozzle end is to be held above the water surface.

While one desirable embodiment of the invention has herein been disclosed by way of example, together with desirable modes of practicing the method it is to be understood that the invention is broadly inclusive of any and all modifications falling within the scope of the appended claims.

I claim:

1. A portable low-lift pump having a manually actuatable handle and in which the pumping action results from a pronounced transverse swinging movement of the pump handle in any one plane, said pump comprising, in combination, a rigid, hollow foot having a substantially cylindrical open upper end, said foot, when the pump is in use, being immersed in the liquid to be pumped, the lower end of the foot having an opening forming the intake of the pump, an upwardly opening check valve housed in said foot and which opens in response to upward pressure of liquid thereagainst, but which closes automatically to prevent movement of liquid downwardly through the inlet, said foot having an opening at its upper end, a flexible tubing having one end thereof secured leak-tight to the foot in coaxial relation to the opening at the upper end of the foot, the internal diameter of the flexible tubing approximating the diameter of the opening at the upper end of the foot, the flexible tubing having substantial length for enabling the pronounced swinging movement, said flexible tubing having a rigid discharge nozzle attached to the opposite free end thereof, said nozzle being of a shape and size such as to constitute the handle, whereby the pronounced transverse swinging movement of the handle in any one plane imparts a similar motion to the nozzle and to the adjacent portion of the flexible tubing and thereby produces a low-lift suction effect such as to cause the induction of liquid into the intake and unidirectional flow of the liquid upwardly past the check valve and into and through the flexible tubing and its discharge from the nozzle.

2. A portable low lift pump according to claim 1, wherein the major portion of the length of the combined nozzle and handle is approximately elliptical in transverse section whereby, by holding the nozzle with the major axis of its elliptical section in said one plane of oscilla-

tion, the resistance of the ambient medium to rapid oscillation of the nozzle is minimized.

3. A portable low lift pump according to claim 2, wherein said nozzle and handle have a length in the order of 12" and the combined nozzle and handle comprises a unitary piece of stiff metal tubing, said tubing having a wall thickness of approximately 0.025", whereby said pump is made light and portable and easily operable.

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