Jan. 21, 1964 R. J. SAILE 3,118,596

PUMPS

Filed Aug. 26, 1960 2 Sheets-Sheet 1

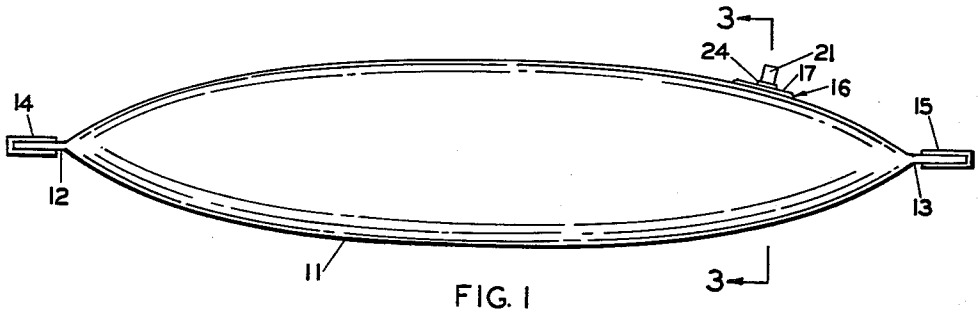

FIG. 1

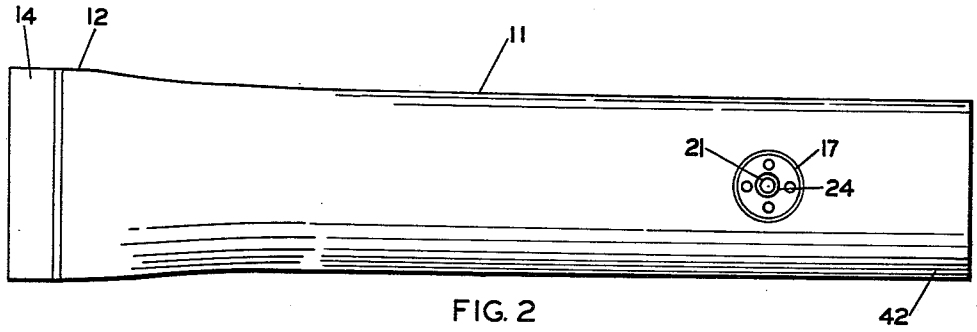

FIG. 2

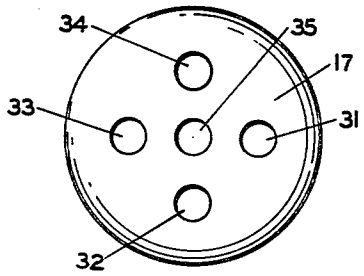

FIG. 5

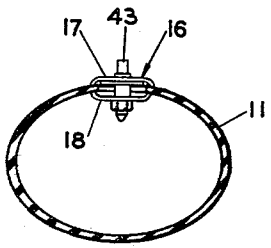

FIG. 3

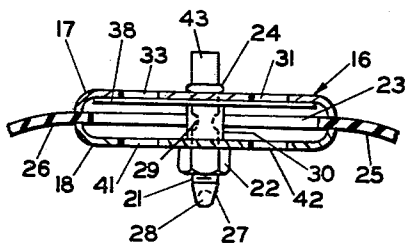

FIG. 4

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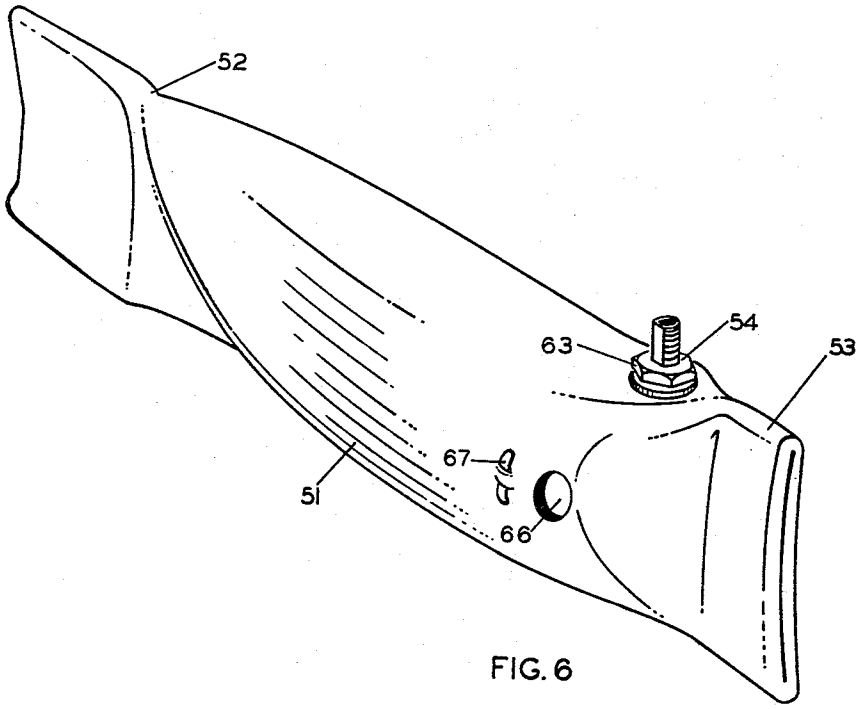

FIG. 6

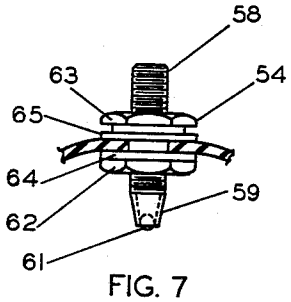

FIG. 7

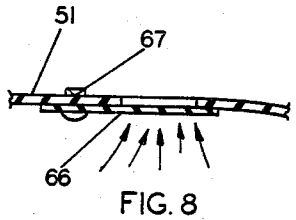

FIG. 8

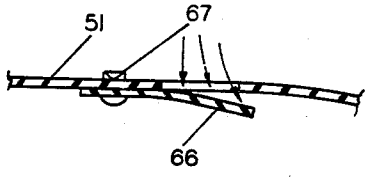

FIG. 9

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PUMPS

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The invention disclosed and claimed in this application relates to pumps.

It is illustrated as a foot operated air pump for low pressure requirements, such as for inflating air mattresses, etc. Pumps heretofore used for such requirement are, so far as I know, of two types. One is operated by hand, such as the well known bicycle pump, and the other is operated by lifting and lowering the foot by an up and down movement. I have designed a pump which can be operated by the foot by a rocking movement with the heel resting at all times upon one end of the pump and the ball of the foot being rocked alternately up and down.

One of the objects of my invention therefore is the improvement in foot operated air pumps for low pressure requirements.

A further object of my invention is the provision of a pump which can be operated by rocking the foot while the heel remains fixed and the ball of the foot is moved alternately up and down.

A further object of my invention is the provision of a pump of the character described which is made from a tube of flexible material such as rubber, plastic, or any similar material, which is so constructed that when the tube is compressed and released, it rebounds to its original shape without requiring a spring.

Further objects and features of my invention will be apparent from the subjoined specification and claims when considered in connection with the accompanying drawings illustrating embodiments of my invention.

In the drawings illustrating such embodiments:

FIG. 1 is a view in side elevation of a pump constructed according to my invention;

FIG. 2 is a view in top plan of an elastic tube while in process of being formed into the pump shown in FIG. 1;

FIG. 3 is a vertical sectional view taken substantially along the line 3—3 of FIG. 1;

FIG. 4 is a vertical sectional view of a fragmentary portion of the showing of FIG. 3 shown on an enlarged scale;

FIG. 5 is a view in top plan of the upper plate of the valve shown on the scale of FIG. 4;

FIG. 6 is a view in perspective of another embodiment of my invention consisting of another pump constructed according to the invention;

FIG. 7 is a fragmentary view in elevation showing one of the valves of the pump of FIG. 6 but having portions of the flexible tube broken away for clarity;

FIG. 8 is a view in fragmentary horizontal section illustrating another valve of the pump shown in FIG. 6, showing the valve in closed position; and

FIG. 9 is a fragmentary horizontal view in section of the valve shown in FIG. 8, but showing the valve in an open position.

Referring now to FIGS. 1 to 5 inclusive for a detailed description of the embodiment of my invention therein illustrated, it may be seen that I have shown in FIG. 1 a pump formed from a tube 11 of flexible material such as rubber, plastic or any material which when compressed and released, regains its original tubular form. The tube 11 is compressed at its ends as at 12 and 13 and is clamped so that the open ends are entirely closed to prevent the escape or ingress of air, or any other gas. The closure is effected by metal clamps such as the clamps 14 and 15

which serve thereafter to hold the ends closed in leakproof condition. The pump is also provided with valves for controlling the ingress and egress of air to and from the interior of the tube. In the embodiment illustrated in FIGS. 1 to 5, these valves are combined in a single unit which is illustrated best in FIGS. 3, 4 and 5. The valve unit there shown is designated 16 and comprises a pair of identical cup-shaped plates 17 and 18 held together face to face by a tubular valve stem 21 and a nut 22. The plates 17 and 18 clamp between them the edges of the tube 11, portions thereof being shown at 25 and 26. The tubular stem 21 is threaded at its lower end for the reception of the nut 22. It is also tapered at said lower or inner end as at 27. The ball check valve 28 is contained within the bore and rests in the tapered portion 27 for sealing against the escape of air or gas from the object being inflated. The stem 21 is preferably metallic or of solid plastic which is not easily deformable. It is pinched or deformed as at 29 so as to prevent the ball check valve 28 from moving upward and escaping. The upper plate 17 is identical with the lower plate 18 and is shown more clearly in FIG. 5 wherein it may be seen that the plate 17 is formed with openings such as 31, 32, 33, 34 and 35. The plate 17 bears upward against an annular ridge or shoulder 24 formed on the stem 21 (preferably by a pressing operation). A flexible disk 38 bears against the underside of the plate 17 and is positioned above the deformation 29. The rim of the cup of the rigid plate 18 presses against the circular edge of a hole 23 in the tube 11 of which portions are shown at 25 and 26 and forces said circular edge tightly into contact wtih the rim of the cup of the rigid plate 17. The plate 18 is held in tight relationship therewith by the nut 22 which is threaded onto the lower end of the stem 21. The plate 18, like the plate 17, is also formed with a plurality of holes corresponding to the holes 31, 32, 33, 34 and 35 of plate 17. The holes 41 and 42 of plate 18 corresponding to the holes 33 and 31 are shown in FIG. 4. A bottom plan of plate 18 would be the same as the view of FIG. 5. The stem 21 passes through the hole 35 and the corresponding hole of plate 18.

In the construction of my pump, the tube 11 is first cut to appropriate length, then the opening 23 is formed therein. Then the valve subassembly is assembled by dropping the ball check valve into the stem 21 so that it rests in the tapered portion 27. The stem is then deformed or punched as at 29 to hold the ball check valve in the stem. Then the stem 21 is inserted downward through the hole 35 of the plate 17 so that the ridge 24 bears on the top of the plate 17. The rubber disk valve 38 is then added below the cup-shaped plate 17 and the short piece of tubing 30 (metal, rubber, plastic or other desirable material) is inserted over said lower end 27 of the stem 21 and pushed up to hold the disk valve 38 in place. The assembly consisting of the cup-shaped plate 17, the disk valve 38, the stem 21, the check valve 28, and the tubing 30, is inserted through the opening 23 of the tube 11 so that the end 27 of the stem 21 is within the tube 11. The cup 18 is then inserted in the opening in the end 42 of the tube 11 and onto the end of the metallic stem 21, and the nut 22 is also inserted through the end 42 and threaded onto the threaded lower end of the stem 21 and tightened to clamp the parts in the position shown in FIG. 4, and especially clamping the cup 18 to hold the circular edge 23 of the hole in the tube 11 against the cup 17. The ends of the tube 11 are flattened and preferably cemented in flattened condition. Then the clamps 14 and 15 are added and machine pressed to their flattened condition shown. In FIG. 2 the tube 11 is shown with the end 42 open so that the plate 18, the nut 22, etc. may be inserted thereon.

In the operation of this pump the operator places his

heel upon the flat surface 14 and presses down on the body of the tube 11 with the ball of the foot in a rocking motion (never having to lift the heel from its original position) so that the tube 11 is compressed and air is forced out through the stem 21, past the ball check valve 28, and through the upper end 43 of the stem 21. The stem is connected to any container in which it is desired to have air (such as, for example, an inflatable bag or mattress into which it is desired to supply air). Normally, a flexible tube connected to the stem 21 is used for this purpose. Upon the raising of the ball of the foot, the natural resiliency of the tube 11 causes it to assume the position shown in FIG. 1, and air is drawn in through the openings 31, 32, 33 and 34 past the flexible disk 38, into the interior of the pump of the tube 11. On repeating the operation, the pressure exerted by the ball of the foot again exhausts air from the tube 11 and forces the air into the container being inflated. This operation is repeated as often as desired.

I wish to emphasize that not only is the pump economical to form and efficient and easy to operate, but it is tamper proof. The clamps 14 and 15 cannot be removed without first cutting the ends of the tube. The valve stem may not be removed from the opening 23 because the nut 22 is entirely within the tube 11.

In FIGS. 6, 7, 8 and 9, I have shown a different embodiment of my invention. Therein the ends of the tube 51 instead of being cemented and clamped by metallic clamps are flattened and heat sealed or cemented to close the ends permanently. The heel rest end thereof is relatively wide as shown at 52 while the opposite end may be more narrow as shown at 53. The heel rest end may be of an optional length of from 2" to 5". Separate inlet and outlet valves are provided. The outlet valve is shown at 54 and especially in FIG. 7, and consists of a threaded stem 58 tapered at 59 and provided in its interior with a ball check valve 61. It is clamped by nuts 62 and 63 and washers 64 and 65 through a hole in the tube 51. The inlet valve consists of a flap 66 stapled as at 67 to the tube 51 and capable of being moved from the closed position shown in FIG. 8 in which air is prevented from flowing out of the tube to the open position shown in FIG. 9 in which air may flow into the tube. Instead of being stapled, the flap 66 may be cemented or otherwise held in place at one end only. The manner of construction of this embodiment of my invention is similar to the construction of the embodiments shown in FIGS. 1 to 5 inclusive, and the operation of this embodiment of my invention is also similar to the operation of the pump shown in FIGS. 1 to 5.

It is to be understood that the above described embodiments of my invention are for the purpose of illustration only, and various changes may be made therein without departing from the spirit and scope of the invention.

I claim:

1. A pump comprising a flexible tube having both of the ends flattened and closed, and having one end closed for at least two inches so that it provides a heel rest, and provided with an inlet and outlet valve.

2. A pump comprising a flexible tube having both ends sealed to close the ends permanently; means comprising a flattened portion of at least two inches at one end of said tube, said flattened portion forming a heel rest for operating the pump; and a pair of valves, one consisting of an inlet valve and one consisting of an outlet valve.

3. A pump comprising a flexible tube having both ends sealed; means comprising a pair of metallic clamps for closing the ends permanently; means comprising a flattened portion of at least two inches at one end of said tube, said flattened portion forming a heel rest for operating the pump; and a pair of valves, one consisting of an inlet valve and one consisting of an outlet valve.

4. A pump comprising a rubber tube having both ends sealed to close the ends permanently; means comprising a flattened portion of at least two inches at one end of said tube, said flattened portion forming a heel rest for operating the pump; and a pair of valves, one consisting of an inlet valve and one consisting of an outlet valve.

5. A pump comprising a flexible tube having both ends sealed to close the ends permanently; means comprising a flattened portion of at least two inches at one end of said tube, said flattened portion forming a heel rest for operating the pump; and a pair of valves, one consisting of an inlet valve and one consisting of an outlet valve, in which the inlet and outlet valves consist of a rigid hollow stem having one end tapered and having a ball check valve positioned within the hollow of the stem, and a pair of face to face perforated cup elements, positioned on said rigid stem and clamping the tube between them, and having a flexible disk at times contacting one of the cup elements to prevent the passage of air in one direction while allowing the passage of air in the opposite direction.

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