April 27, 1965 A. R. MURAT ETAL 3,180,566

BELLOWS TYPE FOOT PUMP

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Fig. 1

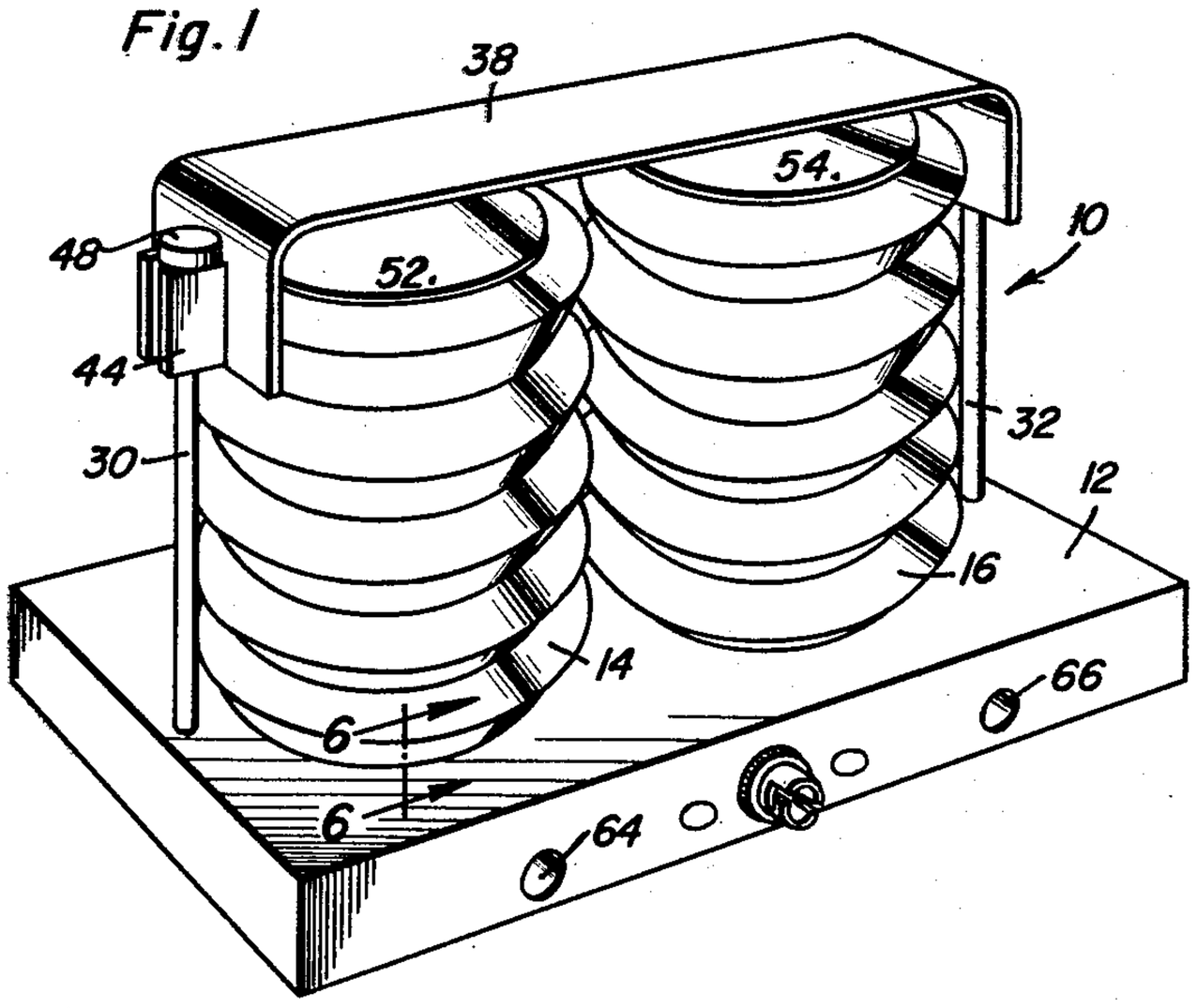

Fig. 2

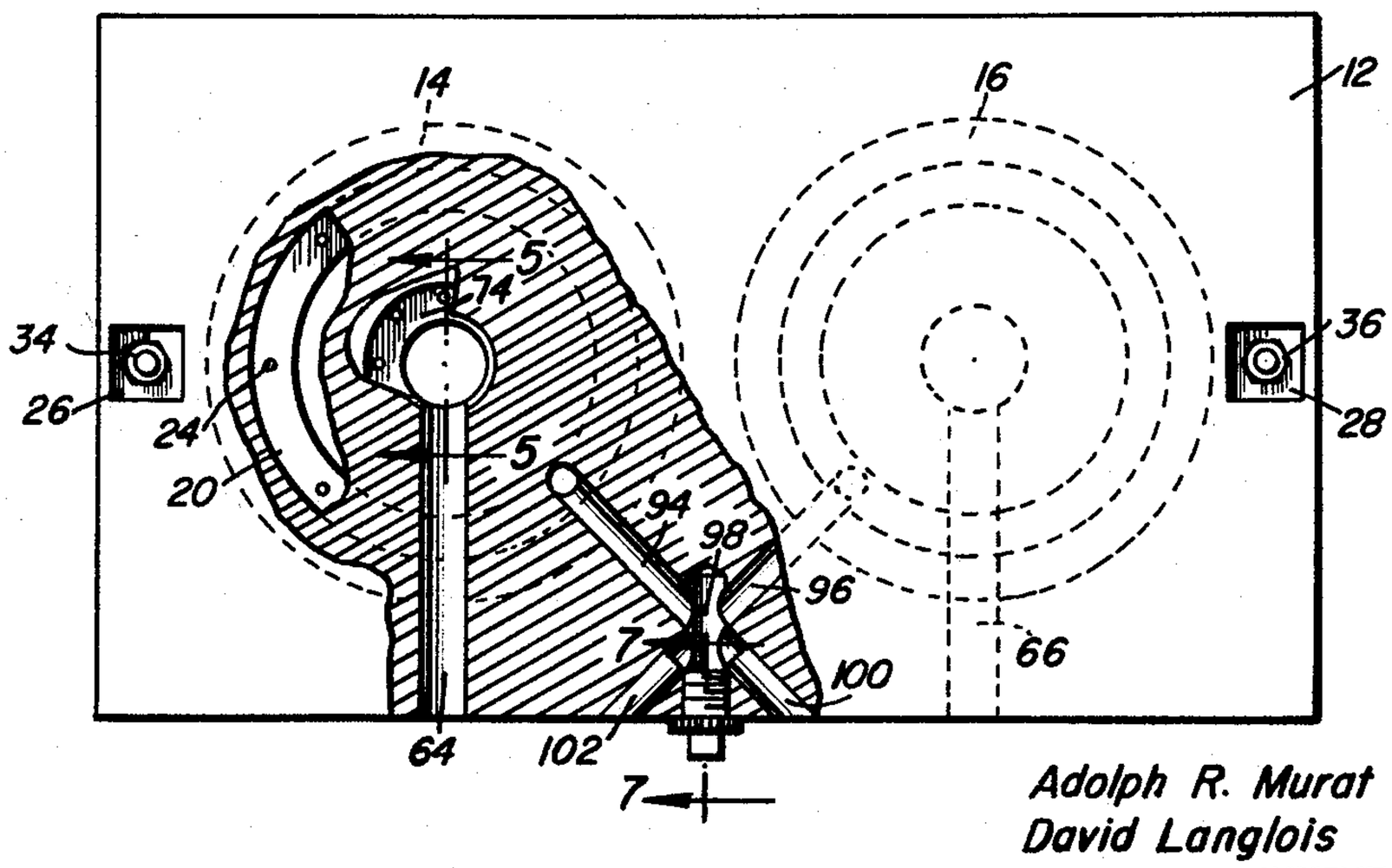

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Fig. 3

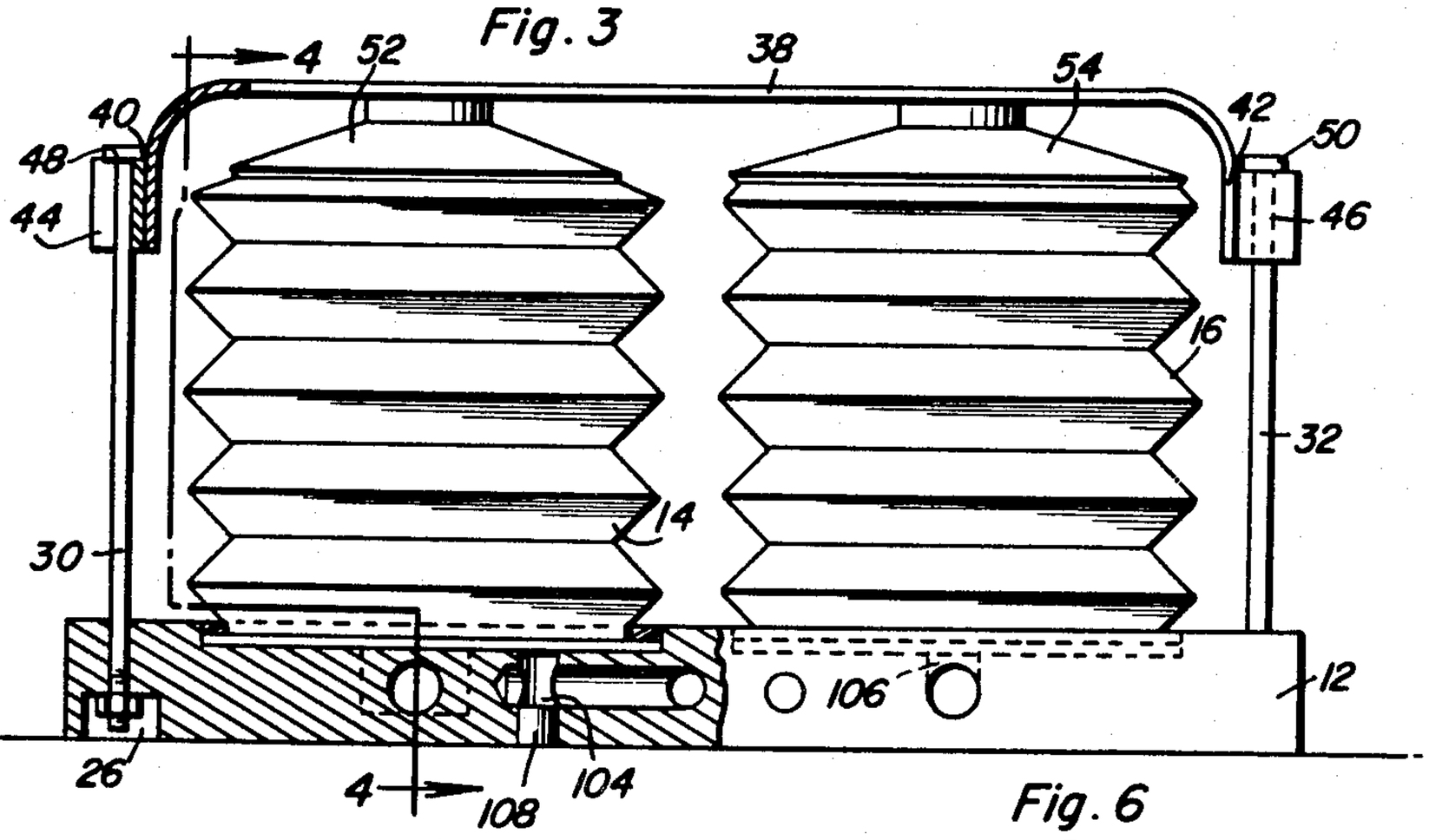


Fig. 5

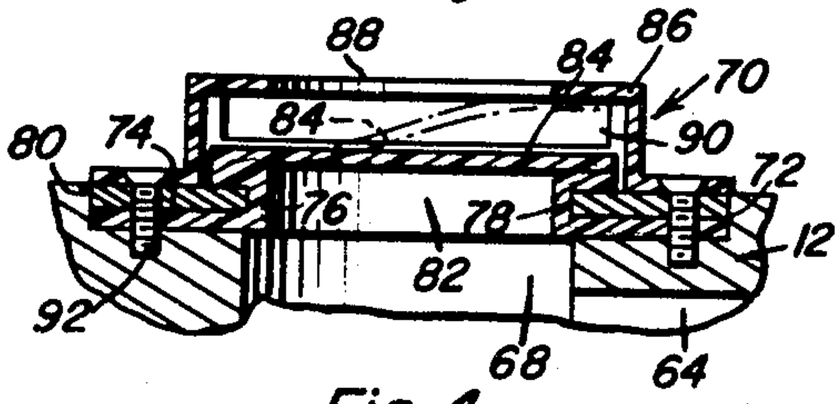


Fig. 4

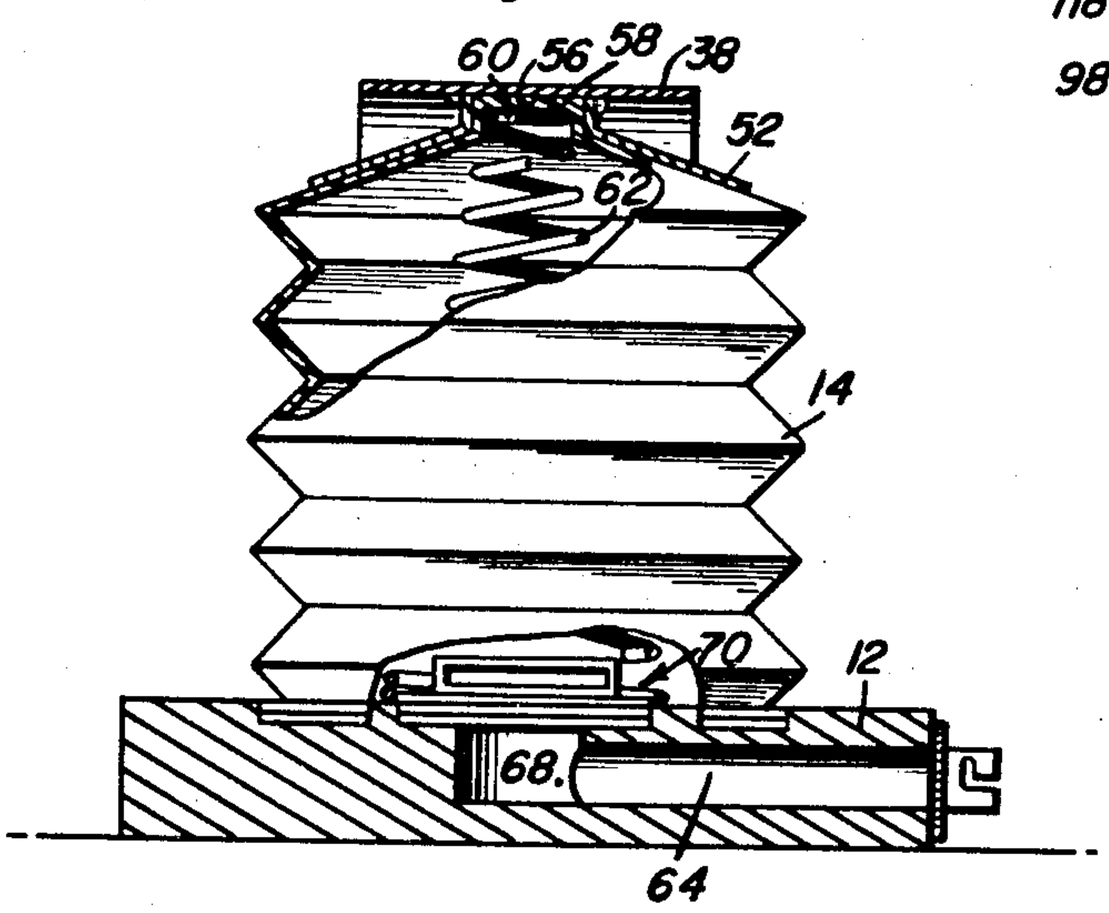
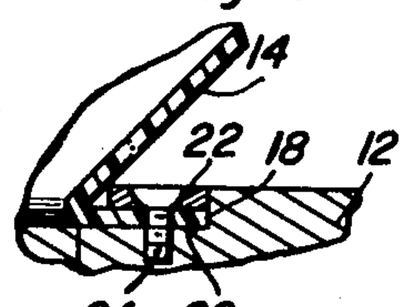


Fig. 6



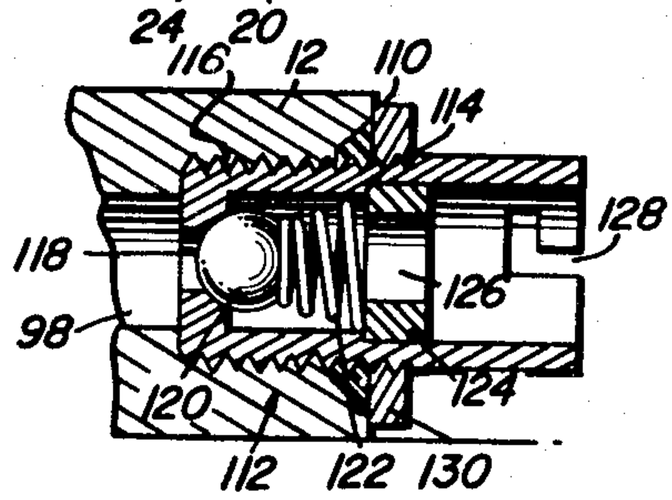


Fig. 7

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3,180,566
BELLOWS TYPE FOOT PUMP

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7 Claims. (Cl. 230—160)

This inevention generally relates to a foot operated pump assembly which is of the low pressure, high volume output type.

An object of this invention is the provision of a novel foot operated pump assembly which utilizes a pair of compressible and expansible bellows to receive and pump air through a common discharge port.

Another object of this invention in accordance with the preceding object is the provision of guide means which slidably mount a foot operated actuating strap for compressing the bellows.

A still further object of this invention resides in the provision of a pair of inlet conduits communicating the atmosphere with the interior of each of said bellows, and a one-way check valve overlying the aforementioned communication to admit air to the interior of said bellows only during expansion thereof.

Yet another object of this invention resides in the provision of a one-way check valve disposed in the aforementioned common discharge port to permit the exhausting of the air only upon compression of said bellows means.

Another object of this invention in accordance with the preceding objects resides in the fact that all the major components of the device are self-lubricating thereby rendering maintenance thereof at a minimum.

Yet another object of this invention resides in the provision of a novel hose coupling member formed integral with the one-way check valve at the discharge port.

A still further object of this invention is to provide a foot operated pump assembly of the character described which is simple and efficient in use but yet develops a high volume of the air pumped to the aforementioned discharge port.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a perspective view of the pump assembly and illustrates the bellows and actuating means therefor.

FIGURE 2 is a bottom plan view of the pump assembly with certain portions broken away in horizontal section to illustrate details thereof.

FIGURE 3 is a front view in elevation of the pump assembly with certain portions broken away to illustrate in vertical section further details thereof.

FIGURE 4 is a detailed sectional view taken substantially along the plane 4—4 of FIGURE 3 with certain portions of the bellows structure broken away to illustrate in vertical section the details of the interior thereof.

FIGURE 5 is a fragmentary vertical transverse sectional view taken substantially along the plane 5—5 of FIGURE 2 and illustrates upon an enlarged scale a portion of the air intake means utilized in the present pump assembly.

FIGURE 6 is a fragmentary sectional view taken substantially along the plane 6—6 of FIGURE 1 and illustrates the mounting of the bellows upon the base structure.

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FIGURE 7 is a fragmentary sectional view taken upon an enlarged scale substantially along the plane 7—7 of FIGURE 2 and illustrates the discharge port utilized in connection with the pump assembly of the present invention and the control means for allowing exhausted air to flow therethrough.

Referring now to the drawings in detail, the pump assembly comprising the subject matter of the instant invention is generally designated by the numeral 10 and comprises a base member 12 upon which a pair of bellows 14 and 16 are mounted. The bellows 14 and 16 are mounted within annular recesses such as 18 cut in the base structure 12. The bottom portion of each of the bellows, see FIGURE 6, is formed with a horizontal annular flange 20 adapted to seat within a recess 18 and is fixedly secured therein by means of a clamping ring 22 mounting a plurality of threaded members 24 through the flange 20 and into the base structure 12.

The base structure 12 further comprises a pair of rectangular recesses 26 and 28 cut in the bottom surface thereof for receiving a pair of upright standards 30 and 32 which are threaded adjacent the recesses 26 and 28 to receive hexagonal nuts 34 and 36 which retain said standards upon the base 12. A channel shaped strap member 38 is adapted to overlie and straddle each of the bellows 14 and 16 and comprises a foot receiving surface to compress each of said bellows. The flanges 40 and 42 of said strap member have rigidly attached thereto a pair of channel shaped bearings 44 and 46 which are slidably received upon the standards 30, 32, respectively, in encompassing relation thereto for guiding the path of movement of the strap 38 upon the strap being actuated by a foot to compress the bellows. Each of the standards 30, 32 comprises a head or stop member 48 and 50 to prevent the strap 38 and bearings 44, 46 from leaving each of the standards. It should be understood that the bearings 44, 46 may be made self-lubricating by forming the same out of a plastic material such as polyethylene resin or the like. The web of the strap 38 mounts a plurality of disk or cymbal shaped members 52 and 54 by welding or the like, which are adapted to overlie and conform to the shape of each of the bellows 14 and 16 whereupon by imparting a force to the strap 38 by means of the foot, the disk shaped members 52, 54 will transmit said force to compress the bellows 14 and 16, respectively. It should also be noted that the bellows 14 and 16 are also formed of plastic polyethylene whereby the bellows are rendered self-lubricating. However, this invention is not specifically limited thereto and the bellows may be made of flexible steel members or the like.

As shown in FIGURE 4, the disk 52 is formed with an upstanding recess 56 to receive an upstanding projection 58 at the top surface of the bellows 14. Correspondingly, such a projection is formed on the bellows 16 to be received within a recess in the disk 54. The projection 58 houses a recess 60 into which a coiled helical spring 62 is jammed at one end thereof. The other end of the coiled spring is adapted to rest upon the base structure whereupon compression of the bellows will cause compression of the coiled spring 62 and release of the foot pressure on the strap 38 will allow the spring 62 to expand thus expanding the bellows and restoring it to its initial position. Of course, the bellows could be formed of such resiliency as to return itself to its initial position.

Upon expansion of each of the bellows 14 and 16 a vacuum is created therein which if the bellows is open to the atmosphere will cause an in-rush of air thereto. In order to produce this result, air intake means comprising a conduit 64 and 66 is adapted to communicate

the interior of the bellows with the atmosphere. As the air intake means for each of the bellows is the same, explanation of one only, that is, the one in conjunction with the bellows 14, will be explained. The conduit 64 comprises a passage from the atmosphere into a vertical bore 68 formed beneath the bellows 14. A flap valve assembly generally designated by the numeral 70 is adapted to overlie the bore 68 and allows admission of air into the interior of the bellows 14 upon expansion thereof. The flap valve or disk assembly 70 is adapted to seat within an annular recess 72 formed in the base 12. The air intake disk assembly 70 comprises a flexible member 74 formed of a plastic material or the like seated within the recess 72 and has a pair of C-shaped legs 76 and 78 which clamp therebetween an annular pressure plate 80. The central portion of the member 74 has a recess 82 adapted to communicate with the recess 68 from the conduit 64 and is normally closed by a flap valve 84 which overlies the recess 82. A generally U-shaped disk 86 having a central aperture 88 and lateral passageways such as 90 overlies the pressure disk 80 and effectively clamps the member 74 and pressure disk 80 within the recess 72 by means of threaded fasteners or the like 92. Therefore, it should now be apparent that the expansion of the bellows 14 will cause an in-rush of air through the conduit 64 into the vertical bore 68 and into the recess 82 thus causing the flap valve 84 to be raised and allowing the air to emanate into the interior of the bellows 14 through the passageways 88 and 90. The pump assembly further comprises air outlet means for guiding compressed air through a suitable hose connection or the like. The outlet means comprises a pair of conduits 94 and 96 drilled at an angle to one side face of the base portion as shown in FIGURE 2 and meeting at a juncture 98. The ends of the conduits 94 and 96 contain suitable plugs such as 100 and 102. Each of the conduits 94, 96 meets with a vertical bore 104, 106 drilled through the base 12 and which are plugged by suitable stoppers such as 108 adjacent the bottom surface of the base 12. Each of said bores 104, 106 opens into the interior of the bellows and is adapted to communicate the interior of each of said bellows with a discharge port for the compressed or expelled air at the juncture 98 of the conduits 94, 96. The base 12 is threaded adjacent the juncture 98 as shown at 110 to receive a suitable one-way check valve 112 adapted to admit the passage of air therethrough only upon the compression of the bellows 14, 16. Said valve comprises a tubular member 114 externally threaded at 116 to mate with the threads 110 on the base 12. An air passage 118 permits the entrance of air exhausted through the juncture 98 to the valve 112 and a spherical valve member 120 normally is seated to close the air passage 118. This is accomplished by means of a coil spring 122 attached to an annular washer 124 or the like rigidly attached to the interior of the tubular member 114 which biases the spherical valve 120 to close the passage 118. The washer 124 has an aperture 126 centrally located therein to admit exhausted air when the valve 120 is opened. On the side of the washer 124 remote from the valve 120 is a suitable coupling 128 for the attachment of a hose or the like. A lock washer 130 on the exterior of the tubular member 114 completes the assembly. Thus, upon compression of the bellows 14, 16 air will be caused to flow through the conduits 94, 96 to the juncture 98 whereupon the air will meet and continue to flow through the air passage 118 in the valve structure or assembly 112 causing the spring-biased spherical valve 120 to open thus admitting air to a hose suitably connected at the hose connection 128.

The operation of the device should now be readily apparent. Upon downward movement imparted by the foot of the operator to the strap 38, the bellows 14 and 16 will be caused to be compressed thus forcing air to the juncture 98 of the outlet conduits of the pump assembly and through the valve assembly 112 to a suitable hose connected thereto. Upon the release of the foot pressure, the

coil spring 62 or the inherent resiliency of the bellows 14, 16 will cause the same to expand thereby causing an in-rush of air through the conduits 64, 66 and the valve assembly 70 into the interior of the bellows 14, 16 to condition the pump for its next compression stroke. Due to the one-way valves in the air intake and outlet means effective control of the air within the bellows is maintained at all times. The guide arrangement comprising the uprights 30, 32 and the bearings 44, 46 connected to the strap 38 define or restrict the path of movement of the foot operated actuating means to thereby render effective the full force imparted to the strap 38 by having the same applied in a vertical direction parallel to the axis of each of the bellows.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A foot operated pump assembly comprising a base, a pair of compressible and expansible bellows means mounted on said base, air intake means on said base communicating the atmosphere with the interior of the bellows means for admitting air upon expansion thereof, air outlet means communicating with the interior of the bellows means for exhausting air upon compression of said bellows means, foot operated actuating means common to and straddling all of said bellows means for imparting a force to compress said bellows means, and a pair of guide means mounted upon and rising from said base on opposite sides of said bellows means defining and restricting the path of movement of said actuating means connecting the actuating means to the base.

2. The structure of claim 1 wherein said actuating means and guide means include a pair of upright standards connected to the base, a channel shaped strap having a web overlying and straddling said bellows means and having flanges on its ends, a bearing on each flange of said strap slidably received on said uprights and connecting means on the web of said strap overlying the bellows means for transmitting a force imparted to the strap to said bellows means for compressing the same.

3. The structure of claim 1 wherein said bellows means includes a pair of bellows fixed to the base, said air outlet means including a plurality of conduits each communicating with the interior of one of said bellows means and joining to form a common discharge port, one-way valve means at the discharge port for discharging air only upon compression of said bellows means and a hose coupling integral with the one-way valve means in the discharge port.

4. The structure of claim 3 wherein said actuating means and guide means include a pair of upright standards connected to the base, a channel shaped strap including a web overlying and straddling said bellows means and having flanges on its end, a bearing on each flange of said strap slidably received on said uprights and connecting means on the web of said strap overlying each of said bellows means for transmitting a force imparted to the strap to said bellows means for compressing the same.

5. The structure of claim 3 wherein the air intake means includes a pair of conduits communicating the atmosphere with the interior of each of said bellows and one-way valve means disposed in each of said conduits for admitting air to the interior of said bellows upon expansion thereof.

6. The combination of claim 1 wherein said air inlet means includes a plurality of conduits in said base, each for a bellows means, each conduit having an inlet communicating with the atmosphere at the side of said base, and an outlet communicating with the interior of the associated bellows means, said outlet consisting of a recess in

the top surface of said base, a non-return upwardly opening valve assembly mounted in said recess.

7. The combination of claim 6 wherein said valve assembly comprises a member having C-shaped legs, a pressure plate engaged in said C-shaped legs, means securing said pressure plate in said recess to said base, said member having a bore therethrough opening into the associated bellows means and a disk valve cooperating with said bore and limiting air flow therethrough upwardly into the associated bellows means.

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