

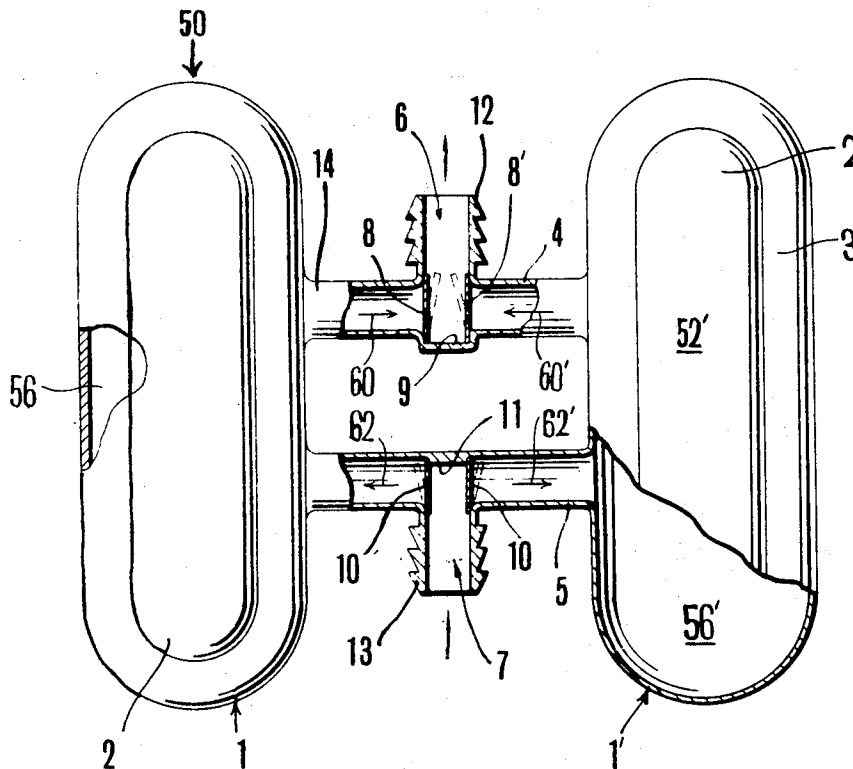
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[21] Appl. No. **867,577**
[22] Filed **Oct. 20, 1969**
[45] Patented **Oct. 12, 1971**

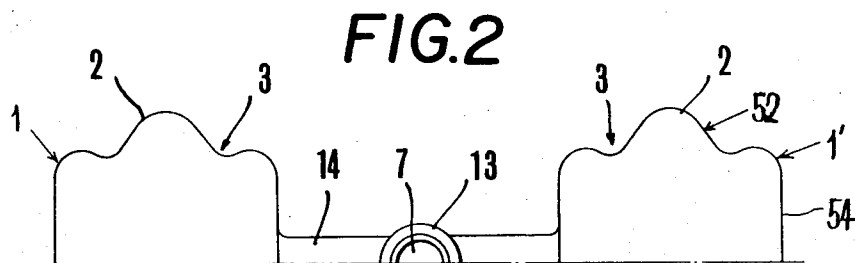
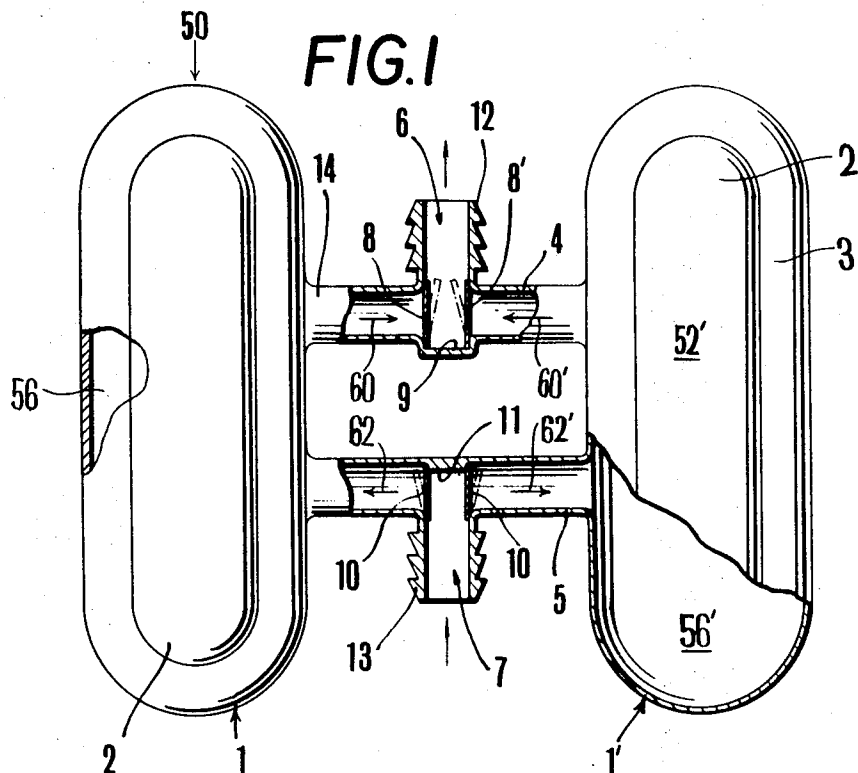
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Primary Examiner—Robert M. Walker
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[54] **TREADLE-TYPE PNEUMATIC PUMP**
4 Claims, 5 Drawing Figs.

[52] U.S. Cl..... 417/533,
417/903, 417/566
[51] Int. Cl..... F04b 23/04,
F04b 21/02, F04b 9/02
[50] Field of Search..... 417/903,
533, 565, 566, 567, 568

ABSTRACT: A treadle-type pneumatic pump includes means defining two pumping chambers with compressible walls arranged in spaced relationship and interconnected by conduit means to provide for the alternate inlet and discharge of air upon the release and the collapse of the walls of the respective chambers. The device advantageously includes chambers formed of a material such as a plastic and which are provided with pump walls of a general outline of a person's foot to permit the walls and the interior chamber to be alternately compressed and opened by the upward and downward movement of the feet of the user to affect the pumping action.





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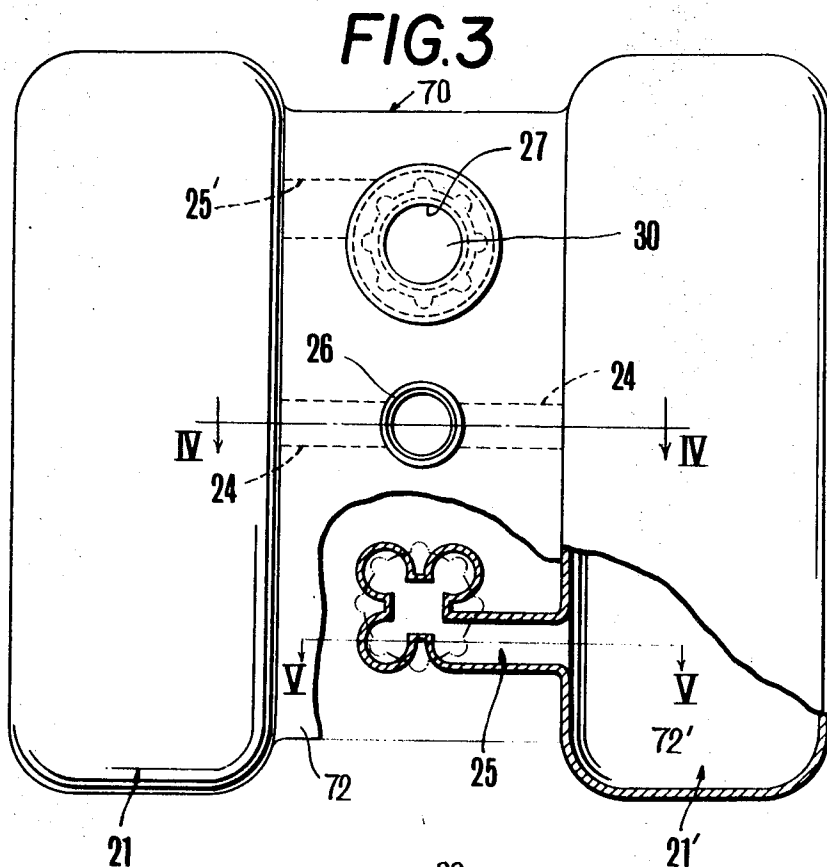
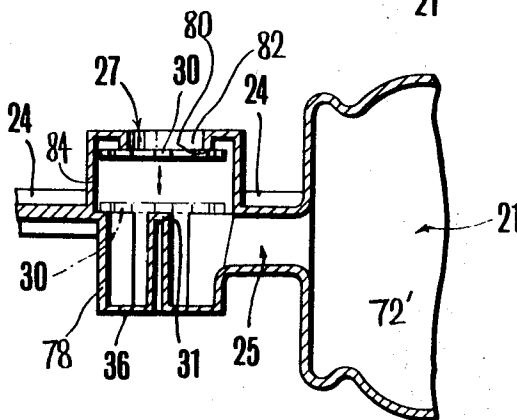


FIG. 5



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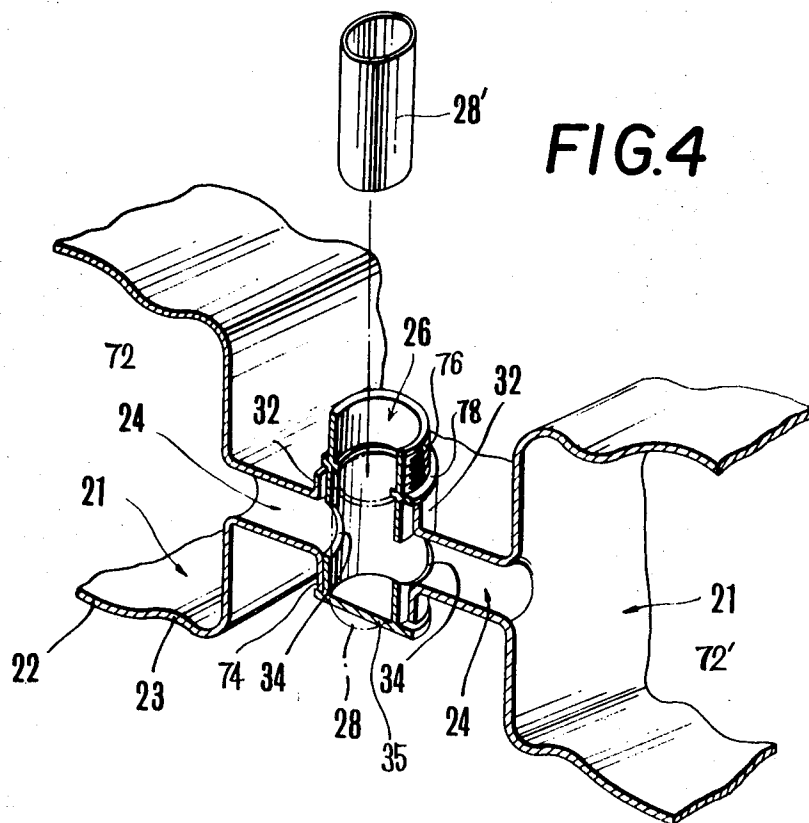


FIG. 4

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TREADLE-TYPE PNEUMATIC PUMP

SUMMARY OF THE INVENTION

This invention relates in general to pump construction and in particular, to a new and useful pneumatic pumping unit which includes alternately engageable treadle elements which are interconnected by conduit means permitting alternate inlet and discharge of air from each treadle chamber.

The invention is an improvement over the prior art particularly in respect to the employment of two chambers arranged side by side in a position to permit them to be contacted by each foot of an operator in order that he may alternately move upwardly and downwardly on each treadle element to cause collapsing and a discharge of air from one while the other is relaxed to permit inlet of air to the other chamber and vice versa. With such a construction it is possible to affect substantially a continuous pumping stream of air in the discharge of the pump as a person moves upwardly and downwardly in walking fashion to operate it.

Accordingly, it is an object of the invention to provide an improved pump device which includes two side-by-side air-forming chambers having collapsible walls which may be engaged by the foot of an operator in the manner of a treadle to alternately collapse and permit expansion of the walls and with conduit means associated with each chamber for permitting intake and discharge of air in accordance with the expansion and collapsing movement of the walls of the chambers.

A further object of the invention is to provide a foot treadle which may be constructed of an inexpensive material such as plastic and which includes laterally space oblong chambers formed of a material such as plastic which may be collapsed by a person's foot and which are interconnected by cross conduits each conduit containing a valve permitting inlet flow to an expanding one of the chambers when the other is being collapsed and discharge flow from the collapsing chamber and vice versa.

A further object of the invention is to provide a foot treadle pump which is simple in design, rugged in construction and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated and described preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a partial top plan and partial sectional view of a treadle pump constructed in accordance with the invention;

FIG. 2 is an end elevation of the pump indicated in FIG. 1;

FIG. 3 is a view similar to FIG. 1 of another embodiment of the invention;

FIG. 4 is a section taken along the line IV—IV of FIG. 3; and

FIG. 5 is a section taken along the line V—V of FIG. 3.

GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings in particular, the invention as embodied therein in FIGS. 1 and 2 comprises a treadle pump generally designated 50 which is particularly suitable as an air pump and which includes a pair of elongated containers 1 and 1' which are laterally spaced and each of which includes a top wall 52 and a sidewall 54 with at least a portion thereof which is collapsible and expandable in order to permit alternate collapse and expansion of the associated chambers. In the embodiment illustrated the top wall 52 includes a central bulbous portion 2 and an annular recessed portion 3 around the bulbous portion.

The numbers 1 and 1' define elongated reservoirs or air chambers 56 and 56', respectively, which are held in spaced relationship by cross conduits in the form of a discharge conduit 4 and a supply or inlet conduit 5. The conduits 4 and 5 hold the members 1 and 1' in a fixed orientation in a position in which they can easily form a foot engageable treadle element.

In accordance with a feature of the invention centrally connected to the discharge conduit 4 and to the inlet conduit 5, are axially extending fittings or nipples 12 and 13 for facilitating connection of the pumping device to a discharge conduit and inlet conduit respectively.

The discharge conduit 4 is provided with a central recessed area which accommodates two separate valve elements 8 and 8' of a discharge valve. The valve elements are constructed such that they each permit selective opening for airflow in the direction of arrows 60 and 60' respectively. This flow is produced when the conduit 4 is pressurized by the collapse of an associated treadle element 1 or 1' to cause flow in the direction of the arrow 60 or 60' respectively. This collapsing movement takes place alternately so that when the valve 8 is opened by flow in the direction 60 for example, the valve 8' will be closed by this same airflow pressure so that the associated air reservoir 56' will be permitted to fill by the releasing expansion movement of its associated chamber walls 52 and 54.

The inlet conduit 5 is provided with a projection 11 against which abut respective valve elements 10 and 10'. The valve elements 10 and 10' permit flow in the direction of arrows 62 or 62' when the associated air reservoir 56 or 56' is permitted to expand after it is released when a person disengages his foot therefrom.

In accordance with a feature of the invention a person may place his feet over the top walls 52 and 52' and move his feet to alternately and cyclically compress and expand the associated top wall 52 or sidewall 54 or both and effect an alternate collapsing and expansion of the associated reservoir.

During each associated expansion of the reservoir air flows in through the inlet 7 to whichever of the chambers 56 or 56' is being expanded and during the collapse of the reservoir chamber walls air flows outwardly through the outlet 6 fed from which ever the associated chambers 56 or 56' is being collapsed.

In the embodiment indicated in FIGS. 3 to 5 a treadle-type pneumatic pump generally designated 70 includes elongated fluid reservoir forming elements 21 and 21' which define pumping reservoirs 72 and 72', respectively. In this embodiment the material of the elements 21 and 21', for example, plastic, forms a central connecting chamber generally designated 72 in which is formed suction conduits 25 and 25', located at respective opposite ends, and a central discharge conduit 24 extending between the two reservoirs 72 and 72'.

In FIG. 4, there is indicated a schematic showing of the construction of the discharge passage 24 and the associated discharge or exhaust valve generally designated 26. The construction includes a cylindrical projection 74 which is centrally arranged within the conduit 24 and terminates in a bottom wall 35. An inner cylindrical formation 28 extends from the bottom wall 35 upwardly through the conduit 24 and terminates at the upper end in a projecting fitting 76. The tubular element 28 is provided with openings 34 which at each side which align in the passage 24. An upper extension 32 connects into the cylindrical element 28 by a flange 78. The construction includes an inner cylindrical or insert 28' of soft material which closes the openings 34 but which will flex inwardly to permit passage of air from the discharge conduit 24 outwardly through the fitting 76 when the associated chamber 72 or 72' is pressurized by the collapsing of the associated treadle elements 21 or 21'.

The suction valve assembly generally designated 27 in FIG. 5 includes a cylindrical formation 78 which terminates in a lower wall portion 36 and includes a central valve seat formation 31. A floating valve 30 is captured between the seat 31

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and a set 80 formed by depending flange adjacent the central inlet opening 82 defined at the upper end of a cylindrical extension 84. When the chamber 72' is being permitted to expand by release of the foot from the associated treadle-forming chamber member 21' air will flow in through the inlet 82 and cause the valve 30 to move downwardly until it hits the seat 31. When the associated chamber 72' is being pressurized by the collapsing of the associated treadle forming member 21', the valve 30 will be moved upwardly against the seat 80 to close off the opening 82.

What is claimed is:

1. A pump comprising first and second air chamber forming members having at least a portion thereof which is collapsible and subsequently recoverable to its original form to effect alternate discharge and intake of the air therewithin, valved conduit means connected to said first and second members for permitting inflow into and subsequent discharge of air under pressure out of said members during intake and discharge thereof respectively, said valve conduit means comprising a first conduit connected to and extending between said first and second air chamber forming members for supplying air into said members, valve means positioned within said first conduit and arranged for alternately admitting air into one of said members while air is being forced out of the other said member, valved discharge conduits connected to said first and second air chamber forming members for alternately discharging air under pressure from said members, and said air chamber forming members being located in spaced orientation for engagement by feet of an operator to cause the alternate collapse and recovery of said members.

2. A pump comprising first and second air chamber forming members having at least a portion thereof which is collapsible and subsequently expandable to effect alternate pressurizing and expansion of the air therewithin, valved conduit means connected between said first and second members for permitting inflow into and subsequent discharge of air under pressure out of said members during expansion and collapsing thereof respectively, said first and second air chamber forming members comprising substantially elliptical-shaped members in plan view each defining a separate air chamber arranged in spaced relationship with their major axes being parallel and being arranged for the engagement by the feet of an operator to cause the alternate expansion and contraction of said members, said valved conduit means comprising an inlet conduit extending between said first and second members and connected into each of the air chambers thereof, an inlet fitting connected into said inlet conduit centrally between said first and second air chambers, a discharge conduit extending between said first and second members and connected into each of the air chambers thereof, a discharge fitting connected

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into said discharge conduit between said first and second air chambers, inlet valve means disposed between said inlet fitting and said inlet conduit for selectively permitting inflow to the associated ones of said first and second air chamber forming members, and discharge valve means located between said discharge fitting and said discharge conduit for selectively permitting flow from the associated first and second air chambers outwardly through said discharge conduit to said discharge fitting.

3. A pump comprising first and second air forming members having at least a portion thereof which is collapsible and subsequently expandable to effect alternate pressurizing and expansion of the air therewithin, valve conduit means connected between said first and second members for permitting inflow into and subsequent discharge of air under pressure out of said members during expansion and collapsing thereof respectively, said chamber forming members being located in spaced orientation for engagement by the feet of an operator to cause the alternate expansion and contraction of said members, and a separate exhaust conduit connected to at least one of said first and second air chamber forming members, a tubular exhaust fitting connected through said exhaust conduit and having an opening in said fitting aligned with said exhaust conduit, and a tubular member of soft material arranged within said exhaust fitting enclosing the openings of said exhaust fitting to said exhaust conduit but being of a soft material permitting flexing thereof to open said openings for the outflow of air from the associated exhaust conduit.

4. A pump comprising first and second air chamber forming members having at least a portion thereof which is collapsible and subsequently expandable to effect alternate pressurizing and expansion of the air therewithin, valved conduit means connected between said first and second members for permitting inflow into and subsequent discharge of air under pressure out of said members during expansion and collapse thereof respectively, said chamber-forming members being located in spaced orientation for engagement by the feet of an operator to cause the alternate expansion and contraction of said members, said valved conduit means comprising at least one conduit extending outwardly from at least one of said first and second air chamber forming members, a tubular member connected to said conduit and having an inlet opening, said tubular member defining a valve seat at a spaced location from said inlet opening and being connected to said inlet conduit below said valve seat, said tubular member having a flange portion defining a second valve seat spaced from said first seat and an opening for inlet air centrally of said second valve seat, and a valve disk member floating between said second valve seat and said first valve seat.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,612,731 Dated October 12, 1971

Inventor(s) KEIGO TANEMOTO

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading of the patent insert

--[32] Priority October 25, 1968
[33] Japan
[31] 44 28039--

Signed and sealed this 18th day of April 1972.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents