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PUMP FOR AIR MATTRESSES

Filed May 3, 1961

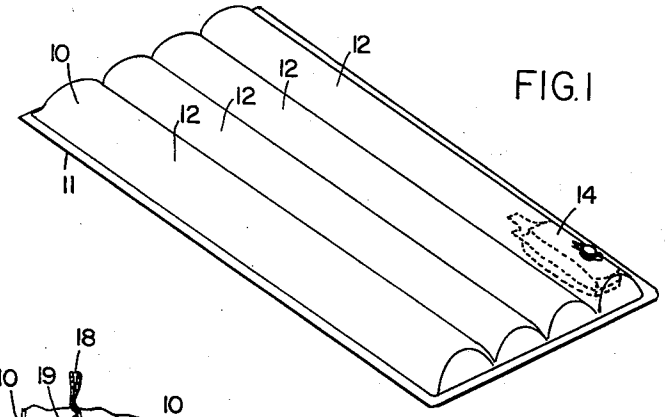

FIG. 1

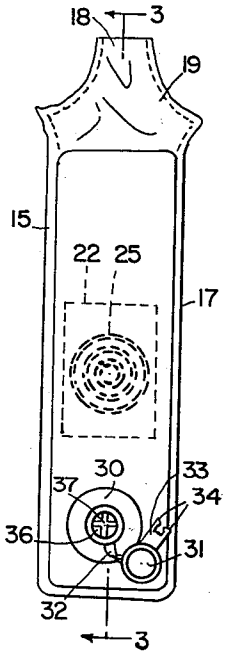

FIG. 2

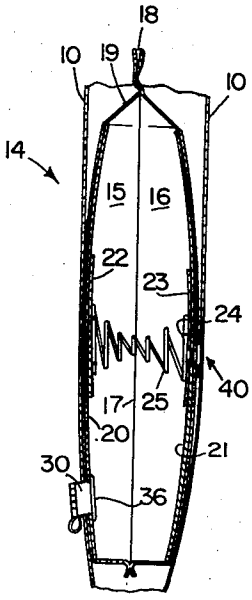

FIG. 3

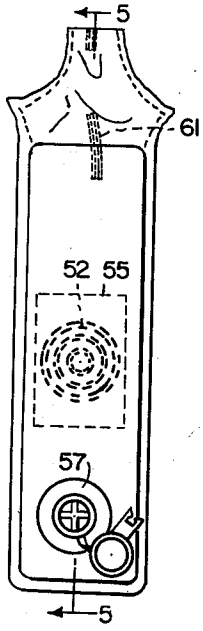

FIG. 4

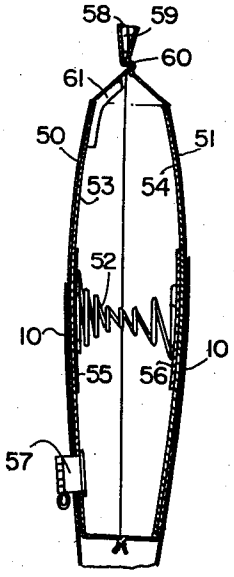

FIG. 5

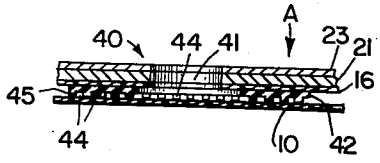

FIG. 3a

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PUMP FOR AIR MATRESSES

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The present invention relates to a pump for air mattresses and in particular to an improved pump for air mattresses and the like having a self contained improved deflating valve.

Air mattresses currently offered for sale are normally made with a foot operated air pump contained within one of the elongated sections that normally are incorporated into the air mattress. The user repeatedly presses down on the pump with his foot to inflate the mattress. When the mattress is to be deflated a separate air valve in the mattress is opened. Such arrangement while normally satisfactory is a relatively expensive structure for it requires separate and added operations in the manufacture and assembly of the mattress casing with an additional valve. These costs are relatively significant factors in domestic manufacture of such mattresses competing with similar mattresses made abroad.

It is therefore an object of the present invention to provide an air mattress having a pump with a self contained air exhaust valve adapted to permit the inflation and deflation of the mattress through the air pump. This construction is relatively simple and less costly than comparable devices of the prior art.

It is also an object of the present invention to provide an air mattress having an air pump with a self contained air outlet valve that is relatively easy to manufacture, and is relatively certain of operation, and will not fail even after many thousands of operations.

A still further object of the present invention is to provide an air mattress having a self contained air outlet valve through which the air in the mattress may be rapidly exhausted upon deflation of the mattress.

These and other objects and advantages of the present invention will be more clearly understood when considered in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of an air mattress containing the pump of the present invention.

FIG. 2 is a top plan view of the air pump illustrating a preferred embodiment of the invention.

FIG. 3 is a cross section taken along the line 3—3 of FIG. 2.

FIG. 3A is a cross-sectional detail of the air outlet valve illustrated in FIG. 3.

FIG. 4 is a top plan view of a modification of the present invention, and,

FIG. 5 is a cross sectional view taken along the line 5—5 of FIG. 4.

The pump of the present invention is utilized in an air mattress of the type illustrated in FIG. 1. Such air mattresses are formed with opposite walls 10, preferably sealed together at their periphery 11. The mattress is divided into a plurality of longitudinal sections 12, by means of interconnecting webs (not shown), which extend substantially, but not completely the length of the mattress so that each of the sections 12 are interconnected with one another. The pump generally illustrated at 14 is secured within one of these sections 12, preferably at one end.

This pump 14 is an elongated tubular device preferably having a length at least comparable to the length of an individual's foot, so that an individual may press repeatedly down upon the pump with his foot in order to actuate it. The pump is formed with opposite walls 15 and 16 seamed together at their periphery as illustrated at 17 except for an opening at one end 18 formed from the flap-like projections 19. The casing walls are preferably formed of a flexible resilient non-permeable material such as rubber or treated impermeable canvas and may also be made of the same flexible material as the mattress walls 10. Positioned within the casing are a pair of elongated relatively rigid panels 20 and 21 which may for example be made of a fiber-board material. Secured on the inner facing surfaces of these panels 20 are reinforcing members 22 and 23. In turn, secured to these reinforcing members 22 and 23 is the helical expansion spring 25 which may be secured to these members 22 and 23 by suitable means such as staples 24. This helical spring is normally under a compression and thereby maintains an outwardly directed force on the panels 20 and 21 which in turn maximizes the volume within the casing 10. A one-way air inlet butterfly valve 30 is securely sealed to the casing wall 15 and the wall 10 of the mattress. If desired this valve 30 may be cemented or otherwise suitably secured to both walls 15 and 10. The valve 30 opens into the interior of the pump 14 through a suitable hole in the panel 20. This valve is provided with an integral cover 31 connected to the valve by connecting web 32. A projecting tab 33 having a pair of prongs 34 at its end is formed on the cap 31. The valve is provided with a butterfly flap 36 secured to a supporting cross member 37 at the base of the valve opening. The prongs 34 are adapted to fit on either side of the cross member 37 for purposes of pushing the butterfly flap 36 away from the edge of the valve so as to open the valve 30 when it is desired to deflate the mattress.

A second opening is formed in the base of the pump generally illustrated at 40 and illustrated most clearly in FIG. 3A. This opening 40 forms an air inlet valve for cooperating with the inlet valve 30 for deflating the air mattress. An opening 41 is formed in the wall 16, panel 21 and reinforcing member 23. Cemented or otherwise suitably secured to the outer surface of the wall 16 is an annular ring 42 made of a resilient material such as foam rubber. The lower surface lies in face to face relation with the casing wall 10. The ring 42 is formed with a plurality of small air passages 44 extending from the inner portion of the annular ring 42 outwardly to its outer surface. These passages may be formed in any convenient manner. For example, the ring 42 may comprise an annular member having a plurality of projecting cylindrical bosses in spaced relation to form a large plurality of such passages 44. Alternately the ring 42 may be formed of a foam rubber material having elongated channels extending radially through the ring. This ring however, should be so constructed that when the ring is compressed the passages 44 will close. In this specific embodiment illustrated in FIG. 3A, with application of pressure downwardly on the ring 42 in the direction of the arrow A, the small bosses 45 will expand in width as they are compressed in height. This will cause openings 44 to close.

In the operation of the pump illustrated in FIGS. 2, 3 and 3A, the operator opens the cover 31 of the valve 30 and by pressing his foot up and down on the valve 14, causes a cyclical contraction and expansion of the spring 25 and the consequent compression of the casing 14. When the casing is compressed air in the casing is forced outwardly through opening 18 into the air mattress. The valve 30 however remains closed as it is a one-way air inlet buterfly valve. The valve 40 also closes because the compressive pressure of the individual pressing downwardly on the pump 14 closes the air passages 44. When the operator's foot is raised in the cyclical pumping

action, the expansion spring 25 returns the casing to its original position in which the volume within the casing is maximized. In this portion of the cycle air will pass through the valve 30 filling the volume of the casing pump 14. Substantially no air will enter the pump 14 through opening 40 because there is still some compressive force of the individual's foot in the cyclical pumping operation which closes passages 44. While some air might leak through it would not be a sufficient amount to impair effective operation of the pump. During this cycle of operation the opening 18 closes because the flap-like members 19 are drawn together, due to the air pressure differential inside and outside the pump 14. This sequence is repeated cyclically until the air mattress is pumped up.

When the operator desires to deflate the mattress the cap 31 is twisted so that prongs 34 project between the cross member 37 and press the butterfly valve flap 36 away from the valve opening. This permits air to pass from within the pump 14 outwardly through valve 30 so long as the prongs 34 hold the flap 36 from the edge of the valve. Since the operator is no longer standing on the pump 14, air passes through the openings 44 and the air inlet valve 40, through the interior of the pump 14 and outwardly through valve 30.

A modification of the present invention is illustrated in FIGS. 4 and 5. In this arrangement the pump is formed with casing walls 50 and 51 sealed together in a manner similar to the arrangement illustrated in FIG. 2. An expansion helical spring 52, panels 53 and 54, reinforcing members 55 and 56, positioned within the pump are similar in construction to the comparable portions illustrated in FIG. 2. Valve 57 is similar in construction and location to the valve generally illustrated at 30 in FIG. 2. Flap-like valve 58 is formed substantially the same as flap-like portions 19, except that in this particular modification a short tube segment 59 is secured at the open end of the flap-like opening to the inner surface of the wall 53. This tube 59 extends inwardly to a point just short of the natural crease line 60 in the flap-like valve 58. A second and longer tube 61 is secured to the panel 53. This tube 61 extends longitudinally of the pump to a position just short of the inner edge of the natural crease line 60 in the flap-like valve 58.

No opening, such as illustrated at 40, FIG. 3, is provided in this construction. In the operation of the modification illustrated in FIGS. 4 and 5, the operator will cyclically apply pressure by standing on the pump and then release the presure by raising his foot slightly in a manner as previously described. When the pump is compressed air will flow outwardly through the flap-like valve 58 in a manner as described in connection with FIG. 2. When pressure is released and the spring returns the casing to its original position, the flap-like valve 58 will close along the crease line indicated at 60. This cycle is repeated until the air mattress is filled. When the operator desires to deflate the mattress the prongs of the valve 57 are inserted in the manner as previously described. Because there is no active cyclical pressure on the mattress at this point the flap-like valve 58 is held open even at the crease line 60 by the somewhat stiff tube 61. This permits an even but gentle flow of air in through the tube 59 past the crease line section 60 and into the interior of the casing.

What is claimed is:

1. A pump for an air mattress having walls forming a plurality of elongated tubular interconnected sections comprising an elongated flexible casing having walls adapted to be secured within one of said sections, said casing walls having means forming a flap-like oneway outlet air valve at one end, spring means for tensioning said casing walls outwardly whereby the volume within said casing is normally maximized, a oneway air inlet valve in said casing wall and passing through said section wall whereby air may be drawn from outside said mattress into said casing, and a second air inlet valve in said casing wall in an area opposite said first air inlet valve, said second air inlet valve comprising means forming a lower opening in said casing wall, an annular resilient cushion surrounding said lower opening with means forming air pasages normally open in said resilient cushion when said cushion is uncompressed and closed when said cushion is under compression, said air passages interconnecting the interior of said casing and the interior of said sections.

2. A device as set forth in claim 1 wherein said cushion is interposed between said section wall and said casing wall.

3. An air mattress construction comprising flexible opposite walls sealed together at their periphery forming an air tight enclosure adapted to be inflated into a mattress shaped body, an air pump positioned between said walls comprising an elongated flexible casing forming a contractable enclosure, said casing having flexible walls having portions thereof formed as a pair of flap-like extensions bordering an opening in said casing and extending outwardly of said casing and thereby forming a one-way outlet air valve, means including a spring positioned internally of said casing for tensioning said flexible casing walls outwardly whereby the volume within said casing is normally maximized, a normally one-way air inlet valve in said casing wall and extending through one of said opposite walls whereby air may be drawn from outside said mattress into said casing, said one-way air inlet valve having means for adjustment thereof for free outward passage of air therethrough, and a second air inlet valve in said casing wall comunicating with said enclosure and having means for maintaining said second air inlet valve open when said casing is uncompressed and closed when said casing is under compression.

4. A container construction comprising flexible opposite walls sealed together at their periphery forming an air tight enclosure adapted to be inflated into a shaped body, an air pump positioned between said walls comprising an elongated flexible casing forming a contractable enclosure, said casing having flexible walls having portions thereof formed as a pair of flap-like extensions bordering an opening in said casing and extending outwardly of said casing and thereby forming a one-way outlet air valve, means including a spring positioned internally of said casing for tensioning said flexible casing walls outwardly whereby the volume within said casing is normally maximized, a normally one-way air inlet valve in said casing wall and extending through one of said opposite walls whereby air may be drawn from outside said container into said casing, means for automatically forming an air passage between said enclosure and the interior of said casing only when said casing is uncompressed.

5. A device as set forth in claim 4 wherein said means for forming an air passage comprises an air tube secured between said flap-like extensions and extending from the outer edge of said flap-like extensions in a direction inwardly of said casing, and a second tube secured within said casing and extending outwardly toward said flap-like extensions, said tubes having adjacent ends in spaced relation with said intermediate area defining a transverse crease section in said flap-like extensions adapted to be drawn together for closure of said opening bordered by said flap-like extensions.

6. In an air mattress a pump for inflation and deflation of said mattress comprising means forming a compressible casing, means forming a one-way air outlet valve in said casing, means forming a pair of air inlet valves in said casing, with automatic means for maintaining one of said inlet valves open when said casing is uncompressed and closed when said casing is under compression, and means for selectively permitting air to pass outwardly through the other of said air inlet valve.

7. In the container a pump for inflation and deflation of said container comprising means forming a compressible casing, means forming a one-way air outlet valve in said casing, means forming an air inlet valve in said casing with means for selectively permitting air to pass outwardly through said inlet valve, and automatic means for allowing air to pass through said casing when said casing is uncompressed.

8. A pump as set forth in claim 7 wherein said container has flexible walls and said automatic means comprises an angular resilient cushion defining air passages

communicating with the interior of said casing when said casing is uncompressed.

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