Nov. 14, 1961 A. GAL 3,008,465

PULSATING PNEUMATIC BODY SUPPORTING DEVICE AND PNEUMATIC VALVE THEREFOR

Filed Oct. 10, 1958 2 Sheets-Sheet 1

FIG. 2

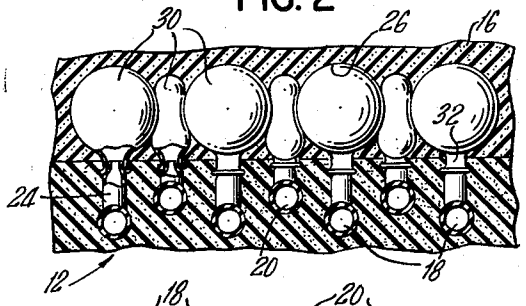
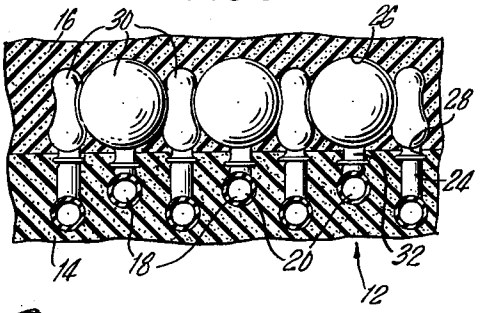


FIG. 3



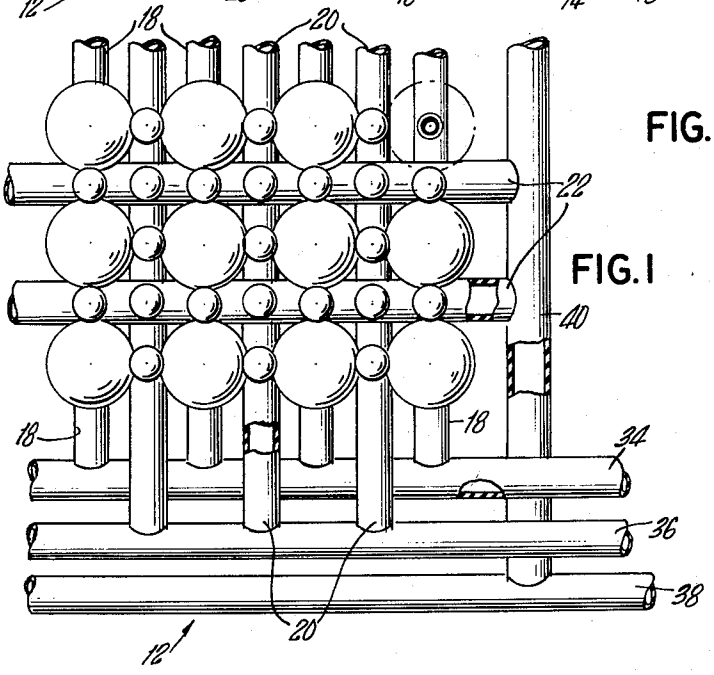
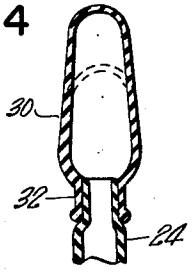


FIG. 1

FIG. 4



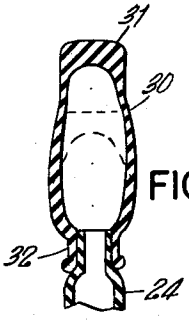
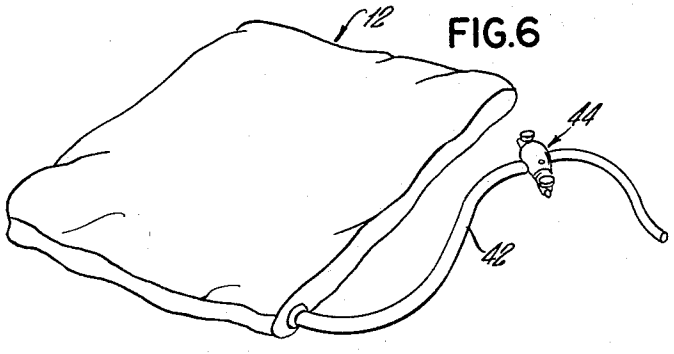


FIG. 5

FIG. 6



INVENTOR.
ANDREW GAL

BY

ATTORNEY

Nov. 14, 1961 A. GAL 3,008,465

PULSATING PNEUMATIC BODY SUPPORTING DEVICE AND PNEUMATIC VALVE THEREFOR

Filed Oct. 10, 1958 2 Sheets-Sheet 2

FIG. 7

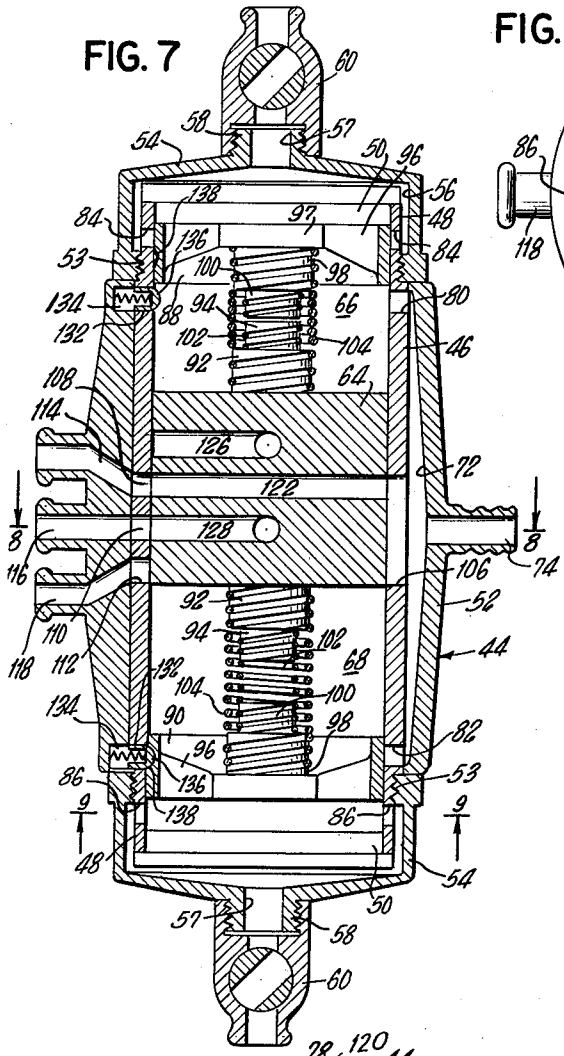


FIG. 9

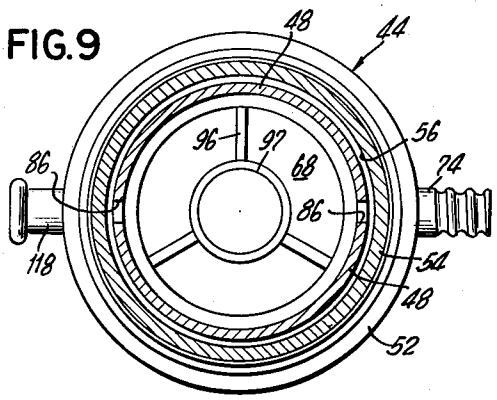
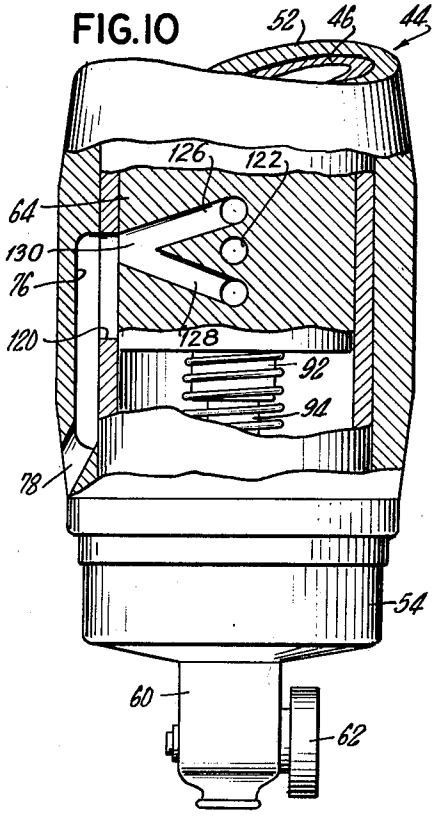


FIG. 10



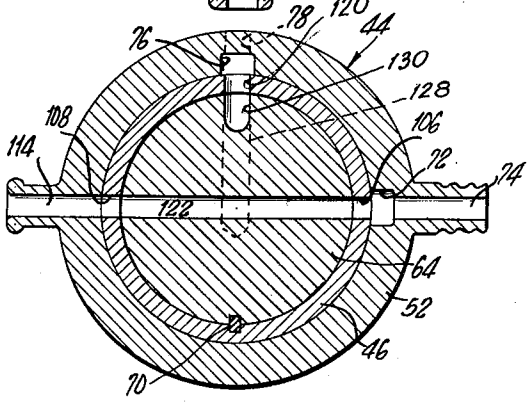


FIG. 8

INVENTOR.
ANDREW GAL

BY

ATTORNEY

United States Patent Office 3,008,465 Patented Nov. 14, 1961

3,008,465

PULSATING PNEUMATIC BODY SUPPORTING DEVICE AND PNEUMATIC VALVE THEREFOR

Andrew Gal, 1816 Kane Place, Milwaukee, Wis., assignor of one-half to Ida Molner, Brooklyn, N.Y.

Filed Oct. 10, 1958, Ser. No. 766,433
19 Claims. (Cl. 128—33)

The present invention relates to a body rest or support, such as a mattress or seat cushion, and, more particularly, to a pneumatic mattress or seat cushion, especially a vibratory mattress or seat cushion for use by persons who maintain their lying or sitting position for prolonged periods of time, as invalids, for instance.

It is well known that the maintaining of a lying or sitting position by a person for a prolonged period of time generally has deleterious effects on such person's health because of insufficient or inadequate circulation of the blood. The maintaining of the same lying position for a prolonged period of time may also cause serious skin irritations, such as bedsores, or the like.

Various ways of eliminating the difficulties attendant upon maintaining prolonged sitting or lying positions have been attempted. One of the ways heretofore tried has been the provision of seat cushions or mattresses which provide a pulsating or vibration-like effects by successively changing their shape or thickness along alternate portions thereof, generally by pneumatic means. However, such pneumatically vibrated seat cushions or mattresses, as heretofore made, attained pulsation generally over relatively large areas thereof, so that the stimulation to the circulating system and to the skin was relatively slow and sparse and not adequate to attain the desired effect.

It is an object of the present invention to provide a pneumatically-actuated mattress or seat cushion of the character described which provides surface variations or pulsations concentrated over relatively small, alternate areas thereof, to thereby provide more localized, and greater stimulation of the skin and blood circulating system, and to attain the desired effect in a relatively much shorter period of time.

It is another object of the present invention to provide a pneumatically-actuated mattress or seat cushion of the character described which attains changes in level or pulsations more rapidly and over relatively small areas, to thereby approximate the effect of a body massage and be more effective for its purposes.

It is still another object of the present invention to provide a seat cushion or mattress of the character described in which surface level changes or pulsations are automatically effected.

It is a further object of the present invention to provide a seat cushion or mattress of the character described in which the surface level changes are automatically effected in response to the internal air pressure within the pneumatic system of the device.

It is a still further object of the present invention to devise a multiple-way automatic valve that may automatically inflate and deflate, in succession, a plurality of staggered groups of inflatable, balloon-like elements or chambers in response to air pressure within the pneumatic system.

The foregoing and other objects and advantages of the variable pneumatic seat cushions or mattresses of the present invention, and of the automatic control valve therefor, will become more readily apparent to those skilled in the art from the embodiment shown in the accompanying drawings, and from the description following. It is to be understood, however, that such embodiment is shown by way of illustration only, to make the

principles and practice of the invention more readily comprehensible, and without any intent of limiting the invention to the specific details therein shown.

In the drawings:

FIG. 1 is a fragmentary, more or less diagrammatic, transverse, horizontal sectional view through a body supporting or resting device of the present invention having three separate sets of alternately inflatable units; shown with one of the sets inflated while the others are in deuated state, the body of the device not being shown, for purposes of clarity;

FIG. 2 is a fragmentary, vertical section through a seat cushion or mattress of the invention, showing two of the sets of the inflatable units, with the units of one set inflated and the units of the other set deflated;

FIG. 3 is a view similar to that of FIG. 2, with the inflated units of FIG. 2 shown as deflated and the deflated units of FIG. 2 shown as inflated;

FIG. 4 is a more or less diagrammatic vertical section through one form of an inflatable unit or balloon and its connection to a compressed fluid conduit;

FIG. 5 is a view similar to that of FIG. 4, of a modified form of an inflatable unit;

FIG. 6 is a perspective view of a seat cushion, or the like, made according to the present invention, shown connected to a control valve;

FIG. 7 is a vertical sectional and partly elevational view throught an automatic, pneumatic control valve for the body supporting devices of the present invention;

FIG. 8 is a section taken on line 8—8 of FIG. 7;

FIG. 9 is a section taken on line 9—9 of FIG. 7; and

FIG. 10 is a fragmentary, elevational and partly sectional view of the valve of FIG. 7, with the section taken at right angles to the view of FIG. 7.

Referring now, in greater detail, to the accompanying drawings, the device therein illustrated comprises a body, generally designated as **12**, which may be of seat cushion or mattress size, or any other size, as may be desired, and which may comprise a preferably flexible and resilient lower portion **14**, which may be formed of rubber, or substitute thereof, or the like, and a more resilient and more flexible or pliable upper portion **16**, which may comprise foam rubber or a foam rubber substitute, as plastic foam, or other pliable plastic material, or cloth or the like.

The lower portion **14** of the body **12** may have embedded or otherwise disposed therein, in any suitable manner, a plurality of longitudinally extending series or sets of preferably flexible conduits or tubes, as of synthetic plastic material. These sets of conduits may all run in the same direction, at the same or different levels, or may cross one another. In the embodiment illustrated in FIG. 1, the conduits consist of three groups or sets, respectively designated as **18, 20** and **22**; two of which, as **18** and **20**, run in the same direction but at different levels, and the third, **22**, runs at right angles to and at a different level from the first two. Each of the conduits is formed with a plurality of spaced, upright extensions **24** that may extend into the upper portion of the base portion **14**, and open into its surface, and constitute nipples.

The upper layer **16** of the article **12** may be formed with a hollow center portion or portions **26**, and with a plurality of openings **28**, in its bottom, each registering with a conduit extension **24** in the base **14**. Disposed within the hollow center portions **26** are a plurality of inflatable, normally collapsed, preferably elastic bodies **30**, each of which may be balloon-shaped and formed with a neck **32** that may pass through an opening **28** and engage over a nipple **24**. The balloon necks **32** may be cemented on the nipple **24**, if desired.

The base **14** may also have associated therewith and

preferably disposed therein trunk conduits, such as 34 and 36, one of which, as 34, may connect the conduits of group 18, and the other of which, as 36, may connect the conduits of group 20. A third trunk conduit 38 may have a branch 40 which connects the third conduit group 22. The three trunk conduits, 34, 36 and 38, extend to the exterior of the body 12, where they may all be housed in a common covering tube 42, which extends to a three-way valve, generally designated as 44; as more or less diagrammatically shown in FIG. 6, to a part of which each of the trunk conduits 34, 36 and 38 are individually connected, in a manner which will be hereafter more fully described.

It may here be stated that the inflatable units or balloons 30 may be soft, pliable and elastic throughout, as shown in FIG. 4, or they may, if desired, be formed with a thickened and more or less rigid top 31, as shown in FIG. 5, to provide, upon inflation, more vigorous contact against the human body reposing on the article 12, to exert massage-like action thereagainst.

Any suitable, multiple-port, three-way valve 44, either mechanical, electrical or pneumatic, connectable to a source of fluid under pressure, such as an air compressor or a compressed air tank, may be used for the successive inflation and deflation of the several groups of the balloons 30, associated with the trunk conduits 34, 36 and 38. I prefer, however, to utilize the valve developed by me for the purpose of the present invention, illustrated in FIGS. 7–10, of the drawings, which is a pneumatically operated valve that is directly connected into and is actuated by the pneumatic system or circuit that inflates the balloons 30, in response to the pneumatic pressure built up in the system.

The illustrated embodiment of the valve 44 comprises a preferably elongated, inner cylinder 46, preferably having externally reduced wall portions 48, at each end, and closed at both ends, as by cylinder heads 50. The valve also comprises an outer cylinder 52, shorter and preferably thicker-walled than the cylinder 46, and fitted centrally about the latter, intermediate its reduced ends 48. The inner cylinder 46 is externally threaded at each end of its thicker portion, as at 53, and a cap 54 is engaged on each such threaded portion 53, over each reduced end portion of the inner cylinder 46; such caps 54 each fitting closely against an end of the outer cylinder 52 and being spaced from the contiguous reduced end portion 48 of the inner cylinder 46 and from its cylinder head 50 to provide a surrounding space 56 around each end of the inner cylinder 46. Each of the caps 54 is provided with an outlet opening 57, defined by a threaded nipple 58, on which is engaged an adjustable petcock 60 having the operating knob 62.

A relatively short piston 64 is snugly fitted in the inner cylinder 46, for longitudinal reciprocation therewithin, and divides the cylinder interior to provide spaces, 66 and 68, at its respective ends. The piston 64 may be keyed on the cylinder 46 against rotational movement, in any desired suitable manner, such as shown at 70.

The outer cylinder 52 is formed with a longitudinal channel 72 on its interior, extending substantially its entire height, which channel is provided, preferably, at its center, with an inlet 74 which may be defined by a nipple integral with the cylinder wall. The outer cylinder 52 is also provided with a longitudinal interior channel 76 extending approximately half the height thereof, preferably at a distance of about one quarter of the circumference away from the channel 72, and having an outlet opening 78.

The inner cylinder is formed with ports 80 and 82 connecting the opposed ends of the channel 72 with the spaces 66 and 68, respectively, and also with ports 84 and 86 outwardly of ports 80 and 82, respectively, and respectively connecting the spaces 66 and 68 of the cylinder interior with the spaces 56 in the contiguous caps 54 around the ends 48 of the inner cylinder 46.

A pair of slide rings, 88 and 90, are closely and slidably fitted within the inner cylinder 46, one in each of the spaces 66 and 68, respectively, and are each resiliently connected to the piston 64, for delayed movement therewith, to selectively open and close the ports 80, 84 and 82, 86, as the case may be. The resilient connection between the piston 64 and the two slide rings, 88 and 90, may be effected by the provision of a central cylindrical stud 92 on each end of the piston 64, preferably formed with a reduced cylindrical end 94, and by providing each of the rings, 88 and 90, with a web 96, radiating from a hub 97, formed with an inwardly extending cylindrical stud 98, having a reduced cylindrical end portion 100. The studs 92 and 98 of the piston and rings, respectively, and of their respective reduced end portions, 94 and 100, are externally threaded and are interconnected by the outer and inner coiled springs, 102 and 104, which are engaged, respectively, by their terminal coils, on the threads of said studs and their reduced ends. It will be apparent that the springs 102 and 104 may be adjusted on their holding threads, to vary the space between the piston 64 and the rings 88 and 90 as well as the resilience of the interconnection between them.

The inner cylinder 46 is formed with a longitudinally extending, centrally disposed slot 106, facing the channel 72 of the outer cylinder 52 and preferably extending to each side of its outlet 74. The cylinder 46 is also provided, opposite the slot 106, with three spaced openings or ports, 108, 110 and 112, formed through the wall thereof, which register with corresponding ports, 114, 116 and 118, formed through the wall of the outer cylinder 52, each of which is preferably defined by an outwardly extending nipple adapted to connect with one of the trunk conduits of the seat cushion or mattress 12.

The inner cylinder 46 is also provided, at a point about 90° removed from the slot 106, with a second, longitudinally extending slot 120, which is in register with the upper portion of the channel 76 formed in the outer cylinder 52.

The piston 64 is formed with a preferably central, diametrically disposed inlet passageway 122, which extends from the slot 106 in the wall of cylinder 46 to the row of ports 108, 110 and 112 formed in said cylinder wall, diametrically opposite the slot 106; such passageway 122 being vertically displaceable, upon reciprocation of the piston 64, from one end of slot 106 to the other, and from registry with port 108 to port 112. The piston 64 is further provided with outlet passageways 126 and 128 that may preferably extend from the center of the piston in the direction of the row of outlet ports 108—112, preferably parallel to and, respectively, one above and one below the adjacent portion of the inlet passageway 122. The outlet passageways 126 and 128 are spaced from inlet passageway 122 a distance to bring them, respectively, into register with ports 108 and 112 when inlet passageway 122 is in register with the central port 110. As shown in FIG. 10, outlet passageways 126 and 128, at their inner ends, continue at right angles to their outer ends, convergently, to a junction 130, which is in register with the slot 120 in the cylinder 46; such junction 130 being vertically displaceable, upon reciprocation of the piston 64, the length of the slot 120.

The inner and outer cylinders, 46 and 52, may be provided, opposite each of the ports 80 and 82 of the inner cylinder, with an aperture 132 and recess 134, respectively, such aperture and recess being in register with one another and housing a spring-urged detent 136 that partly projects, through aperture 132, into the interior of the cylinder 46 and is depressible by the adjacent slide ring 88 or 90, as it moves past the same, and is engageable in a detent depression 138 formed for the purpose in the outer face of each such slide ring, when the latter is in position of closing the diametrically opposed port, 80 or 82, as the case may be, to thereby resist the shifting of the slide ring out of such port closing position.

Having thus described the construction and arrangement of parts of the valve 44, its operation, particularly

in connection with a pneumatic body supporting device, such as 12, will now be explained.

Assuming that each of ports 114, 116 and 118 of outer cylinder 52 is connected respectively, to the trunk conduits 34, 36 and 38 of the device 12, and that the nipple of the inlet port 74 is connected to a source of fluid under pressure, as compressed air, from a tank or compressor (not thought necessary to be specifically illustrated), the operation of the valve 44 is as follows:

In the position of the valve shown in FIGS. 7 to 10, the piston 64 is off center within the cylinder 46, being closer to port 80. Its inlet passageway 122 is disposed between the upper end of inlet slot 106 and outlet ports 108 and 114, of the inner and outer cylinders, respectively. In this position, the inlet passageway 122 connects such inlet port 74 with the registering outlet ports 108 and 114 and with trunk conduit 34, to inflate the group of balloons 30 connected to the latter through conduits 18. In this position of the valve, the slide ring 88 has been moved by the piston 64, through the connecting springs 102 and 104, into its outermost position within the space 66 of cylinder 46, to open the port 80 and close the ports 84, to thereby also admit air under pressure into the space 66. The other slide ring 90 is in its innermost position, within space 68 of cylinder 46, closing port 82 and opening ports 86, and with its detent recess 138 engaged over the spring-urged detent 136. In this position registering ports 112 and 118 are blocked off by the piston 64, while registering ports 110 and 116, connected to trunk conduit 36, are in communication with passageway 128, junction 130, slot 120, channel 76 and outlet 78, for the escape of air from the balloons 30 connected to the trunk conduit 36, through conduits 20 and the passageway 126 is inoperative, being blocked by the wall of cylinder 46.

It will be noted that, in the position of the valve illustrated in FIG. 7, the space 68, at the other end of the cylinder is in communciation with the valve exterior through the ports 86, space 56, and adjacent petcock 60, and that the air enclosed within said space 68 as well as the detent 136, will resist, through the agency of the adjacent springs 100 and 102, the movement of the piston 64 in the direction of space 68. Such resistance will persist until sufficient air pressure is built up in space 66 and sufficient air escapes from space 68, through adjacent petcock 60, to overcome the same. As pressure builds up in space 66, it will move the piston 64 toward space 68, against the pull and push of the springs 102 and 104, initially without displacement of the rings 88 and 90 that are held in place by the detents 136 which engage their inner edge and detent depression 138, respectively. This initial movement of piston 64 will move passageway 122 out of register with ports 108, 114 and into register with ports 110, 116, and will simultaneously bring ports 108, 114 into register with outlet passageway 126, and ports 112, 118 into register with outlet passageway 128. This will bring about the inflation of the group of balloons 30 associated with trunk conduit 36 and the deflation of the balloons 30 associated with trunk conduits 34 and 38.

As pressure continues to build up in space 66, piston 64 will shift further toward space 68, to its other extreme position within the cylinder 46, to bring passageway 122 into register with ports 112, 118, to inflate the balloons fed by trunk conduit 38. Outlet passageway 126 will move into register with ports 110, 116, to deflate balloons fed by trunk conduit 36; whereas outlet passageway 128 will be moved into inoperative position and ports 108, 114 will be blocked to maintain their preceding state.

The additional movement of piston 64, under increased pressure, will also shift the rings 88 and 90; the former moving inwardly, to close off inlet port 80 and open outlet ports 84; the latter moving outwardly to open inlet port 82 and close outlet ports 86, thereby completing a cycle and starting a reverse cycle.

It may here be pointed out that, since the movement of the piston 64, in either direction, is directly affected both, by the tension of springs 102 and 103 and by the resistance of the compressed fluid present in the cylinder space toward which it is moving, it will be apparent that the cycle time of the valve may be regulated by the adjustment of the spring tension or by the regulation of the air outlets through the petcocks 60, or both.

This completes the description of the pulsating body supporting device of the present invention and of the pneumatic valve for controlling the same. It will be apparent that the body supporting device of the invention, by reason of the provision of a large number of relatively small inflatable and interspersed elements, alternately changes the device surface over small, interspersed areas, to provide most effective stimulation to the skin and to the circulation of blood therethrough.

It will also be apparent that the pneumatic valve of the invention is highly effective for the purpose of successively inflating the several groups of interspersed balloons of the body supporting device and that, because it is responsive to the same air pressure that inflates the balloons, renders the combination highly simplified, effective and economical and eliminates separate valve actuating means or electric circuits.

It will be further apparent that numerous modifications and variations in the device of the present invention and in the valve for use in connection with the same may be made by any one skilled in the art, in accordance with the principles of the invention hereinabove set forth, and without the exercise of any inventive ingenuity. I desire, therefore, to be protected for any and all such modifications and variations that may be made within the spirit of the invention and the scope of the claims hereto appended.

What I claim is:

1. A pulsating, body supporting device, comprising a body having a hollow central portion and a flexible top, a plurality of rows of normally deflated, inflatable elements disposed within said hollow central portion in closely spaced relation and in position to contact said flexible body top upon inflation, a plurality of conduits provided in said body, each row of inflatable elements connected to a conduit other than the elements of an adjacent row, a plurality of trunk conduits, each extending on the exterior of the body, the conduits of adjacent rows of inflatable elements each connected to a different trunk conduit, and a multiple port valve, connectable to a source of fluid under pressure, each of said trunk conduits connected to one port of said valve, said valve automatically pneumatically operated from said source of compressed air to successively direct fluid under pressure to each of said trunk conduits while discharging fluid from another thereof, said valve comprising a cylinder closed at each end, said cylinder having formed in the wall thereof escape ports at each end thereof, a fluid inlet slot intermediate said inlet ports, fluid outlet ports, one for each of said conduit trunks arranged in longitudinally spaced relation to one another and in spaced relation to said inlet slot, and an escape slot in spaced relation to said inlet slot, a piston longitudinally reciprocable within said cylinder and dividing the same into two compartments, a transversely disposed fluid conduit passageway formed in said piston, one end thereof registering with said inlet slot and the other with said row of outlet ports, at least one fluid escape passageway formed in said piston with one end thereof registering with said row of outlet ports and spaced from the adjacent end of said conduit passageway a distance equal to the space between outlet ports, and its other end registering with said escape port, an air tight chamber on said cylinder said chamber having an inlet port and connecting with each of said cylinder inlet ports and said

inlet slot, and a valve in each of said compartments connected to the adjacent end of said piston to move therewith for alternately closing and opening the adjacent of said escape ports while simultaneously opening and closing the adjacent inlet port.

2. The device of claim 1, wherein said escape ports are each provided with means for regulating the outflow therefrom.

3. The device of claim 1, wherein said device is provided with three trunk conduits and said valve is formed with three outlet ports each connected to one of said trunk conduits, and said piston is formed with a pair of escape passages, one to each side of said conduit passageway, said escape passageways merging to a common outlet registering with said escape slot.

4. The device of claim 1, wherein a cap is secured in air tight relation over each end of said cylinder in spaced relation thereto and encompassing said escape ports, said caps each having an outlet opening and means for regulating fluid escape through said opening.

5. A pulsating, body supporting device, comprising, in combination, a body having a central hollow portion and a flexible top, a plurality of closely spaced, normally deflated, inflatable elements, and means for successively inflating and deflating different groups of said elements comprising a plurality of conduits provided in said body and extending to the exterior thereof, each connected to a separate group of said inflatable elements within the body, and a multiple port pneumatic valve connectable to a source of fluid under pressure, each of said conduits connected to one port of said pneumatic valve, said valve including a cylinder closed at each end, said cylinder having a piston longitudinally reciprocable therein and dividing the same into two compartments, one to each end of said piston, each of said compartments having fluid escape ports at the outer end thereof and a fluid inlet port inwardly of said escape ports, said cylinder having a fluid inlet slot and a plurality of outlet ports, one for each said conduits, opposite said piston, in spaced relation to said inlet slot, and an escape slot opposite said piston, in spaced relation to said outlet ports and said inlet slot, an air tight chamber on said cylinder, opening into said inlet ports and said inlet slot and having a fluid inlet thereinto, said piston having a fluid passageway transversely disposed therethrough to have one end thereof in register with said inlet slot and the other end thereof in register with said outlet ports, said piston having escape passageways therethrough, each having one end in register with said outlet slot, and a member in each of said compartments movable with said piston, to each alternately close and open said escape ports therefrom and simultaneously open and close the inlet port thereinto.

6. The device of claim 5, wherein said members within said compartments are each resiliently connected to the adjacent end of said piston.

7. The device of claim 5, wherein said members within said compartments are each adjustably resiliently connected to the adjacent end of said piston.

8. The device of claim 5, wherein said members within said compartments each comprises a ring slidable against the inner wall of said cylinder, and the means connecting said ring to said piston comprises a threaded stud on the adjacent piston end, a web having an externally threaded stud at the hub thereof directed toward said piston and a coil spring threaded by its end coils on said studs.

9. The device of claim 5, wherein said members within said compartments are each resiliently connected to the adjacent piston end and wherein means are associated with each said escape port for regulating the escape of fluid therethrough.

10. The device of claim 5, wherein said members within said compartments are each resiliently connected to the said piston and wherein means are associated with each said escape port for regulating the escape of fluid therethrough, said means comprising a cap secured over each end of said cylinder in spaced relation thereto and encompassing said escape ports, said cap having an outlet opening and means regulating the flow of fluid through said outlet opening.

11. The device of claim 5, wherein said members within said compartments are each resiliently connected to said piston and wherein cooperating, spring-tensioned detent means are provided on each said valve means and said cylinder for resisting the movement of each said valve means out of inlet port closing position.

12. A multiple port pneumatic valve connectable to a source of fluid under pressure and responsive to the pressure of said fluid, including a cylinder closed at each end, said cylinder having a piston longitudinally reciprocable therein and dividing the same into two compartments, one to each end of said piston, each of said compartments having fluid escape ports at the outer end thereof and a fluid inlet port inwardly of said escape ports, said cylinder having a fluid inlet slot and a plurality of outlet ports, opposite said piston, in spaced relation to said inlet slot, and an escape slot opposite said piston, in spaced relation to said outlet ports and said inlet slot, an air tight chamber on said cylinder, opening into said inlet ports and said inlet slot and having a fluid inlet thereinto, said piston having a fluid passageway transversely disposed therethrough to have one end thereof in register with said inlet slot and the other end thereof movable into register with each said outlet ports, said piston having escape passageways therethrough, each having one end in register with said row of outlet ports and its other end in register with said outlet slot, and a member in each of said compartments movable with said piston, to each alternately close and open said escape ports therefrom and simultaneously open and close the inlet port thereinto.

13. The valve of claim 12, wherein said members within said compartments are each resiliently connected to the adjacent end of said piston.

14. The valve of claim 12, wherein said members within said compartments are each adjustably resiliently connected to the adjacent end of said piston.

15. The valve of claim 12, wherein said members within said compartments each comprises a ring slidable against the inner wall of said cylinder, and the means connecting said ring to said piston comprises a threaded stud on the adjacent piston end, a web having an externally threaded stud at the hub thereof directed toward said piston and a coil spring threaded by its end coils on said studs.

16. The valve of claim 12, wherein said members within said compartments are each resiliently connected to the adjacent piston end and wherein means are associated with each said escape port for regulating the escape of fluid therethrough.

17. The valve of claim 12, wherein said members within said compartments are each resiliently connected to the said piston and wherein means are associated with each said escape port for regulating the escape of fluid therethrough, said means comprising a cap secured over each end of said cylinder in spaced relation thereto and encompassing said escape ports, said cap having an outlet opening and means regulating the flow of fluid through said outlet opening.

18. The valve of claim 12, wherein said members within said compartments are each resiliently connected to said piston and wherein cooperating, spring-tensioned detent means are provided on each said valve means and said cylinder for resisting the movement of each said valve means out of inlet port closing position.

19. The valve of claim 12, wherein an outer sleeve is fitted about the central portion of said cylinder, and said air-tight chamber is formed on the inner surface of

said outer sleeve and said escape slot and said outlet ports extend through said outer sleeve.

References Cited in the file of this patent

UNITED STATES PATENTS

1,772,310	Hart	Aug. 5, 1930
2,361,242	Rossett	Oct. 24, 1944
2,379,497	Sellmeyer	July 3, 1945
2,460,245	Summerville	Jan. 25, 1949
2,580,433	Kain	Jan. 1, 1952
2,604,758	Swindler	July 29, 1952
2,684,672	Summerville	July 27, 1954
2,819,712	Morrison	Jan. 14, 1958
2,856,147	Knapp	Oct. 14, 1958