Jan. 25, 1949. D. V. SUMMERVILLE 2,460,245

MASSAGING APPARATUS OR THE LIKE

Filed May 26, 1945 2 Sheets-Sheet 1

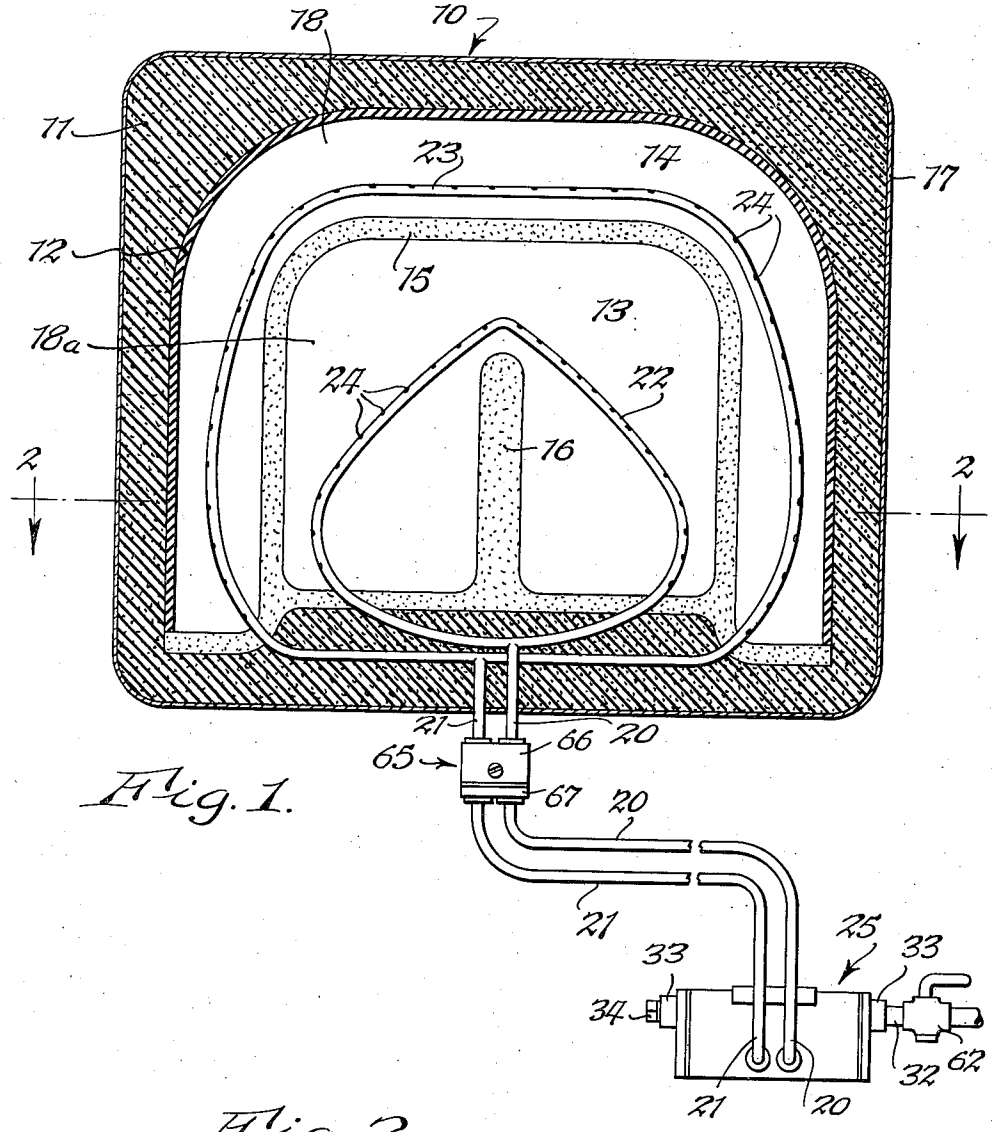


Fig. 1.

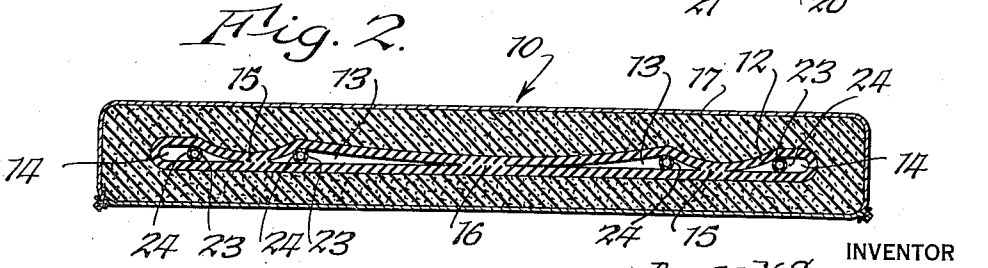


Fig. 2.

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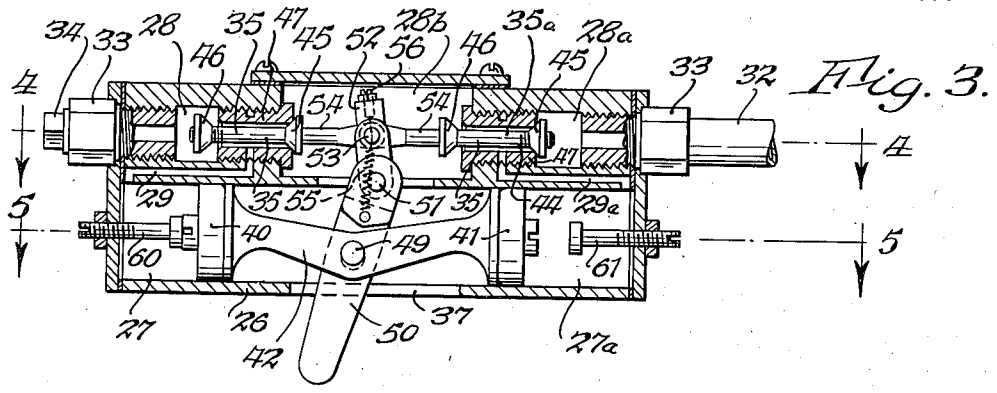


Fig. 3.

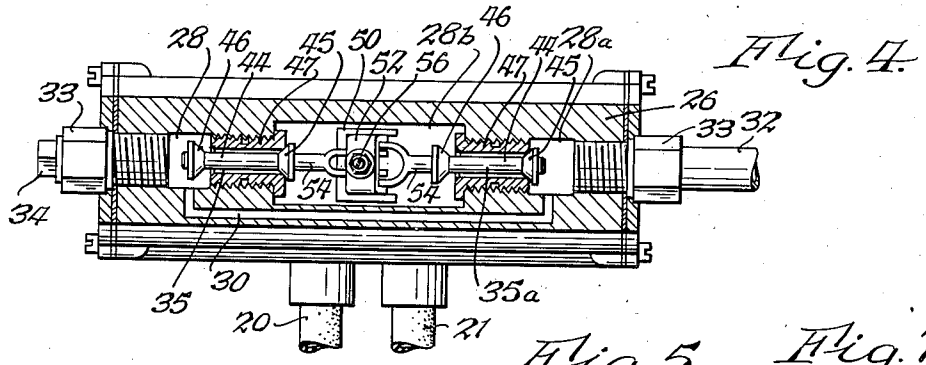


Fig. 4.

Fig. 5.

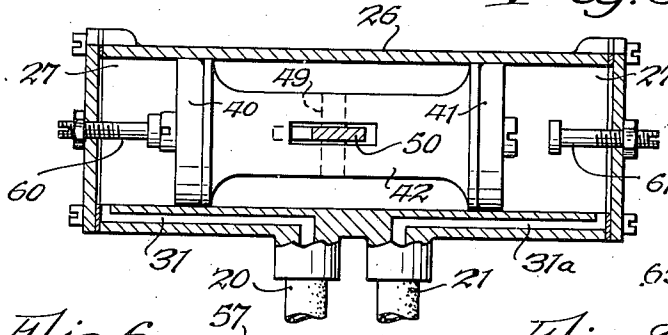


Fig. 7.

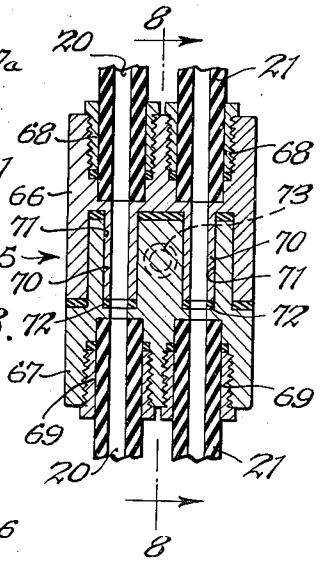


Fig. 6.

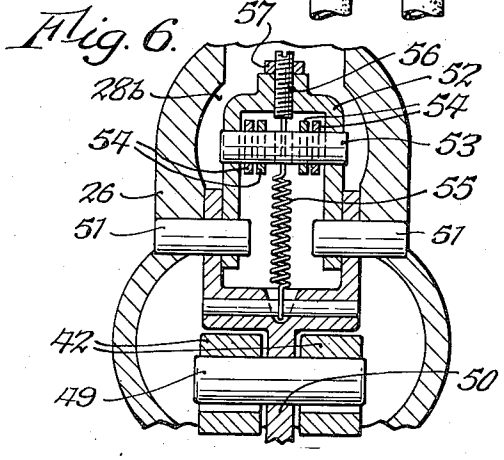
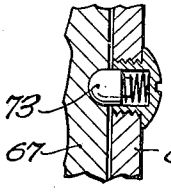


Fig. 8.



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UNITED STATES PATENT OFFICE

2,460,245

MASSAGING APPARATUS OR THE LIKE

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Application May 26, 1945, Serial No. 595,929

8 Claims. (Cl. 128—33)

1

This invention relates to massage apparatus or devices for producing pulsating or intermittent surface pressure effects on the human body or anatomy for the relief or muscular pains or fatigue. While the embodiment of the invention herein disclosed includes an element in the form of a pneumatic cushion or seat pad especially suited for the relief of compression pains or fatigue of the gluteal or buttocks muscles, the invention is not restricted to such application, but also embraces the use of pads, sacks, mats or analogous devices having expansible and contractable cells or chambers in which fluid pressure pulsations are produced and which are adapted for massaging or treating one or another affected portion of the body to re-establish circulation, innervation and general reduction of fatigue in the affected regions. When a person sits without change of position for a considerable period of time, he or she develops what is known as compression pain or fatigue of the gluteal or buttock muscles. This is caused by the weight of the torso affecting these muscles and thereby restricting arterial and venous circulation and impeding nerve impulse or function within this area. This is a true fatigue with agonizing symptoms under certain conditions, as in the case of an aeronaut who often has to maintain substantially the same cramped sitting position over long periods of time.

A particular purpose of my invention is the provision of a seat pad, cushion or parachute pack seat for use by aeronauts and airplane passengers, or a seat pad for drivers of motor vehicles or other persons required to occupy sitting positions for extended periods of time, which will afford a most practical means for relieving such fatigue or distress by massaging such muscles or areas of the body during the time that the person is required to maintain the sitting posture. However, pads, mats, sacks or the like embodying the invention also provide practical means for relief in other cases, such as bed-ridden cases, where constant or protracted prone positions of a patient predisposes to compression fatigue and discomfort, which are the forerunners of the common bed sores, and for effectively treating or massaging of persons afflicted with poliomyelitis or infantile paralysis to enhance to a greater degree their useful recovery, it being recognized that massage treatment is very beneficial in such cases.

Another object of the invention is to provide an improved device which will be especially efficient for body treatment purposes such as before mentioned.

Other objects of the invention are to provide a device in the nature of a pneumatic cushion, mat or the like having fluid pressure-confining cells in which the fluid pressure is controlled or

2

alternately applied and relieved so as to produce a pulsating action of walls of the cells for the treatment of the body; also to provide a novel device which will produce a bodily massaging or kneading effect more nearly like that produced by hand massaging; also to provide a massaging device in the nature of a pad, sack or the like having plural flexible walled cells and means for producing pulsating fluid pressures therein so as to effect pressure increases and decreases alternately in adjacent cells; also to provide such a device with means for admitting fluid pressure to said adjacent cells alternately and relieving the pressure in one cell while the pressure is increasing in the adjacent cell so as to subject one area of the body to pressure while relieving pressure on an immediately adjourning area; also to provide an improved massaging device by means of which the body can be subjected to pulsating or intermittent pressures of variable effect, as desired.

Further objects and advantages of the invention will appear from the following specification of the preferred embodiment of the invention shown in the accompanying drawings, and the novel features of the invention are set forth in the appended claims.

In said drawings:

Fig. 1 is a sectional elevational view of an apparatus embodying the invention, showing the cushion pad or mat element thereof in horizontal section on line 2—2, Fig. 2.

Fig. 2 is a transverse, vertical section of the pad element.

Fig. 3 is a vertical, sectional elevation of the fluid pressure control or valve mechanism, and showing the valve elements in position to admit fluid pressure to the inner pad cell.

Fig. 4 is a horizontal, sectional view of the control or valve mechanism on line 4—4, Fig. 3.

Fig. 5 is a horizontal, sectional view of the control or valve mechanism on line 5—5, Fig. 3.

Fig. 6 is an enlarged, transverse sectional elevation on line 6—6, Fig. 3.

Fig. 7 is an enlarged sectional view of the quick detachable connection for the pressure tubes with the seat pad.

Fig. 8 is a section of the quick-detachable coupling on line 8—8, Fig. 7.

The pad, cushion or mat element 10 may be of generally rectangular, relatively broad and flat or shallow shape and may be formed of sponge or air cell rubber or other suitable soft and pliable or resilient cushioning material 11 which surrounds or covers a relatively thin or shallow bag or sack 12, preferably made of rubber or analogous flexible, elastic material adapted to form fluid-tight chambers or cells. As shown, the bag or sack 12 is formed so as to provide cells 13 and 14 of U-shape in plan arranged

one within or bounded by the other, which cells 13 and 14 are separated by a partition or wall 15 that may be formed, as by vulcanizing together the top and bottom walls of the sack 12 along the line of the partition wall. The inner cell may be made of U-form, as by vulcanizing together the top and bottom walls of the bag or sack along the intermediate portion 16 of the inner cell between and parallel with the opposite side partitions of the U-shaped partition 15 which separates the two cells. The pad or cushion may be provided with an outer cloth or the like protecting cover or bag 17.

This pad or cushion, which, as illustrated in the drawings, is made of suitable plan dimensions to provide a seat cushion for a normal-sized person, thus has therein relatively shallow, adjacent inner and outer fluid pressure cells 13 and 14 having back portions 18 and 18a that extend crosswise beneath the rear portion of the buttocks of a person sitting on the pad, and connecting side portions that extend forwardly from said connecting rear portions, with the side portions of the outer and inner cells extending respectively beneath the outer and inner portions of the gluteal muscle areas of the sitter's legs.

Fluid pressure is admitted to and exhausted or relieved from the pad cells 13 and 14 respectively through suitable tubes or conduits 20 and 21. The conduit 20 connects with or is formed with a loop-shaped tube 22 extending within and through the side and back connecting portions of the inner cell 13, and the other conduit 21 connects with or is formed with a similar loop-shaped tube 23 extending within and through the side and connecting back portions of the outer cell 14. These loop tubes may be flexible tubes provided substantially throughout the lengths of the portions thereof within the cells with perforations 24 in their sides through which pressure fluid can enter and leave the cells, to thereby more uniformly distribute the admission and exhaust of the pressure throughout the cells, and prevent the possibility of interruption in the delivery or discharge of the pressure fluid to or from the cells, as might happen in the use of a single inlet and exit hole, by the collapsing of the pad cells at or near the hole under the weight of the person sitting on the pad.

Air or fluid under pressure is delivered to and exhausted from the pad cells 13 and 14 by suitable means which preferably admits and exhausts or relieves pressure fluid to and from the adjacent or inner and outer cells alternately, and in such a way that while pressure is building up in one cell to inflate said cell, pressure will be exhausting or relieved from the adjacent cell to deflate it, thus producing an alternating pulsating action of the adjacent cells.

For this purpose, in the embodiment of the invention illustrated, a valve or control mechanism 25 is provided to which the air or fluid is supplied under suitable pressure from a supply source, and which control mechanism admits the pressure fluid to and exhausts or relieves it from the adjacent cells 13 and 14 alternately, as above stated. This valve or control mechanism 25, as shown, is constructed as follows:

26 represents the casing of the device which is formed in its opposite ends with actuator or pressure chambers 27 and 27a and also with two valve chambers 28 and 28a between which is an exhaust chamber 28b opening to the atmosphere. Valve chamber 28 connects, as by a passage 29, with the actuator chamber 27, and the valve chamber 28a connects, as by a passage 29a, with the actuator chamber 27a. Said valve chambers communicate with each other, as by a passage 30 in the casing, and one actuator chamber 27, communicates, as by a passage 31 in the casing, with the tube 20 leading to the inner cell 13 of the pad 10, and said other actuator chamber 27a communicates, as by a passage 31a, with the other tube 21 leading to the outer pad cell 14. Air or fluid under appropriate pressure is supplied to the valve chambers 28 and 28a from a suitable source of air or fluid under pressure, as by a supply pipe 32 which may connect with one of the valve chambers, as by a nipple or connection 33. One of these nipples is shown at each of the opposite ends of the casing 26, and communicates with the adjacent valve chamber to enable the connection of the supply pipe 32 at either end of the casing 26, whichever may be most convenient, and when it is connected to one nipple, the other nipple 33 is closed, as by a screw cap or stopper 34. When connected to either nipple, the supply pipe will communicate with both valve chambers, since the two chambers are in communication with each other through the passage 30.

A movable valve element 35 controls communication of the actuator chamber 27 with the valve chamber 28, or with the exhaust chamber 28b through the passage 29, and a similar movable valve element 35a controls communication of the other actuator chamber 27a with the valve chamber 28a or with the exhaust chamber through the passage 29a. These valve elements are connected to move in unison, and in the position thereof shown in Figs. 3 and 4, the pressure fluid will flow from the valve chamber 28 past the valve through the actuator chamber 27, passage 31 and tube 20 to the inner pad cell 13, while pressure fluid will exhaust from the other cell 14 through tube 21, passage 31a, actuator chamber 27a and passage 29a past the valve to the exhaust chamber. In the other position of the valves 35 and 35a, the pressure fluid will pass through the valve chamber 28a, actuator chamber 27a and tube 21 to the outer pad cell 14, while the pressure fluid in the inner pad cell 13 can exhaust through the tube 20, actuator chamber 27 and passage 29 past the valve 35 to the exhaust chamber which, as shown is open to the atmosphere through an opening 37 in a wall of the casing 26. Shifting of the valve elements 35, 35a is controlled by an actuator having piston heads 40 and 41 at opposite ends of a connecting rod 42 and arranged to reciprocate in the actuator chambers 27 and 27a, so as to be moved in one direction by fluid pressure in the chamber 27 and in the opposite direction by fluid pressure in the chamber 27a, when the pressure in the chamber 27 or 27a is increased to the desired maximum pressure in the pad cell 13 or 14.

Each of the valve elements 35 and 35a, as shown, consists of a reduced waist portion 44 connecting opposite spaced valve heads 45 and 46 having frusto-conical faces arranged to engage complementary valve seats at opposite ends of a seat-tube 47 through which the reduced waist of the valve element passes, and one of which seat tubes 47 is threaded and screwed into each of the valve chambers 28 and 28a. In the position of the valves shown in Figs. 3 and 4, the heads 45 of the two elements will be seated, while the other heads 46 of the two elements will be

unseated, thus admitting the pressure fluid to the actuator chamber 27 and pad cell 13 and connecting the other pad cell 14 and actuator chamber 27a with the exhaust opening. By shifting the valve elements so as to seat the heads 46 and unseat the heads 45, the pressure fluid will be admitted to the outer cell 14 of the pad, and the other or inner cell 13 of the pad will be connected with the exhaust opening. One head of each valve element, as head 46 of element 35 and head 45 of element 35a, is made adjustable relatively to the opposite head of the element, as by a screw connection of the head with the waist portion or connecting rod of the element. This adjustability of the valve heads and the adjustability of the seat tubes, permitted by their screw connections with their valve chambers, always ensures proper seating of the heads of the two elements on their seats in both of the two positions of the valve elements.

The valves are shifted to their two different operative positions by the actuator 40—41, preferably through the medium of suitable spring-action connections which, as shown, are as follows: The connecting rod 42 of the actuator is connected by a pin 49 to a lever 50 having a forked arm fulcrumed by pins 51 in the casing 26, on which fulcrum pins 51 are also fulcrumed the legs of a U-shaped link 52 which is connected to the adjacent ends of the rods 54 of the two valve elements 35 and 35a. As shown, these rods have bifurcated adjacent ends with slots through which a cross pin 53 of the link 52 passes, and a tension spring 55 is connected at opposite ends to the lever 50 and the free end of link 52 so that when the actuator 40—41 is moved in one direction, for instance to the left, as shown in the drawings, by the fluid pressure in the actuator chamber 27a, the lever 50 will be swung to the left as shown in Fig. 3 and carry the connected end of the spring 55 with it past a central or dead center position and by the pull of the spring, swing the link 52 also to the left to shift the valve elements 35 and 35a to the position shown in Fig. 3, and thereby seat the heads 45 of the valve elements 35 and 35a and unseat the heads 46 of said elements. Opposite, or right hand, movement of the actuator 40—41 will swing the lever 50 to the right and carry the connected end of the spring 55 with it, and thus throw the link 52 to the right so as to shift the valve elements 35 and 35a to the right to unseat the heads 45 thereof and move the other heads 46 of the two elements against their seats.

The spring 55 is under tension in either position of the actuator 40—41 and valve elements 35 and 35a and acts to hold the valve elements against their seats, and this spring has to be strained to move the actuator and valve elements away from either of their rest positions toward the opposite position. Therefore, the fluid pressure on the actuator 40—41 required to effect the shifting of the valve elements from one to the other of their seated positions can be regulated by adjusting or varying the tension of the spring 55. For this purpose, one end of the spring, as shown, passes through a hole in the pin 53 connecting the link 52 and valve rods, and is attached to an anchoring screw 56 extending through and adjustable endwise in a screw threaded hole in the free end of the link 52. The tension of the spring 55 can be increased or decreased by appropriate adjustments of this screw, which may be secured in adjusted positions by a suitable lock nut 57. 60—61

represent adjustable stops for limiting the opposite movements of the actuator 40—41. These stops, which may consist of screws endwise adjustable in threaded holes in the opposite ends of the casing 26, may be set so as to be engaged by one or the other piston head of the actuator when the valve elements 35, 35a have been seated in one or the other of their two seated positions, and thus relieve the valve elements and actuating connections between the same and the actuator from undue pressure or strain.

Since each of the actuator chambers 27 and 27a is in free communication with its connected cell 13 or 14 of the pad, the pressure will be the same in each actuator chamber as in its connected pad cell. Therefore, since the tension of spring 55 determines the pressure required to shift the actuator and valve elements, the maximum pressure which will be created in the pad cells can be determined as desired, within the limit of the pressure supply source, by appropriate adjustment of the tension of the spring 55. The pressure fluid supply pipe 32 may be provided with a valve 62 of any suitable sort by means of which the volume of pressure fluid to the pad cells can be regulated to thereby control, as desired, the frequency of pulsations or inflations and deflations of the cells of the pad or applicator element by which the pulsating pressure is applied to the body. The lever 50 of the valve mechanism, as shown, has an end projecting out of the casing 26 to enable manual shifting of the valve elements if necessary for any reason.

A valve or control mechanism constructed as illustrated in the drawings and above described provides effective means for producing fluid pressure pulsations for alternately expanding and contracting or inflating and deflating adjacent cells of an applicator element and expanding or inflating one cell while contracting or deflecting an adjacent cell, but means of various other constructions could be employed for producing similar pulsating action alternately in adjacent cells of an air applicator element of the character described, and my invention is not restricted to the particular means herein disclosed for the purpose.

When the applicator element 10 is intended to form the seat pad of a parachute pack to be strapped or secured to the person of the user, it is desirable to make the tubes or conduits 20, 21 that lead from the fluid pressure supply or control mechanism 25 to the seat pad, in sections connected by a quick-detachable coupling 65 which will enable quick and easy release of the seat pad from the fluid pressure supply or control mechanism in case of emergency.

The coupling 65 shown for this purpose, see Fig. 7, comprises separable sections 66, 67. One section of each tube 20, 21 is suitably fastened securely with a fluid tight joint, as at 68, in one coupling section 66, and the other section of each tube 20, 21, is similarly or suitably fastened, as at 69, to the other coupling section, and one coupling section may have nipples 70 adapted to be releasably seated in sockets 71 in the other coupling section 67 with suitable joint-sealing gaskets 72 between the parting faces of the two coupling sections. The nipples and sockets have passages establishing communication between the two sections of each tube 20, 21. A suitable spring actuated detent or round-nosed plunger 73 carried by one coupling section is adapted to spring into a rounded depression or seat in the

other section to releasably hold the coupling sections together with their nipples and sockets interfitting, and the sealing gaskets compressed to form a tight joint between the sections of the tubes 20, 21. In an emergency it is simply necessary to pull apart the coupling sections to free the seat pad from the supply or control mechanism.

I claim as my invention:

1. An apparatus of the character described comprising an element having adjacent fluid pressure-confining cells adapted to support a person's body, each of said cells having a flexible top wall, means for supplying fluid under pressure to said cells, and valve mechanism admitting the pressure fluid to one cell while exhausting it from the adjacent cell thereby producing out of phase fluid pressure pulsations in said adjacent cells, and including an actuator subject to the pressures in said cells and operable upon a predetermined maximum pressure in either one of said cells to shift said valve mechanism to exhaust pressure fluid from said one cell and admit pressure fluid to the other cell.

2. A fatigue-relieving seat having a freely flexible top wall on which a person may sit and immediately beneath said wall a plurality of adjacent, closed supporting air cell means disposed side by side in horizontal plan, and means for alternately increasing and decreasing the pressures in the adjacent cell means, whereby the pressures exerted by said seat may be shifted between one zone thereof and another.

3. A body supporting device comprising an elastic element having adjacent fluid pressures-confining cells, each of said cells having a flexible wall for applying pulsating surface pressure to a body when supported thereon, means for supplying fluid under pressure to said cells, valve mechanism admitting the pressure fluid to one cell while exhausting it from the adjacent cell, and including an actuator subject to the pressures in said cells and operable upon a predetermined maximum pressure in either one of said cells to shift said valve mechanism to exhaust pressure fluid from said one cell and admit pressure fluid to the other cell, and adjustable means for controlling the shifting of said valve mechanism so as to be responsive to different pressures within said cell means.

4. A body supporting device comprising an elastic element having adjacent fluid pressure-confining cells, each of said cells having a flexible wall for applying pulsating surface pressure to a body when supported thereon, means for supplying fluid under pressure to said cells, shiftable valve means for admitting the pressure fluid to said cells alternately and exhausting pressure fluid from one cell while admitting pressure fluid to the other cell, spring means opposing the shifting of said valve means, and means responsive to the fluid pressures in said cells acting to shift said valve means in opposition to said spring means to exhaust pressure fluid from said one cell while admitting pressure fluid to the other cell, and means for adjusting the spring pressure exerted by said spring means for varying the fluid pressures required in said cells to shift said valve means.

5. A seat pad for applying pulsating surface supporting pressures, said pad having laterally adjacent non-communicating, fluid pressure-confining cell means each having flexible walls formed of elastic, air tight material, said pad having freely flexible resilient material such as sponge rubber covering said cell means above, and supply and exhaust conduits opening into said adjacent cell means whereby the support pressures may be at least partly shifted from cell means to cell means by alternately relieving and applying air pressure in out-of-phase relation in said adjacent cell means to reciprocally shift the zones of pressures applied by said pad.

6. A fatigue-relieving support pad comprising a relatively broad shallow sack having partitions therein forming a plurality of adjacent fluid pressure-confining cell means disposed side by side in a horizontal plane, and said pad having freely flexible resilient material such as sponge rubber covering said sack above, said sack with the partitions and cell means thereof being formed by a single integral body of rubber-like material, and conduits opening into said adjacent cell means whereby the support pressures of the pad may be at least partly shifted reciprocally from cell means to cell means by alternately relieving and applying fluid pressure in out-of-phase relation in said adjacent cell means.

7. A cushion for supporting a person thereon, said cushion including a plurality of laterally adjacent fluid pressure-confining elongated cell means having flexible top walls formed of elastic fluid-tight material, means for selectively applying fluid under pressure to said cell means and for exhausting fluid therefrom including mechanism admitting pressure fluid to one cell means while exhausting it from the next adjacent cell means thereby producing reciprocal fluid pressure pulsations in adjacently disposed cell means, and a resilient pad formed of flexible material such as sponge rubber overlying said cell means for diffusing the pressure variation effects thereof.

8. A seat pad having adjacent fluid pressure-confining cells which have flexible top walls and are substantially U-shape in plan and arranged one within the other, and means for alternately increasing and decreasing the pressures in the adjacent cells thereby producing reciprocal fluid pressure pulsations in said cells.

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