

July 27, 1954

D. V. SUMMERVILLE

2,684,672

BODY SUPPORT DEVICE

Filed Oct. 26, 1951

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FIG. 1.

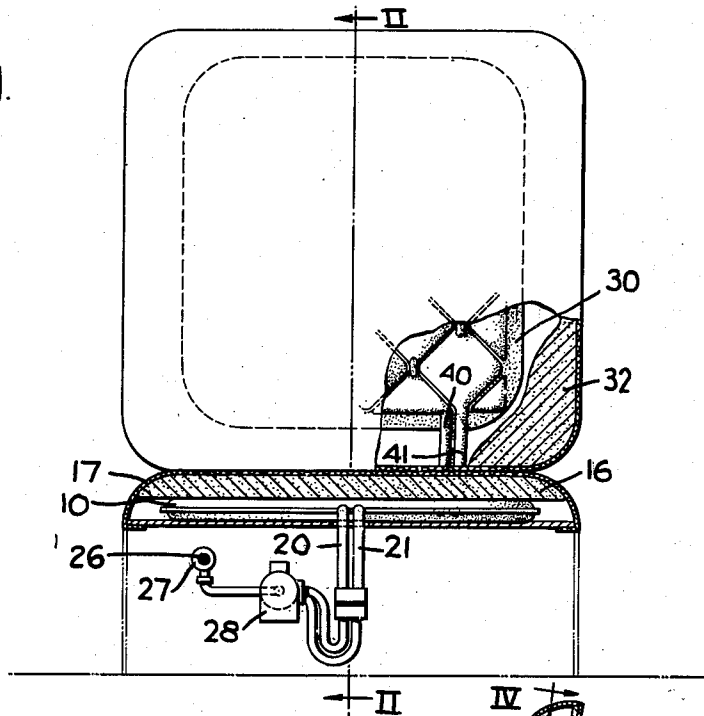
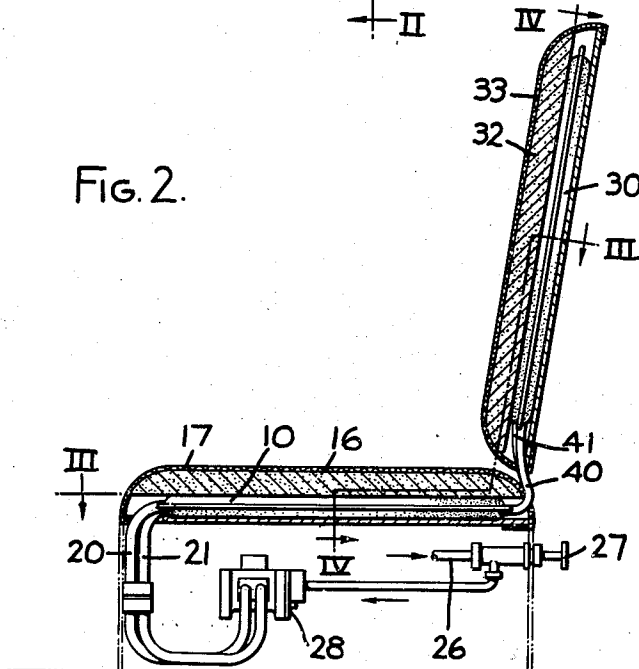


FIG. 2.



INVENTOR.
DONALD V. SUMMERVILLE
BY

Bean, Brooks, Buckley & Bean.
ATTORNEYS

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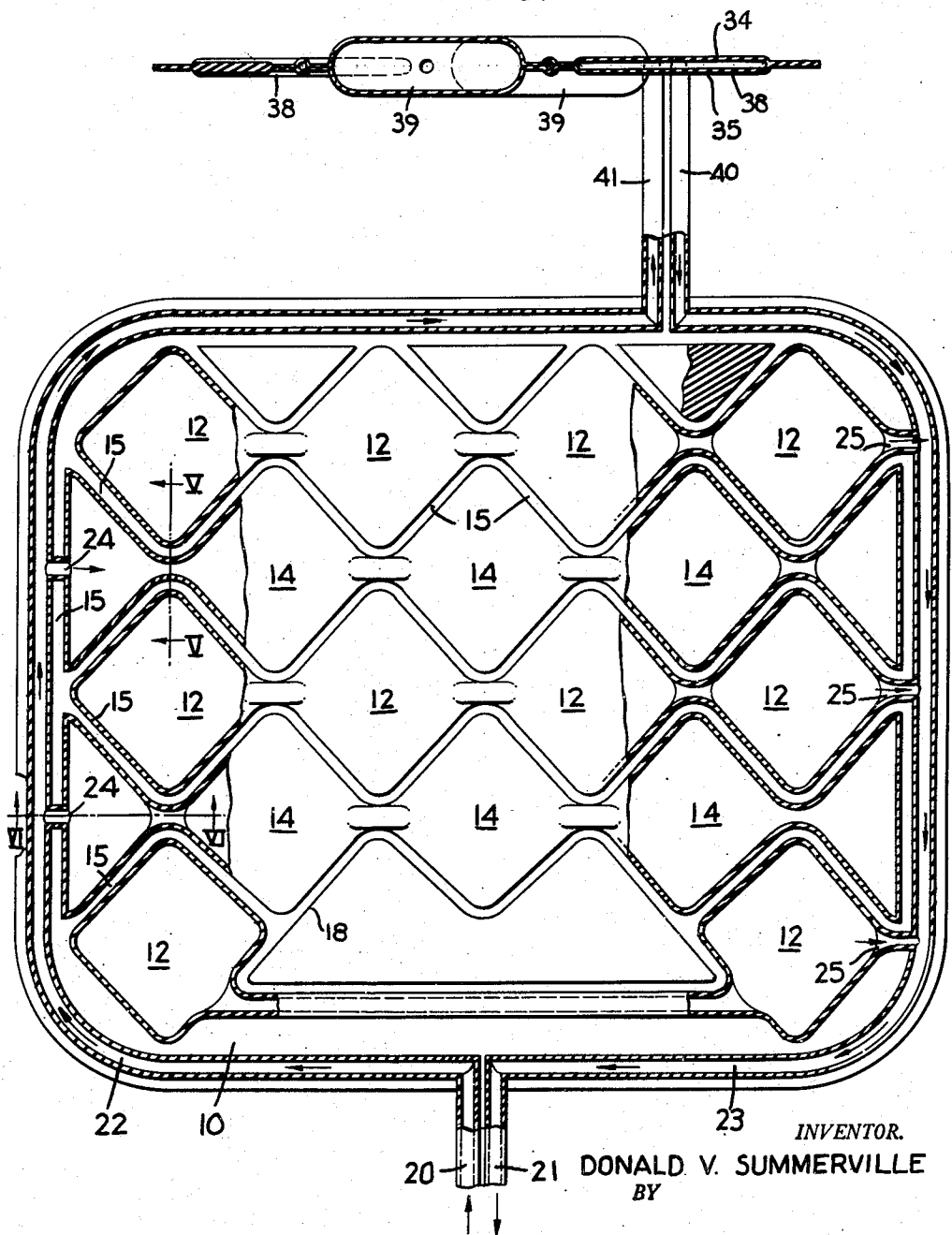
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FIG. 3.



INVENTOR.
DONALD V. SUMMERVILLE
BY
ATTORNEYS, *Bean, Brooks, Buckley & Bean.*

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FIG. 4

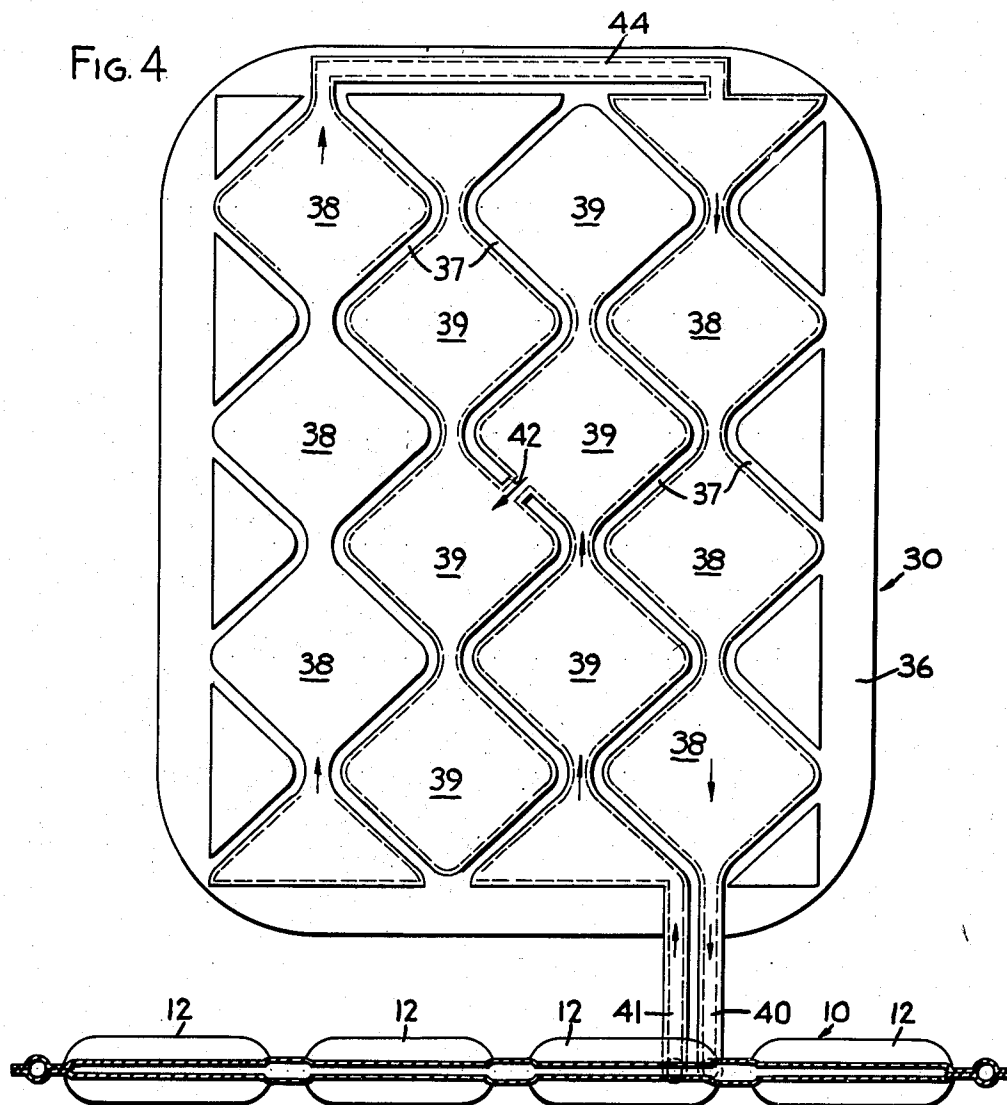
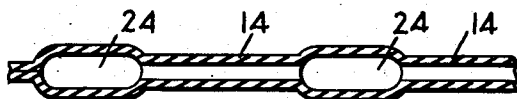


FIG. 5



FIG. 6



INVENTOR.
DONALD V. SUMMERVILLE
BY

Bean, Brooks, Buckley & Bean
ATTORNEYS

UNITED STATES PATENT OFFICE

2,684,672

BODY SUPPORT DEVICE

Donald V. Summerville, Fort Erie, Ontario, Canada, assignor to Aeromat Products Company, Inc., Buffalo, N. Y.

Application October 26, 1951, Serial No. 253,378

1 Claim. (Cl. 128—33)

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This invention relates to massage apparatus or devices for producing pulsating or intermittent surface pressure variations on parts of the human body for prevention or relief of muscular pains or fatigue. The present invention constitutes a development extending from my work as disclosed in my prior U. S. Patent No. 2,460,245 and my presently pending application Serial No. 59,906 filed November 13, 1948, now abandoned. The invention herein relates more specifically to improvements in the design and construction of pneumatic cushions or seat pads or mats or mattresses or analogous devices having expansible and contractable cells or chambers in which fluid pressure pulsations are produced and which are adapted for treating the human body to induce and maintain proper circulation even though the weight of the torso in sitting or lying position tends to restrict arterial and venous circulation and to impede nerve impulse or function within the affected area.

Particular applications of my invention may reside in seat pads, cushions, or parachute pack seats for use by aeronauts and airplane passengers, or in seat pads for motor vehicle drivers or passengers or other persons required to occupy sitting positions for extended periods of time. The device affords a most practical means for relieving muscle 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, mattress sacks, or the like embodying the invention also provide practical means for relief in other cases, such as in the case of bed-ridden invalids, where constant or protracted prone positions predispose to compression fatigue and discomfort which may lead for example to development of bed sores; and/or effectively treating or massaging of persons afflicted for example with poliomyelitis to enhance to a greater degree their useful recovery, it being recognized that massage treatment is very beneficial in such cases.

A primary object of the present invention is to provide in a device of the character described an improved form of alternating pressure pattern which will be especially efficient for body treatment purposes such as before mentioned.

Another object of the invention is to provide an improved pneumatic cushion, mat or the like having fluid pressure-confining cells of improved shape, in which the fluid pressure is controlled or alternately applied and relieved so as to produce an improved form of pulsating action through the walls of the cells for the treatment of the body.

Another object is to provide an improved de-

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vice which will produce a body massaging or kneading effect more nearly like that produced by hand massaging.

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

In said drawings:

Fig. 1 illustrates a seat embodying the invention, showing the seat portion thereof in section and the back portion in elevation with parts broken away to show the internal construction.

Fig. 2 is a transverse, vertical section taken along line II—II of Fig. 1;

Fig. 3 is a section taken along line III—III of Fig. 2, on an enlarged scale;

Fig. 4 is a section on an enlarged scale taken along line IV—IV of Fig. 2;

Fig. 5 is a sectional view taken along line V—V of Fig. 3; and

Fig. 6 is a sectional view taken along line VI—VI of Fig. 3.

As shown in Figs. 1, 2, 3, a seat element 10 of the invention may be of generally rectangular, relatively broad and flat or shallow shape and may be formed as a bag or sack made of rubber or plastic or analogous flexible material adapted to be sub-divided into fluid-tight chambers or cells. As shown in Fig. 3 the bag or sack 10 is formed so as to provide alternate rows of interconnecting cells 12 and 14 which are separated by partitions 15 that may be formed, as by uniting the top and bottom wall sheets of the sack 10 along the lines of the partition walls. The bag 10 may be provided with a pressure distributing pad 16 formed of sponge rubber or the like, and an outer protecting cover formed of cloth or the like as indicated at 17. As shown in Fig. 3, if the device is to be used as an aircraft pilot seat cushion, an opening through the cushion may be provided as indicated at 18.

Fluid pressure is admitted to and exhausted or relieved from the cells 12 and 14, respectively, through suitable tubes or conduits 20—21. The conduit 20 connects with or is formed with a loop-shaped extension 22 extending within and around one side portion of the device, and the other conduit 21 connects with or is formed with a similar loop-shaped extension 23 extending within and around the other side of the device. The extension 22 communicates with perforations or ports 24 in their sides through which pressure fluid can enter and leave the cells 14 to thereby more uniformly distribute the admission and exhaust of the pressure throughout

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the cells; and the extension 23 communicates with ports 25 in their sides through which pressure fluid can enter and leave the cells 12.

Air or fluid under pressure is delivered to and exhausted from the pad cells 12 and 14 by any suitable means which admits and exhausts or relieves pressure fluid to and from the adjacent rows of cells 12-14 alternately; and in such a way that while pressure is building up in one row of cells to inflate said cells, pressure will be exhausting or relieved from the adjacent row of cells to deflate it, thus producing an alternating pulsating action of the adjacent rows of cells.

For this purpose, in the embodiment of the invention illustrated, any suitable compressed air source and valve or control mechanism may be provided which admits the pressure fluid to and exhausts or relieves it from the adjacent cells 12 and 14 alternately, as above stated. Suitable valve or control mechanisms are disclosed in my prior patent and/or patent application aforesaid, and in Figs. 1-2 herein a compressed air supply conduit is indicated at 26; a control valve at 27; and a shuttle valve is indicated at 28 as being arranged to provide alternately increasing and decreasing pressures in the conduits 28-21.

Thus, the control mechanism provides for alternately expanding and contracting or inflating and deflating adjacent rows of cells and expanding or inflating one row of cells while contracting or deflating the adjacent row of cells.

It is a particular feature of the present invention that the cells 12, 14 are so shaped in plan view as to cooperate to provide cell rows which alternately swell and contract in plan view; the swelled portions of one cell row being disposed to complementarily interfit with the constricted portions of the next adjacent cell row. As shown in the drawing, the cell devices may be of rectangular or diamond shape, so as to resemble generally the overall appearance of a waffle pattern; but it is to be understood that in lieu thereof the cells may be circular or elliptical shapes or any other modified shapes whereby to provide the complementary interfitting pattern referred to hereinabove. It is this feature of the invention that provides a unique massaging action compared to devices of the prior art. For example, during the time which any one of the cells 12, 14 is being expanded by introduction of pressure fluid, as explained hereinabove, the four cells most nearly adjacent and surrounding said expanding cell are in process of being deflated.

Thus, the body resting upon the device is receiving an upward pressure effect over the area of the first designated cell while the body areas therearound are experiencing a reverse or pressure relieving effect. Then, subsequently upon reversal of the pressure control valve device the first designated cell undergoes a slow deflationary action thereby releasing its pressure effect against the supported body while at the same time the cells at the perimeter of the first designated cell are expanding and applying increased pressure effects against the body throughout an area around the first designated cell. This action is of course being simultaneously repeated throughout the entire "waffle" pattern, and thus it will be appreciated that a body supporting and massaging action is obtained such as cannot possibly be obtained by pulsating cushion devices of the prior art and/or as shown for example in my prior patent and patent application aforesaid. The present invention provides pressure changing effects in such manner as to avoid impedance to

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normal circulatory flow, but to the contrary provides a "milking" effect inducing normal flow thereby preventing development of toxic effects in the body cell structure.

Figs. 1, 2, 4 illustrate also application of the invention to the back element of a chair device or the like. Thus, a pulsating pad is indicated at 30 as being vertically supported in the seat structure and preferably covered by a pressure disbursing pad 32 formed of any suitable material such as sponge rubber or the like, and then enclosed with an outside fabric cover 33. The pad device 35 is generally of the same construction as the seat pad element 10, as explained hereinabove; the pad device being illustrated as constructed by cementing or vulcanizing or welding or stitching a pair of flexible sheet members 34-35 together at the marginal edges 36 and along zig-zag lines 37 so as to thereby provide rows of cells 38, 39. As shown in Fig. 4, for example, the two outer rows are arranged to be in open communication and supplied with pressure fluid through a conduit 40 which connects to one of the fluid passageways in the seat pad 10, while the two inner rows of cells 38-39 are arranged in open communication with a conduit 41 which in turn communicates with the other pressure supply passageway of the seat element 10. As shown in Fig. 4, a port 42 through the partition dividing the rows 38, 39 and a branch conduit 44 interconnecting the outside rows 38, 39 cooperate to provide the action referred to. Thus, it will be appreciated that upon operation of the reversing control valve 29, as explained hereinabove, the "waffle" pattern cells of the back pad 30 will pulsate with the novel massaging action described hereinabove in connection with the seat pad 10.

Whereas, the invention has been illustrated and described in detail hereinabove as being applied to a chair seat and back arrangement, it is to be understood that the invention is applicable with equal facility to pulsating bed mattresses or any other type mats or pads adapted to support a human body for prevention and/or relief of pressure fatigue or circulatory interruption effects; and that although only one form of the invention has been shown and described in detail, it will be apparent to those skilled in the art that the invention is not so limited but that various changes may be made therein without departing from the spirit of the invention or the scope of the appended claim.

I claim as my invention:

55 A body supporting device comprising a unitary construction having a plurality of rows of fluid pressure confining cells adapted to support a person's body, the cells of each row being all in direct fluid pressure communication with each other, and the cells of each row being in staggered and interfitting relation to cells of adjoining rows, each of said cells having a flexible top wall, means for supplying fluid under pressure to each row of cells, and means admitting pressure fluid to one row of cells while exhausting pressure fluid from the rows of cells adjoining thereto and thereby producing out of phase fluid pressure pulsations in perimetally adjacent cells.

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