July 6, 1965 R. E. SWANK 3,192,540

ADJUSTABLE PNEUMATIC SUPPORT

Filed Jan. 22, 1962 2 Sheets-Sheet 1

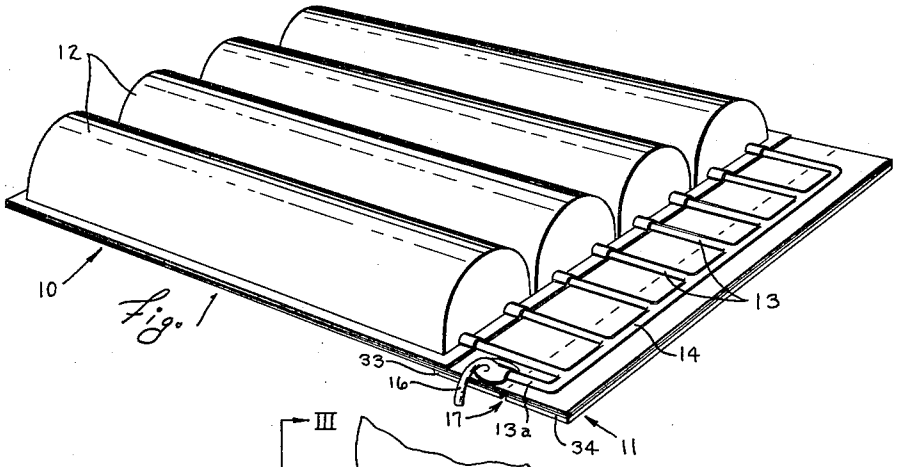


Fig. 1

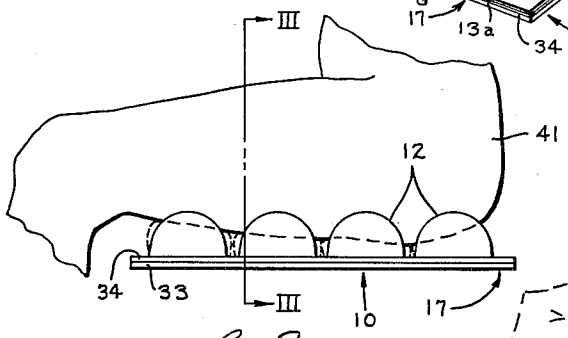


Fig. 2

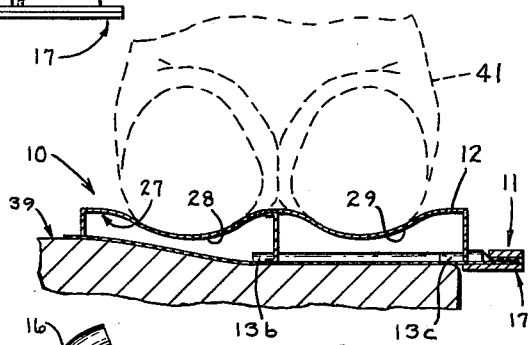


Fig. 3

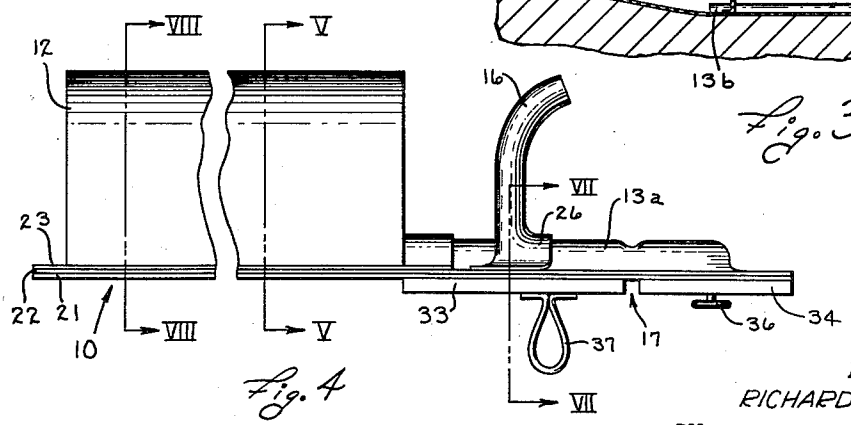


Fig. 4

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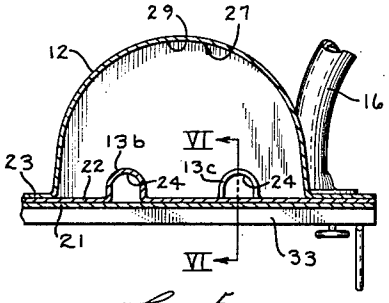


Fig. 5

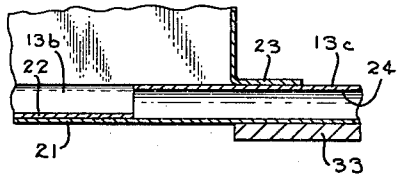


Fig. 6

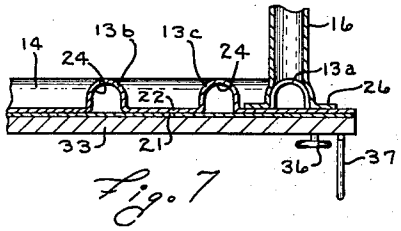


Fig. 7

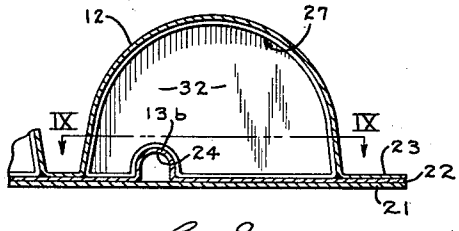


Fig. 8

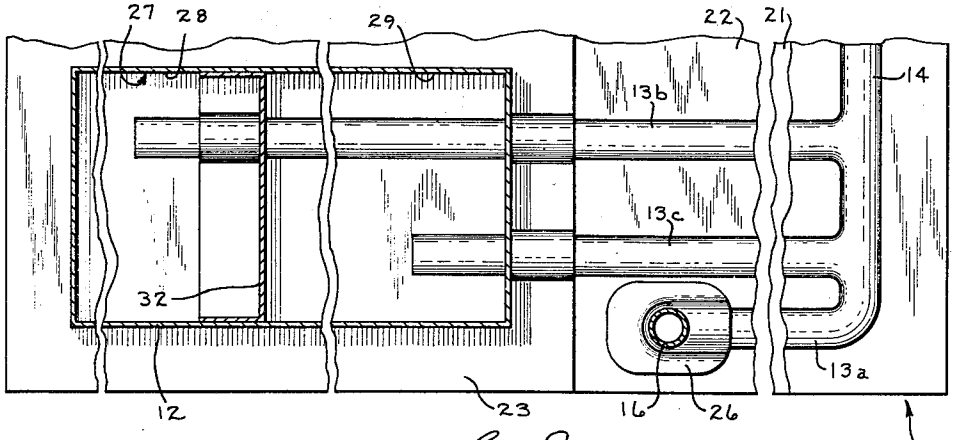


Fig. 9

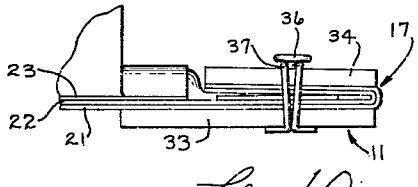


Fig. 10

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United States Patent Office 3,192,540 Patented July 6, 1965

3,192,540

ADJUSTABLE PNEUMATIC SUPPORT

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Filed Jan. 22, 1962, Ser. No. 167,662
2 Claims. (Cl. 5—349)

This invention relates in general to a support structure in the form of a compartmented cushion filled with pressure fluid and, more particularly, to a type of such cushion in which each of the compartments is independently connected to a supply of pressure fluid so that the relative amount of pressure fluid within said compartments can be adjusted.

Fluid filled cushions, and particularly seat cushions inflated with a gas, have long been known and widely used with varying degrees of success. However, insofar as I am aware, such attempts have always been somewhat less than completely satisfactory for one important reason. Specifically, existing, fluid filled cushions are not capable of providing a stable support which is both resiliently flexible and adjustable. That is, the fluid within the cushion tends to move away from the center pressure created by the object supported thereon, regardless of where the object is placed upon the cushion. Moreover, if the object is moved or moves from one position on the cushion to another, the cushion automatically adjusts and does not tend to move the object back toward its initial position. This, conventional reaction of existing pneumatic cushions may be, and often is, highly desirable for certain types of use. However, where it is desired to use the cushion so that it tends to hold the object supported thereon in a particular position or attitude, or where it is desired to intentionally adjust this position or attitude from time to time in a controlled manner, existing support structures of this character are inadequate.

Accordingly, a primary object of this invention has been the provision of a fluid filled, adjustable support structure, such as a pneumatic cushion, whereby an object can be resiliently and adjustably supported upon said cushion in a selected position or attitude, a change of the object's position or attitude being resisted somewhat by the cushion until an appropriate adjustment is made in the inflation of the cushion.

A further object of this invention has been the provision of a cushion, as aforesaid, which can be manufactured inexpensively, which can be adjusted quickly and easily, which is adaptable to a wide variety of uses including the comfortable support of human beings, and which can be packaged and/or stored easily and in a small amount of space.

Other objects and purposes of this invention will become apparent to persons familiar with this type of equipment upon reading the following descriptive material and examining the accompanying drawings, in which:

FIGURE 1 is a perspective view of a pneumatic seat cushion embodying the invention.

FIGURE 2 is an end elevational view of said cushion supporting a person.

FIGURE 3 is a sectional view taken along the line III—III in FIGURE 2.

FIGURE 4 is a broken side elevational view of said seat cushion.

FIGURE 5 is a sectional view taken along the line V—V in FIGURE 4.

FIGURE 6 is a sectional view taken along the line VI—VI in FIGURE 5.

FIGURE 7 is a sectional view taken along the line VII—VII in FIGURE 4.

FIGURE 8 is a sectional view taken along the line VIII—VIII in FIGURE 4.

FIGURE 9 is a sectional view taken along the line IX—IX in FIGURE 8.

FIGURE 10 is a fragment of the structure appearing in FIGURE 4 with part thereof in a different operating position.

For convenience of disclosure herein, the terms "upper," "lower" and words of similar import will have reference to the seat cushion embodying the invention and parts thereof as appearing in FIGURE 2. The terms "inner," "outer" and derivatives thereof will have reference to the geometric center of said seat cushion and parts thereof.

General description

The objects and purposes of the invention, including those set forth above, have been met by providing a support structure (FIGURE 1), which is the form of a seat cushion and is comprised of flexible means defining a plurality of adjacent, air-tight compartments arranged for normal disposition between a pair of relatively close, parallel planes. A plurality of conduits are individually connected to said compartments for conducting fluid, such as a gas, into each of said compartments. The conduits are arranged upon a hinged member so that the flow of the gas through said conduits between said compartments can be stopped by bending said member along its hinge line. Said conduits are interconnected so that the gas can flow through said conduits and between said compartments for adjustment purposes when said hinged member is substantially unbent.

In one preferred embodiment, the support structure is fabricated from sheets of flexible, air-tight material, and some of said sheets are molded before they are sealed to each other to form compartments and passageways therebetween. A filler pipe is connected to the passageways so that the various compartments can be simultaneously filled with said gas.

Detailed construction

The support structure shown in FIGURES 1 and 2 illustrate one preferred embodiment of the invention which is particularly designed as a seat cushion. More specifically, the support structure of FIGURE 1 includes a cushion portion **10** and a control portion **11** secured thereto. The cushion portion **10** includes a plurality of elongated, parallel envelopes **12**, which are held in side-by-side relationship, and a plurality of conduits **13**, each of which is separately connected to a compartment within one of said envelopes **12**. The conduits **13** are each connected to a single conduit or header **14** having a filler pipe **16** through which pressure fluid, such as air, can be moved into or out of the envelopes **12** through the conduits **13**. The conduits **13** are mounted upon a hinged member which, when bent, blocks the individual conduits **13** and thereby acts as a valve mechanism for controlling the flow of pressure fluid through the filler pipe **16** and also through the conduits **13** between the envelopes **12** and the header **14**.

The support structure (FIGURE 1) is formed in this particular embodiment primarily from three, superimposed sheets **21**, **22** and **23** which are preferably fabricated from a resiliently flexible and moldable material, such as plastic or rubber. The bottom sheet **21** is preferably rectangular in shape and substantially flat. The center sheet **22** preferably has the same rectangular shape as the bottom sheet **21**, so that it can be placed upon the bottom sheet in a superimposed position. The center sheet **22** is molded to provide a plurality of interconnected channels **24** (FIGURES 5, 7 and 9), which channels become the conduits **13** and header **14** when the center sheet **22** is placed upon and secured to the bottom sheet **21**. The securing of the bottom and center sheets may be accomplished, depending upon the characteristics of the materials involved, by heat, by pressure, by an adhesive or any combination of these three, for example.

One of the conduits 13, which is identified as conduit 13*a* (FIGURE 9), communicates at one end thereof with the header 14 and at its other end with a filler pipe 16. An integral flange 26 is mounted upon the connecting end of the filler pipe 16, and said flange is secured upon the center sheet 22 to hold the pipe 16 upon the center sheet 22 and in communication with the conduit 13*a*. The remainder of the conduits 13 are comprised of alternating short and long conduits 13*c* and 13*b*, respectively, for reasons appearing hereinafter. The open ends (FIGURES 5, 6 and 7) of the conduits 13*a*, 13*b* and 13*c*, which are remote from the header 14 are formed by slitting the center sheet 22 adjacent the ends of the channels 24 from which said conduits are formed.

The top sheet 23 (FIGURES 4 and 9) is also preferably rectangular and is of the same width as, but is slightly shorter than, the center sheet 22. Said top sheet 23 is molded to provide a plurality of elongated, parallel cavities 27 which combine with the adjacent surface of the center sheet 22 to provide the envelopes 12 when the top sheet is secured upon the center sheet 22. Such securement may be accomplished in the same manner discussed above with respect to the securement of the center sheet 22 upon the bottom sheet 21. When the top sheet 23 is thus mounted upon the center sheet 22, each of said cavities 27 communicates with the open ends of one long conduit 13*b* and one short conduit 13*c*. These two conduits open into the cavity 27 near the opposite ends thereof. Each cavity 27, hence the envelope 12 formed thereby, is divided into a pair of air-tight compartments 28 and 29 by a resiliently flexible partition 32 which is secured to and between the opposing surfaces of the top sheet 23 and center sheet 22, preferably midway between the opposite ends of each cavity 27. Accordingly, each envelope 12 has one compartment 28 with which a conduit 13*b* communicates and a compartment 29 with which a conduit 13*c* communicates. The flange 26 may be secured upon the center sheet 22 and the partition 32 may be secured to the sheets 22 and 23 in the same manner that the several sheets are secured to each other.

The hinged structure 17 (FIGURES 4 and 10) of the control portion 11 may be comprised of a pair of relatively flat, elongated members 33 and 34 which are secured, as by adhesive, to the lower side of the bottom sheet 21 adjacent the header 14. Said flat members 33 and 34 may be fabricated from plastic sheets which are somewhat thicker and substantially stiffer than the material used in the sheets 21, 22 and 23. The adjacent, lengthwise edges of the two members 33 and 34 are preferably spaced slightly from each other so that the outermost member 34 can be folded or pivoted from its FIGURE 4 position into its FIGURE 10 position where adjacent portions of the sheets 21 and 22 are pressed together between the flat members 33 and 34. It will be apparent that such folding of the sheets 21 and 22 will pinch those portions of the conduits 13*a*, 13*b* and 13*c* along the fold line of said sheets, thereby positively preventing the movement of the gas through these conduits.

A button 36 (FIGURE 4 and 10) is mounted upon the bottom of the flat member 34 adjacent one end thereof and a loop 37 is secured to the bottom of the flat member 33 adjacent the corresponding end thereof. When the flat member 34 is folded upon the flat member 33, as shown in FIGURE 10, the loop 37 can be fastened around the button 36 to hold the flat members 33 and 34 in their folded positions. A similar button and loop can be mounted upon the other ends of the flat members 33 and 34 for the same purpose.

Operation

The support structure (FIGURES 2 and 3) embodying the invention is normally used by placing the cushion portion 10 thereof upon a support surface 39 where said cushion portion can be occupied by an object, such as a human 41. It will be seen that the support surface may be provided by the seat cushion of an automobile or chair, a hard bleacher seat in an athletic stadium or relatively uneven ground. For illustrative purposes, the cushion portion 10 is disclosed in FIGURE 3 as being supported upon an uneven surface 39.

The compartments 28 and 29 (FIGURE 9) of the cushion portion 10 are inflated by attaching the pipe 16 to a source of pressure fluid, such as gas. In many instances this can be accomplished by placing the filler pipe 16 in the mouth and simply blowing air therethrough into the header 14, the conduits 13 and said compartments. After said compartments 28 and 29 have been properly inflated, the filler pipe 16 is manually pinched so that air cannot escape therethrough. The object is then placed upon the cushion portion 10, while the air is still free to move between the compartments, and said object is moved into its desired position. Where the cushion portion 10 is being used to support a human, said human merely sits upon the cushion in a comfortable position.

While the human, for example, is comfortably seated upon the cushion 10 (FIGURE 2), the flat member 34 is folded over and above the flat member 33, thereby pinching all of the conduits 13 so that air can no longer move through said conduits and between the compartments 28 and 29. As shown in FIGURE 3, one of the compartments 28 and 29 may have a greater volume of air in it than do the other compartments due to an irregularity in the surface upon which the cushion portion 10 is placed. However, due to the compartmentation of each envelope, a change in the attitude of the person supported upon the structure will be gently but firmly opposed. That is, the partition 32 will not permit all of the air to move from the leftward to the rightward end of the envelope 12 (FIGURE 3), if the occupant of the cushion moves from right to left. Similarly, if the person supported upon the cushion portion 10 rocks forwardly or rearwardly, the inability of the gas to move between the various envelopes also tends to oppose such rocking movement thereby stabilizing the position of the person supported upon the cushion. It will be apparent that the sensitivity of this stabilization can be increased by increasing the number of compartments in a cushion portion for a given area. In fact, by providing sufficient, independently controlled compartments, the cushion portion can be virtually molded to the shape of the lower side on the object which it engages and supports. This would increase the number of conduits required, but such can be supplied by utilizing the same principles disclosed above.

If, after a period of use, a change is desired in the attitude of the object or person supported upon the support structure, such can be accomplished by releasing the loop 37 from the button 36, pinching the filler pipe 16 and unfolding the flat member 34 from its FIGURE 10 position above the flat member 33. The person or object is then relocated upon the cushion portion 10 while the air is free to move between the compartments as needed. Thereafter, the flat member 34 is again folded upon and above the flat member 33 after which the loop 37 is placed around the button 36 to hold the flat members in their FIGURE 10 positions. This again prevents movement of the gas between or into and out of the various compartments so that the new attitude will be maintained.

It will be apparent that a support structure, which embodies the principles of the invention, can be utilized substantially in the above-described manner to support large objects such as machines, where it is desirable to have such objects resiliently supported in a selected attitude, which attitude can be adjusted from time to time.

Accordingly, although a particular preferred embodiment of the invention has been disclosed in detail above

for illustrative purposes, it will be recognized that variations or modifications of such disclosure, which come within the scope of the appended claims, are fully contemplated.

What is claimed is:

1. A resiliently flexible, fluid holding structure for supporting an object, comprising:

a plurality of elongated, flexible envelopes, each envelope having partition means disposed therein between the lengthwise ends thereof and dividing each envelope into a plurality of compartments;

connecting means for normally holding said envelopes together in parallel, substantially coplanar positions;

a plurality of flexible conduits, each of said conduits communicating with one of said compartments;

header means communicating with each of said conduits at points spaced from said envelopes, whereby said fluid can flow freely through said conduits and said header between said compartments, said conduits having portions between said header and said envelopes extending transversely of a substantially straight line;

a filler conduit communicating with said header means; and hinged support means connected to said envelopes, each of said conduits having said portion thereof mounted upon said support means and extending transversely of the hinge axis thereof so that said line is parallel with and adjacent to said hinge axis, said support means being hingedly movable around said hinge axis into and out of a position wherein said portions of said conduits are pinched at the same time to block the flow of fluid through said conduits.

2. A resiliently flexible structure for holding a gas and for supporting an object, comprising:

first and second, flexible sheets of substantially the same size and peripheral shape, said sheets being secured to each other in substantially parallel and superimposed positions, adjacent portions of said sheets being spaced from each other to define therebetween a plurality of elongated, branch conduits extending from near one pair of adjacent edges of said superimposed sheets to selected points spaced from said edges of said sheets, and a header conduit communicating with said branch conduits near said edges of said sheets;

means defining openings in the second sheet, each opening communicating with an end of a branch conduit at a said selected point along said sheets;

a filler pipe connected to said second sheet and communicating with said header conduit;

a third flexible sheet superimposed upon said second sheet and spaced from the said one edge thereof, said third sheet being secured to said one sheet along selected portions thereof to define between said second and third sheets a plurality of elongated, substantially parallel and adjacent chambers, each of said chambers communicating with two of said openings in said one sheet;

a partition member within each of said chambers for dividing said chamber into two, enclosed compartments, each of said compartments communicating with one of said openings in said one sheet; and

hinged means secured to said first sheet near said adjacent edge thereof, the hinge axis of said hinged means intersecting each of said branch conduits between said header conduit and said chambers, said hinged means being movable around the hinge axis into and out of a position wherein said branch conduits are pinched at the same time for blocking the flow of gas through said branch conduits.

References Cited by the Examiner

UNITED STATES PATENTS

2,136,510	11/38	Jenson	137—223
2,245,909	6/41	Enfiajian	5—348
2,716,013	8/55	Tinker	251—4

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