Dec. 4, 1962 K. B. LAWRENCE ET AL 3,066,928

RESILIENT CUSHION STRUCTURE

Filed Oct. 28, 1958 2 Sheets-Sheet 1

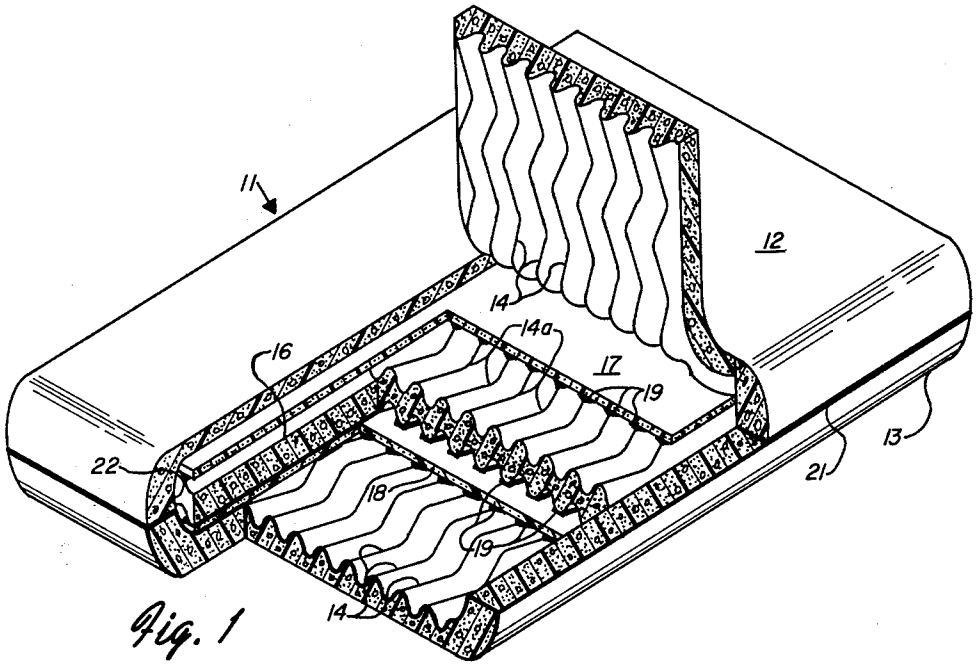

Fig. 1

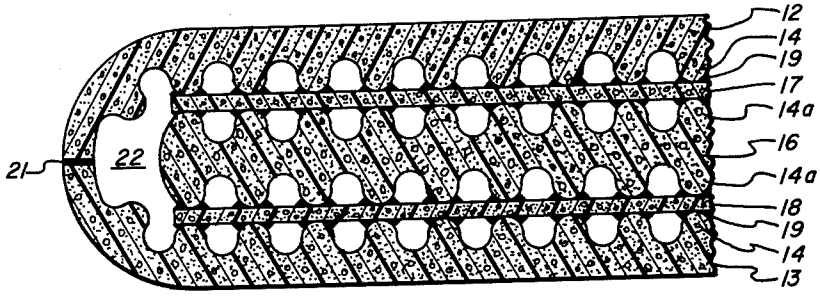

Fig. 2

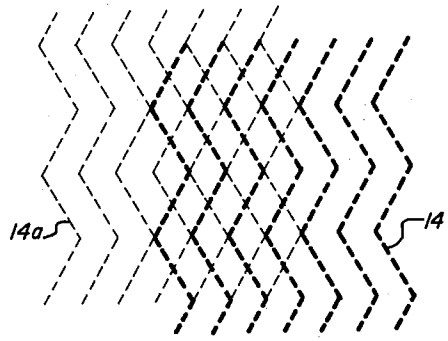

Fig. 3

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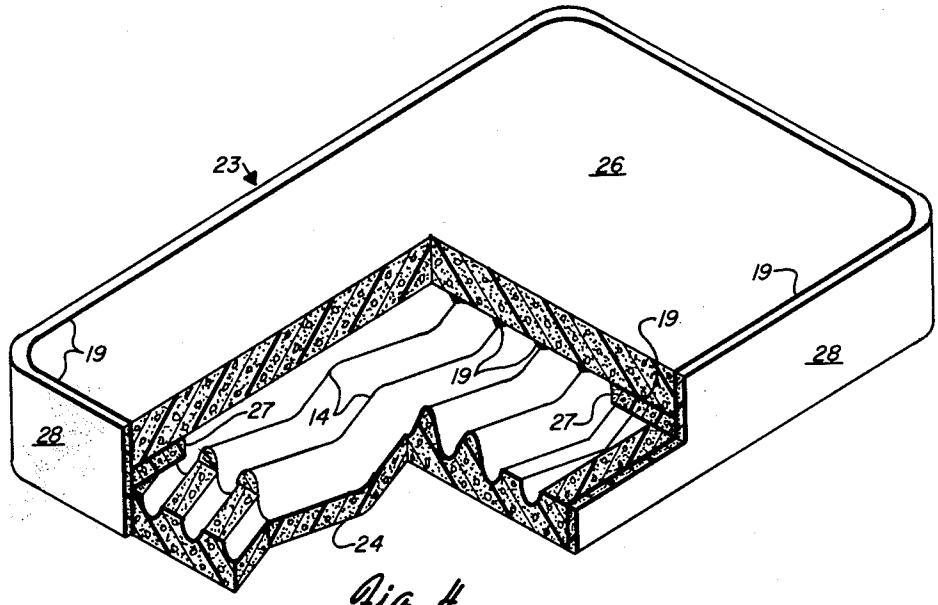

Fig. 4

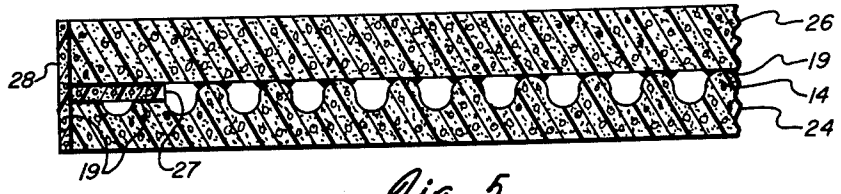

Fig. 5

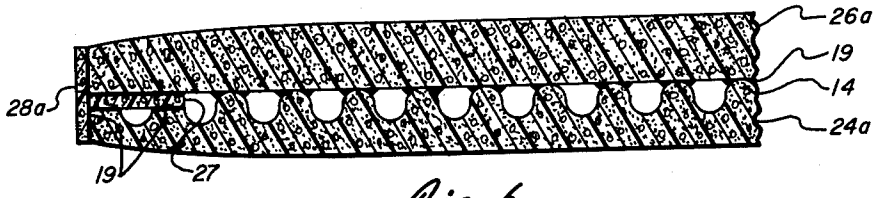

Fig. 6

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RESILIENT CUSHION STRUCTURE

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8 Claims. (Cl. 267—1)

This invention relates to resilient cushion structures such as seat cushions, mattresses, pillows, and the like, which may be formed of foamed organic polymer material, preferably foamed polyurethane, but also including other foamed plastics, foam rubber, and similar materials.

When such material is used in a solid piece as a comfort cushion, it lacks sufficient initial or touch softness, that is, the rate of change of the deflection under moderate load is less than under heavier loads. Hence it is desirable to provide a cushion structure of such designs as to overcome this difficulty. The material is also deficient in "breathing" qualities, that is, it is insufficiently permeable to air, owing to the fact that passage of air through the tortuous channels of the foamed polymer is necessarily slow.

It is therefore an object of this invention to provide a cushion structure formed of foamed organic polymer having increased softness.

It is a further object to provide a cushion structure of foamed organic polymer having an internal air reservoir.

It is another object to provide such a cushion structure having walls with relatively thin portions between the exterior surface and an internal air reservoir.

A still further object of this invention is to provide a cushion structure having an internal air reservoir with means for re-expanding the reservoir after compression.

Yet another object of the invention is to provide a cushion structure having a pumping action for ventilating and cooling.

These objects and others ancillary thereto will be better understood on reading the following specification, taken in conjuction with the drawings, in which like numerals are used for like elements, and in which:

FIGURE 1 is a perspective view, partially cut away, of one embodiment of the invention;

FIGURE 2 is a fragmentary cross-section in elevation of an embodiment similar to that of FIGURE 1;

FIGURE 3 is a diagram showing one orientation of the corrugations of the cushion structures;

FIGURE 4 is a perspective view, partially cut away, of another embodiment of the invention;

FIGURE 5 is a fragmentary cross-section in elevation of the embodiment of FIGURE 4; and

FIGURE 6 is a cross-section similar to FIGURE 5 of a slightly modified embodiment.

Referring more particularly to FIGURE 1, there is shown a cushion structure 11 formed of five elements to give maximum softness. For convenience of illustration the structure is shown as rectangular in shape, although it may equally well be of any other desired configuration. Two similar external layers 12 and 13 of foamed organic polymer are formed with a plurality of resilient zigzag corrugations 14 on the inner face of each layer. Positioned between the external layers is

a central core layer 16 having corrugations 14*a* on both sides; the corrugations of the core may have the crests on one side staggered with the troughs of the corrugations on the other side, as shown in FIGURE 1, or they may have their crests opposed, as shown in FIGURE 2. The core layer is spaced apart from external layer 12 by a relatively thin, flat first stabilizer sheet 17, and from external layer 13 by a second stabilizer sheet 18.

The crests of the corrugations 14 and 14*a* on all layers are joined to adjacent elements by any suitable adhesive 19, or by self-adhesion produced by heating the material at the juncture. The external layers 12 and 13 are greater in area than any of the inner elements, and each external layer has had the corrugations removed from the inner face around the periphery thereof to provide a peripheral flat surface. These peripheral flat surfaces are inturned and their edges joined together in a seam 21, leaving a peripheral air channel 22 surrounding the inner elements. In assembling the cushion structure the corrugations 14 of the external layers may be oriented congruent with corrugations 14*a* of the core, or they may be displaced half a wavelength, as schematically illustrated in FIGURE 3.

The resulting product provides a cushion structure having air channels between adjacent corrugations, all such channels being interconnected by the peripheral channel 22 to form an internal air reservoir. This structure gives greater resiliency and softness than a solid block of the foamed material, owing to the fact that the corrugations are more easily compressible, and to the partial compression of air in the reservoir of interconnected air spaces. When weight is removed the cushion structure restores itself to its original shape more rapidly than the solid material, since the compressed corrugations immediately expand and thereby restore the air reservoir to its original capacity. Breathing characteristics are improved by having only the relatively thin web of material at the troughs of the corrugations separating the exterior surfaces from the inner air reservoir, which allows fresh air to be drawn in on recovery from compression. The internal air channels provide a pumping action for cooling and ventilation.

FIGURE 2 shows an embodiment differing from that of FIGURE 1 only in having corrugations 14*a* on opposite sides of core 16 disposed with their crests directly opposed, rather than staggered as in FIGURE 1.

FIGURE 4 shows another embodiment 23 of the invention, where some degree of softness may be dispensed with in favor of simpler construction, and where a stiffer edge is desired. In this embodiment there is provided a layer 24 having zigzag corrugations 14 on its inner face, and a second layer 26 of flat material of like area abutting the corrugations and adhered thereto at 19. The crests of the corrugations are removed around the periphery of layer 24 to a depth sufficient for the insertion of reinforcing strip 27 to give a solider edge to the cushion structure. In this embodiment the edges may be left raw, or may be finished off with a strip of trim 28 covering the edges around the entire periphery, as shown. All elements are adhered together at 19 by any suitable adhesive or by self-adhesion.

FIGURE 5 shows a cross-section in elevation of a portion of the embodiment of FIGURE 4. It will be observed that in layer 24 the corrugations are of sub-

stantially the same height as the thickness of web between corrugations, and that layer 26 is thicker (somewhat exaggerated in the drawing) than the web thickness of layer 24. Owing to the small area of contact between the crests of the corrugations and layer 26, if it were no thicker than the web of layer 24 the outer surface of layer 26 would in time show the conformation of the internal corrugations; making it somewhat thicker therefore preserves its smooth outer surface.

FIGURE 6 shows an embodiment of the same general form as that of FIGURES 4 and 5, the only differences being that both the flat and the corrugated layers have been tapered in thickness at the edge in order to reduce the edge thickness of the cushion structure as a unit, and a narrower trim strip is used. In FIGURE 6 the altered elements have been given numerals having the affix "*a*" to distinguish them from the similar elements of FIGURES 4 and 5.

It will be understood that this invention is not limited to the specific details of construction and arrangement herein shown and described, and that various modifications may be made without departing from the spirit of the invention. It is intended to cover all such modifications in the appended claims.

What is claimed is:

1. A resilient cushion structure comprising in combination a central core formed of foamed organic polymer material and having a plurality of resilient corrugations of generally sinusoidal cross-section extending from opposite sides thereof and across the surface of each side, a first flat stabilizer sheet formed of foamed organic polymer and adhered to the crests of said corrugations on one side of said core, a second flat stabilizer sheet formed of foamed organic polymer and adhered to the crests of said corrugations on the opposite side of said core, a first external layer formed of foamed organic polymer and having a plurality of resilient corrugations of generally sinusoidal cross-section extending vertically from one side and horizontally across the surface thereof, the crests of said corrugations on said first layer being adhered to said first stabilizer sheet on the side opposite to said core, a second external layer formed of foamed organic polymer and having a plurality of resilient corrugations of generally sinusoidal cross-section extending vertically from one side and horizontally across the surface thereof, the crests of said corrugations on said second layer being adhered to said second stabilizer sheet on the side opposite to said core, the edges of said first and second layers being adhered in a peripheral seam and defining a peripheral channel.

2. A resilient cushion structure as defined in claim 1, wherein said foamed organic polymer material is foamed polyurethane.

3. A resilient cushion structure comprising in combination a central core formed of foamed organic polymer material and having a plurality of resilient zigzag corrugations of generally sinusoidal cross-section extending from opposite sides thereof, a first flat stabilizer sheet formed of foamed organic polymer and adhered to the crests of said corrugations on one side of said core, a second flat stabilizer sheet formed of foamed organic polymer and adhered to the crests of said corrugations on the opposite side of said core, a first external layer formed of foamed organic polymer and having a plurality of resilient zigzag corrugations of generally sinusoidal cross-section extending from one side thereof, the crests of said corrugations on said first layer being adhered to said first stabilizer sheet on the side opposite to said core and displaced one-half wavelength from the corrugations of said core, a second external layer formed of foamed organic polymer and having a plurality of resilient zigzag corrugations of generally sinusoidal cross-section extending from one side thereof, the crests of said corrugations on said second layer being adhered to said second stabilizer sheet on the side opposite to said core and displaced one-half wavelength from the corrugations of said core, the edges of said first and second layers being adhered in a peripheral seam and defining a peripheral channel.

4. A resilient cushion structure as defined in claim 3, wherein said foamed organic polymer material is foamed polyurethane.

5. A resilient cushion structure comprising in combination a central core formed of foamed organic polymer material and having a plurality of resilient corrugations of generally sinusoidal cross-section extending from opposite sides thereof and across the broad extent of each surface, a first flat stabilizer sheet formed of foamed organic polymer adhered to the crests of said corrugations on one side of said core and defining therewith a first plurality of air spaces between said corrugations, a second flat stabilizer sheet formed of foamed organic polymer and adhered to the crests of said corrugations on the opposite side of said core and defining therewith a second plurality of air spaces between said corrugations, a first external layer formed of foamed organic polymer and having a plurality of resilient corrugations of generally sinusoidal cross-section extending from one face thereof and across the broad extent of its surface and having a peripheral flat area on said corrugated face surrounding said corrugations, the crests of said corrugations on said first layer being adhered to said first stabilizer sheet on the side opposite to said core and defining with said first sheet a third plurality of air spaces between said corrugations, a second external layer formed of foamed organic polymer and having a plurality of resilient corrugations of generally sinusoidal cross-section extending from one face thereof and across the broad extent of its surface and having a peripheral flat area on said corrugated face surrounding said corrugations, the crests of said corrugations on said second layer being adhered to said second stabilizer sheet on the side opposite to said core and defining with said second sheet a fourth plurality of air spaces between said corrugations, said flat areas of said first and second layers having their edges adhered together and defining a peripheral channel interconnecting said first, second, third, and fourth pluralities of air spaces.

6. A resilient cushion structure as recited in claim 5, wherein said foamed organic polymer material is foamed polyurethane.

7. A resilient cushion structure comprising in combination a first external layer formed of foamed organic polymer and having a plurality of resilient corrugations of generally sinusoidal cross-section extending from one face thereof and having a peripheral flat area on said corrugated face surrounding said corrugations, a stabilizer sheet formed of foamed organic polymer and adhered to the crests of said corrugations on said first layer and defining a first plurality of air spaces between said corrugations, a second external layer formed of foamed organic polymer and having a plurality of resilient corrugations of generally sinusoidal cross-section extending from one face thereof and having a peripheral flat area on said corrugated face surrounding said corrugations, the crests of the corrugations on said second layer being adhered to said stabilizer sheet and defining a second plurality of air spaces between said corrugations, said flat areas of said first and second layers having their edges adhered together and defining a peripheral channel interconnecting said first and second pluralities of air spaces.

8. A resilient cushion structure comprising in combination a first layer formed of foamed organic polymer and having a plurality of zigzag resilient elongated corrugations of generally sinusoidal cross-section extending from one face and across the surface thereof, a stabilizer sheet of foamed organic polymer having one surface adhered to the crests of said corrugations throughout their lengths and defining a first plurality of air spaces between said corrugations, a second layer formed of foamed organic polymer and having a plurality of zigzag resilient elongated corrugations of generally sinusoidal cross-sec-

tion extending from one face and across the surface thereof, the crests of the corrugations on said second layer being adhered throughout their lengths to the other surface of said stabilizer sheet and defining a second plurality of air spaces between said corrugations, the peripheral edges of said first and second layers being joined together and forming a peripheral channel interconnecting said first and second pluralities of air spaces.

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