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(72) Inventors:
• **Hochschild, Arthur A.**
Garden Grove CA 92841 (US)
• **Horeczko, Roman**
Huntingdon Beach CA 92647 (US)

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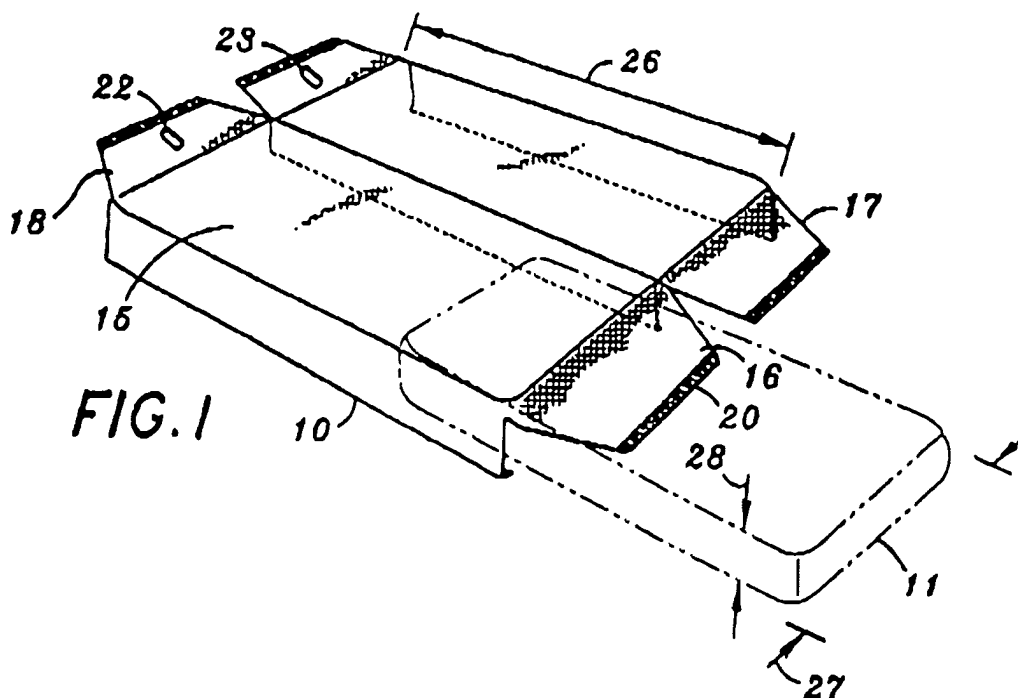
(74) Representative: **Merrifield, Sarah Elizabeth et al**
Boult Wade Tennant
Verulam Gardens
70 Gray's Inn Road
London WC1X 8BT (GB)

(71) Applicant: **The Nautilus Group, Inc.**
Vancouver, WA 98684 (US)

(54) **Stabilized shape retentive air-inflated bed**

(57) A bed including a flexible air-inflatable bladder (11) embraced by a flexible inextensible shroud (10). The shrouded bladder (11) may be encircled by a sur-

round (40) to define the outer periphery of the resulting mattress construction. An inextensible layer (90) can be peripherally attached to the upper edge of the surround.



Description

Field of the Invention

[0001] Providing to an air-inflated bed stability, longevity, and shape retentiveness.

Background of the Invention

[0002] Air-inflated beds, commonly called "air beds" include an impermeable bladder which is sufficiently deformable to accommodate to the contours of a person lying on it. The amount of deflection and thus the hardness of the bed, is adjustable by varying the air pressure. Air beds are not to be confused with water beds. Although they both are filled with a fluid, the differences in properties of liquid and gas lead to different problems. This invention is limited to improvements in air beds.

[0003] For reasons of cost and function, it is common to form the air-containing bladder with a skin of an organic plastic sheet material, usually a plasticized vinyl. Such a skin adequately retains air under pressure, and flexes to accommodate the occupant. However, such material also has the property of extensibility- it can stretch and balloon.

[0004] This capacity to stretch and balloon often leads to unsightliness of the bed faces, especially the top side, and end faces. Such distortions are unwelcome in fine beds. In conventional double beds which utilize two parallel and edge-contiguous inflated bladders, often one bladder will rise and lap over the other, even when side bolsters are provided. In others, longitudinal ridges will be formed on the bladder, and thus on the top of the bed, and also form a valley between the bladders.

[0005] Because the bladder can extend laterally, it is possible for the outer side face to balloon destroying the symmetry of the bed. This is often countered by a rigid side enclosure, an added element of cost.

[0006] A less visible but often costly situation arises when the plastic material is overlaid by a layer of a substance such as an organic foam. Such layers are often provided to improve the comfort of the mattress. Such layers can leach plasticizer from the vinyl. After enough plasticizer had been leached out, the sheet may crack and leak. Then the leak must be repaired or the entire bladder must be replaced.

[0007] These problems have long been recognized, and attempts have been made to alleviate them. Invariably they have done an inefficient job, and have been too expensive.

[0008] It is an object of this invention to stabilize the basic configuration of the bed, and extend the life of the bladder at an economical cost, and also to dispense with bed components that previously were thought to be necessary.

Brief Description of the Invention

[0009] According to this invention, one or two bladders are utilized, depending on whether the bed is to be single or double. Each bladder has a flexible, impermeable skin and means to inflate it with air. The bladder when inflated has a top face, a bottom face, two side faces and two end faces. The bladder is formed from sheet material. Because of internal channeling structures, the top and bottom faces are not purely planar without restraint, the side surfaces will tend to bow out obtusely, and the corners will be rounded, as will the edges of the top and bottom faces. These are well-recognized bladders which when held in a suitable bounding structure and within layers of material laying on the top face, will provide an acceptably flat and rectangular-appearing bed, at least at first.

[0010] According to a feature of this invention, the bladder is enclosed in a shroud of flexible material which itself is substantially inextensible. Its area is formed with dimensions that are substantially equal to the desired ultimate outer dimensions of the bladder when inflated, and before being stretched. Accordingly, when inside the shroud, no dimension of the bladder can "grow" beyond its design shape, no matter what air pressure is exerted in the bladder, and no matter what loads are placed on the beds.

[0011] The shroud is preferably a continuous band wrapped peripherally around the top and the sides of the bladder, while at least one of the ends, or preferably both, is or are openable to receive the bladder, and closeable so as fully to encapsulate the bladder. Thus the bladder is trapped against growth beyond its design dimensions.

[0012] According to a preferred but optional feature of the invention, in the double bed configuration the adjacent side faces of both shrouds are fixed to the bottom surface.

[0013] According to yet another preferred but optional feature of the invention, in the double bed configuration, the adjacent edges of the top surfaces of the shrouds are joined, and are also joined to the adjacent lower edges, by a web which forms in common the adjacent side faces of the shrouds.

[0014] According to still another preferred but optional feature of the invention, side and end bolsters adjoin the sides and ends of the shrouds, presenting a concave shape to receive the sides and ends of the shroud to resist outward, tilting, and upward movement of the outer sides and ends.

[0015] According to still another preferred but optional feature of the invention, a flexible surround embraces the assembled group of bladders to hold them in an assembled array.

[0016] The above and other features of this invention will be fully understood from the following detailed description and the accompanying drawings, in which:

Brief Description of the Drawings

[0017]

Fig. 1 is a perspective view, partly in dashed-line notation showing the relationship of the shroud and the bladders;

Fig. 2 is an exploded view of the presently-preferred embodiment of the invention;

Fig. 3 is a cross-section taken at line 3-3 in Fig. 1;

Fig. 4 is a cross-section similar to Fig. 3 showing a modification of the invention;

Fig. 5 is a cross-section similar to Fig. 4, showing a defect of the prior art;

Fig. 6 shows the presently preferred shroud construction, similar to that shown in Fig. 3;

Fig. 7 is a cross-section showing another construction for the shroud; and

Fig. 8 is a cross-section showing yet another construction for the shroud.

Detailed Description of the Invention

[0018] Fig. 1 illustrates the relationship between shroud 10 and bladders 11, 12. The shroud provides a pocket 13, 14 for each of the bladders. The structure includes a peripheral tube-like surround 15, and end closures 16, 17, 18, 19 to close the ends of the surround.

[0019] At least one end closure for each bladder can be opened to receive the bladder. If desired, the other may also be openable, or be permanently closed. With both ends open the bladder can more conveniently be inserted. Attachments means 20 such as hook-loop strips may be provided releasably to hold the closures in the closed position.

[0020] As will be seen, when the end closures are closed and the bladders are inflated, the bladder is entirely encapsulated. While a double bed is illustrated, all of the considerations regarding the double bed are applicable to single bladder (single bed) installations.

[0021] As best shown in Fig. 2, hoses 21 are provided to conduct inflation air into the bladders. They pass through ports 22, 23 in end closures 16, 17. The bladder includes an outer impermeable and flexible skin 25. It is formed from sheet material to the desired shape by tailoring pieces to size and joining them by seam welding techniques. Inner structures are usually provided to restrict flow of air from one region to another inside the bladder. They form no part of the invention, and require no detailed description here.

[0022] The material used is usually a plasticized vinyl material which can be stretched. As described above, such stretching can lead to distension and ultimate damage to the bladder. The bladder is formed so that, when it is inflated and enclosed, it will fill any available room for expansion. The dimensions of the bladder structure are selected so that when it is restricted, its surface will fill the volume defined by the bladder before being sub-

stantially stretched.

[0023] The bladder includes dimension 26 of longitudinal length, of width 27 and of depth 28. When inflated as stated, its surface area will be near to the arithmetic product of these dimensions.

[0024] A shroud 30 according to this invention has dimensions of length, width and depth substantially equal to dimensions 26, 27 and 28 of the inflated bladder.

[0025] The material of the shroud is selected to be flexible, but not appreciably stretchable. Tightly woven fabrics are suitable for this purpose. The intended result is for the shroud to define the intended shape of the inflated mattress.

[0026] The upper face 31 of the shroud performs an additional function. A good cotton based fabric will not tend to leach plasticizers from the bladder material. Heretofore it has been expedient to place an independent layer of similar material on the top of the bladder for this purpose. Because the shroud material performs this additional function, the extra layer can be omitted, at a surprisingly large saving of cost.

[0027] As best shown in Figs. 2 and 3 the bladders (only bladder 11 will be described in detail, because both are alike) has a pair of side faces 33, 34 end faces 35, 36, top face 37 and bottom face 38. These faces are intended to be sensibly planar in the bed as installed, although curvature at the corners and edges is to be expected.

[0028] When installed as a mattress, the assembled shroud and bladder or bladders will be laid into a receptacle formed by side surround 40 (Fig. 2). Surround 40 has a base sheet 41 of cloth laid on the floor. A band 42 is attached at its lower edge 43 to the base sheet. Band 42 is formed as an open rectangular structure, often of soft and decorative material. The resulting rectangular shape is defined by its attachment to the base sheet. As such, it becomes a receptacle for the encapsulated bladders.

[0029] In prior art constructions, a layer of sheet material is often stitched to the upper edges of the surround to keep it from spreading. An advantage of this invention is that such reinforcement is not necessary, and an element of cost is saved.

[0030] Instead, a comfort layer 45 of foam material (perhaps egg-crate type material) can simply be laid in the upper surface of the shroud. The shroud protects the bladder from leaching out of its plasticizer. Normal sheets or bed pads (not shown) can be laid directly onto comfort layer 45.

[0031] The shroud can be provided in several configurations. They all have in common their embrace of all faces of each bladder. The cloth shape can be formed by sewing or cementing as preferred, joining suitably tailored pieces of material.

[0032] Fig. 4 shows the presently preferred embodiment of shroud 50, because it is readily manufactured. The peripheral portion 57 extends completely around both of the bladders to embrace their top faces, bottom

faces, and outer side faces. A web 52 of similar material is attached to the under (inside) surface of the top of portion 57 and to the upper (inside) surface of the bottom of portion 51. This web may be attached by stitching or cementing as desired.

[0033] The end closures are stitched to the upper end edges of portion 57, and are fastened at the lower end edges by a suitably means such as Velcro (TM), a loop and hook fastener.

[0034] The construction of Figs. 3 and 6 is preferred for its ease of manufacture, and also because of the joiner of the web at attachment seams 55, 56. This provides optimum restraint against sidewise rolling movement of the mattress, and also enlists each bladder in side support of the other.

[0035] Fig. 7 shows that instead of a web, each bladder 60, 61 can have its own respective shroud 62, 63. It is convenient to use base sheet 64 as the lower part of the shroud, although individual, complete separate shrouds may be provided. In any event the lower inner parts of the shrouds, such as parts 65, 66 should be anchored to base sheet 64.

[0036] Fig. 7 offers the advantage that both shrouds are independent and both use the base sheet as part of the shroud. Attachment points 67, 68, 69 illustrate this feature. If desired, both shrouds can be part of a single sheet of material.

[0037] Fig. 8 shows another scheme in which shroud 70 is a complete "arch". Shroud 71 is a partial arch, and uses leg 72 of shroud 70 as a web in common with shroud 71.

[0038] It will be appreciated that persons skilled in the art of sewing flexible structures can conceive of other arrangements, all of which will be within this invention.

[0039] Many prior art constructions have by necessity used relatively rigid bolsters along the sides and ends of the mattress to limit the blowing out of the bed. While the improvements of this invention eliminate the need for them, they may be used if desired.

[0040] Fig. 4 shows a pair of foam bolsters 80, 81 which extend along the sides of the bladders. Similar bolsters (not shown) about the ends. The same surround holds the bolsters against the bladder or bladders. A concave surface 83 is intended to trap the edge of the bolster to keep it from climbing.

[0041] There is a problem in the prior art when a shroud is not used. The tendency is shown in Fig. 5 for the bladders not only to expand laterally, but for one to climb over the other, while bowing out the bolsters. As shown, bladder 86 is climbing on bladder 87, and bolsters 88 and 89 are forced apart. This is totally unacceptable, so it is known to hold the two bolsters down, an element of significant expense. It is a benefit of this invention that, while bolsters can if desired be used, they need not be interconnected.

[0042] The bed of this invention is finished with a finish layer 90, usually of attractive quilted material, which is preferably attached around its periphery to the periph-

eral upper edge of the surround. This attachment can be accomplished by a separable zipper along the respective edges and relates in a singularly stable bed, with or without bolsters.

[0043] The underlying foam layer can, if desired, be provided in two pieces instead of one. The occupants can thereby have different levels of cushioning resistance as well as individually selectable inflation air pressure.

[0044] The problem of "rollover" is well known to users of air beds. Even with internal channeling, there is ordinarily some shear movement between the top and the bottom of the bladder. When the shroud is used, especially in a double bed, and the shroud or shrouds is or are attached to be base sheet as shown, such movement is considerably resisted.

[0045] Ultimate ballooning of the bladders is prevented by the shroud, and then results a long-lived attractive bed well worth a premium price.

[0046] This invention is not to be limited by the embodiments shown in the drawings and described in the description, which are given by way of example and not of limitation, but only in accordance with the scope of the appended claims.

Claims

1. In combination:

an air-inflatable bladder having an outer skin made of an organic plastic material having the properties of flexibility, impermeability and extensibility under stress, said bladder having a top face, a bottom face, two side faces and two end faces; and

a shroud made of a cloth having the properties of flexibility and negligible extensibility under stress, said shroud encapsulating said bladder and having shapes and dimensions substantially identical to those of the said outer skin when inflated, whereby said shroud prevents substantial change in total area of the skin when under pressure.

2. A combination according to claim 1 in which said shroud includes at least one area which can be opened to receive said bladder, and closed to retain said bladder.

3. A combination according to claim 2 in which said area is closed by fastener means.

4. A combination according to claim 3 in which said fastener means is a strip of loop-hook material.

5. A combination according to claim 1 in which a surround of flexible, substantially non-extensible ma-

terial surrounds and embraces said shroud, said surround having a peripheral upper edge and a peripheral lower edge, and a base sheet to which said lower edge is continuously attached to provide an open-topped rectangular receiver in which said shroud encapsulated bladder is place. 5

6. In combination:

a pair of said bladders and shrouds according to claim 1. 10

7. A combination according to claim 5 in which said shrouds share a common wall extending from the top of each shroud to the bottom of each shroud, said common wall comprising a web attached at said top and bottom by continuous joinders. 15

8. A combination according to claim 6 in which said shrouds comprise a common base sheet, and a pair of arch shapes attached to said base sheet. 20

9. A combination according to claim 6 in which a surround of flexible, substantially non-extensible material surrounds and embraces said shroud, said surround having a peripheral upper edge and a peripheral lower edge, and a base sheet to which said lower edge is continuously attached to provide an open-topped rectangular receiver in which said shroud encapsulated bladder is place. 25 30

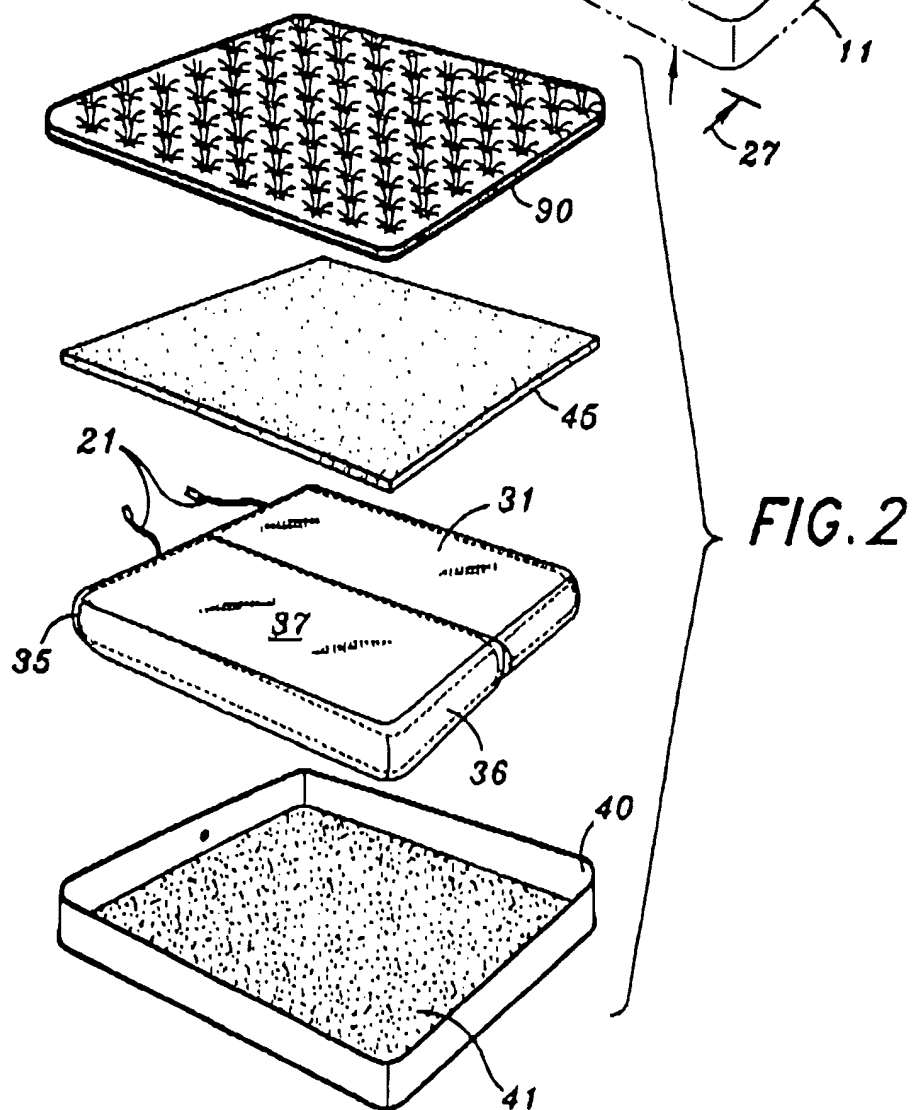
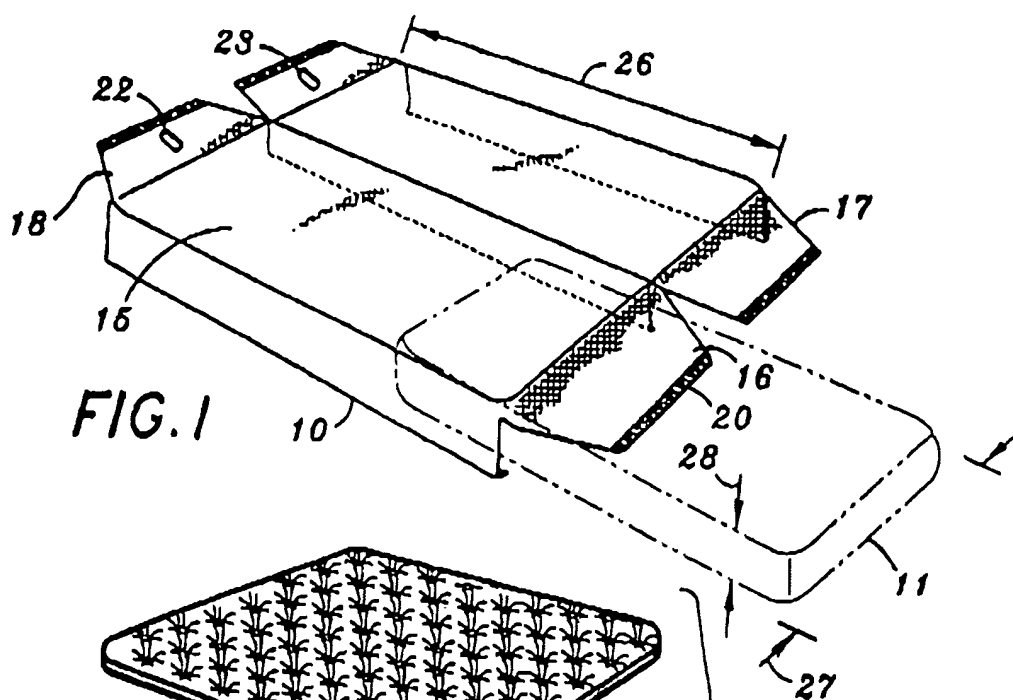
10. A combination according to claim 9 in which layer of foam is laid upon said shroud-encapsulated bladders. 35

11. A combination according to claim 10 in which a finish layer is laid atop said foam layer, continuously attached to said upper edge of said surround by a continuous attachment. 40

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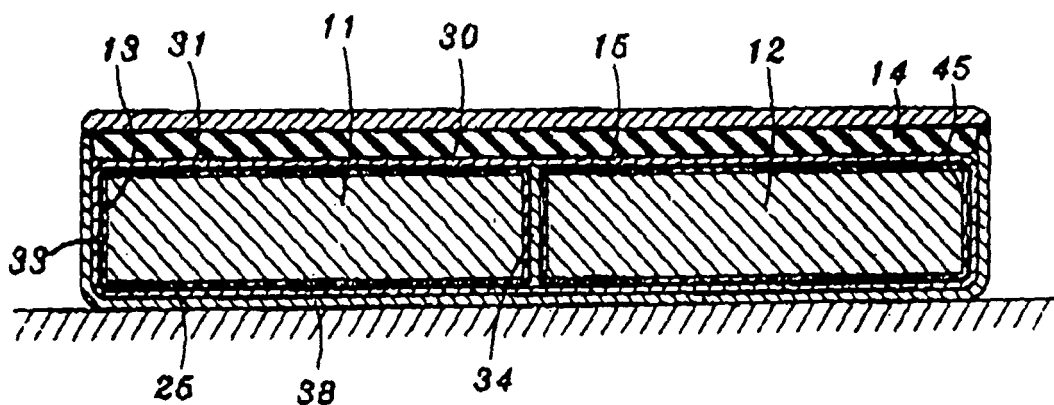


FIG. 3

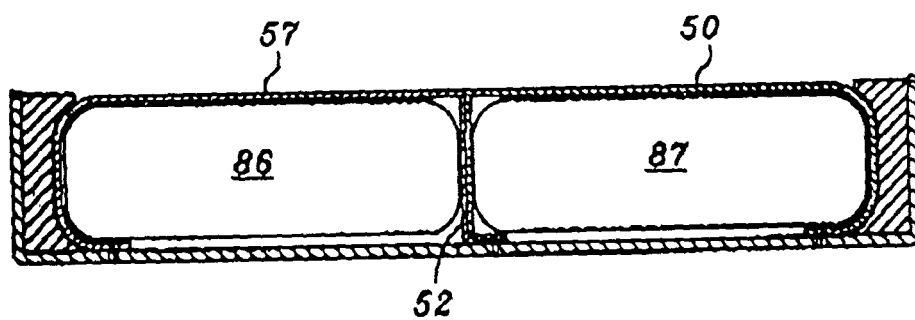


FIG. 4

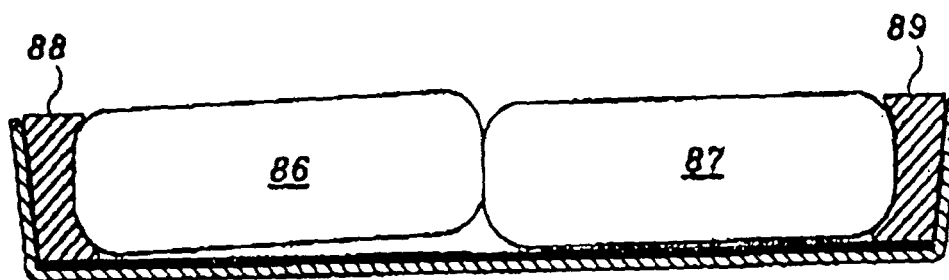


FIG. 5
(PRIOR ART)

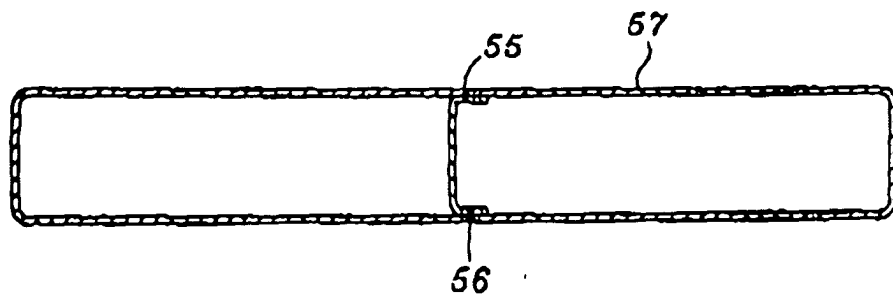


FIG. 6

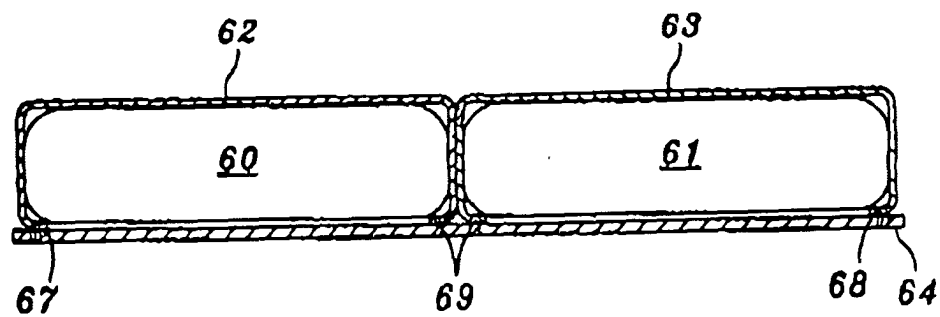


FIG. 7

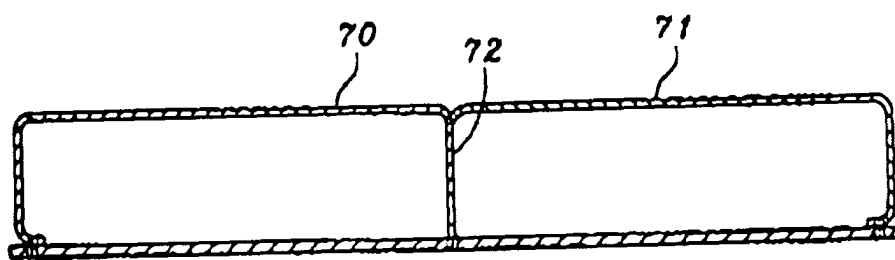


FIG. 8



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 03 25 6304

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		19 January 2004	Kus, S
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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