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(54) **AIR CUSHION**

LUFTKISSEN

COUSSIN PNEUMATIQUE

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Description

Background of the Invention

[0001] Common sportswear such as sneakers, protective pads, helmets, etc, have used traditional sponge, foam rubber, or polymer compositions as shock-absorbing materials. Air inflated cushions have gradually been taking the place of these traditional materials, utilizing gas or liquid contained in an air cushion for absorbing shocks.

[0002] An air cushion is generally made of two sheets placed one on the other and sealed tightly at outer circumferential edges to form a hollow interior inflated with a gas or a liquid. Another kind of air cushion is made by means of an injection molding process to produce a three dimensional air cushion with a hollow interior and then inflating air chambers provided therein with a gas or a liquid. US4 187 620 discloses a similar air cushion.

[0003] A cushion as shown in Figure 1 is made of two sheets placed one on the other and fused together to have an upper flat surface. When a shock is imparted to its surface, it is received on a spot of the cushion and then dispersed gradually to other surfaces. This kind of cushion absorbs only a little shock, and therefore required for energy dispersion is comparatively large. In addition, its center of gravity is high so that instability produced by shock is accordingly increased.

[0004] As can be understood from the stabilizing principles of physics, a cushion with a flat surface can barely support an exterior high force. Such a cushion can only have a shock-absorbing function for an object the cushion is protecting.

[0005] A hollow three dimensional cushion as shown in Figure 2, made by means of an injection molding process, may have a curved upper surface for contacting an object protected by it, but the cushion does not have a structure of shape memorization, and has to rely on an exterior layer added on its surface to form its upper curved surface. The whole curved surface of the cushion is nearly under the lower surface of the object protected, i.e. a shocking surface so that when a shock or a pressure is added to the surface of the cushion by the object, the shock or pressure force cannot be dispersed to two sides, as the cushion is provided with no higher side walls than the height of the cushion. Therefore a shock energy it receives is only temporarily converted into a side effect, limited in absorbing and stabilizing shock, which is not an ideal structure for a cushion.

Summary of the Invention

[0006] The main purpose of the invention is to offer an air cushion with a better structure for shock-absorbing and stability.

[0007] A three dimensional air cushion according to the invention is shown in Figure 3, intended to have the following advantages.

1. Comparatively higher sides, two or three of which are provided with air chambers extending from a center portion so that the air cushion and an object it protects may contact with a curved surface so that dispersion of a surface receiving shock may be increased to minimize moving shock energy, and to maximize a compressible area, and consequently to obtain the largest shock-absorbing effect.

2. It can sufficiently convert shock energy added on an intermediate upper surface into outer side support energy.

3. When shock or pressure disappears, the side support energy can completely return to the point of the shock, forming a rebound energy producing an excellent rebounding effect.

[0008] The buffer-functioning and shock-absorbing effect of air cushions according to the invention has been tested by SATRA FOOTWEAR TECHNOLOGY CENTER in England, and proved to be so far the best structural design for practical use.

Brief Description of the Drawings

[0009] This invention will be better understood by referring to the accompanying drawings, wherein:

Figure 1 is a side cross-sectional view of a conventional air cushion with an upper flat surface as in the present invention;

Figure 2 is a side cross-sectional view of a conventional air cushion with an upper curved-down surface as in the present invention;

Figure 3 is a side cross-sectional view of an air cushion of the present invention;

Figure 4 is a perspective view of a first preferred embodiment of an air cushion of the present invention;

Figure 4a is an alternate embodiment of the first preferred embodiment of an air cushion of the present invention;

Figure 5 is a cross-sectional view taken along line I-I in Figure 4a;

Figure 6 is a cross-sectional view taken along line II-II in Figure 5;

Figure 7 is a cross-sectional view of a second preferred embodiment of an air cushion of the present invention;

Figure 8 is a cross-sectional view taken along line III-III in Figure 7;

Figure 9 is a cross-sectional view of a third preferred embodiment of an air cushion of the present invention;

Figure 10 is a perspective view of a fourth preferred embodiment of an air cushion of the present invention;

Figure 11 is a cross-sectional view taken along line IV-IV in Figure 10;

Figure 12 is a perspective view of a fifth preferred embodiment of an air cushion of the present invention;

Figure 13 is a cross-sectional view taken along line V-V in Figure 12;

Figure 14 is a cross-sectional view of a sixth preferred embodiment of an air cushion of the present invention;

Figure 15 is a cross-sectional view of a seventh preferred embodiment of an air cushion of the present invention;

Figure 16 is a cross-sectional view of various air cushions of the invention practically utilized in a sneaker;

Figure 17 is a perspective view of a eighth preferred embodiment of an air cushion of the present invention;

Figure 18 is a perspective view of a ninth preferred embodiment of an air cushion of the present invention; and

Figure 19 is a perspective view of a tenth preferred embodiment of an air cushion of the present invention;

Detailed Description of the Preferred Embodiments

[0010] A three dimensional air cushion of the present invention can be formed as a heel air cushion as shown in Figure 4, a foot bottom air cushion as shown in Figure 10 or a shoe sole air cushion as shown in Figure 12, not limited in its shape, and adaptable to sneakers, protective pads, helmets, etc.

[0011] A first preferred embodiment of a three dimensional air cushion of the present invention, as shown in Figures 4, 4a, 5 and 6, includes a plurality of independent air chambers 10 or communicated air chambers 10 with passageways 11. Every air chamber 10 can extend to two opposite sides of the cushion body 1, forming a three dimensional inner upper surface and a lower flat smooth curved surface not protruding into the air chambers 10. The sealed peripheral edge of the cushion body 1 can be of a geometric shape. The hollow interior surrounded by the sealed peripheral edge has a projected surface area smaller than the upper surface area of the cushion body 1. The cushion body 1 is of a curved shape occupying a three dimensional space, adaptable to be inwardly recessed or having swollen curved cushions.

[0012] A second preferred embodiment of an air cushion of the present invention, as shown in Figures 7 and 8, includes a cushion body 1, a plurality of air chambers as the first preferred embodiment, with one or more recessed elongated grooves 12 provided in a lower surface so as to form a three dimensional recessed surface, and the upper surface is formed flat and smooth with a curvature.

[0013] A third preferred embodiment of an air cushion of the present invention, as shown in Figure 9, is formed almost the same as the second preferred embodiment,

but with one or more elongated grooves 12 formed both on the upper surface and the lower surface.

[0014] A fourth preferred embodiment of an air cushion of the present invention, as shown in Figure 10 and 11, includes a cushion body 1, formed to support a foot bottom, having elongated grooves 12 formed in an upper surface or in a lower surface as shown in Figure 8, or in both the upper and the lower surface as shown in Figure 9. As this foot bottom air cushion is to be fixed in an intermediate portion of a sneaker, the two opposite sides are curved upwardly in a preset angle, different from the three dimensionally curved inward or swollen air cushion described above. The special feature of this air cushion is that the inner surface area is smaller than the outer surface area, and each elongated groove 12 of each air chamber 10 has two ends with a projected line extending nearly vertically to the projected elevational surface of the groove.

[0015] A fifth preferred embodiment of an air cushion of the present invention, as shown in Figures 12 and 13 includes an air cushion for use in a toe region of a foot bottom.

[0016] A sixth preferred embodiment of an air cushion of the present invention, as shown in Figure 14, includes an outer layer 2 of a different material from the cushion body 1 added on the cushion body 1 of the first preferred embodiment, but also adaptable to other air cushions.

[0017] A seventh preferred embodiment of an air cushion of the present invention, as shown in Figure 15 includes an outer layer 2 of a different material from the cushion body 1 added on the cushion body of the third preferred embodiment shown in Figure 9.

[0018] The air chambers 10 provided in a cushion body 1 of the various preferred embodiments can be filled with a gas, or a liquid, as the air cushion 1 itself is a hollow sealed body. In addition, a one-way air valve and pump device may be attached with the air cushion body 1 for filling its interior with a needed pressure with a gas or a liquid.

[0019] An eighth, ninth and tenth preferred embodiment of an air cushion of the present invention, as shown in Figure 17-19, includes a fluid inlet 15, including a valve 13 (as shown in Figure 17) or two valves 13 (as shown in Figure 18) located on opposite sides of a pump device 14.

[0020] Figure 16 shows the three air cushions shown in Figures 4, 10 and 12, adapted to be used on a sneaker. The air cushions can be used without or with an outer layer added, with a wide variation of details. Besides, recessed grooves in an upper surface and/or a lower surface can be made independent or connected with each other.

[0021] Referring to Figure 3, the air chambers 10 of the air cushion 1 extend to two curved-up opposite sides, having a curved surface contacting an object protected by it, increasing the dispersing shock-bearing surface to produce a minimum moving of shock energy and comparatively large compressible dimensions to produce

maximum shock-absorbing effect. When the air cushion 1 receives a downward shock, the shock pressure will disperse to the two higher sides so that the two opposite higher sides receive larger pressure to produce a clamping effect against the object or the shock source. Then the object, for example a foot, will be moved to the center of the air cushion. In other words, the air cushion can automatically clamp the object or the shock source towards its center and consequently obtain the largest stability. If the shock disappears, the dispersed pressure to the two sides will move back to the location of the shock, forming a rebounding force, and thus giving the air cushion an excellent shock-absorbing function.

Claims

1. A three dimensional air cushion (1) **characterized by**

a plurality of interconnected sealed air chambers (10) each having a defined peripheral edge, said plurality of interconnected air chambers (10) together defining a central air chamber portion, two opposite side edges, a leading edge and a trailing edge, said plurality of interconnected air chambers (10) extending upwardly from said central air chamber portion and entirely along a longitudinal axis of said plurality of interconnected air chambers and entirely along at least one edge and including said two opposite side edges.

2. The three dimensional air cushion as claimed in claim 1, wherein said plurality of air chambers (10) extend upwardly from said central portion at one of said leading edge and said trailing edge.

3. The three dimensional air cushion as claimed in claim 1 or 2, wherein at least one of said plurality of air chambers (10) has a one-way valve (13) to communicate with open air.

4. The three dimensional air cushion as claimed in any preceding claim, wherein an upper surface is provided with at least one recessed elongated groove (12) and a lower surface is flat and smooth.

5. The three dimensional air cushion as claimed in any preceding claim, wherein a lower surface is provided with at least one recessed elongated groove (12), and an upper surface is flat and smooth.

6. The three dimensional air cushion as claimed in any preceding claim, wherein an upper surface and a lower surface are provided with at least one recessed elongated groove (12).

7. The three dimensional air cushion as claimed in claim 6, wherein said elongated recessed grooves (12) provided in said upper surface and lower surface are connected with each other.

8. The three dimensional air cushion as claimed in any preceding claim, wherein said air cushion is a component in one of a shoe, a sneaker, a protective pad, and a helmet, for providing a buffer and shock-absorbing effect.

9. The three dimensional air cushion as claimed in any preceding claim, further including an inlet (15) for filling fluid.

10. The three dimensional air cushion as claimed in claim 9, further including a valve device (13).

11. The three dimensional air cushion as claimed in claim 9 or 10, further including a pump device (14).

12. The three dimensional air cushion as claimed in any of claims 9 to 11, wherein said air chamber (10) is filled with a liquid fluid.

13. The three dimensional air cushion as claimed in any of claims 9 to 11, wherein said air chamber (10) is filled with semi-liquid fluid.

14. The three dimensional air cushion as claimed in any of claims 9 to 11, wherein said air chamber (10) is filled with foam material.

15. The three dimensional air cushion as claimed in any of claims 9 to 11, wherein said air chamber (10) is filled with a gas other than air.

Patentansprüche

1. Dreidimensionales Luftkissen (1), **gekennzeichnet durch**

eine Mehrzahl untereinander verbundener versiegelter Luftkammern (10), die jeweils einen festgelegten peripheren Rand haben, wobei die Mehrzahl untereinander verbundener Luftkammern (10) gemeinsam einen zentralen Luftkammerabschnitt, zwei gegenüberliegende Seitenränder, einen vorderen Rand und einen hinteren Rand definiert, wobei sich die Mehrzahl untereinander verbundener Luftkammern (10) aufwärts vom zentralen Luftkammerabschnitt aus und vollständig entlang einer Längsachse der Mehrzahl untereinander verbundener Luftkammern und vollständig entlang zumindest einem Rand und einschließlich der beiden gegenüberliegenden Sei-

tenränder erstreckt.

2. Dreidimensionales Luftkissen nach Anspruch 1, wobei sich die Mehrzahl von Luftkammern (10) vom zentralen Abschnitt aus am vorderen Rand oder am hinteren Rand aufwärts erstreckt.
3. Dreidimensionales Luftkissen nach Anspruch 1 oder 2, wobei zumindest eine aus der Mehrzahl von Luftkammern (10) ein Einwegventil (13) aufweist, um mit dem Freien in Verbindung zu stehen.
4. Dreidimensionales Luftkissen nach einem der vorangehenden Ansprüche, wobei eine obere Fläche mit zumindest einer zurückgezogenen länglichen Rille (12) versehen ist und eine untere Fläche flach und glatt ist.
5. Dreidimensionales Luftkissen nach einem der vorangehenden Ansprüche, wobei eine untere Fläche mit zumindest einer zurückgezogenen länglichen Rille (12) versehen ist, und eine obere Fläche flach und glatt ist.
6. Dreidimensionales Luftkissen nach einem der vorangehenden Ansprüche, wobei eine obere Fläche und eine untere Fläche mit zumindest einer zurückgezogenen länglichen Rille (12) versehen sind.
7. Dreidimensionales Luftkissen nach Anspruch 6, wobei die länglichen zurückgezogenen Rillen (12), die in der oberen Fläche und in der unteren Fläche vorgesehen sind, miteinander verbunden sind.
8. Dreidimensionales Luftkissen nach einem der vorangehenden Ansprüche, wobei das Luftkissen eine Komponente in einem Schuh, einem Sneaker, einem Schutzpolster oder einem Helm ist, um einen Puffer und eine stoßdämpfende Wirkung zu bieten.
9. Dreidimensionales Luftkissen nach einem der vorangehenden Ansprüche, weiterhin umfassend einen Einlass (15) zum Einfüllen von Fluid.
10. Dreidimensionales Luftkissen nach Anspruch 9, weiterhin umfassend eine Ventileinrichtung (13).
11. Dreidimensionales Luftkissen nach Anspruch 9 oder 10, weiterhin umfassend eine Pumpeinrichtung (14).
12. Dreidimensionales Luftkissen nach einem der Ansprüche 9 bis 11, wobei die Luftkammer (10) mit einem flüssigen Fluid gefüllt ist.
13. Dreidimensionales Luftkissen nach einem der Ansprüche 9 bis 11, wobei die Luftkammer (10) mit einem halbflüssigen Fluid gefüllt ist.

14. Dreidimensionales Luftkissen nach einem der Ansprüche 9 bis 11, wobei die Luftkammer (10) mit Schaummaterial gefüllt ist.

- 5 15. Dreidimensionales Luftkissen nach einem der Ansprüche 9 bis 11, wobei die Luftkammer (10) mit einem anderen Gas als Luft gefüllt ist.

10 Revendications

1. Coussin d'air tridimensionnel (1), **caractérisé par**

une pluralité de chambres à air interconnectées scellées (10) ayant chacune un bord périphérique défini,
ladite pluralité de chambres à air interconnectées (10) définissant ensemble une portion de chambre d'air centrale, deux bords latéraux opposés, un bord avant et un bord arrière,
ladite pluralité de chambres à air interconnectées (10) s'étendant vers le haut depuis ladite portion de chambre à air centrale et entièrement le long d'un axe longitudinal de ladite pluralité de chambres à air interconnectées et entièrement le long d'au moins un bord et incluant lesdits deux bords latéraux opposés.

2. Coussin d'air tridimensionnel selon la revendication 1, où ladite pluralité de chambres à air (10) s'étend vers le haut depuis ladite portion centrale à l'un parmi ledit bord avant et ledit bord arrière.
3. Coussin d'air tridimensionnel selon la revendication 1 ou 2, où au moins une de ladite pluralité de chambres à air (10) présente une vanne à une voie (13) pour communiquer avec l'air ouvert.
4. Coussin d'air tridimensionnel selon l'une des revendications précédentes, où une surface supérieure présente au moins une rainure évidée oblongue (12), et une surface inférieure est plate et lisse.
5. Coussin d'air tridimensionnel selon l'une des revendications précédentes, où une surface inférieure présente au moins une rainure évidée oblongue (12), et une surface supérieure est plate et lisse.
6. Coussin d'air tridimensionnel selon l'une des revendications précédentes, où une surface supérieure et une surface inférieure présentent au moins une rainure évidée oblongue (12).
7. Coussin d'air tridimensionnel selon la revendication 6, où lesdites rainures évidées oblongues (12) réalisées dans ladite surface supérieure et ladite surface inférieure sont reliées l'une à l'autre.

8. Coussin d'air tridimensionnel selon l'une des revendications précédentes, où ledit coussin d'air est un composant dans l'un parmi une chaussure, une chaussure de sport, un coussinet de protection et un casque pour produire un effet d'amortissement et d'absorption des chocs. 5
9. Coussin d'air tridimensionnel selon l'une des revendications précédentes, comprenant en outre une entrée (15) pour introduire un fluide. 10
10. Coussin d'air tridimensionnel selon la revendication 9, comprenant en outre un dispositif de vanne (13).
11. Coussin d'air tridimensionnel selon la revendication 9 ou 10, comprenant en outre un dispositif formant pompe (14). 15
12. Coussin d'air tridimensionnel selon l'une des revendications 9 à 11, où ladite chambre à air (10) est remplie avec un fluide liquide. 20
13. Coussin d'air tridimensionnel selon l'une des revendications 9 à 11, où ladite chambre à air (10) est remplie avec un fluide semi-liquide. 25
14. Coussin d'air tridimensionnel selon l'une des revendications 9 à 11, où ladite chambre à air (10) est remplie avec un matériau mousse. 30
15. Coussin d'air tridimensionnel selon l'une des revendications 9 à 11, où ladite chambre à air (10) est remplie avec un gaz autre que l'air.

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FIG. 1
(PRIOR ART)



FIG. 2
(PRIOR ART)

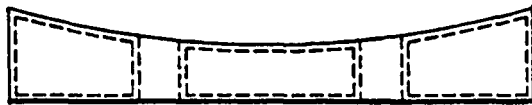


FIG. 3

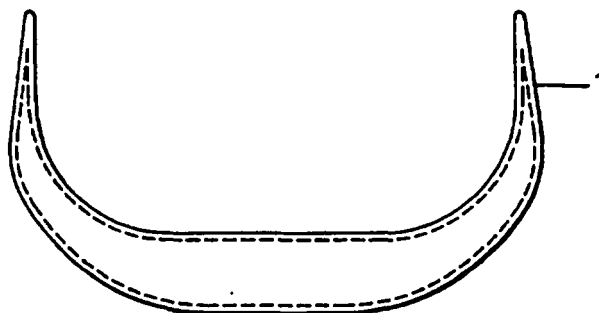


FIG. 4

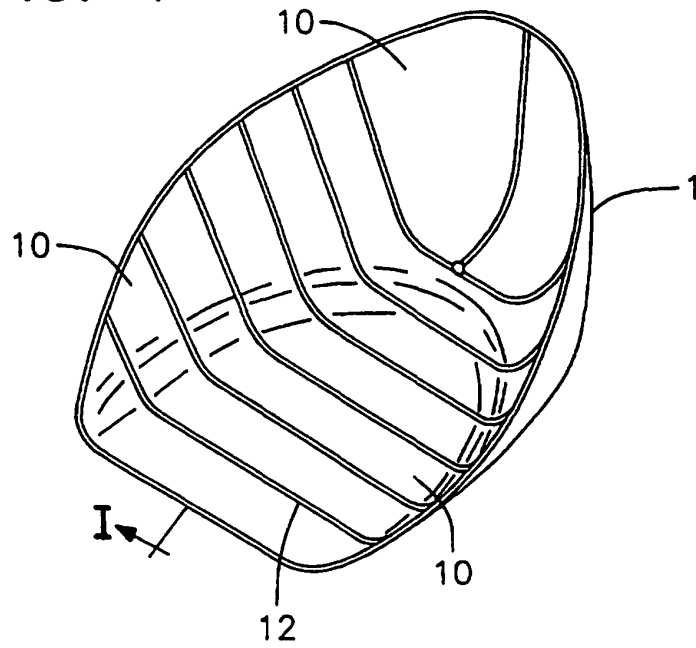


FIG. 5

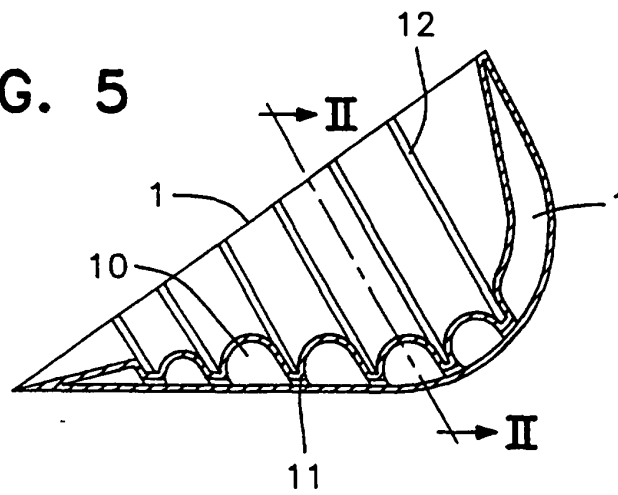


FIG. 6

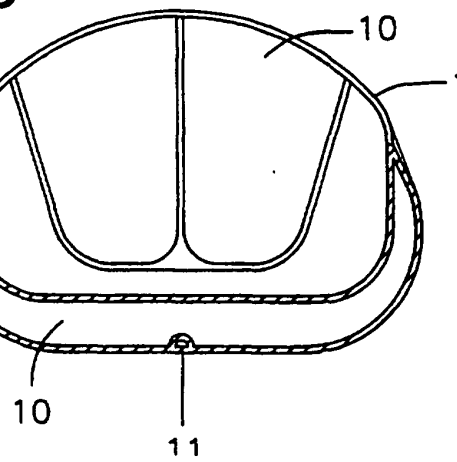


FIG. 4a

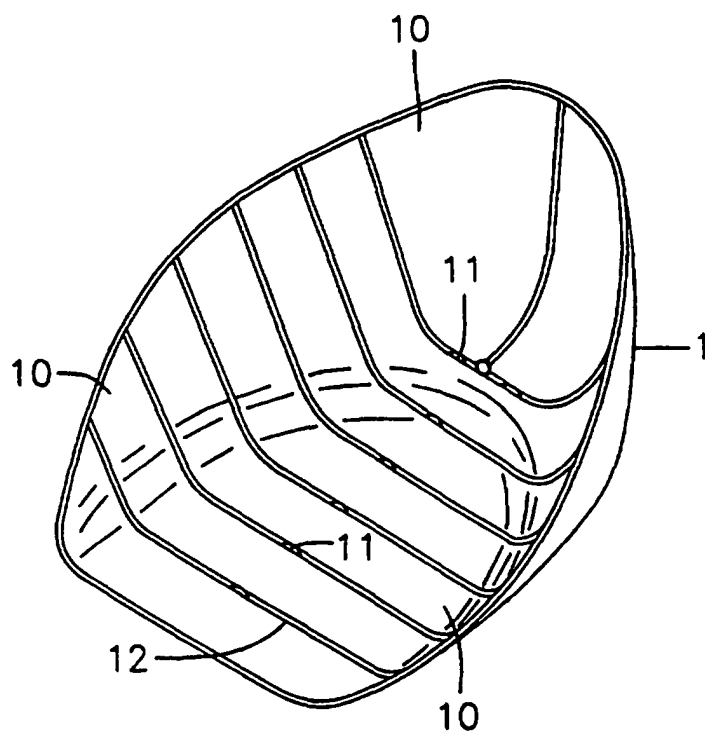


FIG. 19

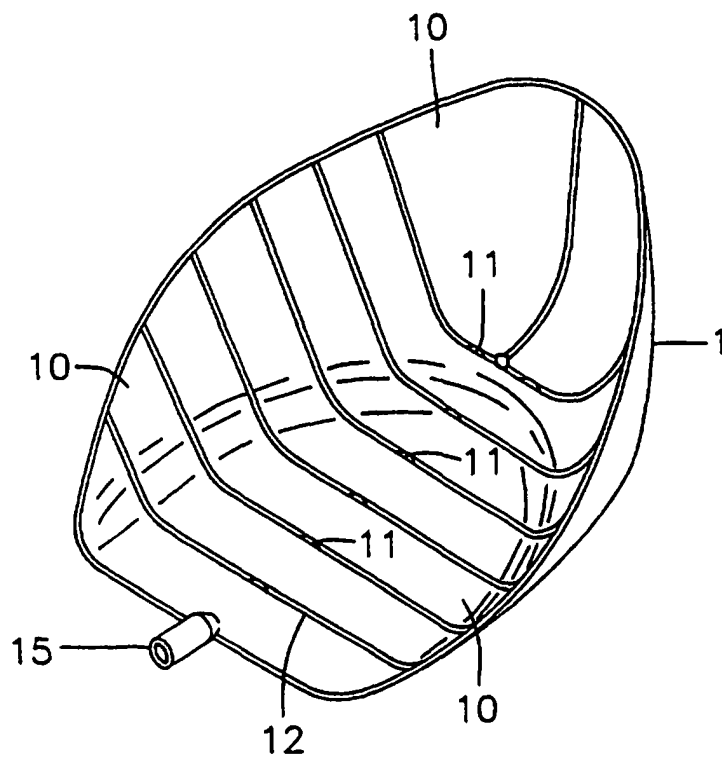


FIG. 7

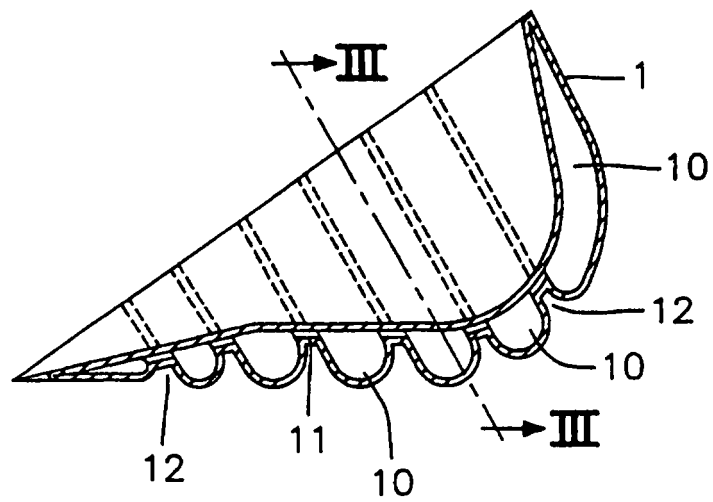


FIG. 8

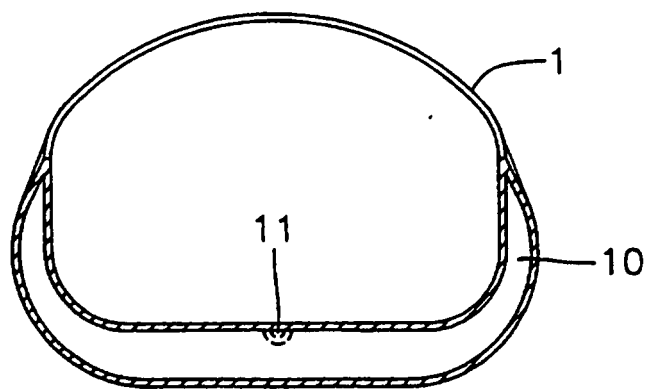


FIG. 9

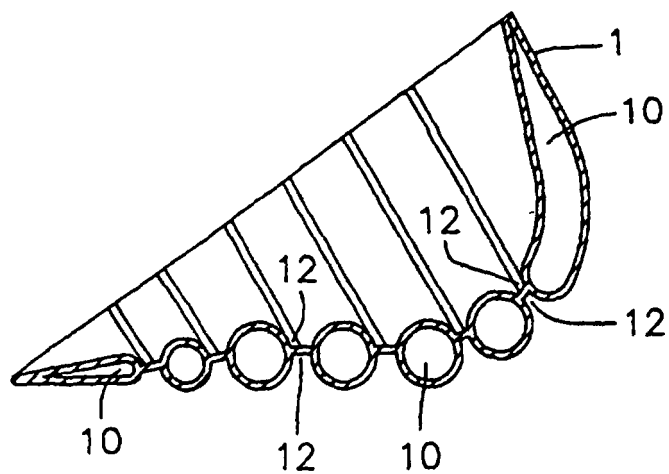


FIG. 10

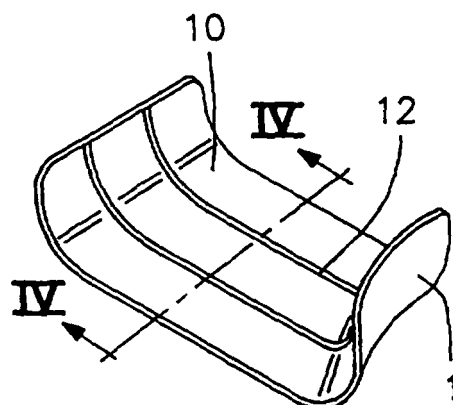


FIG. 11

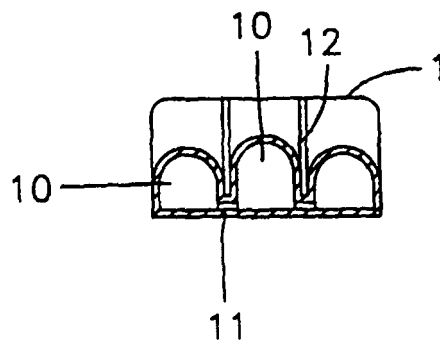


FIG. 12

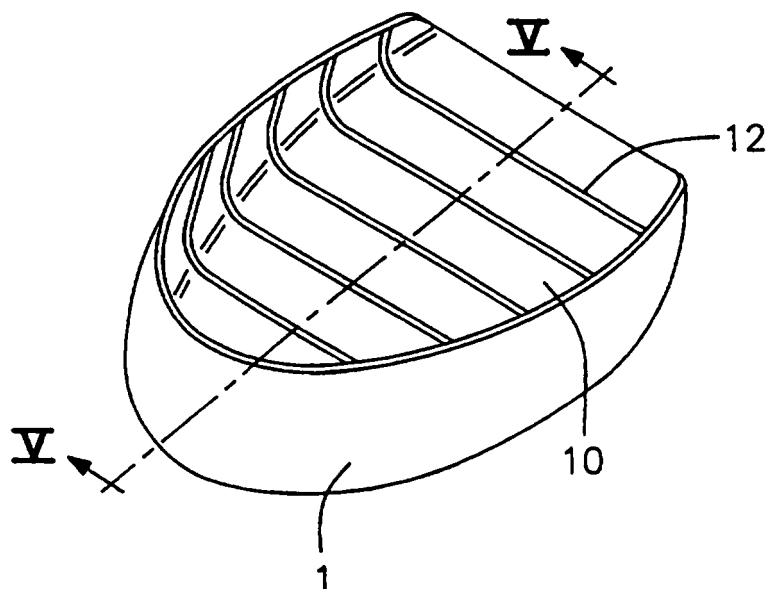


FIG. 13

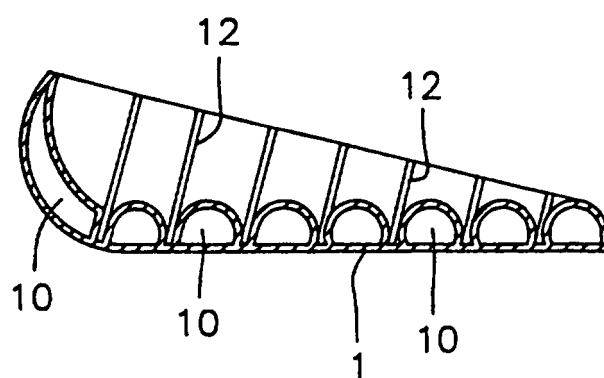


FIG. 14

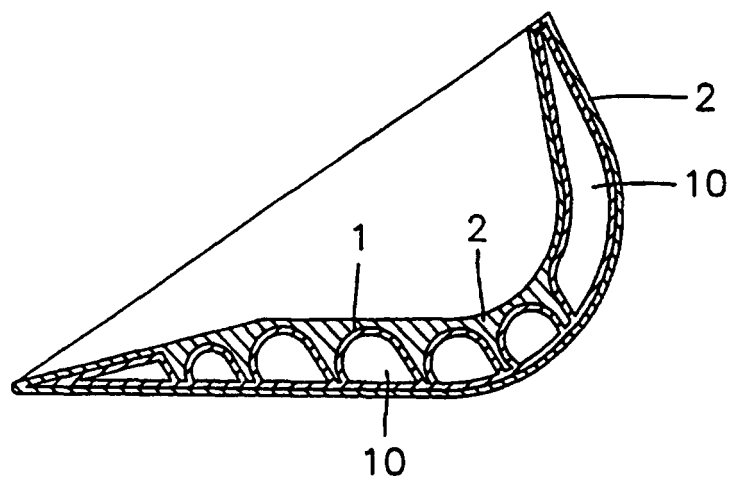


FIG. 15

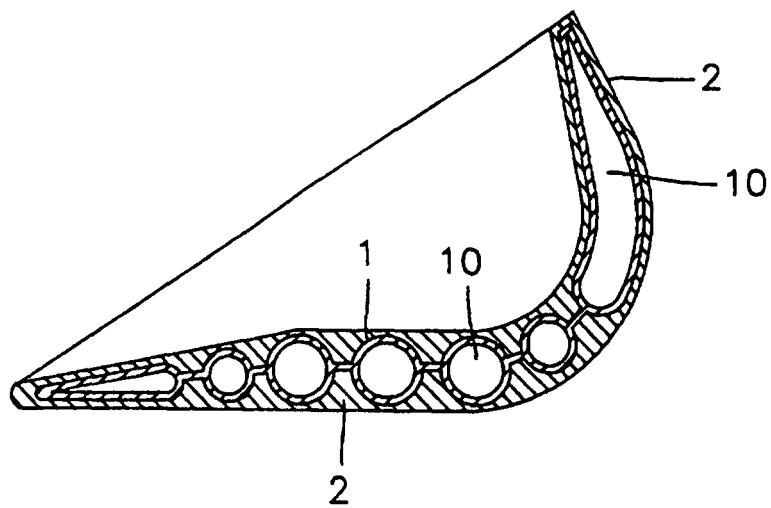


FIG. 16

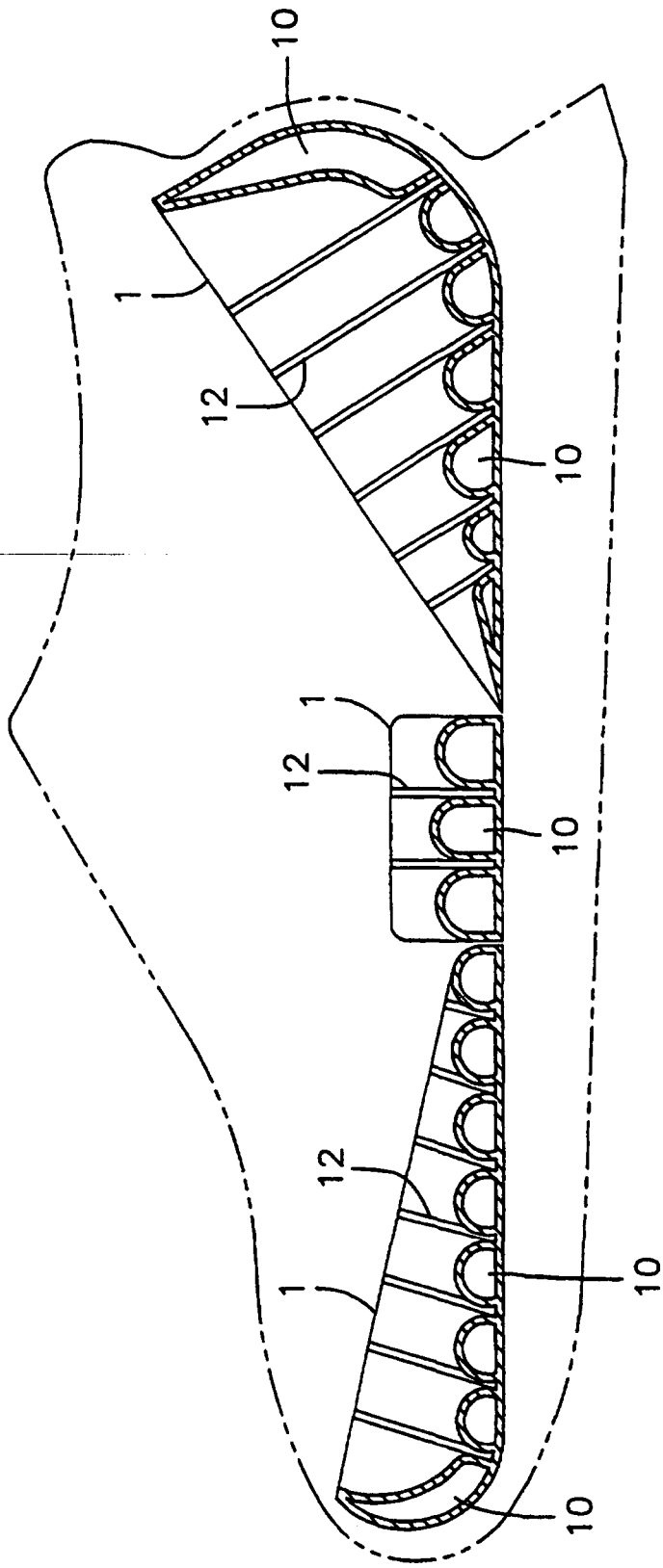


FIG. 17

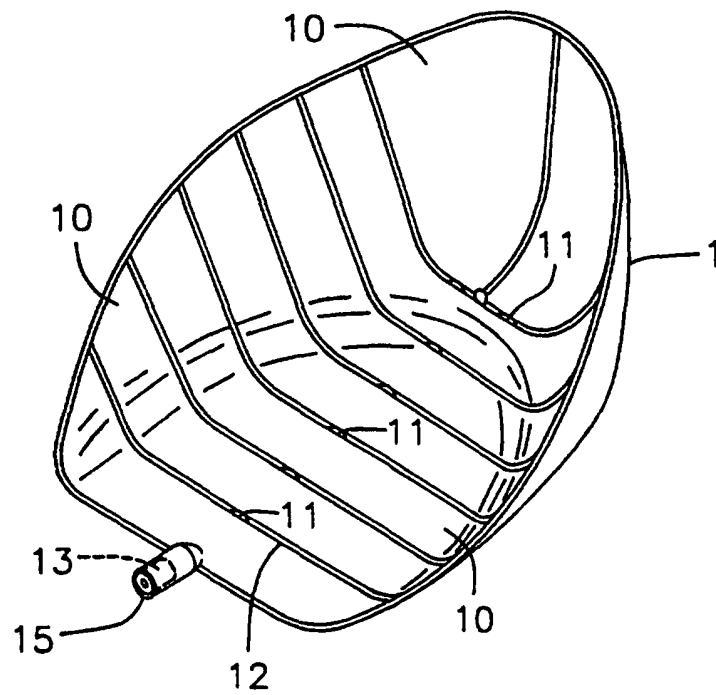
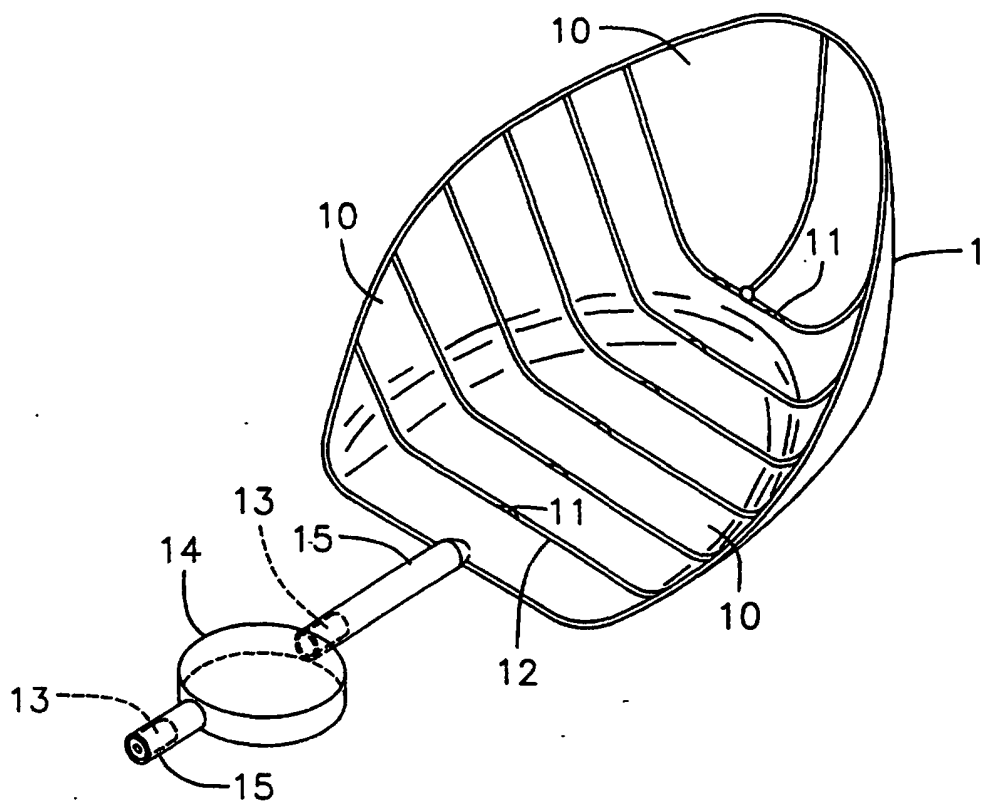


FIG. 18



REFERENCES CITED IN THE DESCRIPTION

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