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(54) **EXPANDABLE STRUCTURE**

AUSDEHNBARE STRUKTUR

STRUCTURE EXTENSIBLE

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Description

[0001] The present invention relates to an expandable structure and in particular to an expandable structure which may be compressed to a substantially flat configuration.

[0002] Over recent years there have been many products made from or incorporating an expandable structure. These expandable or "pop-up" structures often comprise resilient members which are in the form of a loop. The loop-shaped members may be twisted into a figure of eight shape or similar shape and then folded over to give a more compact configuration for storage or transportation. Due to the resilient nature of the loop-shaped members, they tend to unfold into their expanded loop configuration when released from the compressed storage configuration. This allows products to have a compressed storage or transportation configuration ready for use.

[0003] However, whilst such structures are useful they have a number of disadvantages. Firstly, the shape and configuration of the resilient members places limitations on the size, shape and potential uses of the expandable structure. Furthermore, the twisting and folding motion needed to compress many of the expandable structures is often difficult to perform and may require some strength.

[0004] US2003/0183263 discloses a foldable self-erecting tent having an elongate shell of fabric material and frame ribs. The tent has an entrance at one end of the elongate shell.

[0005] There is therefore a need for an improved expandable structure.

[0006] The present invention seeks to provide an improved expandable structure.

[0007] According to the present invention there is provided an expandable structure which is expandable from substantially flat configuration to an expanded elongate configuration wherein the structure has a first end and second end and an axis extending between the first and second end, the expandable structure comprising a frame which comprises a plurality of interconnected resilient members which extend from the first end of the structure to the second end of the structure, and wherein adjacent resilient members extend around the axis of the structure in opposite directions defining a longitudinally extending aperture in a side wall of the structure, this aperture being configured to allow a person to step through said aperture.

[0008] Conveniently, the expandable structure has a substantially cylindrical shape in the expanded configuration.

[0009] Preferably, the resilient members comprise a metal.

[0010] Advantageously, the metal is steel.

[0011] Preferably, the resilient members comprise a plastic.

[0012] Conveniently, the expandable structure comprises a fabric cover surrounding the frame.

[0013] Advantageously, the expandable structure is a shelter.

[0014] Preferably, the expandable structure is sized to allow a person to sit inside the structure.

[0015] Conveniently, the expandable structure is sized to allow a person to stand inside the structure.

[0016] Advantageously, the expendable structure is a boat.

[0017] Preferably, the expandable structure is a tent.

[0018] The present invention will now be described, by way of example, with reference to the accompanying figures in which;

Figure 1 is a perspective view of an expandable shelter in an expanded configuration;
Figure 2 is a perspective view of the shelter shown in Figure 1 in a compressed configuration;
Figure 3 is a perspective view showing the frame of the shelter of Figure 1;
Figure 4 is a side view of the frame of Figure 3;
Figure 5 is a plan view of the frame of Figure 3;
Figure 6 is a perspective view of an alternative shelter according to the present invention;
Figure 7 is a perspective view of a further embodiment of the present invention;
Figure 8 is a side view of a shelter in accordance with the present invention;
Figure 9 is a partial perspective view of the frame of the shelter of the Figure 8;
Figure 10 is a view corresponding to Figure 9 showing the frame in a compressed configuration;
Figure 11 is a perspective view of a frame of an alternative embodiment of the present invention;
Figure 12 is a perspective view of a further embodiment of the present invention;
Figure 13 is a perspective view of a storage unit in accordance with the present invention;
Figure 14 is a perspective view of a boat in accordance with the present invention; and
Figure 15 is a perspective view of a shelter in accordance with the present invention.

[0019] Turning to Figure 1, a shelter 10 is shown which has a substantially cylindrical shape. The shelter 10 comprises a circular floor 12 and a circular roof 14 joined by an arcuate peripheral wall 16 which extends around about 270° of the periphery of each of the floor 12 and roof 14. The wall 16 extends vertically from the floor 12 to the roof 14. The shelter has an aperture 18 defined by the base 12, roof 14 and wall 16. The shelter 10 is sized to allow a person to step through the aperture 18 to stand in the interior of the shelter 10.

[0020] As will be described below, the shelter 10 also comprises an expandable frame which allows the shelter 10 to be axially compressed to a substantially flat configuration. Figure 2 shows the shelter 10 in its substantially flat, disc-like configuration. The compressed shelter 10 may then be put into a bag or held in the compressed

state by some other means. If the compressed shelter 10 is released, it will expand by itself to the expanded shape shown in Figure 1.

[0021] Figure 3 shows the frame 20 of the shelter 10. In other words, Figure 3 shows the shelter 10 of Figure 1 without the outer cover which comprises the floor 12, roof 14 and wall 16. The inner frame 20 of the shelter 10 comprises a number of steel members joined together. The frame 20 comprises a ring-shaped floor member 22, a ring-shaped roof member 24, and a wall frame 26 linking them together.

[0022] The wall frame 26 comprises a number of arcuate segments linked together in a particular configuration. In the embodiment shown in Figure 3, the wall frame 26 comprises ten segments joined together. All of the segments describe portions of helical paths around the long axis of the expandable shelter 10 between the floor 22 and roof 24. The first segment 30 defines a portion of a helical path extending downwardly from roof 24 in an anti-clockwise manner (when viewed from above). The first member 30 defines a path of around 270° around the axis of the shelter 10.

[0023] A second member 32 is joined to the lower end of the first member 30 and again extends downwardly towards the floor 22 in a helical path for around 270° around the axis of the shelter 10. However, the second member 32 defines a helical path in a clockwise direction (when viewed from above) which is the opposite direction to that defined by the first member 30.

[0024] A third member 34 is attached to the lower end of the second member 32 and extends downwardly in a left-handed helical direction in a substantially identical manner to that of the first member 30. This series of connected members having helical paths of opposite direction continues from a first member 30 onwards through the second member 32, third member 34, fourth member 36, fifth member 38, sixth member 40, seventh member 42, eight member 44, ninth member 46 and finally tenth member 48. The tenth member 48 is attached to the floor member 22.

[0025] The ten wall members 30 to 48 are substantially vertically aligned so as to define a vertical aperture or slot 28 extending between the floor member 22 and the roof member 24. The resilient nature of the wall members 30 to 48 has the result that the frame 20 may be axially compressed to a substantially flattened configuration in an elastic manner. When released from the substantially flat configuration, the frame 20 will self expand to the expanded configuration shown in Figure 3.

[0026] Figure 4 shows a side view of the frame 20 which clearly shows the helical nature of wall members 30 to 48 as they extend between the base member 22 and the roof member 24. Figure 5 is a plan view of the frame 20 showing that the wall members 26 define a substantially cylindrical chamber between the roof member 24 and the floor member 22.

[0027] The configuration of alternating members which extend around the axis of the expandable structure in opposite directions allows the expandable structure to have an aperture extending substantially along its length. This allows its use in pop-up shelters because the user may step through the aperture and into the interior of the shelter in order to avoid inclement weather. This is particularly suitable for applications such as watching sports or other outdoor pursuits. The shelter may be easily carried by the user in its compressed state, for example, in a bag. The user may then take the shelter out of the bag and allow it to expand to and then step inside the shelter to view, for example, a game of football. The user may then axially compress the shelter by pressing down on the roof to force it into the flattened configuration, and then put it into a bag.

[0028] Figure 6 shows an alternative shelter 60 according to the present invention which is shorter but wider than the shelter 10 shown in Figure 1. The shelter 60 in Figure 6 is provided with an aperture 62 in its side. The shelter 60 is sized to allow a user to sit inside the shelter rather than to stand and is particularly suitable for use by fishing enthusiasts who could easily transport the shelter 60 in its compressed configuration to a desired fishing location and then set the shelter up ready for use. The user then may sit inside the shelter 60 whilst fishing.

[0029] Figure 7 shows a shelter 50 similar to shelter 10 shown in Figure 1, having an aperture 52 in its side. A door 54 is provided in the lower half of the aperture 52. The fabric door 54 is attached to the aperture 52 by a zip and may be completely removed or alternatively attached to the extent that is suitable for the user of the shelter 50.

[0030] Figure 8 is a side view of an alternative shelter 70 which is provided with an aperture 72 in its side. The roof 74 of the shelter 70 is not flat but is raised into a pitched configuration.

[0031] Figure 9 is a view of the top of the frame of the shelter 70 of Figure 8 and comprises a ring-shaped roof member 76 and a peak member 78. The peak member 78 is a resilient arcuate member which is attached to the roof member 76 at two diametrically opposed positions. As shown in Figure 10, the peak member 78 may be folded down from the configuration shown in Figure 9 to be substantially planar with the roof member 76. The peak member 78 is biased to the upright position shown in Figure 9. The peak member 78 allows shelters of the present invention to have a peaked roof in order that rain may easily run off the roof of the shelter rather than collect. The resilient and foldable nature of the peak member 78 allows the whole shelter to be compressed to a substantially flat configuration and then return to the peaked configuration when released.

[0032] Although the above shelters have been described with reference to a substantially cylindrical shape having a circular cross-section, the present invention is also applicable to other shapes of expandable structure, for example, those having non-helical segments.

[0033] Figure 11 shows a frame 80 of an alternative shelter in accordance with the present invention. The frame 80 comprises a triangular base member 82 and a

triangular roof member 84. Wall members 86 extend between the base member 82 and the roof member 84. In a similar way to the frame 20 shown in Figure 3, the frame 86 comprises a number of resilient members which extend around the axis of the frame 80 in alternate and opposite rotational directions. In this case, the wall members describe paths along two-sides of a triangular prism defined between the floor member 82 and the roof member 84. Again, the configuration of the members 86 defines an aperture 88 on one side of the frame 80. This aperture may be used to allow a user to step into a shelter which comprises a frame 80.

[0034] Figure 12 shows an alternative frame 90 of the present invention. The frame 90 has substantially square cross-section and comprises a square base member 92 and a square roof member 94. Wall members 96 extend between the base 92 and a roof 94 and define paths around three sides of a cuboid. One face of the frame 90 defines an aperture 98 which allows the user to step into the interior of the frame 90.

[0035] The members used to form the frames of the expandable structures of the present invention are resilient or elastic in nature. Suitable materials include metals, such as steel and "memory metals" such as nickel-titanium alloys. Plastic materials may also be used, such as polyethylene and polypropylene.

[0036] Furthermore, in addition to providing shelters, tents and related structures, the present invention is also applicable to a wide range of other uses.

[0037] Figure 13 shows an expandable storage unit 100 of a substantially cylindrical shape having a base 102, roof 104 and a side wall 106. An aperture 108 is provided in one side of the storage unit 100 between the base 102 and roof 104. The interior of the unit 100 is provided with a plurality of shelves 110. The unit 100 may be suspended by hook 112 at a suitable location, or may be stood on the floor.

[0038] Figure 14 shows an expandable boat 120 according to the present invention. The boat 120 comprises a central substantially cylindrical hull 122 and two inflatable cylindrical pontoons 124 and 126 positioned one on each side of the hull 122. The hull 122 has a conical bow 128 at its front end and a substantially flat circular stem 130 at its rear. An aperture 134 is provided on the top of the hull 122. The hull 122 comprises a resilient expandable frame covered by a waterproof PVC fabric. The conical bow 128 is formed by a spiral-shaped member whilst the stem 130 is formed by a ring shaped member for storage or transportation. The pontoons 124 and 126 are deflated and the hull 122 compressed along the axis between the bow 128 and stem 130 to give a flattened configuration.

[0039] Figure 15 shows a shelter in accordance with the present invention generally at 140. The shelter 140 comprises a floor 142, a roof 144 and a wall 146 extending between the floor 142 and roof 144. An aperture 148 is formed in one face of the wall 146. Again the shelter 140 comprises a telescopically expandable frame surrounded by an outer cover. The shelter 140 has a generally square cross-section and the roof 144 is curved to allow rain to run off. The floor 142 comprises a rigid plastic member to ensure durability and to prevent ingress of water. The shelter 140 may be compressed to a substantially flat configuration.

Claims

1. An expandable structure (10) which is expandable from a substantially flat configuration to an expanded elongate configuration wherein the structure has a first end (12) and a second end (14) and an axis extending between the first and second end, the expandable structure comprising a frame (20) which comprises a plurality of interconnected resilient members (30-48) which extend from the first end of the structure to the second end of the structure, and wherein adjacent resilient members extend around the axis of the structure in opposite directions **characterised in that** the resilient members (30-48) define a longitudinally extending aperture (18) in a side wall of the structure, this aperture (18) being configured to allow a person to step through said aperture (18).

2. An expandable structure (10) according to Claim 1 which has a substantially cylindrical shape in the expanded configuration.

3. An expandable structure (10) according to Claim 1 or 2 wherein the resilient members (30-48) comprise a metal.

4. An expandable structure (10) according to Claim 3 wherein the metal is steel.

5. An expandable structure (10) according to Claim 1 or 2 wherein the resilient members (30-48) comprise a plastic.

6. An expandable structure (10) according to any preceding claim comprising a fabric cover surrounding the frame (20).

7. An expandable structure (10) according to any preceding claim which is a shelter.

8. An expandable structure (10) according to any preceding claim which is sized to allow a person to sit inside the structure.

9. An expandable structure (10) according to any preceding claim which is sized to allow a person to stand inside the structure.

10. An expandable structure (10) according to any of

Claims 1 to 6 which is a boat.

11. An expandable structure (10) according to any of Claims 1 to 9 which is a tent.

Patentansprüche

1. Eine ausdehnbare Struktur (10), die von einer im wesentlichen flachen Konfiguration in eine ausgedehnte längliche Konfiguration ausdehnbar ist, wobei die Struktur ein erstes Ende (12) und ein zweites Ende (14) und eine Achse besitzt, die sich zwischen dem ersten und dem zweiten Ende erstreckt, wobei die ausdehnbare Struktur einen Rahmen (20) umfaßt, der mehrere miteinander verbundene elastische Elemente (30-48) aufweist, die sich von dem ersten Ende der Struktur zu dem zweiten Ende der Struktur erstrecken, und wobei benachbarte elastische Elemente sich um die Achse der Struktur in entgegengesetzten Richtungen erstrecken, **dadurch gekennzeichnet, daß** die elastischen Elemente (30-48) eine sich in Längsrichtung erstreckende Öffnung (18) in einer Seitenwand der Struktur definieren, wobei diese Öffnung (18) so konfiguriert ist, daß sie ein Hindurchtreten einer Person durch die Öffnung (18) erlaubt.

2. Eine ausdehnbare Struktur (10) gemäß Anspruch 1, die eine im wesentlichen zylindrische Form in der ausgedehnten Konfiguration besitzt.

3. Eine ausdehnbare Struktur (10) gemäß Anspruch 1 oder 2, wobei die elastischen Elemente (30-48) ein Metall umfassen.

4. Eine ausdehnbare Struktur (10) gemäß Anspruch 3, wobei das Metall Stahl ist.

5. Eine ausdehnbare Struktur (10) gemäß Anspruch 1 oder 2, wobei die elastischen Elemente (30-48) einen Kunststoff umfassen.

6. Eine ausdehnbare Struktur (10) gemäß irgendeinem vorstehenden Anspruch, mit einer Gewebeabdekkung, die den Rahmen (20) umgibt.

7. Eine ausdehnbare Struktur (10) gemäß irgendeinem vorstehenden Anspruch, die ein Schutzraum ist.

8. Eine ausdehnbare Struktur (10) gemäß irgendeinem vorstehenden Anspruch, die so dimensioniert ist, daß sie es einer Person erlaubt, im Inneren der Struktur zu sitzen.

9. Eine ausdehnbare Struktur (10) gemäß irgendeinem vorstehenden Anspruch, die so dimensioniert ist, daß sie es einer Person erlaubt, im Inneren der Struktur zu stehen.

10. Eine ausdehnbare Struktur (10) gemäß irgendeinem der Ansprüche 1 bis 6, die ein Boot ist.

11. Eine ausdehnbare Struktur (10) gemäß irgendeinem der Ansprüche 1 bis 9, die ein Zelt ist.

Revendications

1. Structure extensible (10) qui peut s'étendre d'une configuration sensiblement plate à une configuration allongée étendue dans laquelle la structure a une première extrémité (12) et une seconde extrémité (14) et un axe s'étendant entre les première et seconde extrémités, la structure extensible comprenant un cadre (20) qui comprend une pluralité d'organes résilients raccordés entre eux (30 à 48) qui s'étendant de la première extrémité de la structure à la seconde extrémité de la structure, et dans laquelle des organes résilients adjacents s'étendent autour de l'axe de la structure dans des directions opposées, **caractérisée en ce que** les organes résilients (30 à 48) définissent une ouverture s'étendant longitudinalement (18) dans une paroi latérale de la structure, cette ouverture (18) étant configurée pour permettre à une personne de passer à travers ladite ouverture (18).

2. Structure extensible (10) selon la revendication 1, qui a une forme sensiblement cylindrique dans la configuration étendue.

3. Structure extensible (10) selon la revendication 1 ou 2, dans laquelle les organes résilients (30 à 48) comprennent un métal.

4. Structure extensible (10) selon la revendication 3, dans laquelle le métal est l'acier.

5. Structure extensible (10) selon la revendication 1 ou 2, dans laquelle les organes résilients (30 à 48) comprennent une matière plastique.

6. Structure extensible (10) selon l'une quelconque des revendications précédentes, comprenant une protection en tissu entourant le cadre (20).

7. Structure extensible (10) selon l'une quelconque des revendications précédentes, qui est un abri.

8. Structure extensible (10) selon l'une quelconque des revendications précédentes, qui est dimensionnée pour permettre à une personne de se tenir assise à l'intérieur de la structure.

9. Structure extensible (10) selon l'une quelconque des

revendications précédentes, qui est dimensionnée pour permettre à une personne de se tenir debout à l'intérieur de la structure.

10. Structure extensible (10) selon l'une quelconque des revendications 1 à 6, qui est un bateau.

11. Structure extensible (10) selon l'une quelconque des revendications 1 à 9, qui est une tente.

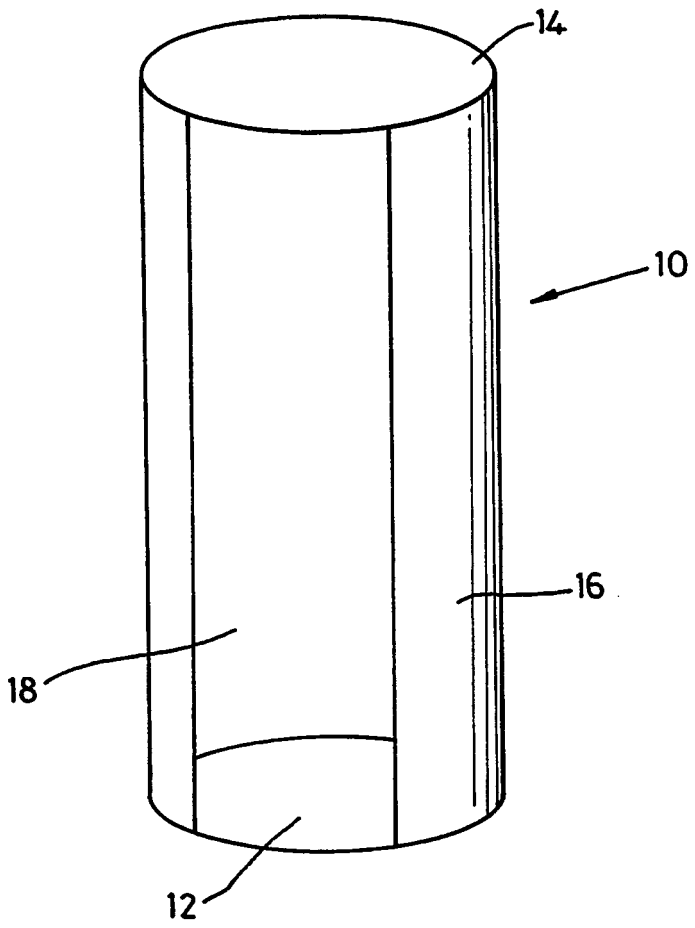

Fig. 1

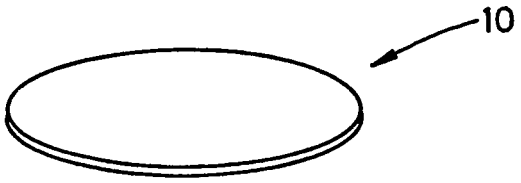

Fig. 2

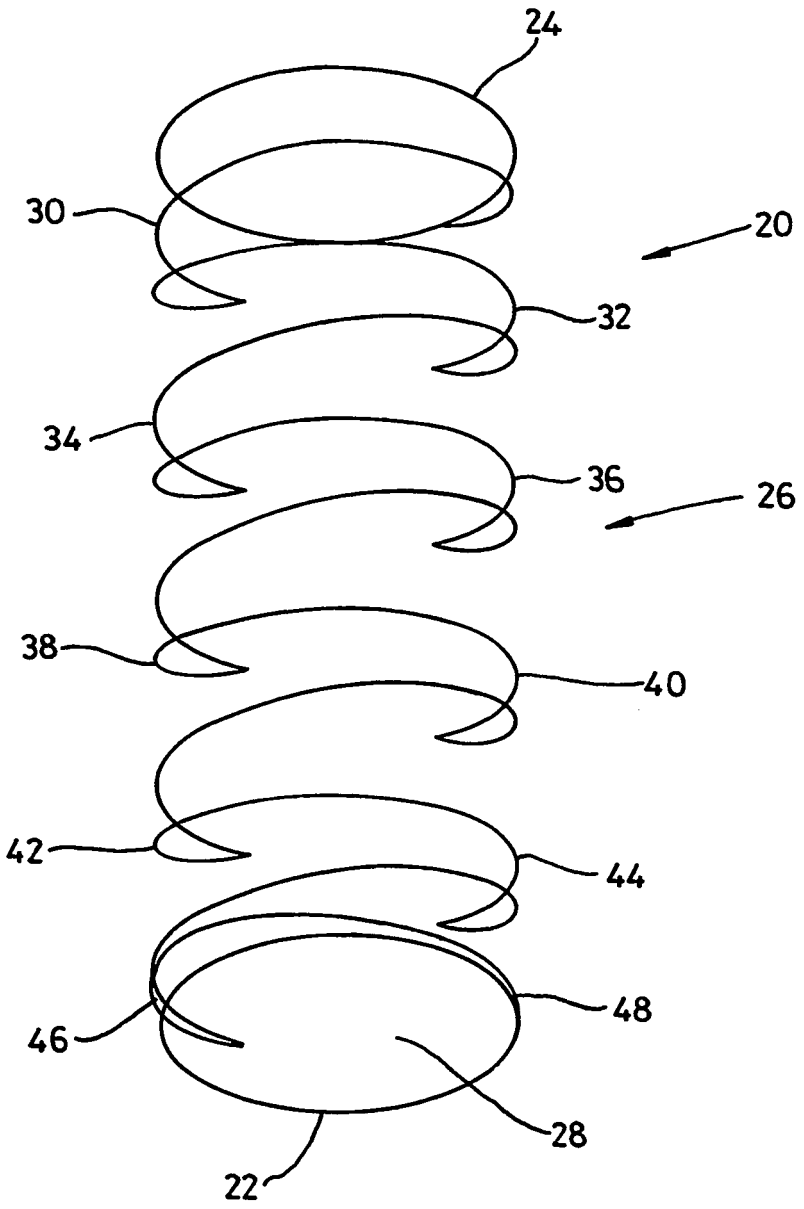

Fig. 3

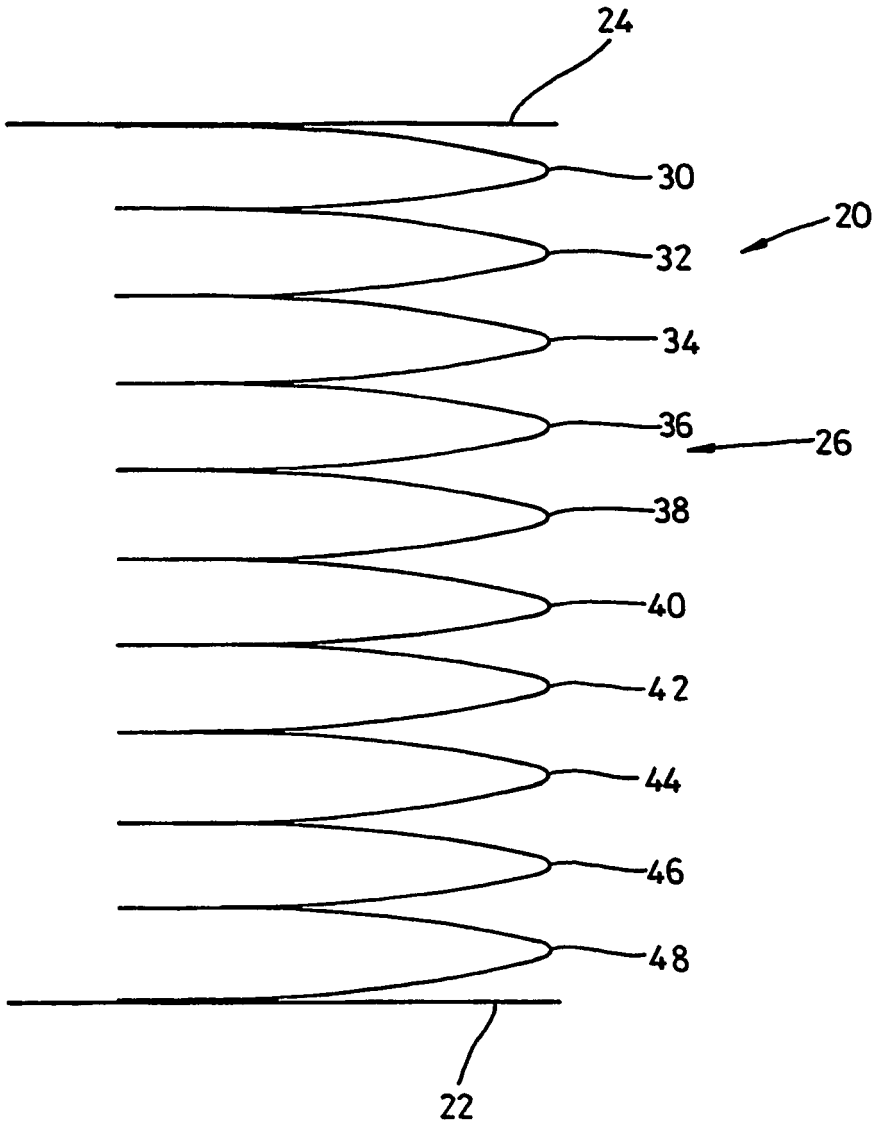

Fig. 4

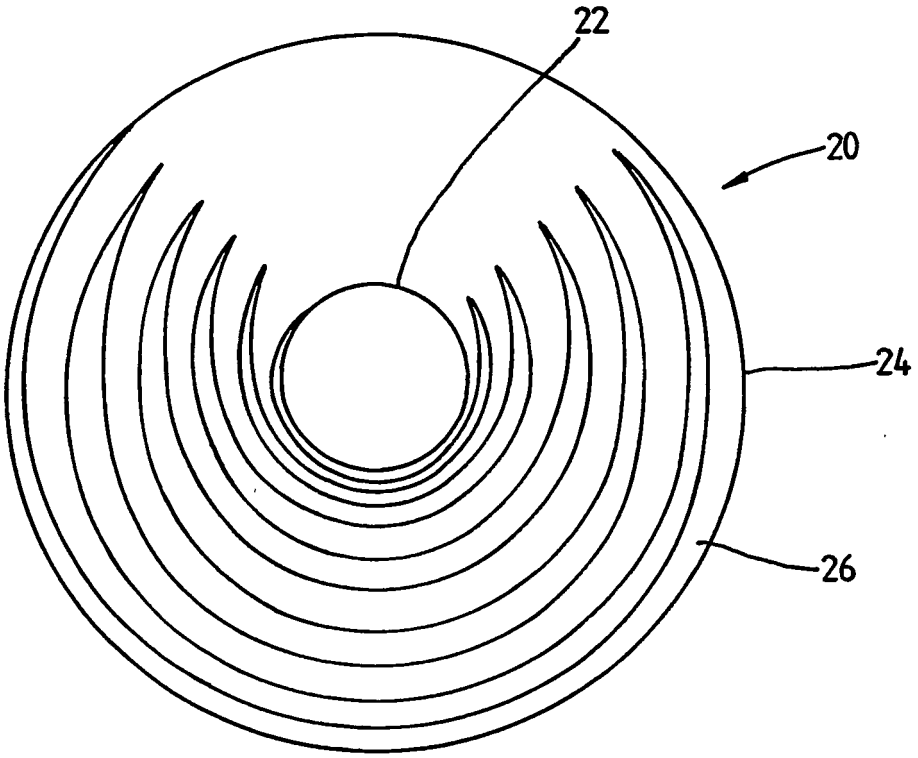

Fig. 5

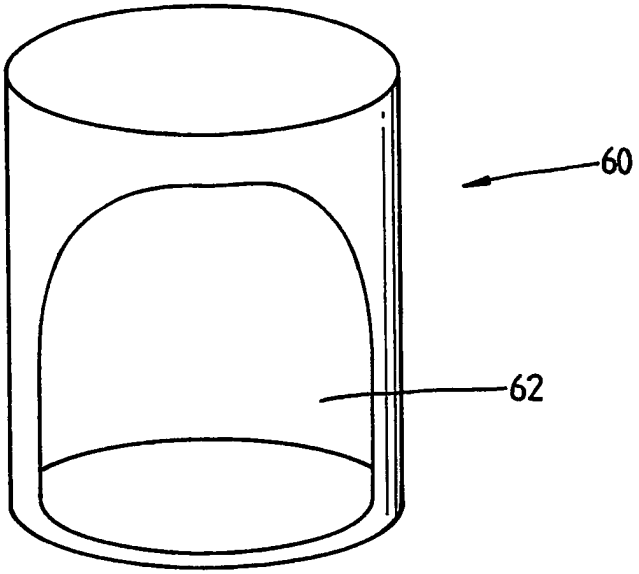

Fig. 6

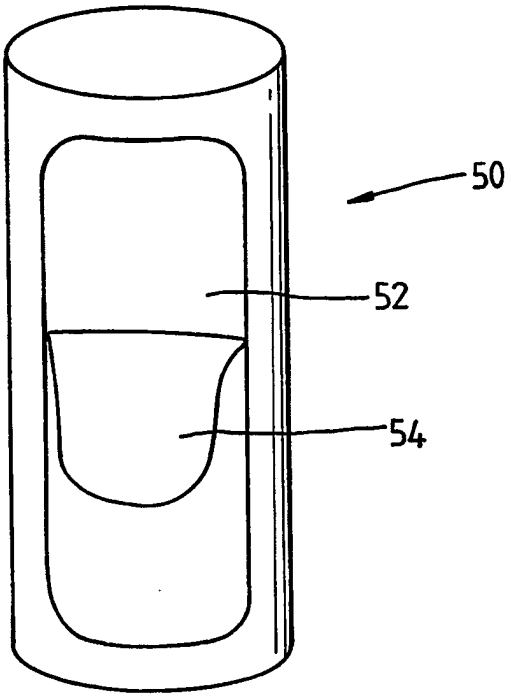

Fig. 7

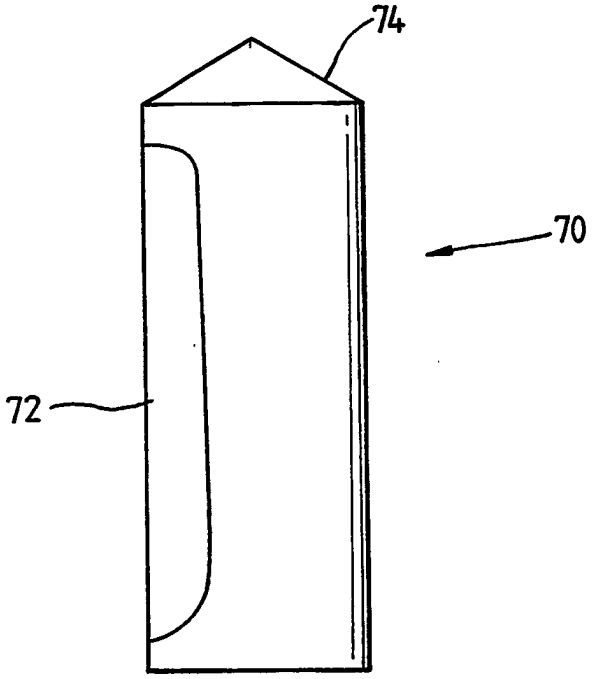

Fig. 8

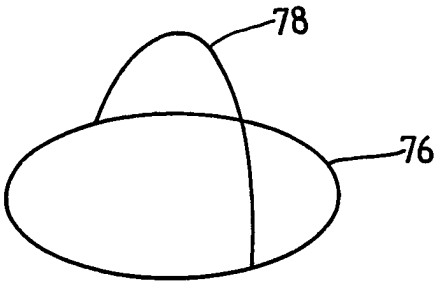

Fig. 9

Fig. 10

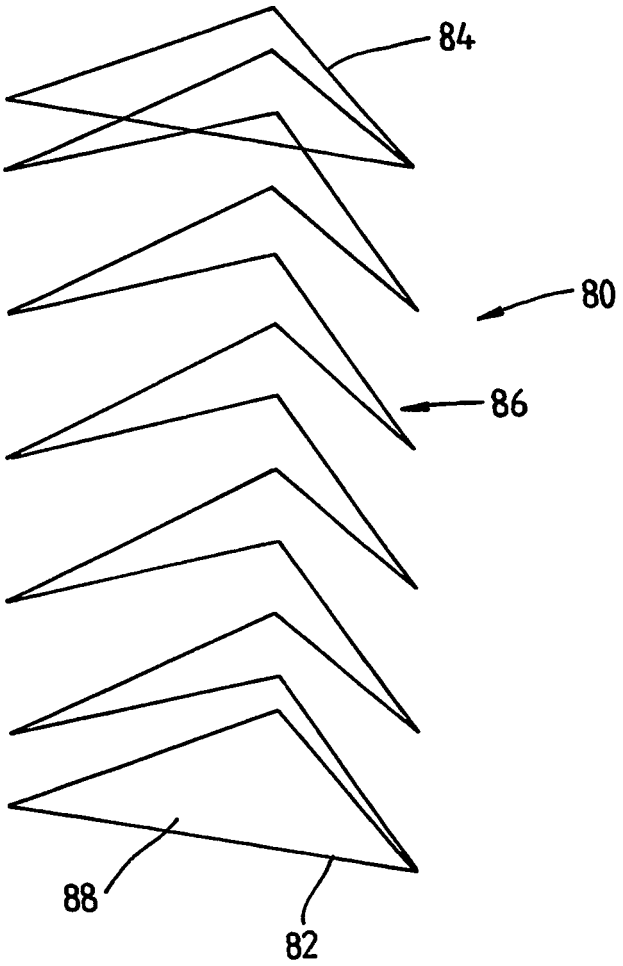

Fig. 11

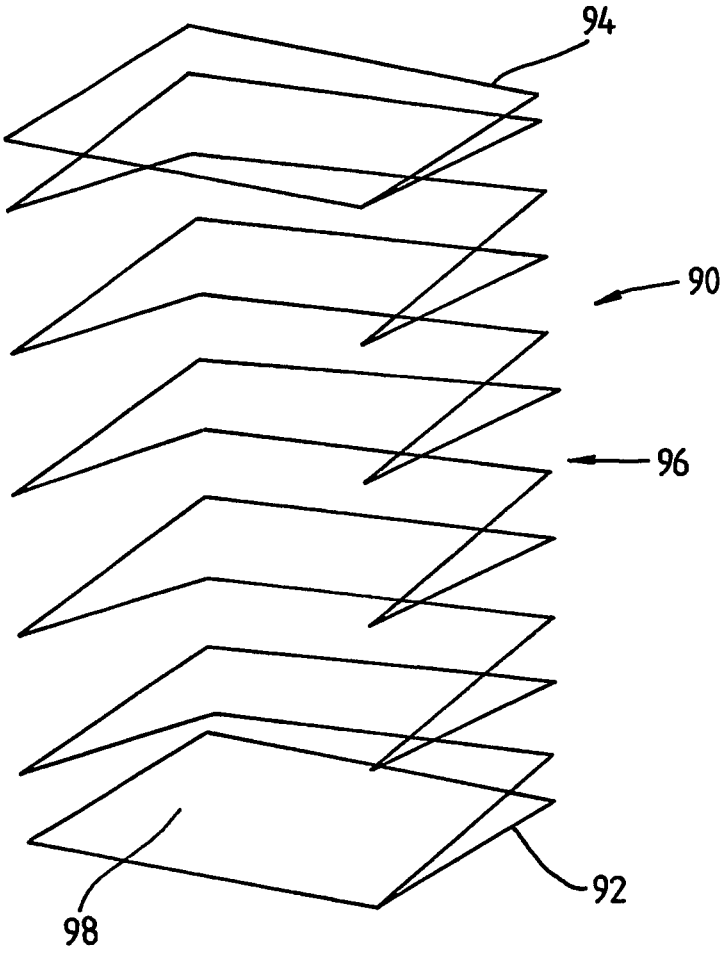

Fig. 12

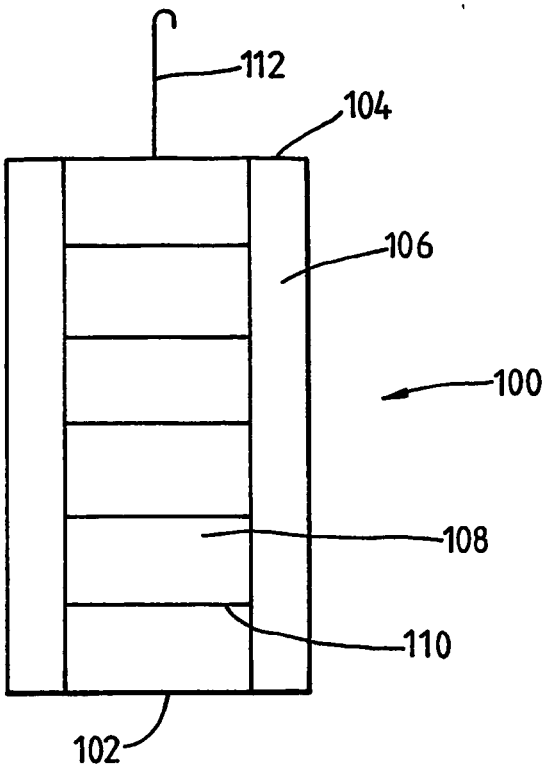

Fig. 13

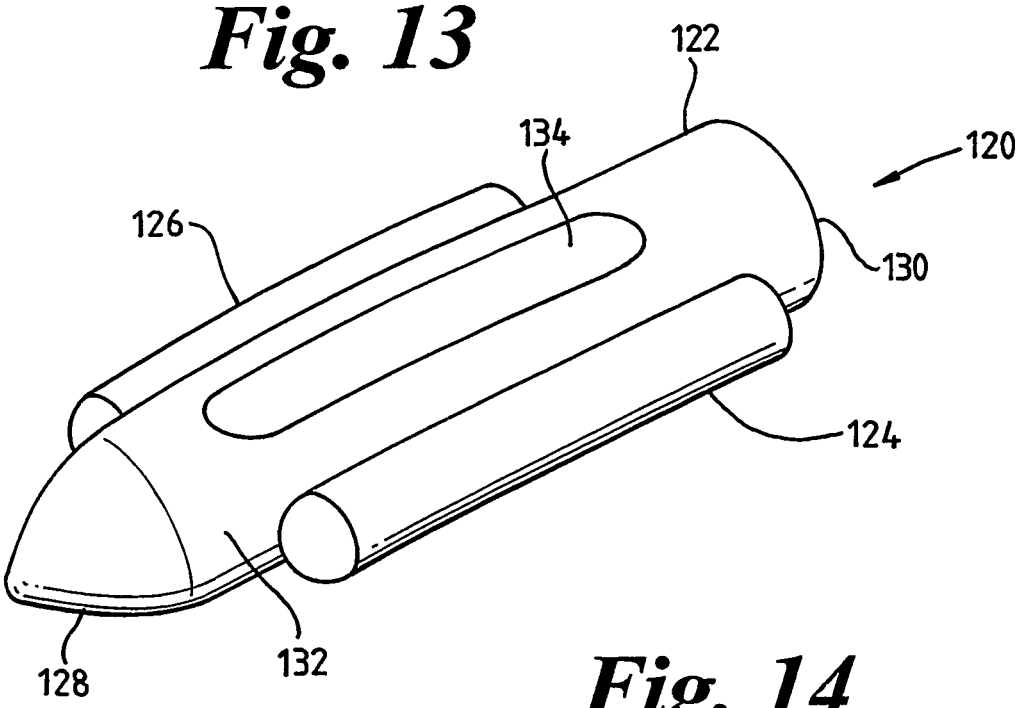

Fig. 14

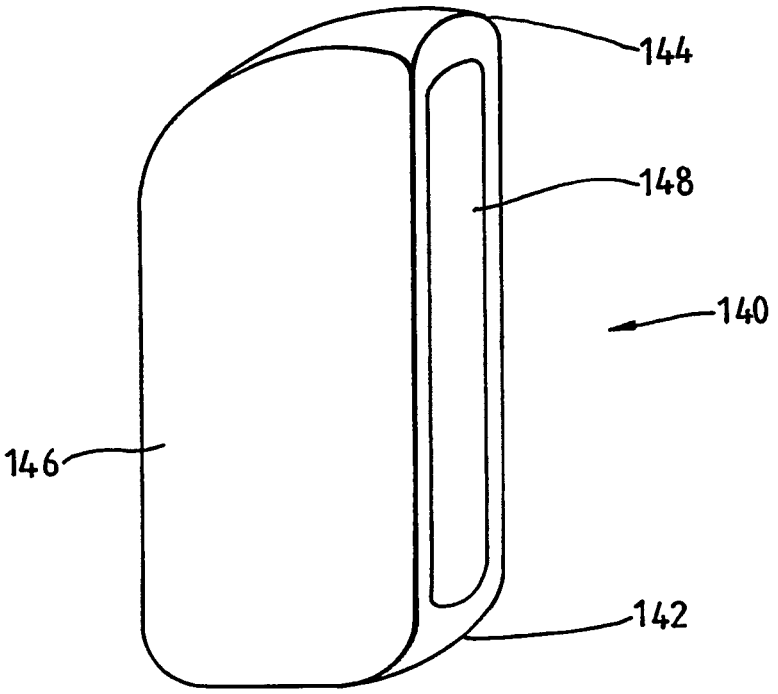

Fig. 15

REFERENCES CITED IN THE DESCRIPTION

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