(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 695 746 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
30.08.2006 Bulletin 2006/35

(51) Int Cl.:
A63F 9/08 *(2006.01)*

(21) Application number: **05447086.9**

(22) Date of filing: **22.04.2005**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR LV MK YU

(30) Priority: **25.02.2005 BE 200500106**

(71) Applicant: **Wittevrongel, Marc**
2270 Herenthout (BE)

(72) Inventor: **Wittevrongel, Marc**
2270 Herenthout (BE)

(74) Representative: **Sarlet, Steven Renaat Irène et al**
Gevers & Vander Haeghen,
Holidaystraat, 5
1831 Diegem (BE)

(54) Ball-shaped puzzle

(57) Ball-shaped puzzle comprising a spherical element (1) and a plurality of movable puzzle elements (3) which all have substantially the same size and shape, the movable puzzle elements being slidably mounted on the outside of the spherical element for being movable between a plurality of predetermined positions on the outside of the spherical element, the movable puzzle elements taking up a given space during movement between any two of said positions, characterized in that the spherical element is fully composed of parts which are fixed with respect to each other and which are all located outside said space.

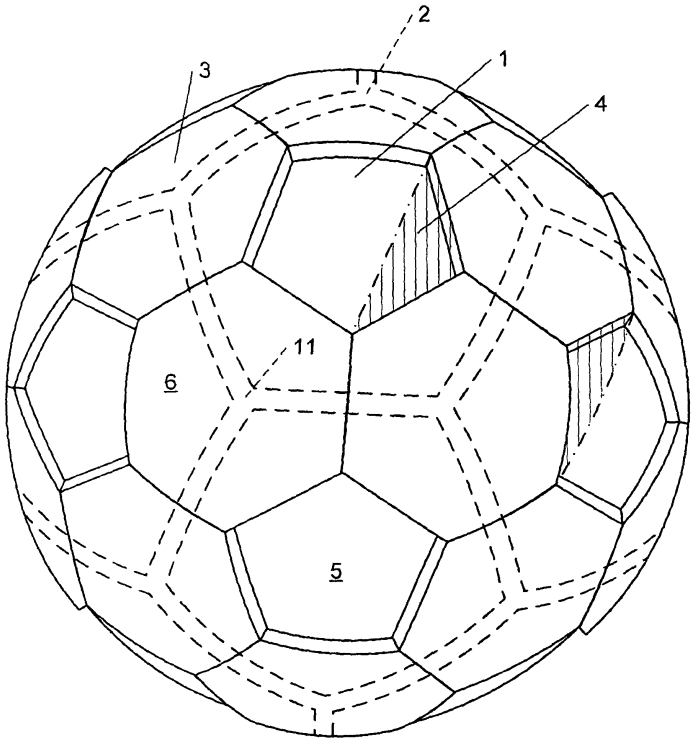

Fig. 1

EP 1 695 746 A1

Description

[0001] The present invention relates to a ball-shaped puzzle according to the preamble of the first claim.

[0002] In FR-A-2797195 a ball-shaped puzzle is described of which the surface is composed by movable parts. The puzzle has the structure of a soccer ball with curved pentagon and hexagon elements. One of the hexagon elements is removable and the others are slidable along a trajectory. The pentagon elements can be depressed towards the inside of the puzzle to enable the hexagon elements to pass upon movement from one position on the trajectory to another.

[0003] The puzzle known from FR-A-2797195 however has the disadvantage that it is difficult to manipulate. In order to be able to slide one hexagon element from one position to another, the user has to depress the two adjacent pentagon elements at the same time.

[0004] It is an aim of the present invention to provide a ball-shaped puzzle which is easier to manipulate.

[0005] This aim is achieved according to the invention with a ball-shaped puzzle showing the technical characteristics of the characterising part of the first claim.

[0006] The ball-shaped puzzle of the invention comprises a spherical element and a plurality of movable puzzle elements which all have substantially the same size and shape. The movable puzzle elements are slidably mounted on the outside of the spherical element for being movable between a plurality of positions on the outside of the spherical element. During the movement from one position to the other, the movable puzzle elements take up a given space. The movement is accommodated by the fact that the spherical element is fully composed of parts which are fixed with respect to each other and which are all located outside the space taken up by the movable puzzle elements during movement.

[0007] Because spherical element is fully located outside the space needed for movement of the movable puzzle elements, there is no longer a need to move parts out of the way of the movable puzzle elements when these are slid from one position to another. As a result, the user only has to manipulate the movable puzzle element for moving it from one position to another, which is a lot easier with respect to the prior art puzzle.

[0008] Furthermore, this has the advantage that the slidably mounted puzzle elements can become the only puzzle elements which are movably mounted on the spherical element. There is no longer a need for elements which can be depressed for enabling the sliding of the movable puzzle elements. This can greatly reduce the complexity of the construction of the ball-shaped puzzle.

[0009] In a preferred embodiment of the ball-shaped puzzle of the invention, at least one of the movable puzzle elements is removably mounted on the puzzle to create an empty position and enable the other movable puzzle elements to be moved one by one for solving the puzzle. This removable puzzle element is replaced after the user has solved the puzzle, to fix the position of the other movable puzzle elements. Alternatively, the number of movable puzzle elements may also be less than the number of positions, so that always at least one empty position is present.

[0010] In a preferred embodiment of the ball-shaped puzzle of the invention, the plurality of positions which can be taken up by the movable puzzle elements is defined by the corners of a polyhedron, such as for example a dodecahedron, a tetradecahedron, an icosahedron, an icositetraheron, a triacontahedron, an icosidodecahedron, a hexecontahedron or other.

[0011] In a preferred embodiment of the ball-shaped puzzle of the invention, the slidable mounting is provided by a plurality of grooves in the outer surface of the spherical element, in which hooked portions of the movable puzzle elements engage. This has the advantage that the spherical element can be constructed as a single-piece moulded body in a plastics material. The spherical element may also be constructed in other materials known to the person skilled in the art, and may be composed of multiple separate parts.

[0012] The outside surface of the ball-shaped puzzle of the invention may be substantially completely formed by movable puzzle elements. In other embodiments, the outside surface may be formed by a combination of fixed and movable puzzle elements. In this case, the movable puzzle elements and the fixed puzzle elements mainly extend in different, concentric spherical planes so that the fixed puzzle elements enable passage of the movable puzzle elements. The fixed puzzle elements may be countersunk with respect to the movable puzzle elements or vice versa. The fixed elements may be unitary with the spherical element in the moulded construction described above, or they may be formed by separate elements which are fixed onto a core, which may be done by screwing, glueing, bonding or any other fixing method known to the person skilled in the art. In the latter case, the fixed and movable surface elements preferably have layered structures which fit into each other, so that the fixed puzzle elements hold the movable puzzle elements on the puzzle. Suitable shapes for the combination of fixed and movable puzzle elements are respectively for example: regular pentagons and regular hexagons (soccer ball), regular stars and regular hexagons, or any other combination of complementary shapes known to the person skilled in the art.

[0013] The invention will be further elucidated by means of the following description and the appended figures.

Figure 1 shows a first embodiment of a ball-shaped puzzle according to the invention.
Figure 2 shows a second embodiment of a ball-shaped puzzle according to the invention.
Figure 3 shows a cross-section of the spherical element of the embodiment of figure 2.

Figure 4 shows a cross-section, a perspective view and a top view of one of the fixed puzzle elements of the embodiment of figure 2.

Figure 5 shows a top view, a cross-section and a perspective view of one of the movable puzzle elements of the embodiment of figure 2.

Figure 6 shows a top view, a cross-section and a perspective view of the removable puzzle element of the embodiment of figure 2.

Figure 7 shows a cross-section of part of the ball-shaped puzzle of figure 2.

Figure 8 shows a top view, a cross-section and a perspective view of one of the movable puzzle elements of the embodiment of figure 1.

Figure 9 shows a cross-section of part of the ball-shaped puzzle of figure 1.

[0014] The ball-shaped puzzles shown in the figures are ball-shaped and have an outer surface comprising movable parts, formed by the top faces of movable puzzle elements which are slidably mounted on a spherical element. The combination of the shape of the movable puzzle elements and the way in which they are mounted on the outside of the spherical element makes it possible to move the puzzle elements without being disengaged from the spherical element. The outer surface of the puzzle is provided with an image of any kind, which can be assembled by the user by sliding the movable parts. Due to the three-dimensional structure of the puzzles and the fact that the movable parts are slidable in multiple directions, the puzzles can have a high complexity.

[0015] The ball-shaped puzzle of figure 1 comprises a spherical element 1 in the outside of which a trajectory 2 is provided. A plurality of movable puzzle elements 3, which all have substantially the same size and shape, are slidably mounted in the trajectory 2 on the outside of the spherical element 1. Thus, the movable puzzle elements 3 are movable between a plurality of positions on the outside of the spherical element. During movement between any two of these positions, the movable puzzle elements take up a given space, which is defined by their shape and size. The space for the movement between two adjacent positions is indicated in figure 1 by the shaded area 4. Therefore, so as not to hamper this movement, the spherical element 1 is fully composed of parts which are fixed with respect to each other and which are all located outside this space.

[0016] The ball-shaped puzzle of figure 1 looks a lot like a soccer ball, or-in mathematical terms - a truncated icosahedron drawn on a sphere. The outside of the puzzle is made up of twenty hexagonal elements 6 and twelve pentagonal elements 5, the hexagonal elements 6 forming the movable puzzle elements 3 and the pentagonal elements 5 being formed by uncovered parts of the outside surface of the spherical element 1. Among the twenty hexagonal elements 6, one (not shown) is removably mounted, for example by means of a screw, so that a vacant position is created which can be used for sliding the other hexagonal elements 6 one by one in an effort to solve the puzzle. The trajectory 2, which is shown in broken lines, has the shape of a dodecahedron to guide the hexagonal elements 6 one by one from their original position to the vacant position. The positions of the hexagonal elements 6 correspond to the corners of the dodecahedron. As a result, each of the hexagonal elements 6 can be moved in three different directions and the vacant position can be filled by one of three different hexagonal elements 6. This adds to the complexity of solving the puzzle.

[0017] Figure 8 shows one of the hexagonal elements 6 of the embodiment of figure 1. The hexagonal element 6 has a bent shape and is slightly concave to facilitate the sliding over the outer surface of the spherical element 1. It comprises a larger top layer 7 and a smaller bottom layer 8, which is shaped such that the hexagonal element 6 can pass in between each two pentagonal elements 5, which protrude on the outside of the spherical element 1 as shown in figure 9. This bottom layer 8 also has a hexagonal shape, rotated 90° with respect to that of the top layer 7. The width of the bottom layer 8 corresponds to the shortest distance between two pentagonal elements 5, so that it can pass in between them. By this shape, the bottom layer 8 has three pairs of parallel guides, formed by the sides of the hexagonal shape, each pair being oriented according to one of the sliding directions of the hexagonal element 6. This construction functions to prevent that the hexagonal element can be rotated about its height axis when it is moved from one position to the other, which can add to the complexity of solving the puzzle: the user has to slide the hexagonal element 6 around a pentagonal element 5 in order to turn it 60° to the left or to the right.

[0018] On the bottom side of the hexagonal element 6, a cone-shaped hooked member 9 is provided, which engages in grooves 10 of the trajectory 2 in the outside of the spherical element 1. These grooves 10 have a profile which surrounds the cone-shaped hooked member, so that undesired removal of the hexagonal element 6 from the spherical element 1 can be prevented.

[0019] As shown in figure 9, the spherical element 1 has a single-piece construction. The pentagonal elements 5 comprise one layer, which is unitary with the remainder of the spherical element 1, and has about the same thickness as the bottom layer 8 of the movable hexagonal elements 6. The spherical element 1 can for example be constructed by moulding a plastic material and milling the trajectory 2 into the outer surface. The mounting of a hexagonal element 6 can be performed by placing its cone-shaped hooked member 9 on one of the crossings 11 of the trajectory 2 and subsequently pressing it onto the spherical element 1 until the hooked member 9 snaps into the trajectory 2, to which end the cone-shaped member 9 is provided with a double slit (cf. Fig. 8). Because of the cone shape, the hooked member

can afterwards prevent that the hexagonal element is removed from the trajectory 2.

[0020] In an alternative embodiment (not shown), the pentagonal elements 5 can be flush with the spherical surface of the spherical element 1, so that they do not protrude therefrom. In this case the hexagonal elements 6 can be formed by a single layer with a groove engagement member, for example the hooked member 9, on the bottom for engaging the grooves 10 of the trajectory 2.

[0021] The ball-shaped puzzle of figure 2 differs in that it comprises a spherical element 12 which is composed of multiple parts: a core 13 (Fig. 3) on which a number of fixed puzzle elements 15 are fixed by means of screws 14. These fixed puzzle elements 15 are shaped such that they slidably hold a number of movable puzzle elements 16 on the outside of the puzzle. The fixed puzzle elements 15 all have a pentagonal shape and the movable puzzle elements 16 all have a hexagonal shape, so that the whole is again a "soccer ball"-type puzzle. The hexagonal element 17 is removably mounted by means of a screw 18, so that a vacant position can be created which can be used for sliding the other hexagonal elements 16 one by one in an effort to solve the puzzle. After the puzzle has been solved, the hexagonal element 17 can be replaced for holding the other hexagonal elements 16 in place.

[0022] Figure 5 shows one of the hexagonal elements 16 of the embodiment of figure 2. The hexagonal element 16 has a bent shape and is slightly concave to facilitate the sliding over the outer surface of the spherical element 12. It has a layered structure comprising a larger top layer 19, a smaller intermediate layer 20 and a larger bottom layer 21. The intermediate layer 20 is shaped such that the hexagonal element 16 can pass in between each two pentagonal elements 15, which protrude on the outside of the spherical element 12 as shown in figure 3. The top and bottom layers 19, 21 have hexagonal shapes of virtually the same size and orientation. The intermediate layer 20 also has a hexagonal shape, rotated 90° with respect to that of the top layer 19. The width of the intermediate layer 20 corresponds to the shortest distance between two pentagonal elements 15, so that it can pass in between them. By this shape, the intermediate layer 20 has three pairs of parallel guides, formed by the sides of the hexagonal shape, each pair being oriented according to one of the sliding directions of the hexagonal element 16. This construction functions to prevent that the hexagonal element can be rotated about its height axis when it is moved from one position to the other, which can add to the complexity of solving the puzzle: the user has to slide the hexagonal element 16 around a pentagonal element 15 in order to turn it 60° to the left or to the right.

[0023] The pentagonal fixed puzzle elements 15, one of which is shown in figure 4, are bent in substantially the same way as the hexagonal movable puzzle elements 16. They have a layered structure which fits into that of the hexagonal elements 16 (see figure 7) and comprises a larger top layer 22 and a smaller bottom layer 23. Both layers have pentagonal shapes, but are inverted with respect to each other, so that the bottom layer 23 forms guides for the hexagonal elements 16.

[0024] The removable hexagonal element 17 is shown in detail in figure 6. It is bent in substantially the same way as the hexagonal movable puzzle elements 16 and comprises a larger top layer 24 and a smaller bottom layer 25. The thickness of the bottom layer 25 equals substantially the sum of those of the intermediate and bottom layers 20, 21 of the other hexagonal elements 16. The screw 18 has a special shape with an eye, giving the ball-shaped puzzle of figure 2 the additional function of a key-ring. This eye also facilitates manual placement or removal of the removable element 17. Possibly a tensioning roundel can be provided to prevent the screw from coming loose.

[0025] The pentagonal elements 15 are fixed to the core 13 by means of screws 14, extending in height direction of the pentagonal elements 15 or in diametrical direction of the ball-shaped puzzle. Alternative fixing means known to the person skilled in the art, such as for example bonding, gluing or welding are however also possible. The puzzle can be assembled by first fixing eleven of the twelve pentagonal elements 15, then mounting the hexagonal elements 16 (which are held on the puzzle by the pentagonal elements 15), then fixing the final pentagonal element 15 and finally placing the removable element 17. For enabling the final placing of the removable element, a threaded hole (not shown) is provided in the centre of each of the positions for the hexagonal elements 16.

[0026] In the embodiments shown in figures 1-9, the hexagonal elements are shaped such that a rotation about their height axis is prevented. In alternative embodiments, they can also be shaped to allow this rotation, which would enable the user to rotate the hexagonal elements when being moved from one position to the other and would simplify the solving of the puzzle. This can for example be achieved by giving the bottom layer 8 of the hexagonal element of figure 8 a circular shape.

[0027] The ball-shaped puzzles of figures 1 and 2 each time have one removable element. In alternative embodiments, there can be no removable element (meaning there is always one vacant position) or there can be more than one removable element for facilitating solving of the puzzle (the user then has more possibilities for sliding puzzle elements).

[0028] For constructing the parts of the ball-shaped puzzles of figures 1 and 2, preferably a mouldable material is used, for example a plastic material. However, the parts may also be constructed in any other material known to the person skilled in the art. The screws 14 are preferably constructed in metal, but may also be constructed in a plastic material or any other suitable material. In one advantageous embodiment, the spherical element or at least its core can be constructed in a magnetisable metal and the removable puzzle element in a magnetic metal, avoiding the use of a screw for attaching the removable puzzle element.

Claims

1. Ball-shaped puzzle comprising a spherical element and a plurality of movable puzzle elements which all have substantially the same size and shape, the movable puzzle elements being slidably mounted on the outside of the spherical element for being movable between a plurality of predetermined positions on the outside of the spherical element, the movable puzzle elements taking up a given space during movement between any two of said positions, **characterised in that** the spherical element is fully composed of parts which are fixed with respect to each other and which are all located outside said space.

2. Ball-shaped puzzle according to claim 1, **characterised in that** at least one of the movable puzzle elements is removably mounted for providing an empty position among said plurality of positions.

3. Ball-shaped puzzle according to claim 1 or 2, **characterised in that** the plurality of positions is defined by the corners of a polyhedron.

4. Ball-shaped puzzle according to any one of the previous claims, **characterised in that** a plurality of grooves are provided in the outer surface of the spherical element, the movable puzzle elements having hooked portions pointing towards the centre of the ball-shaped element and engaging in the grooves.

5. Ball-shaped puzzle according to any one of the previous claims, **characterised in that** the spherical element is formed by a single-piece moulded body.

6. Ball-shaped puzzle according to any one of the previous claims, **characterised in that** the spherical element has parts which are uncovered by the movable puzzle elements, the uncovered parts forming fixed puzzle elements.

7. Ball-shaped puzzle according to claim 6, **characterised in that** the movable puzzle elements extend in a first spherical plane and the fixed puzzle elements extend in a second, concentric spherical plane, the first and second spherical planes showing a predetermined difference in diameter for enabling the movable puzzle elements to pass by the fixed puzzle elements upon movement from one position to another.

8. Ball-shaped puzzle according to claim 7, **characterised in that** the fixed puzzle elements are countersunk with respect to the movable puzzle elements.

9. Ball-shaped puzzle according to any one of the claims 6-8, **characterised in that** the fixed puzzle elements are separate elements which are fixed onto a core, the movable and fixed puzzle elements having layered structures which fit into each other.

10. Ball-shaped puzzle according to any one of the claims 6-9, **characterised in that** the plurality of positions is defined by the corners of a regular dodecahedron.

11. Ball-shaped puzzle according to claim 10, **characterised in that** the movable puzzle elements have a regular hexagonal shape and the uncovered parts of the fixed puzzle elements have a regular pentagonal shape.

12. Ball-shaped puzzle according to claim 10, **characterised in that** the movable puzzle elements have a regular hexagonal shape and the uncovered parts of the fixed puzzle elements are star-shaped.

13. Ball-shaped puzzle according to any one of the claims 1-5, **characterised in that** the movable puzzle elements cover substantially the whole spherical element.

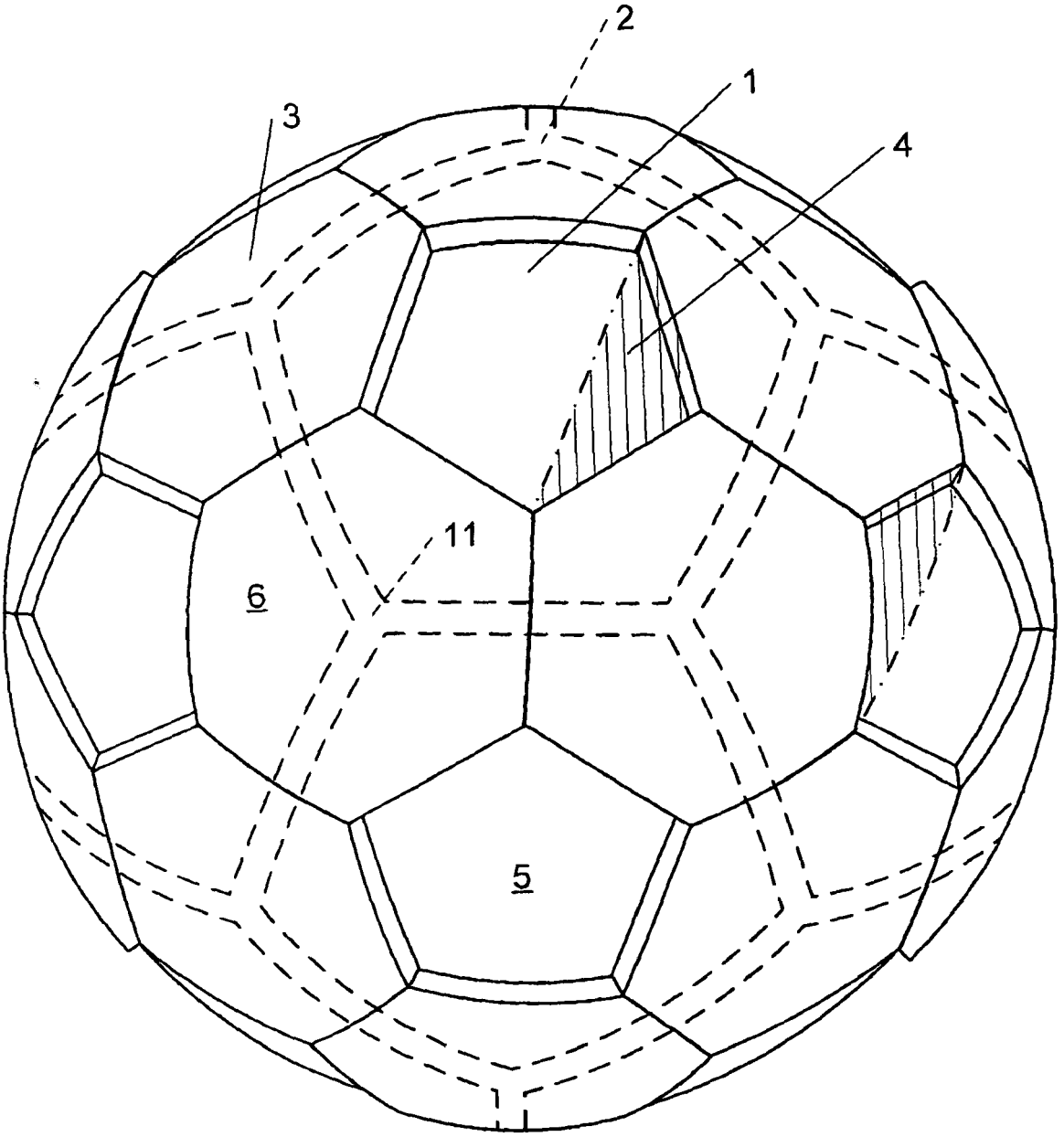

Fig. 1

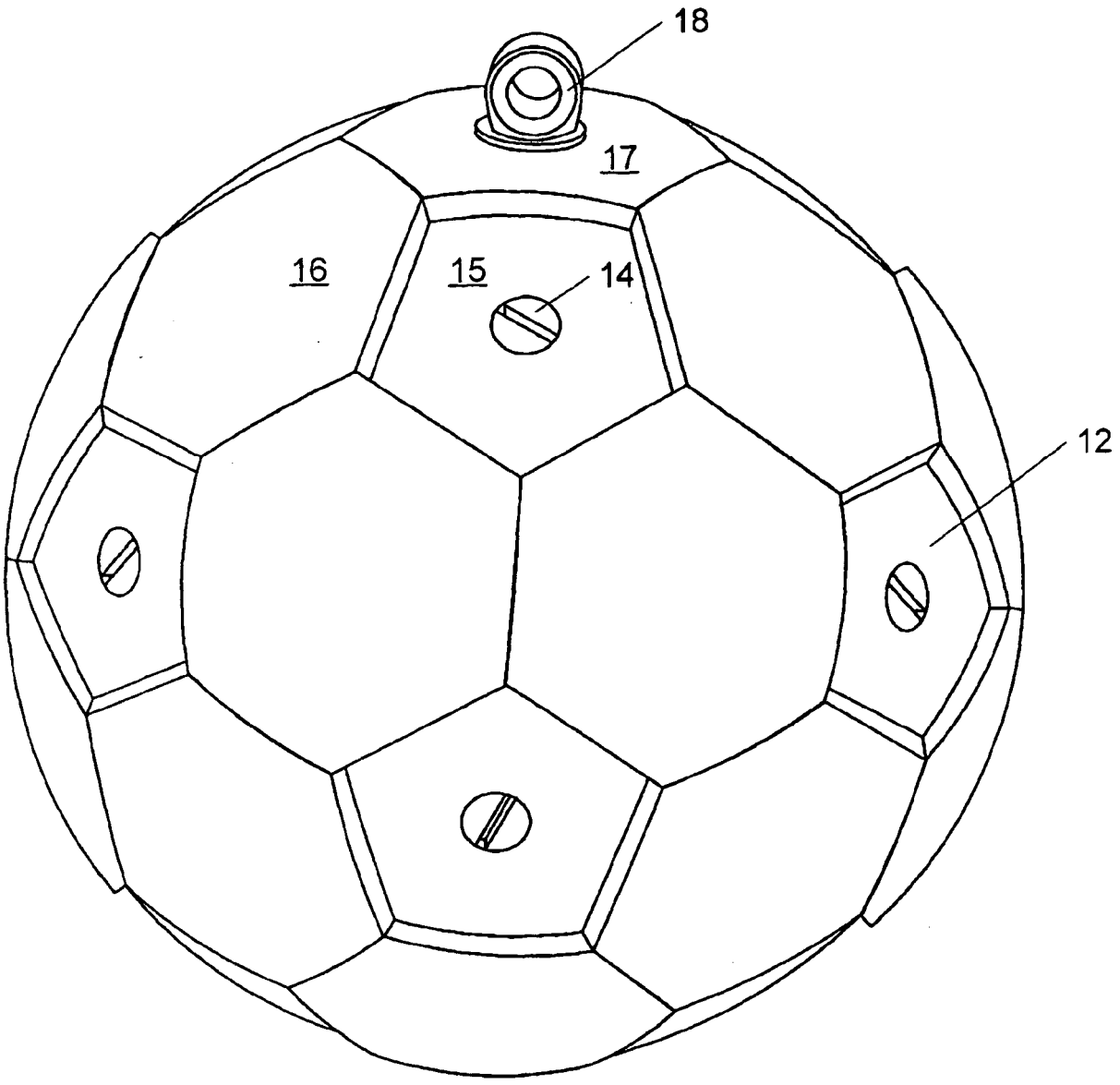

Fig. 2

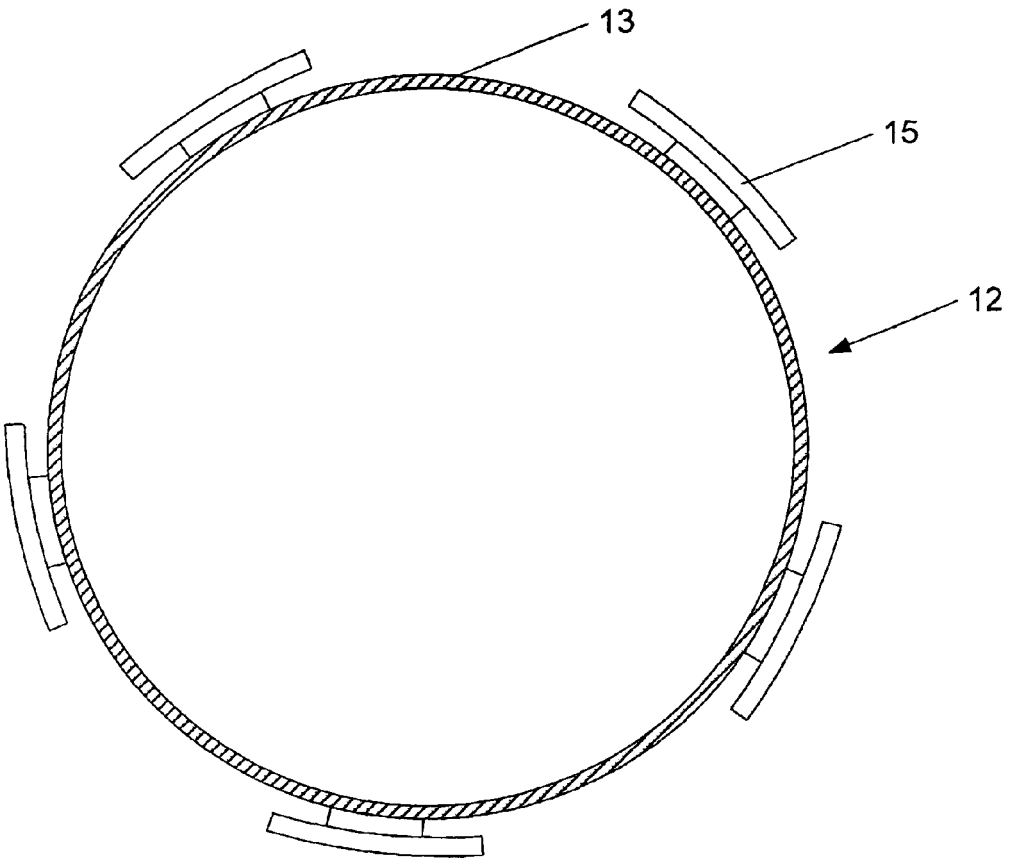

Fig. 3

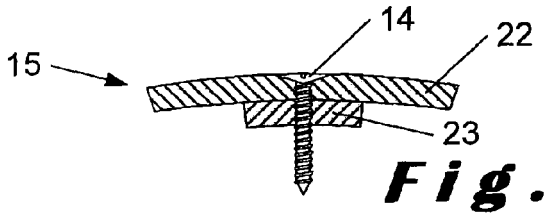

Fig. 4a

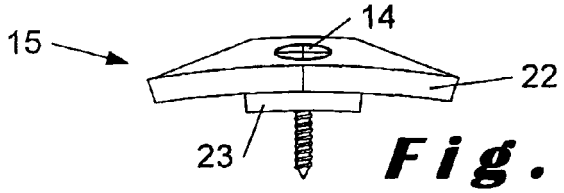

Fig. 4b

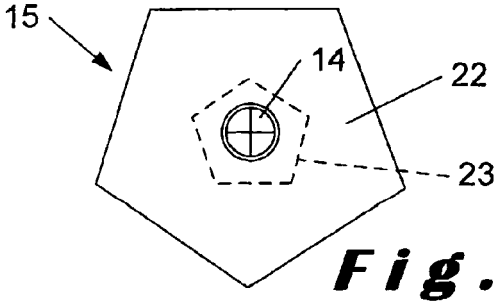

Fig. 4c

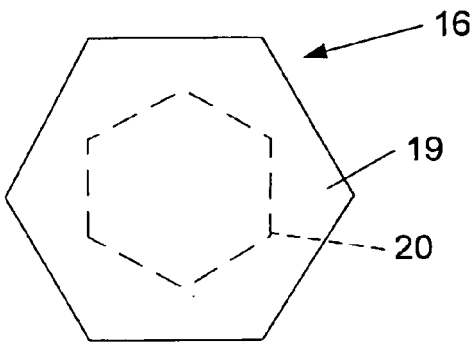

Fig. 5a

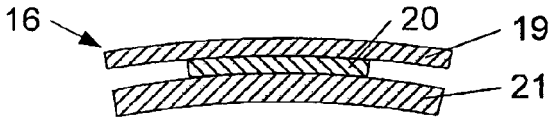

Fig. 5b

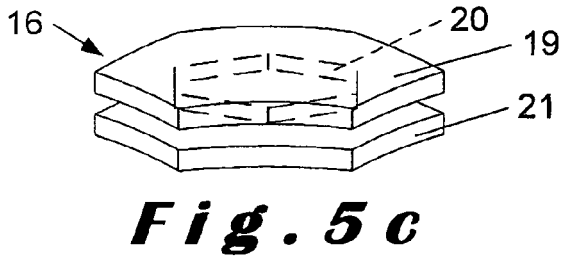

Fig. 5c

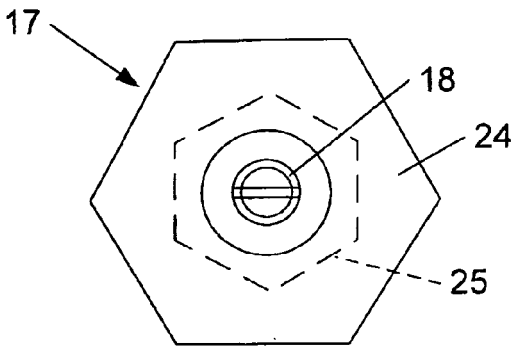

Fig. 6a

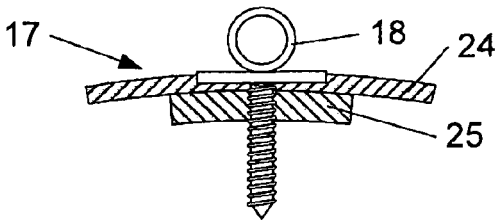

Fig. 6b

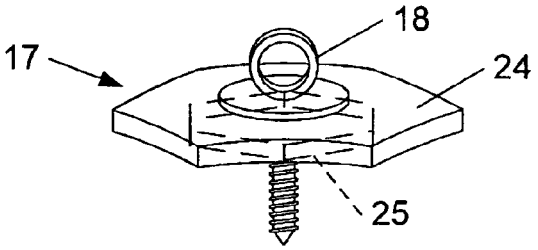

Fig. 6c

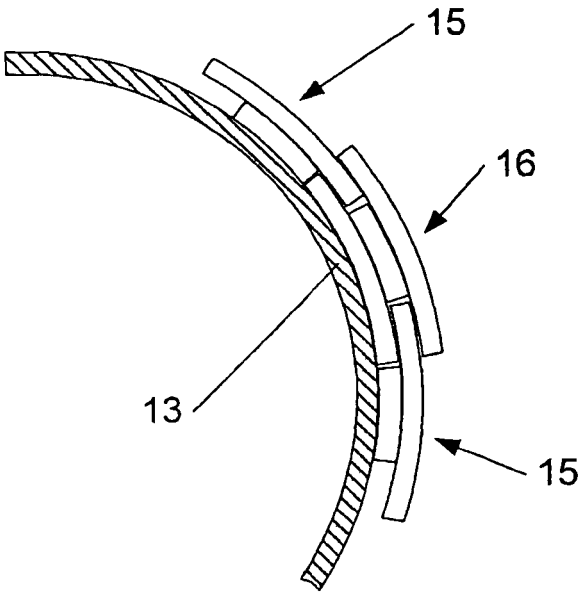

Fig. 7

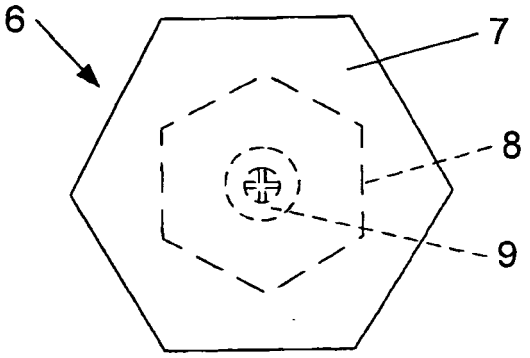

Fig. 8a

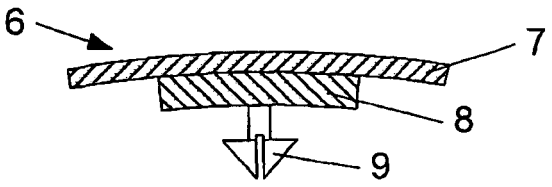

Fig. 8b

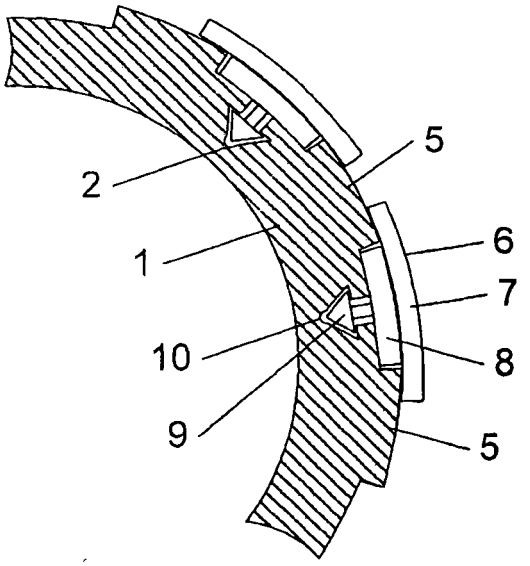

Fig. 9

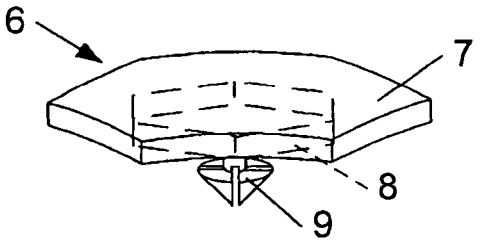

Fig. 8c

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 44 7086

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 566 941 A (DESTICS ET AL) 22 October 1996 (1996-10-22) * column 3, line 24 - line 61; figures 1-4 * -----	1-4,6,9, 13	A63F9/08
X	US 4 889 340 A (GREENE ET AL) 26 December 1989 (1989-12-26) * column 3, line 63 - column 5, line 57; figures 1-6 * -----	1,3-8,13	
X	WO 94/27694 A (LOPEZ, VICTOR-HUGO) 8 December 1994 (1994-12-08) * page 1, line 2 - page 2, line 67; figures * -----	1,3,4,6, 13	
X	WO 2004/030776 A (MARUSENKO, ALEKSANDR IVANOVICH; PEREZ CABEZA, FELIX, ABDON) 15 April 2004 (2004-04-15) * abstract; figures * -----	1	
A,D	FR 2 797 195 A (HUGUET JEAN MARC) 9 February 2001 (2001-02-09) * the whole document * -----	1-13	TECHNICAL FIELDS SEARCHED (Int.Cl.7) A63F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 August 2005	Lucas, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 05 44 7086

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

02-08-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5566941 A	22-10-1996	NONE	
US 4889340 A	26-12-1989	NONE	
WO 9427694 A	08-12-1994	AU 6687494 A WO 9427694 A1	20-12-1994 08-12-1994
WO 2004030776 A	15-04-2004	UA 58096 C2 WO 2004030776 A1	15-07-2003 15-04-2004
FR 2797195 A	09-02-2001	FR 2797195 A1	09-02-2001

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82