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(54) **An inflatable canopy module**

(57) An inflatable canopy module having a framing structure comprising one or more principal inflatable tubes with a cross-sectional diameter of at least 80 cm, each of which tubes forms an arch designed to be arranged in a substantially vertical position with both end parts of the inflated tube resting on the ground during normal use of the module.

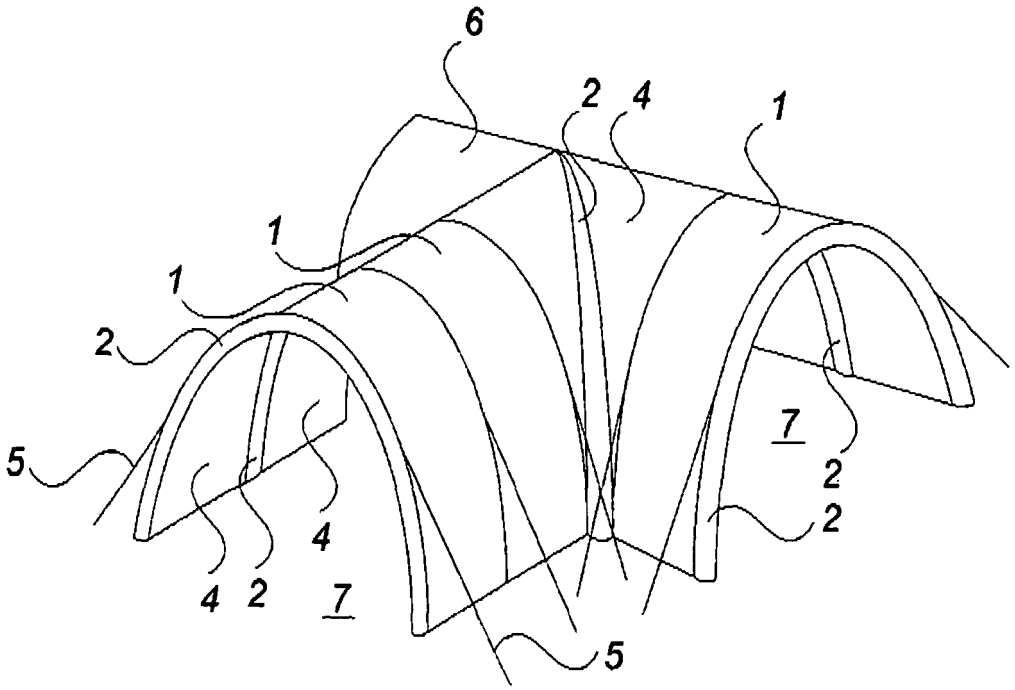

Fig. 4b

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Description

Technical area

[0001] The present invention relates to an inflatable canopy module having a framing structure comprising one or more principal inflatable tubes.

Background

[0002] In certain areas of the world, outdoor construction work is often hindered by difficult weather conditions, such as heavy rain or frosty weather.

[0003] In some places, this means that outdoor construction work can only be carried out during specific seasons of the year depending on the climatic conditions at the place in question.

[0004] Also in some areas, it is not unusual that outdoor construction work is interrupted for shorter or longer periods due to weather conditions. Interruptions of this kind are not only cumbersome and costly for the construction companies, they also make it very difficult to make and follow time schedules for the construction work much to the annoyance of the construction companies as well as the future users of the building being constructed.

[0005] It is well-known to reduce the influence of the climatic conditions on the construction work by covering the construction site (or at least a part of it) by some kind of canopy or shelter, thus making work activity possible even during periods of bad weather.

[0006] Typically, such a canopy consists of some kind of scaffolding covered with tarpaulins. The large weight of the scaffolding materials to be transported to and from the construction site along with the cumbersome work of erecting and dismantling a canopy of this kind is both costly and time-consuming for the construction company.

[0007] European Patent Application EP 0 810 339 discloses a device for forming an elongated roof construction comprising a cover sheet and two or more flexible tubular suspension elements, which roof construction is formed in a reliable and simple manner by bringing the suspension elements to pressure. Each of the suspension elements has a length of at least 4.5 m, preferably at least 10 m, and a diameter of at least 5 cm, preferably at least 10 cm, and is connected to a common air supply duct. Advantageously, the suspension elements are made from fire hoses.

[0008] Due to the small cross-sectional dimensions compared to the length of the suspension elements, a rather high air pressure (3-7 bar, preferably around 5 bar) within the elements is needed to keep the roof construction standing.

[0009] An object of the present invention is to provide the necessary equipment for assembling a construction site canopy of low weight that is easily erected and dismantled.

[0010] Another object of the present invention is to provide different types of modules for a flexible construction site canopy system that can easily be arranged to form a suitable canopy for any specific construction site within certain size limits.

Brief description of the invention

[0011] The invention relates to an inflatable canopy module having a framing structure comprising one or more principal inflatable tubes with a cross-sectional diameter of at least 80 cm. Each of the principal inflatable tubes forms an arch designed to be arranged in a substantially vertical position with both end parts of the inflated tube resting on the ground during normal use of the module.

[0012] By the expression "resting on the ground" it is meant that the end parts of the principal inflatable tubes can rest either directly on the ground or on an intermediate layer between the tubes and the ground. This intermediate layer can be a tarpaulin or another kind of thin and flexible material or it can be some kind of mechanically stiff platform formed from a hard material.

[0013] In a preferred embodiment of the invention, the principal inflatable tubes have a cross-sectional diameter of at least 1.2 m, preferably at least 1.5 m.

[0014] The use of principal inflatable tubes of large cross-sectional dimensions makes it possible to keep the tubes inflated and the canopy module standing at an air pressure substantially lower than the one necessary in the roof construction described in EP 0 810 339 as mentioned above.

[0015] In a preferred embodiment of the invention, the air pressure within the principal inflatable tubes when inflated during use of the canopy module is within 0.3-2.5 bar, preferably within 0.5-2 bar, most preferred within 1-1.5 bar above atmospheric pressure.

[0016] Using relative low air pressures within the tubes reduces the requirements for the equipment used to inflate the canopy module as well as the demands made on the sewings and other joints of the canopy module.

[0017] In a further preferred embodiment of the invention, the canopy module comprises a plurality of smaller supporting inflatable tubes connecting the principal tubes of the module.

[0018] It is advantageous to have a plurality of supporting tubes, because the module is self-supporting when the tubes are all inflated, if the supporting tubes are arranged in an appropriate structural pattern.

[0019] The canopy module preferably comprises a weather-proof cover, which may be made from the same material as the tubes and formed integrally with the tubes, covering substantially the whole surface of the module with the possible exception of one or more semi-circular end openings which could be left open or closed by other means, thus enabling the passage of people and material between the canopy module and other modules and/or the outside.

[0020] It is advantageous in relation to the erection of the canopy module that it consists of only one piece in-

cluding the principal tubes and the supporting tubes as well as the cover, so that no assembly is needed but the module needs only to be inflated before it is ready to use.

[0021] In an embodiment of the invention, the canopy module comprises means for connecting the module to one or more other canopy modules.

[0022] It is advantageous to be able to connect the module to other modules in that this enables the possibility of combining two or more modules to form a canopy suitable in form and size for almost any construction site in question.

[0023] In an embodiment of the invention, the canopy module comprises means for making the connections to one or more other modules substantially weather-proof.

[0024] Preferably, the connections between neighbouring modules are substantially weather-proof in order to make a canopy formed by the interconnection of two or more modules substantially weather-proof.

[0025] In an embodiment of the invention, the canopy module comprises means for fixing it to the ground.

[0026] It is advantageous to fix the module to the ground in order to prevent the canopy module from flying away or just being displaced in the case of hard winds.

[0027] In an embodiment of the invention, the canopy module comprises means for inflating the module, such as one or more electrical fans or blast machines.

[0028] Preferably, the module includes means for inflation, not only to be used for the erection of the module, but also for keeping it fully inflated when it is being used, as, inevitably, there will be a certain loss of air pressure within the tubes of the module over time if air is not continuously supplied.

[0029] In an embodiment of the invention, the canopy module comprises means for deflating the module in a fast and efficient way, such as one or more large zippers or other means for making one or more large openings between the air-filled cavities of the inflatable tubes and the free space outside.

[0030] It is advantageous to be able to deflate the module fast and efficiently, since this can save a lot of time when the module is being dismantled.

[0031] In an embodiment of the invention, the canopy module comprises means for forced ventilation of a canopy, such as one or more electrical fans.

[0032] It is advantageous to be able to use forced ventilation of a canopy in order to make it possible to remove unwanted gases, such as exhaust from motors and machines being used inside the canopy, and to keep the air within the canopy fresh.

[0033] In an embodiment of the invention, the canopy module is made from PVC, nylon, some kind of air-tight textile or another material which is known to be suitable for making weather-proof tarpaulins and the like.

[0034] It is advantageous to make the module from a material of one of the mentioned types, since this makes it possible to make the module durable and substantially weather-proof. For safety reasons, only fire-retardant materials should be used.

[0035] In an embodiment of the invention, the canopy module has a maximum inner height of at least 4.5 m, preferably at least 6 m, most preferred at least 7.5 m.

[0036] It is advantageous to have an inner height of the said size in order to have modules large enough to cover the construction sites for most smaller buildings.

[0037] In an embodiment of the invention, the canopy module has a maximum inner width of at least 9 m, preferably at least 11 m, most preferred at least 13 m.

[0038] It is advantageous to have an inner width of the said size in order to have modules large enough to cover the construction sites for most smaller buildings.

[0039] In an embodiment of the invention, the canopy module is shaped like a substantially semi-cylindrical shell.

[0040] A module of this shape is advantageous in that it provides an efficient coverage of a rectangular area with brilliant access conditions from both ends.

[0041] In an embodiment of the invention, the canopy module shaped like a substantially semi-cylindrical shell has a length of at least 2.5 m, preferably at least 3.5 m, most preferred at least 4.5 m.

[0042] It is advantageous to have a length of the said size in order to be able to cover the construction sites for most smaller buildings by a single module or a combination of only a few modules.

[0043] In another embodiment, the canopy module is formed as a substantially perpendicular junction of two parts, each of the two parts shaped like a substantially semi-cylindrical shell. These two parts may be of equal or different cross-sectional dimensions.

[0044] A module of this shape is advantageous in that it makes it possible to combine two or more modules into a canopy that covers an area which is not rectangular, such as a construction site for a T-shaped or L-shaped house or any other house with any given number of wings.

[0045] In yet another embodiment of the invention, the canopy module is designed to form at least a partly closure of an end opening of a canopy.

[0046] A module of this kind is advantageous in that it makes it possible to reduce the size of the rather large end openings of a canopy which is formed by a combination of one or more modules of the previously mentioned types of modules.

[0047] In an embodiment of the invention, the canopy module designed to form at least a partly closure of an end opening of a canopy has a length of at least 2.5 m, preferably at least 3.5 m, most preferred at least 4.5 m.

[0048] It is advantageous to have a length of the said size in order to be able to cover the construction sites for most smaller buildings by a combination of only a few modules.

[0049] In an embodiment of the invention, the canopy module designed to form at least a partly closure of an end opening of a canopy may comprise one or more doors, gates, curtains or other means designed for making an at least partly weather-proof sealing of an end

opening of a canopy.

[0050] It is advantageous to be able to seal an end opening of a canopy in an at least partly weather-proof way in order to keep good working conditions inside the canopy even during times of bad weather, and at the same time to have the possibility to open up the end of the canopy in a simple and easy way in order to facilitate the motion of people and material into and out from the canopy.

[0051] In an aspect of the invention, it comprises a set of two or more canopy modules being of identical or different types and designed to be mutually interconnectable, thus making it possible to combine them into a canopy of the desired size and form.

[0052] It is advantageous to have access to a set of modules which fit each other and can easily be combined to form a canopy of any required size and shape.

[0053] In another aspect of the invention, it comprises a free-standing canopy, formed by an interconnection of one or more canopy modules, suitable for covering an outdoor area, such as a construction site including one or more buildings.

[0054] In yet another aspect of the invention, the free-standing canopy is used for covering a construction site, enabling construction work to take place in almost all kinds of weather conditions including windy and rainy weather.

[0055] In other embodiments of the invention, the free-standing canopy is used for storage purposes or for weather protection of participants in festivals or concerts. Obviously, the canopy can be used anywhere where a shelter is needed, even if the need arises on a short notice.

[0056] An aspect of the invention is that a canopy formed by two or more canopy modules is very flexible in regard to the terrain onto which it is placed.

[0057] It is advantageous that the canopy is not sensible to the terrain and can be used for covering construction sites and other places that are horizontal, sloping or have minor level differences which can be overcome by the dimensions of the canopy modules.

Brief description of the figures

[0058] Some embodiments of the invention will be described in the following with reference to the figures in which

fig. 1 illustrates a canopy module shaped like a substantially semi-cylindrical shell,

fig. 2 illustrates a canopy module formed as a substantially perpendicular junction of two parts, each of the two parts shaped like a substantially semi-cylindrical shell,

fig. 3a illustrates a canopy module designed to form at least a partly closure of an end opening of a canopy,

fig. 3b illustrates a canopy module comprising a curtain, designed to seal an end opening of a canopy,

fig. 3c illustrates a canopy module comprising an overhead sectional door, designed to seal an end opening of a canopy,

fig. 4a illustrates a canopy module designed to form at least a partly closure of an end opening of a canopy which is connected to a canopy module shaped like a substantially semi-cylindrical shell,

fig. 4b illustrates a combination of one canopy module formed as a substantially perpendicular junction of two parts, each of the two parts shaped like a substantially semi-cylindrical shell, and three canopy modules shaped like substantially semi-cylindrical shells,

fig. 5a illustrates the use of a canopy module on a horizontal construction site,

fig. 5b illustrates the use of a canopy module on a sloping construction site,

fig. 5c illustrates the use of a canopy module on a construction site with minor level differences,

fig. 6a illustrates a normal, cross-sectional shape of a canopy module,

fig. 6b illustrates a canopy module whose width has been increased, and

fig. 6c illustrates a canopy module whose height has been increased.

[0059] The figures are provided to illustrate and support the understanding of the invention and are not to be regarded as limiting of the scope of protection defined by the appended claims.

Detailed description

[0060] Figure 1 shows a canopy module 1 shaped like a substantially semi-cylindrical shell. The illustrated module comprises two principal inflated tubes 2, a number of smaller supporting inflatable tubes 3, a cover 4 and some ropes 5 for fixation of the module to the ground.

[0061] In some embodiments of the invention, the cover comprises two layers of material, thus providing a better thermal insulation of the inside of the canopy module from the outside.

[0062] The ropes 5 shown in the figure only illustrates

one of many ways in which the module 1, 6, 8 can be fixed to the ground. Other possible methods for fixation of the module 1, 6, 8 include the use of rings or clamps at the end parts of the principal inflatable tubes 2 for pegging down the module 1, 6, 8 or strapping it to a number of platforms supporting its principal tubes 2 and/or flaps of a suitable material formed as integral parts of the module 1, 6, 8 and suitable for being spread on the ground and covered with sand bags or other heavy items. Furthermore, water containers and/or sand bags can be placed inside the end parts of the principal inflatable tubes 2 in order to keep the module 1, 6, 8 in position even in stormy weather.

[0063] Figure 2 shows a canopy module 6 formed as a substantially perpendicular junction of two parts, each of the two parts shaped like a substantially semi-cylindrical shell.

[0064] The illustrated embodiment of the canopy module 6 is a T-shaped junction of the two parts with three end openings 7. In another embodiment, the junction could be shaped like a cross with four end openings 7.

[0065] A canopy module 8 designed to form at least a partly closure of an end opening 7 of a canopy is shown in figure 3a. The illustrated embodiment of the module 8 leaves an open end 7, whereas the embodiments shown in figure 3b and 3c illustrates how a canopy end 7 can be sealed in an at least partly weather-proof way by means of a curtain 9 or an overhead sectional door 10, respectively. Alternatively, other means including different types of doors can be used for sealing the end 7 of a canopy.

[0066] Figure 4a shows a canopy module 8 designed to form at least a partly closure of an end opening 7 of a canopy, which module 8 is connected to another canopy module 1 shaped like a substantially semi-cylindrical shell.

[0067] Figure 4b shows a combination of one canopy module 6 formed as a substantially perpendicular junction of two parts, each of the two parts shaped like a substantially semi-cylindrical shell, and three canopy modules 1 shaped like substantially semi-cylindrical shells.

[0068] Obviously, equal and different types of canopy modules 1, 6, 8 can be combined in a vast number of ways depending on the needed form and size of a canopy for a specific construction site.

[0069] The means comprised by each module 1, 6, 8 for connecting it to one or more other modules 1, 6, 8 preferably include a plurality of rings or clamps, advantageously made from metal, arranged on the side parts of the canopy module 1, 6, 8 and suitable for being strapped to similar rings or clamps of one or more other canopy modules 1, 6, 8.

[0070] Other means for connecting canopy modules 1, 6, 8 such as a strap being mounted all the way around two principal inflatable tubes 2 belonging to two neighbouring modules 1, 6, 8, respectively, or other alternative connection solutions are all within the scope of the present invention as well.

[0071] The connection of modules 1, 6, 8 can take place either before or after they are inflated. Due to the large dimensions of the modules 1, 6, 8, it can be advantageous to connect them to each other before they are inflated.

[0072] In order to make the connection between two canopy modules 1, 6, 8 weather-proof, a piece of a suitable material, which can very well be the same type of material as the modules 1, 6, 8 themselves are made from, can be arranged to cover the connection.

[0073] This piece of material can either be formed as an integral part of one or both of the connected canopy modules 1, 6, 8, which part is suitable for being spread out to cover the connection, or it can be a loose piece of material that is suitable for being spread out over the connection and fastened by ropes or other suitable means when the canopy modules 1, 6, 8 have been inflated and are placed in their proper positions.

[0074] Because of the large volume of the tubes of a canopy module 1, 6, 8, each module is advantageously supplied with one or more blowers for inflating the module 1, 6, 8 and keeping it fully inflated. The one or more blowers are connected to the tubes 2, 3 of the module 1, 6, 8 by one or more inflation tubes which are preferably formed as integral parts of the module 1, 6, 8 and have dimensions suitable for connection to the outlets of the one or more blowers. Preferably, the inflation tubes can be opened and closed by means of some form of valve mechanisms.

[0075] In an embodiment of the invention, the tubes 2, 3 of two or more canopy modules 1, 6, 8 can be interconnected through a number of connection tubes that can be opened or closed by means of some form of valve mechanisms. In this case, one or more of the blowers can be disconnected after the two or more modules 1, 6, 8 have been inflated, and the two or more modules 1, 6, 8 can be kept fully inflated, preferably by a single blower and at least by a lower number of blowers than were needed to inflate the modules 1, 6, 8.

[0076] If a canopy module 1, 6, 8 is to be deflated simply by letting the air out through the one or more inflation tubes of the module 1, 6, 8, it will be a very time-consuming process. Therefore, in order to save time, each module 1, 6, 8 preferably comprises means for deflation, such as means for creating a large opening in one or more of the principal inflatable tubes 2 of the module 1, 6, 8 in a fast and simple way. One example of such means for deflation of a canopy module 1, 6, 8 is an air-tight zipper, but any means that can easily create a large opening and close it again in an air-tight manner, can be used.

[0077] In order to be able to ventilate the working area inside one or more canopy modules 1, 6, 8, it is advantageous if the covers 4 of one or more of the modules 1, 6, 8 include one or more parts which can be opened and, if necessary, equipped with one or more electric fans or similar devices designed for ventilation of rooms and buildings. Such openings are also well suited for passing

through materials or equipment such as a crane when necessary during construction work.

[0078] In the case of very cold weather, one or more of the blowers are preferably able to supply the one or more canopy modules 1, 6, 8 with warm air, thus increasing the temperature within the one or more modules 1, 6, 8.

[0079] In an embodiment of the invention, one or more canopy modules 1, 6, 8 comprise means suitable for fastening advertising banners on the outer surface of the module 1, 6, 8, such as Velcro fasteners, rings or clamps.

[0080] The design of the invention makes it useable in varying terrains. To illustrate this, figure 5a shows the use of a canopy module 1, 6, 8 on a horizontal construction site, figure 5b shows the use of a module 1, 6, 8 on a sloping construction site, and figure 5c shows the use of a module 1, 6, 8 on a construction site with minor level differences, which can be overcome by the dimensions of the module 1, 6, 8.

[0081] Figure 6a-6c illustrates another flexibility of the invention by showing how the width and height of a canopy module 1, 6, 8 can be varied according to the actual needs. In figure 6b, it is seen how the width can be increased from the normal form as seen in figure 6a, thus decreasing the height of the module 1, 6, 8, while figure 6c shows how the height of the module 1, 6, 8 can be increased from the normal form by decreasing the width.

Claims

1. An inflatable canopy module (1, 6, 8) having a framing structure comprising one or more principal inflatable tubes (2) with a cross-sectional diameter of at least 80 cm, each of which tubes forms an arch designed to be arranged in a substantially vertical position with both end parts of the inflated tube resting on the ground during normal use of the module.

2. A canopy module (1, 6, 8) according to claim 1, wherein the principal inflatable tubes (2) have a cross-sectional diameter of at least 1.2 m, preferably at least 1.5 m.

3. A canopy module (1, 6, 8) according to claim 1 or 2, wherein the air pressure within the principal inflatable tubes (2) when inflated during use of the canopy module is within 0.3-2.5 bar, preferably within 0.5-2 bar, most preferred within 1-1.5 bar above atmospheric pressure.

4. A canopy module (1, 6, 8) according to any of claims 1-3 comprising a plurality of supporting inflatable tubes (3) connecting the principal tubes (2) in a structural pattern that makes the module self-supporting when the tubes (2, 3) are all inflated.

5. A canopy module (1, 6, 8) according to any of the preceding claims comprising means for connecting the module to one or more other canopy modules.

6. A canopy module (1, 6, 8) according to any of the preceding claims comprising means for ventilating a canopy.

7. A canopy module (1,6,8) according to any of the preceding claims having a maximum inner height of at least 4.5 m, preferably at least 6 m, most preferred at least 7.5 m.

8. A canopy module (1, 6, 8) according to any of the preceding claims having a maximum inner width of at least 9 m, preferably at least 11 m, most preferred at least 13 m.

9. A canopy module (1) according to any of the preceding claims shaped like a substantially semi-cylindrical shell.

10. A canopy module (1) according to claim 9 having a length of at least 2.5 m, preferably at least 3.5 m, most preferred at least 4.5 m.

11. A canopy module (6) according to any of claims 1-8 formed as a substantially perpendicular junction of two parts, each of the two parts shaped like a substantially semi-cylindrical shell.

12. A canopy module (8) according to any of claims 1-8 designed to form at least a partly closure of an end opening (7) of a canopy.

13. A canopy module (8) according to claim 12 having a length of at least 2.5 m, preferably at least 3.5 m, most preferred at least 4.5 m.

14. A canopy module (8) according to claim 12 or 13 comprising one or more doors (10), gates (10), curtains (9) or other means designed for making an at least partly weather-proof sealing of an end opening (7) of a canopy.

15. A set of canopy modules comprising two or more modules (1, 6, 8), each according to any of the preceding claims.

16. A free-standing canopy suitable for covering an outdoor area, such as a construction site including one or more buildings, said canopy comprising an interconnection of two or more self-supporting modules (1, 6, 8), each module according to any of claims 1-14.

17. The use of a canopy according to claim 16 for covering a construction site, enabling construction work to take place in almost all kinds of weather conditions

including windy and rainy weather.

18. The use of a canopy according to claim 16 for storage purposes.

19. The use of a canopy according to claim 16 for weather protection of participants in festivals or concerts.

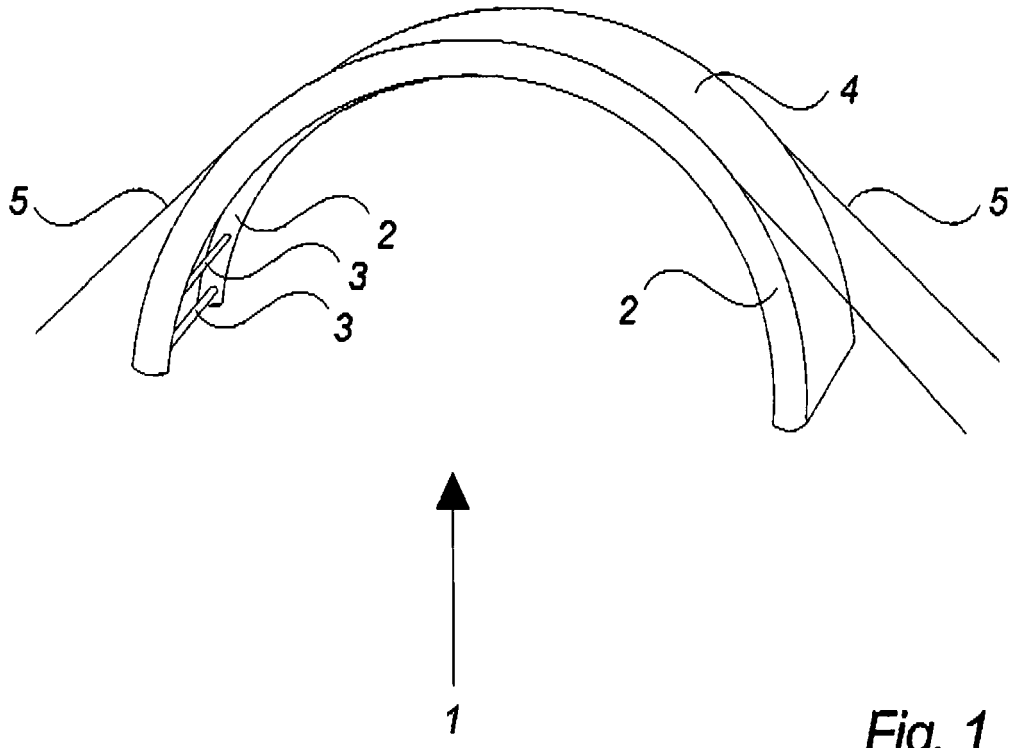

Fig. 1

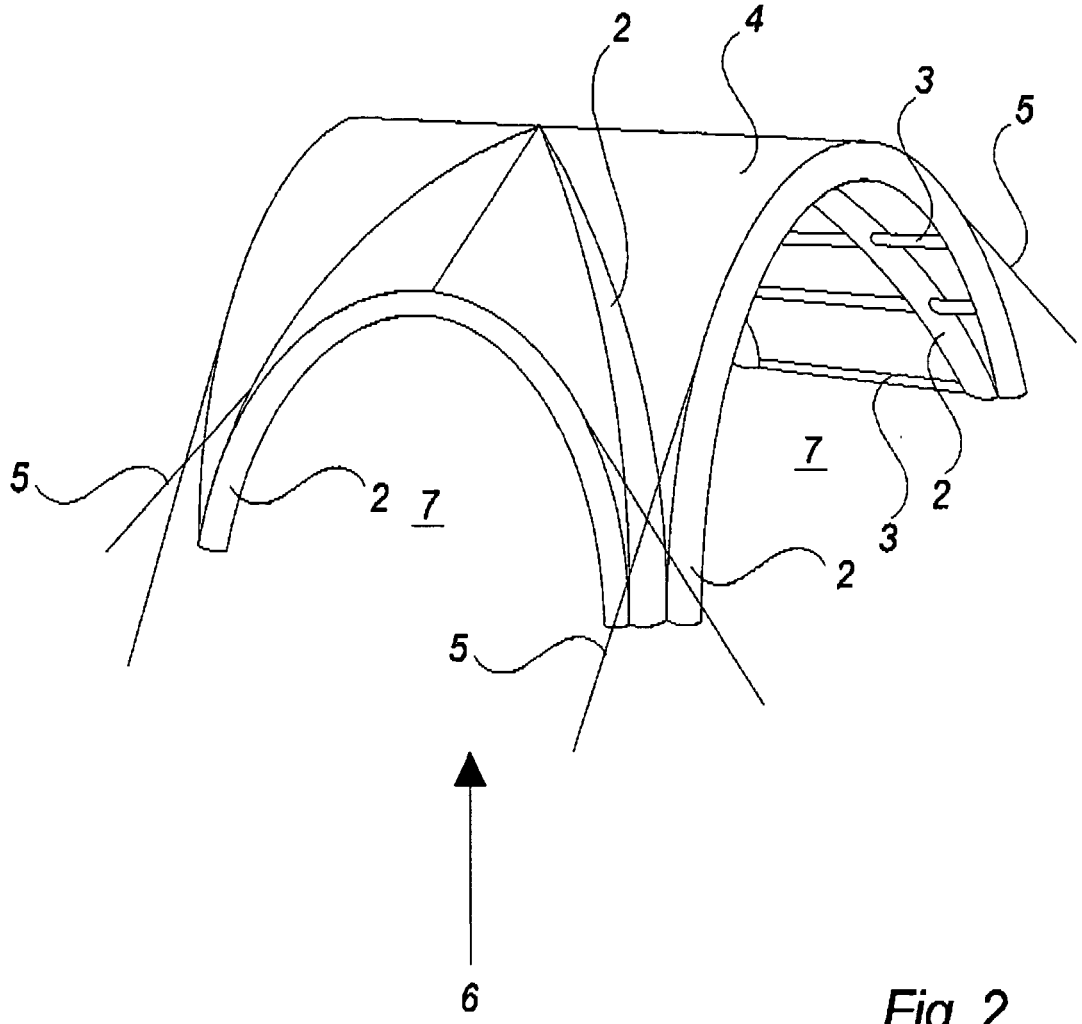

Fig. 2

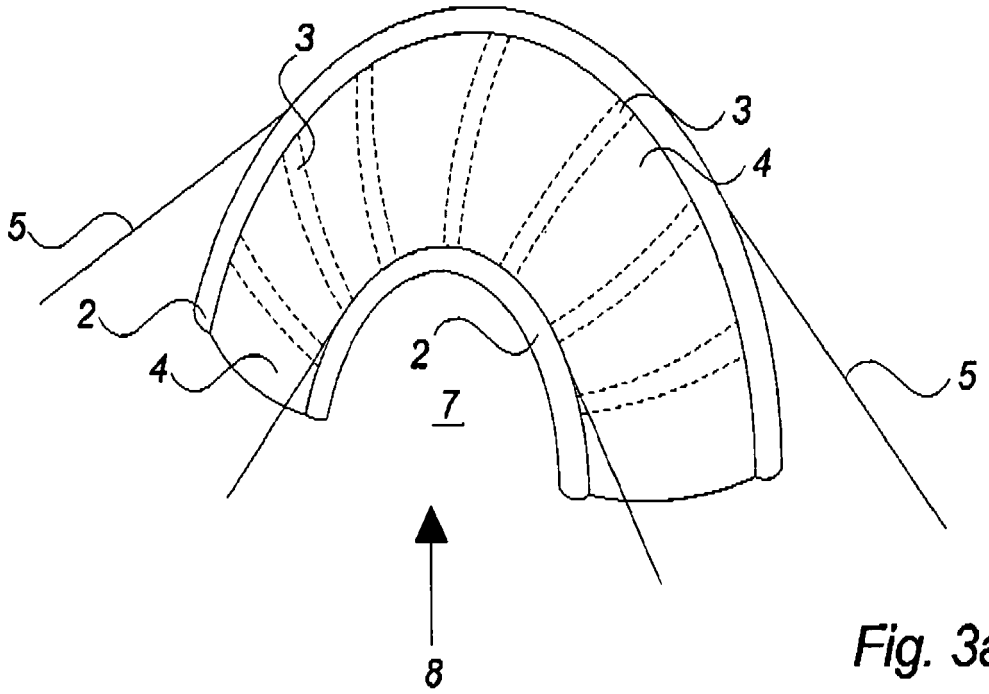

Fig. 3a

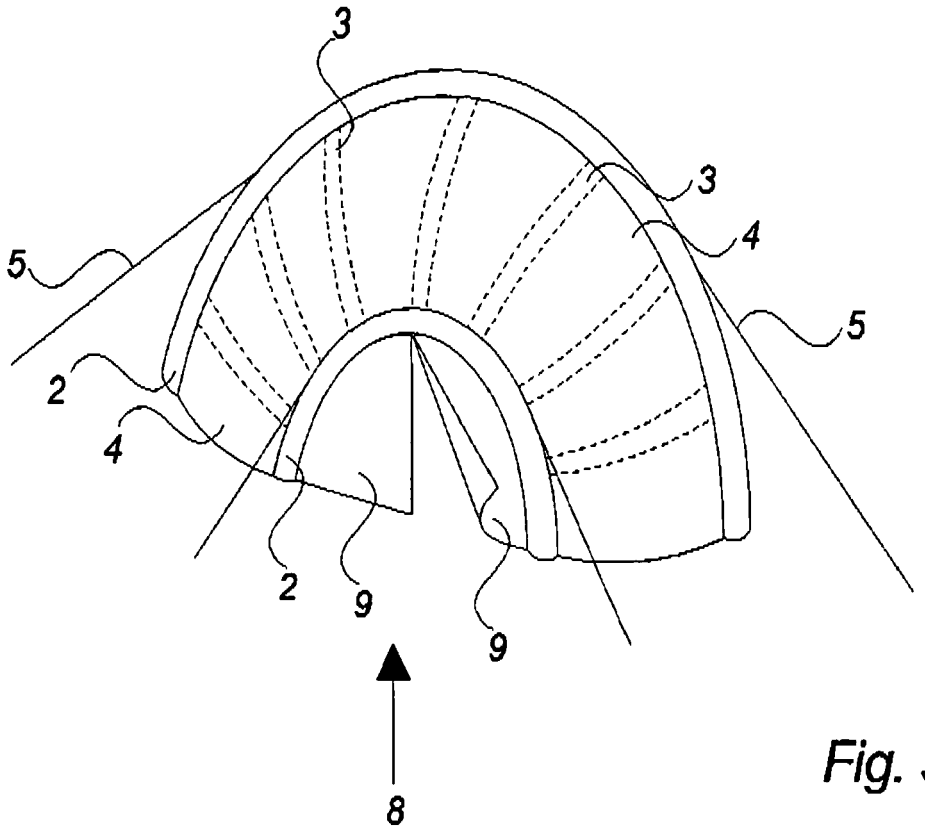

Fig. 3b

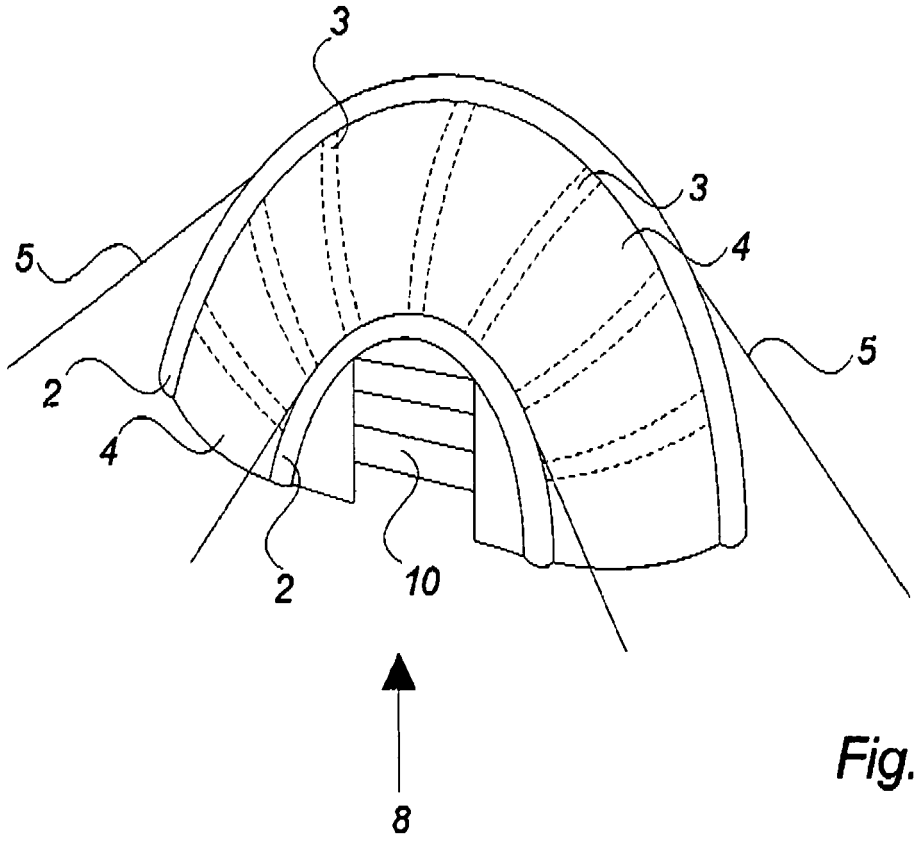

Fig. 3c

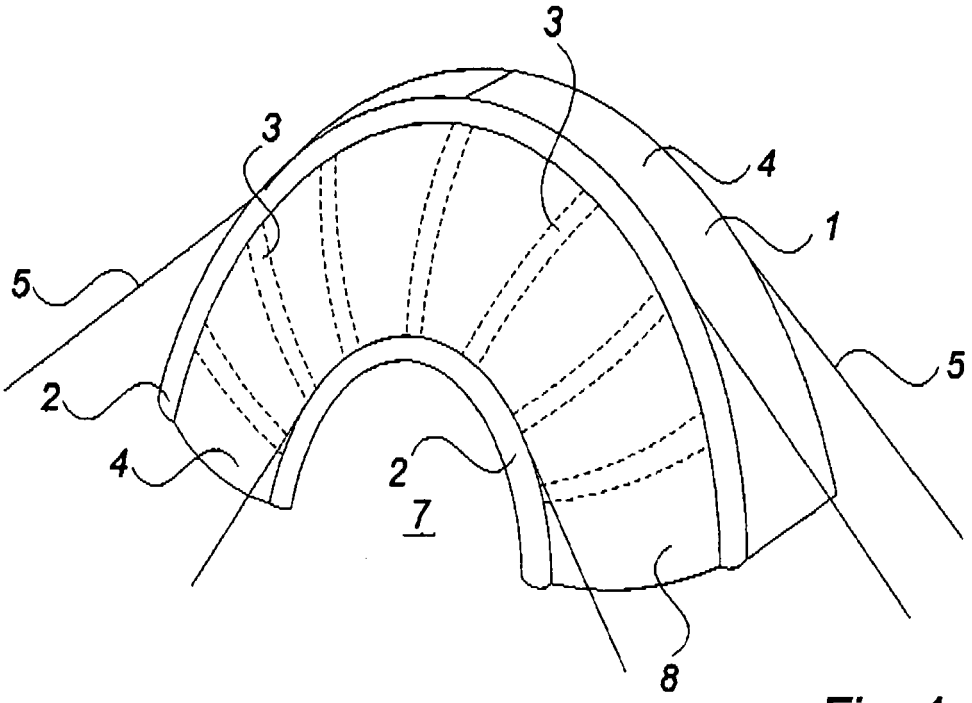

Fig. 4a

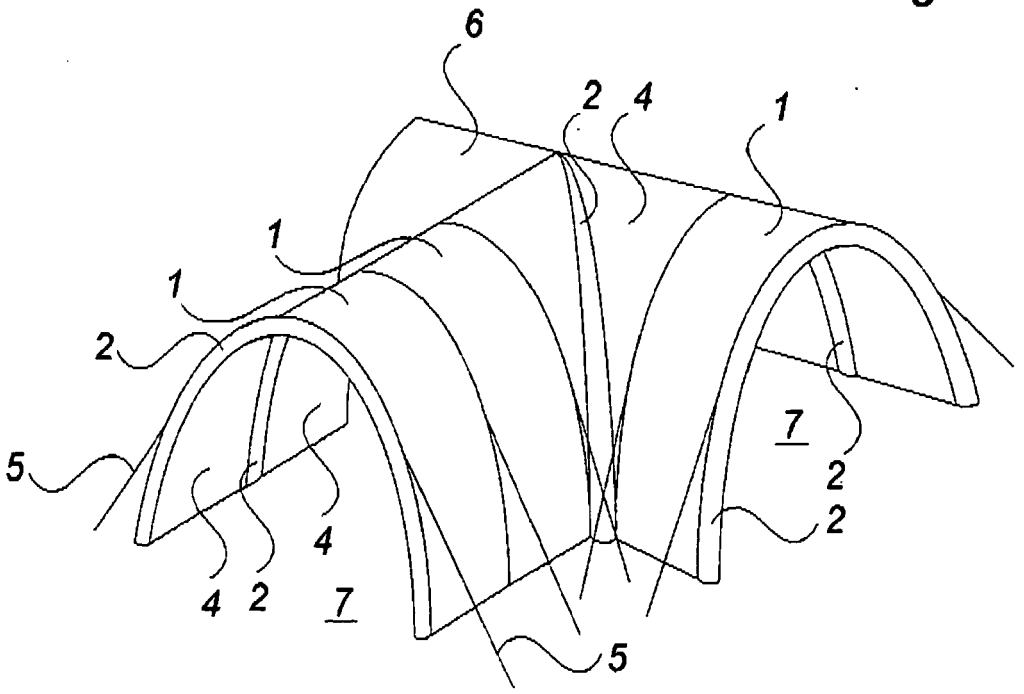

Fig. 4b

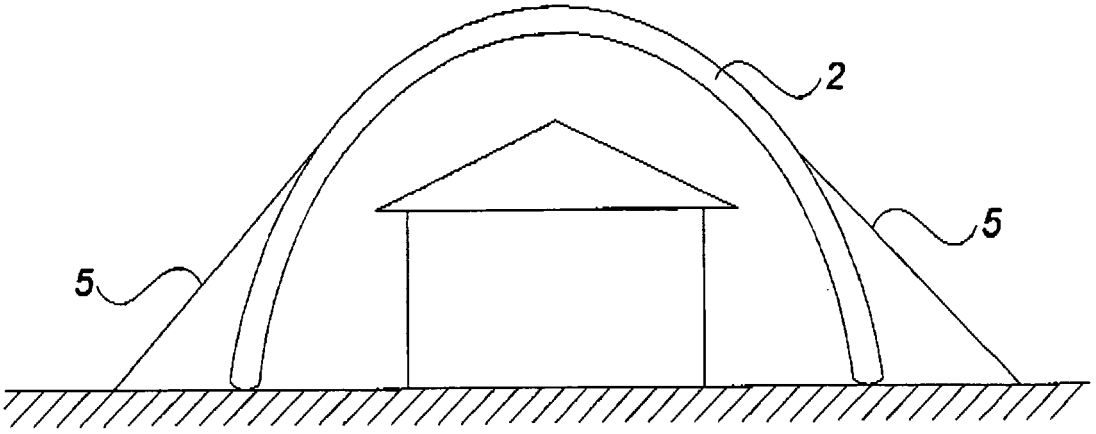

Fig. 5a

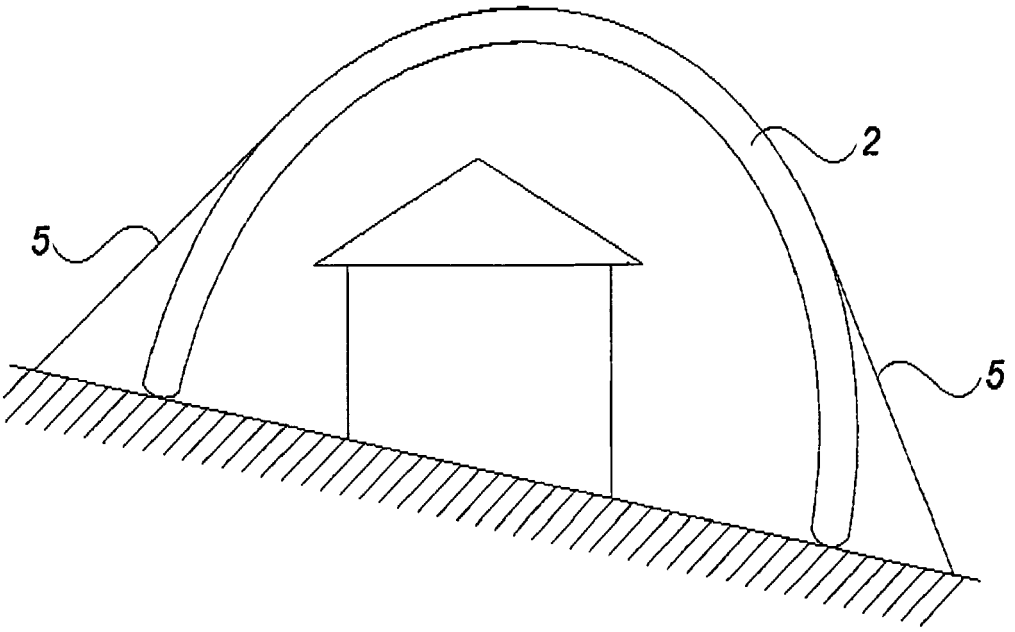

Fig. 5b

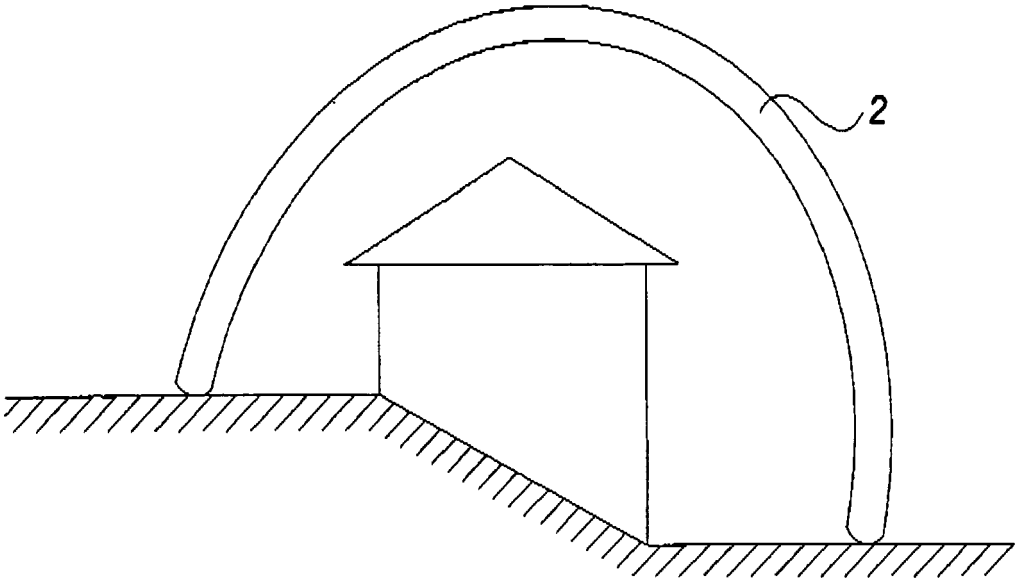

Fig. 5c

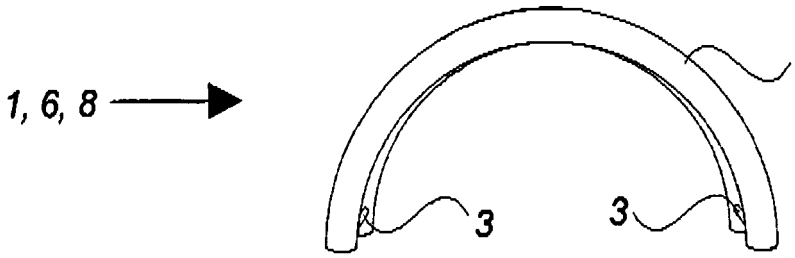

Fig. 6a

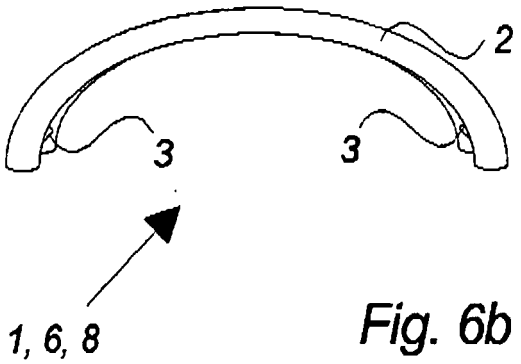

Fig. 6b

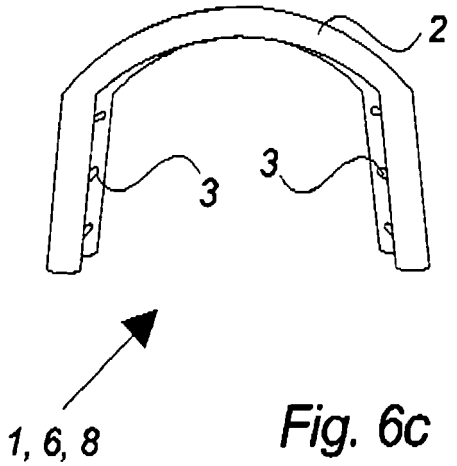

Fig. 6c

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Application Number
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