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(54) Title: HIGH PRESSURE INFLATABLE BEAM

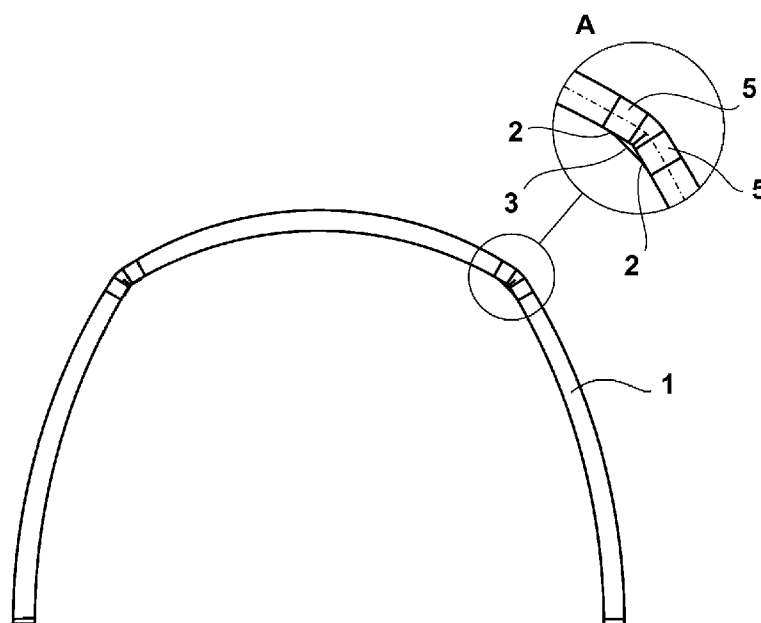


Fig. 2

(57) Abstract: A high pressure inflatable beam (1) with a typical internal operating pressure in the range of 100 to 1,000 kPa, formed from conventional or modified fire hoses, or other industrial hoses or tubes produced by seamless braiding technology with an internal lining impervious to air and a possible outer protective coat, the ends of which are closed by a plug, wherein at least one plug contains at least one filling and/or discharging element for the filling medium, and the ends of the beam (1) are firmly put in at a distance of less than the total length of the beam (1), where at least one a section of its length, the beam (1) is provided with at least two adjoining fixed attachment points (2) located in the longitudinal direction of the beam (1) and formed on the surface of the beam (1) or sleeves (5) of the beam (1), wherein the fixed attachment points (2) are interconnected by at least one force exerting element (3), whose straight length between the fixed attachment points (2) is shorter than the straight length of the plain beam (1) between these fixed attachment points (2).

GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- *as to the identity of the inventor (Rule 4.17(i))*
- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *of inventorship (Rule 4.17(iv))*

Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

Description

HIGH PRESSURE INFLATABLE BEAM

Technical Field

[0001] The technical solution relates to inflatable beams for structures above ground, in particular for forming temporary roofings such as tents, tunnels, podiums and other typical and atypical roofings, for forming ancillary structures for attachment and suspension of technology, for securing another fixed or inflatable structure against a fall, or as separate inflatable objects.

Background Art

[0002] High-pressure inflatable beams filled with air or inert gas, with a typical internal operating pressure in the range of 100 to 1,000 kPa, are used as a load-bearing element of tents and temporary roofings, in which case they preferably use, as a construction element, conventional or modified fire or industrial hoses or other tubes produced using the technology of seamless braiding with an internal lining impervious to air and a possible surface finish.

[0003] The use of fire hoses as beams of a roof construction is presented in the document in EP 0810339. This solution makes it possible to provide temporary roofing by means of a structure comprising inflatable beams, preferably made of fire hoses. These hoses are connected at the ends to fixed supporting elements arranged in a row. When forming the covering of a space, solid supporting elements are placed at the edges of the space to be covered, and the elements also serve as elements for air distribution to the said hoses. Hoses are connected to these supporting elements by the respective ends and, after inflation, the hoses form an arch, or a row of arches, between the said supporting elements. A covering sheet is then attached to this row of arches. The above solution creates an arcuate covering that is open at the ends (a tunnel).

[0004] The document SK 6715 Y1 discloses a tent with an inflatable support structure, which tent uses an inflatable beam made of a standard fire or

other industrial seamless hose with outer textile braiding, the hose being closed at each end by a plug, of which at least one comprises an air inlet or discharge element, and at least one end of the hose is attached to or supported on the outer skin of the tent or on the floor portion of the tent. The use of standard fire or other industrial seamless hoses with outer textile braiding and an internal lining impervious to air allows higher operating pressure without the need for pressure compensation by overpressure valves. The shape and overall size of the supporting structure of the tent is thus defined and constant even in cases of pressure fluctuations caused by a change in temperature or pressure of the external environment. Since the tent skin and the floor portion generally form one unit, or the ends of the hose are anchored to the floor, when inflated the hose is basically formed into an arcuate shape, more specifically in accordance with the shape predefined by the adapted cut of the outer skin and the floor portion.

- [0005] The inflatable beams of the documents EP 0810339 and SK 6715 Y1 preferably provide a sufficiently rigid and stable supporting element to form a roofing of an area in the form of tunnel roofs or dome roofs or tents. The shape of the beam, and thus also the shape of the roof, is achieved by a fixed position of the elements - the bases, in which the beam ends are attached; after inflating the beam and spreading it between the bases, a continuously arcuate shape is created, defined by the ratio of the length of the hose (tube) and the span of the bases. Depending on the said ratio, the arch profile may have a semi-arcuate or elliptical shape.
- [0006] A disadvantage of the prior art in the above described roof construction is basically the given arcuate shape of the inflatable beam. This reduces the application possibilities in cases where a beam profile other than a continuous arch is necessary for static or aesthetic reasons, where it is necessary to copy the shape of another object or where a better underpassability is necessary due to an unsuitable lead angle at the base of the beam.
- [0007] The aim of this technical solution is a substantial elimination of the drawbacks of the prior art.

Disclosure of Invention

- [0008] The said aim is achieved by an arcuate high pressure inflatable beam according to the present invention, with a typical internal operating pressure in the range of 100 to 1,000 kPa, formed from conventional or modified fire hoses, or other industrial hoses or tubes produced by seamless braiding technology with an internal lining impervious to air and a possible outer protective coat, the ends of which are closed by a plug, with at least one plug containing at least one filling and/or discharging element for the filling medium, and the ends of the beam are firmly put in at a distance of less than the total length of the beam, the essence of which lies in the fact that at least one a section of its length, the beam is provided with at least two adjoining fixed attachment points located in the longitudinal direction of the beam axis and formed on the surface of the beam, with the fixed attachment points being interconnected by at least one force exerting element whose straight length between the fixed attachment points is shorter than the straight length of the plain beam between these fixed attachment points.
- [0009] The principle of a force exerting element ensuring a change in the shape of the beam consists in the forcible shortening of the inner circumference of the arcuate beam. This is achieved by fixing two or more points of the beam circumference to a distance that is less than the original distance between the given points before fixation. Depending on the ratio of such a contraction, the ratio of the distance between the circumferential yarns of the basic fabric of the tube changes after inflation of the beam. On the outer circumference of the beam, the yarns remain spaced to the maximum distance allowed by the fabric structure of the tube, while on the inner circumference of the beam distances between circumferential yarns of the basic fabric of the tube are reduced according to the ratio and manner in which the force exerting element is applied. If the contraction is severe, not only is there a reduction of the distance between the circumferential yarns, but also a fold comes into being on the tube surface. Thus, visually, depending on the ratio of contraction of the force exerting

elements, the beam is bent or even kinked at the given point of action of the force exerting elements.

- [0010] The fixed attachment points of the force exerting element may take the form of projections formed on the beam fabric during the process of braiding the tube or tube.
- [0011] The fixed attachment points may also take the form of locally added material on the surface of the hose or tube. This may be formed using the technology of welding, sewing, gluing or other known technologies. The material locally added in this manner may also be around the entire circumference of the hose or tube in the form of a sleeve, which appears to be the most preferable solution. Such a hose sleeve encircles the outer circumference of the hose and can be made of a variety of suitable materials, such as metal, plastic, textile, composite, and the like. It is possible to apply two separate sleeves interconnected by a force exerting element. In the case of sleeves, it is possible for the force exerting element to be constituted by a continuous connection of the sleeves, which essentially creates one shaped sleeve with a preset bending angle.
- [0012] Consequently, this technical solution requires at least one force exerting element attached at at least two points. In the case of placing the force exerting element in the inner arc of the beam, the element is acted upon mainly by tensile forces. The material for forming the force exerting element can thus be either a rigid shaped element made of materials such as metal, composite, plastic, wood and the like, or a tensile element made of materials such as textile, strap, rope, cord and the like. The rigid shaped element is more preferable for the purpose at hand because of better properties in the catching of lateral forces acting at the point of the bend of the beam. In the case of the positioning of the force exerting elements on the side of the beam or on the outer arc of the beam, both tensile and compressive forces are to be captured at the same time and the use of exclusively rigid materials capable of capturing both types of forces is presumed.
- [0013] When the forces are greater or the beams are bigger, a combination of the placement of the force exerting elements on the beam, more specifically

on the beam arc, and/or on the sides of the beam, and/or on the outer arc of the beam may be used preferably. One rigid shaped element or tensile element may be placed on the inner arc of the beam, at least one, preferably a pair of rigid force exerting elements may be placed on the side of the beam and one force exerting element may be placed on the outer arc of the beam. The force exerting element on the side of the beam and the outer arc of the beam has an angle corresponding to the angle of bending or angle of kinking of the beam. Of course, various other combinations of locations of the force exerting elements are also possible depending on the given design requirements for the purpose or placement of the beam.

- [0014] Each single bend or kink of the beam requires its own force exerting element or system of force exerting elements. Thus, the resulting beam shape may be, for example, a combination of an arch with one kink in the middle, forming a gothic arch profile, a bend with two kinks at the sides, ensuring a sharper lead angle from its base and the associated better internal underpassability, or a combination of multiple kinks as far as it is advantageous for the application at hand.
- [0015] To improve the form stability of the beam, it is possible to interconnect the points of attachment of the force exerting element, or force points formed elsewhere on the beam, using a chord.

Brief Description of Drawings

- [0016] The technical solution is explained in more detail in the attached drawings, where:
- [0017] Fig. 1 is a schematic representation of a prior art arcuate high-pressure beam;
- [0018] Fig. 2 is a schematic representation of an arcuate high pressure beam in one illustrative embodiment according to the technical solution with detail A of the bending or kinking of the beam;
- [0019] Fig. 3 is a schematic representation of variants a, b, c, d, e, f, g, h, i of the illustrative embodiment of the fixed attachment point and the force exerting element according to the present technical solution;

- [0020] Fig. 4 is a schematic representation of variants a, b, c, d of examples of the positioning the force exerting element on a single or double hose or tube of a beam according to the present technical solution;
- [0021] Fig. 5 is a schematic representation of variants a and b of illustrative embodiments of various beam shapes according to the present technical solution;
- [0022] Fig. 6 shows an example of the application of a beam according to the present technical solution for a tunnel-type tent.

Mode(s) for Carrying Out the Invention

- [0023] The arcuate high pressure inflatable beam 1 according to the present solution comprises one hose or tube made by seamless braiding technology with an internal lining impervious to air and a possible outer protective coat. This hose or tube is provided with air plugs at its ends.
- [0024] Due to the nature of its symmetrical structure, when no lateral forces act upon it, the high pressure inflatable hose or tube tends to maintain a straight shape when inflated and pressurized to operating pressure. For the purpose of using high pressure hoses or tubes as roofing beams, such as e.g. tents and the like, it is customary to use a hose or tube being longer than the planned distance between the attachments of its ends - bases. As a result of the fixation of the bases, this way the hose or tube is bent into a continuously arcuate shape forming part of a circle or ellipse, as shown in fig. 1
- [0025] For changing the shape of this beam 1, as shown e.g. in fig. 2, fig. 5, and fig. 6, at least two adjoining fixed attachment points 2 are formed at at least one section of the beam 1 length. The points 2 are located in the longitudinal direction of the beam 1 and are formed on the surface or sleeves of the beam 1. The attachment points 2 are interconnected by at least one force exerting element 3 whose straight length, i.e. the direct distance between the two attachment points 2 is shorter than the straight length of the beam 1 between these points 2. Said straight length of the beam 1 is understood to be the length at the stretched or inflated straight beam 1 without applying said force exerting element 3.

- [0026] In the simple inflated state of the beam 1, i.e. in a state where the beam 1 has been inflated without any external force action, the distance between the two fixed points 2 formed on the surface of the beam 1 is defined by the natural expandability of the hose material or tube material and the internal pressure in the hose or tube acting on the tube walls. After deflation of the beam 1 and installation of the force exerting element 3 interconnecting the fixed attachment points 2 and after re-inflation thereof, deformation, bending, kinking of beam 1 occurs that is directly proportional to the difference in length of the force exerting element 3 and the distance between the fixed points 2 in the simple state of the beam 1. The difference in the shape of the beam 1, compared to the state of the art in fig. 1, due to the application of the force exerting elements 3, is visible e.g. in fig. 2 and fig. 5.
- [0027] Fig. 3 shows schematically variants of example embodiments of the fixed attachment points 2, for example in the form of projections 6 formed during the process of braiding of the hose or tube, fig. 3a; by means of additional material 4 applied locally to the surface of the hose or tube; fig. 3b. This additional material 4 may, for example, also take the form of sleeves 5 applied around the circumference of the hose or tube, fig. 3c, d, e, f, g, h, i. The sleeves 5 can be continuously connected to form one shaped sleeve 5, of rigid material, with a pre-set angle of bending or kinking of the beam 1. Thus, the sleeve 5 also forms a force exerting element 3. This embodiment is shown in fig. 3d.
- [0028] Fig. 3 also shows variants of example embodiments of the force exerting element 3.
- [0029] Variants a, b, c represent example embodiments of the force exerting element 3 located only on the inner arc of the beam 1. Variants a, b then show the force exerting element 3 formed as a tensile element; the tensile element may be made of materials such as textile, strap, rope, cord and the like, or also from a rigid material such as metal, wood, hard plastic, and the like. Variant e shows a force exerting element 3 made exclusively as a rigid shaped element. The force exerting element 3 made as a rigid

shaped element can also be located on the outer arc of the beam 1 as shown in the variant g.

- [0030] Variant f represents an example embodiment of a force exerting element 3 formed as a rigid shaped element located on the side of the beam 1. If the force exerting element 3 is located on the side of the beam 1, a symmetrical application of two such force exerting elements 3 formed as a rigid shaped element is presumed preferably.
- [0031] Variants h, i represent an example embodiment of a combination of force exerting elements 3 located on the inner arc of the beam 1 and at the same time on the side of the beam 1. Variant h specifically illustrates a combination in the case of the use of a force exerting element 3 on the inner arc of the beam 1, where the force exerting element 3 is formed as a tensile element made of a soft or rigid material and the force exerting element 3 on the side of the beam 1 is formed as a rigid shaped element. Variant i specifically illustrates a combination where the force exerting element 3 on the inner arc of the beam 1 is a rigid shaped element. By means of a combination of force exerting elements 3 as shown by the variants h, i in fig. 3, it is possible to achieve a better lateral stability of the beam 1, in particular in cases of a single standing beam 1 which is not tied to another structure, system or bracing.
- [0032] It is clear from fig. 3 that the crucial parameter defining the bending or kinking angle of the beam 1 is not the length of the force exerting element 3 as such, but the direct distance between the two points 2, by which the straight or shaped force exerting element 3 is attached to the fixed attachment points 2 of the beam 1.
- [0033] The force exerting elements 3 formed as rigid shaped elements, used on the sides or on the upper arc of the beam 1, are shaped in accordance with the predetermined angle of bending or kinking of the beam 1. The most preferable material in this case is metal strip that is bent, for application to the outer or inner arc of the beam 1, or cut, for application onto the side of the beam 1, to a shape that takes into account the desired angle of bending or kinking of the beam 1.

- [0034] Fig. 4 schematically shows variants of examples of locations of the force exerting element 3 on the hose or tube which is simple hose or tube, variant a, b, c, d, and double hose or tube, variant e, respectively. Fig. 4, variants a, b, c, d are in fact transversal cross-sections of the beam 1 at the location of the force exerting element 3, from the respective variants of fig. 3. The position of the force exerting element 3 is shown schematically, i.e. only the position relative to the beam 1 is indicated, not the actual embodiment of the particular variant of the coupling element 3. Variant e shows a combination of the force exerting elements 3 located on the side of the beam 1, which is an assembly of two coaxial hoses or tubes. In this variant, it is necessary that the force exerting element 3 is applied on each hose or tube.
- [0035] Fig. 5 then shows a schematic view of variants a, b, examples of various beam shapes obtainable by this technical solution.
- [0036] Fig. 6 illustrates an example use of a high-pressure inflatable beam 1 according to the present technical solution as a beam of a tunnel-type tent, where the underpassability at the longitudinal walls of the tent is improved.
- [0037] The example embodiments described above are given by way of illustration only, without limiting in any way the scope of protection defined by the claims. It is obvious that by making use of the principles set forth in the present solution, it is possible to form a large number of embodiments and applications of a bent or kinked high pressure inflatable beam apart from those described as specific example uses of the beam according to this technical solution. These other embodiments and applications result in particular from various other possible combinations of positions and the number of the force exerting elements 3 on the beam 1.
- [0038] Thus, the arcuate high pressure inflatable beam 1 according to the present solution provides a wide variety of shape possibilities for the beam 1 and the associated application possibilities in places where a continuously arcuate beam appears to be insufficient or inconvenient.

Claims

- Claim 1. An arcuate high pressure inflatable beam with a typical internal operating pressure in the range of 100 to 1,000 kPa, formed from conventional or modified fire hoses, or other industrial hoses or tubes produced by seamless braiding technology with an internal lining impervious to air and a possible outer protective coat, the ends of which are closed by a plug, wherein at least one plug contains at least one filling and/or discharging element for the filling medium, and the ends of the beam are firmly put in at a distance of less than the total length of the beam, **characterized in that**, at least one a section of its length, the beam (1) is provided with at least two adjoining fixed attachment points (2) located in the longitudinal direction of the beam (1) and formed on the surface of the beam (1), wherein the fixed attachment points (2) are interconnected by at least one force exerting element (3), whose straight length between the fixed attachment points (2) is shorter than the straight length of the plain beam (1) between these fixed attachment points (2).
- Claim 2. The arcuate high pressure inflatable beam according to claim 1, **characterized in that**, the fixed attachment points (2) are in the form of projections (6) formed on the fabric of the beam (1) during the process of braiding the hose or tube.
- Claim 3. The arcuate high pressure inflatable beam according to claim 1, **characterized in that**, the fixed attachment points (2) are in the form of locally added material (4) applied to the surface of the hose or tube.
- Claim 4. The arcuate high pressure inflatable beam according to claim 3, **characterized in that**, the locally added material (4) applied to the surface of the hose or tube is in the form of sleeves (5) of the beam (1).
- Claim 5. The arcuate high pressure inflatable beam according to claim 4, **characterized in that**, the sleeves (5) are continuously connected to form one shaped sleeve with a preset bending angle.
- Claim 6. The arcuate high pressure inflatable beam according to any of the claims 1 to 5, **characterized in that**, the fixed attachment points (2) and the force exerting element (3) are located on the inner arc of the beam (1).

- Claim 7. arcuate high pressure inflatable beam according to claim 6,
 characterized in that, the force exerting element (3) is a rigid shaped element or a tensile element.
- Claim 8. The arcuate high pressure inflatable beam according to any of the claims 1 to 5, **characterized in that**, the fixed attachment points (2) and the force exerting element (3) are located on the sides of the beam (1).
- Claim 9. The arcuate high-pressure inflatable beam according to claim 8, **characterized in that**, the force exerting element (3) is a rigid shaped element which has an angle corresponding to the angle of bending or kinking of the beam (1).
- Claim 10. The arcuate high pressure inflatable beam according to any of the claims 1 to 5, **characterized in that**, the fixed attachment points (2) and the force exerting element (3) are located on the outer arc of the beam (1).
- Claim 11. The arcuate high pressure inflatable beam according to claim 10, **characterized in that**, the force exerting element (3) is a rigid shaped element which has an angle corresponding to the angle of bending or kinking of the beam (1).
- Claim 12. The arcuate high pressure inflatable beam according to any of the claims 1 to 5, **characterized in that**, the fixed attachment points (2) and the force exerting element (3) are located on the inner arc of the beam (1), and/or at least one side of the beam (1), and/or on the outer arc of the beam (1).
- Claim 13. The arcuate high pressure inflatable beam according to claim 12, **characterized in that**, the force exerting element (3) on the inner arc of the beam (1) is a rigid shaped element or a tensile element, the force exerting element (3) on the side of the beam (2) is a rigid shaped element which has an angle corresponding to the angle of bending or kinking of the beam (1), and the force exerting element (3) on the outer arc of the beam (1) is a rigid shaped element which has an angle corresponding to the angle of bending or kinking of the beam (1).

Drawings

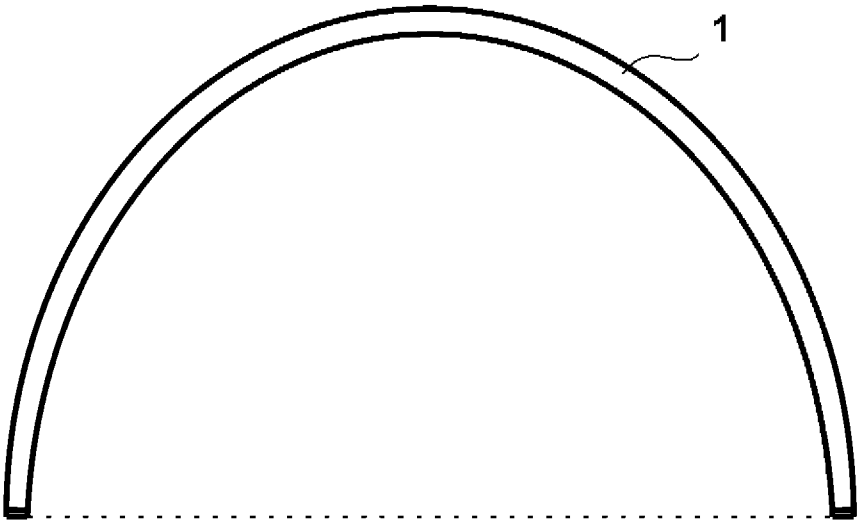


Fig. 1

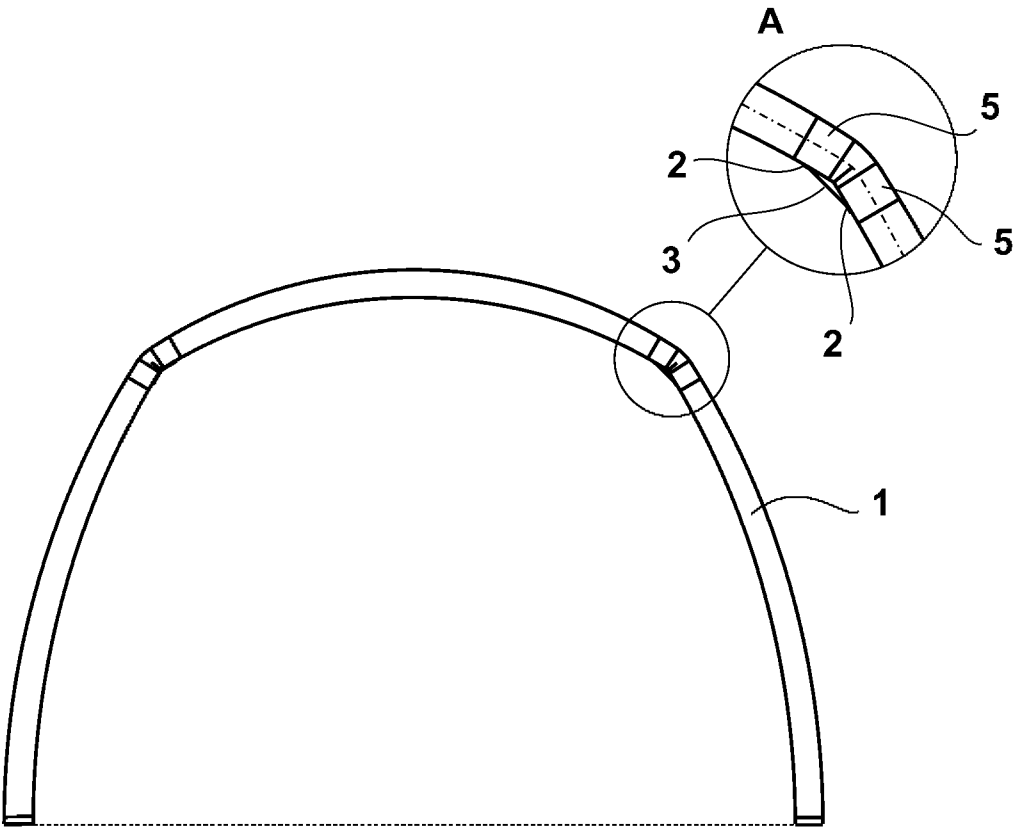


Fig. 2

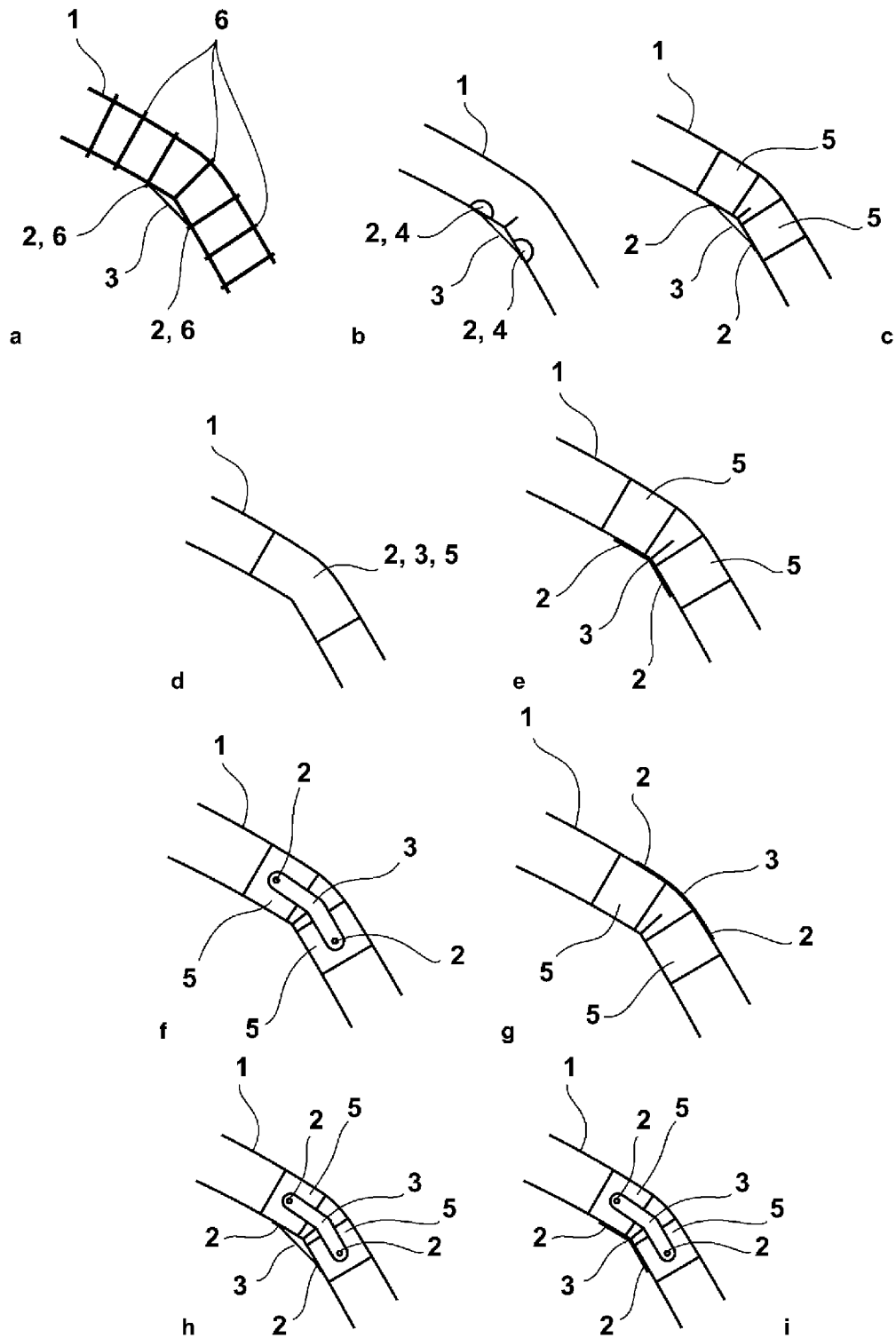


Fig. 3

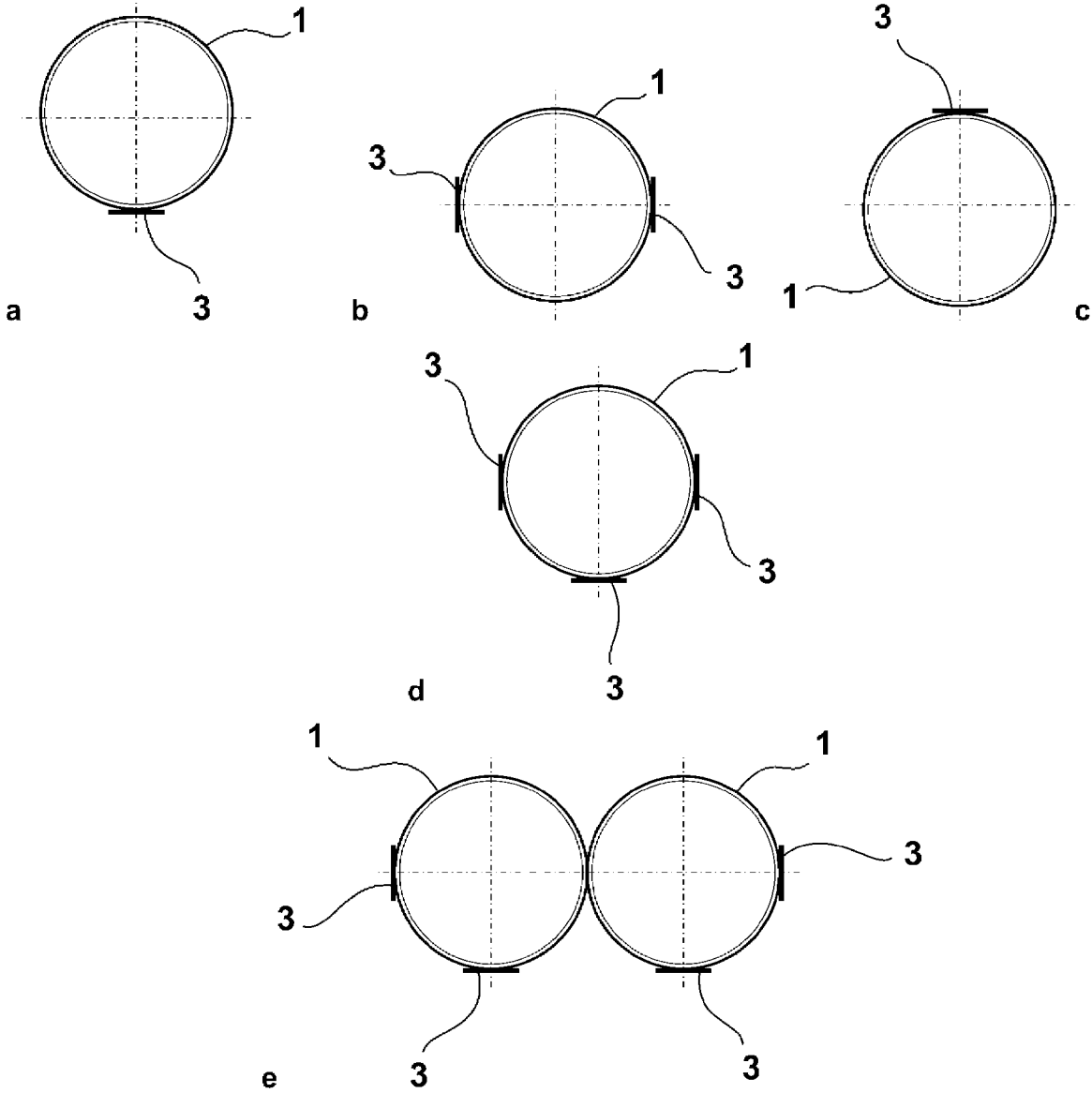


Fig. 4

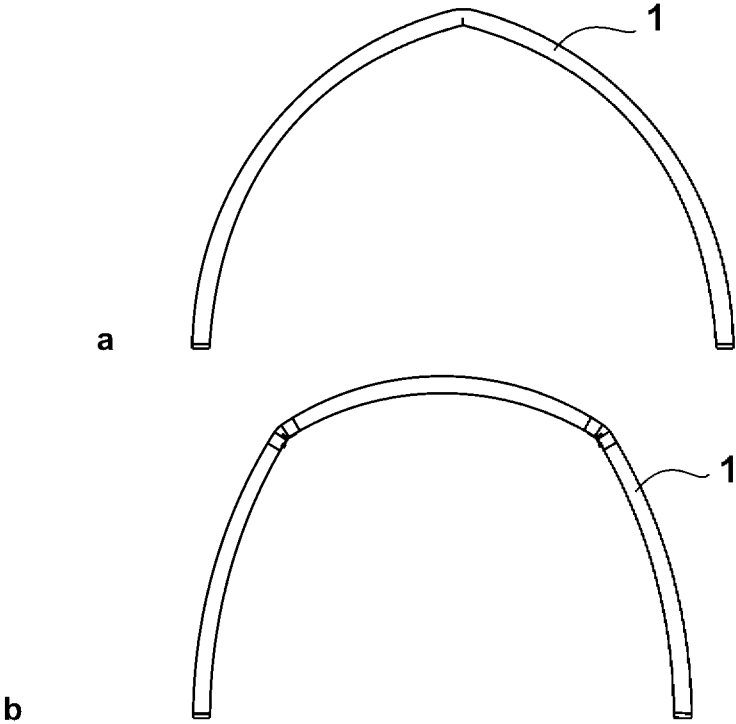


Fig. 5

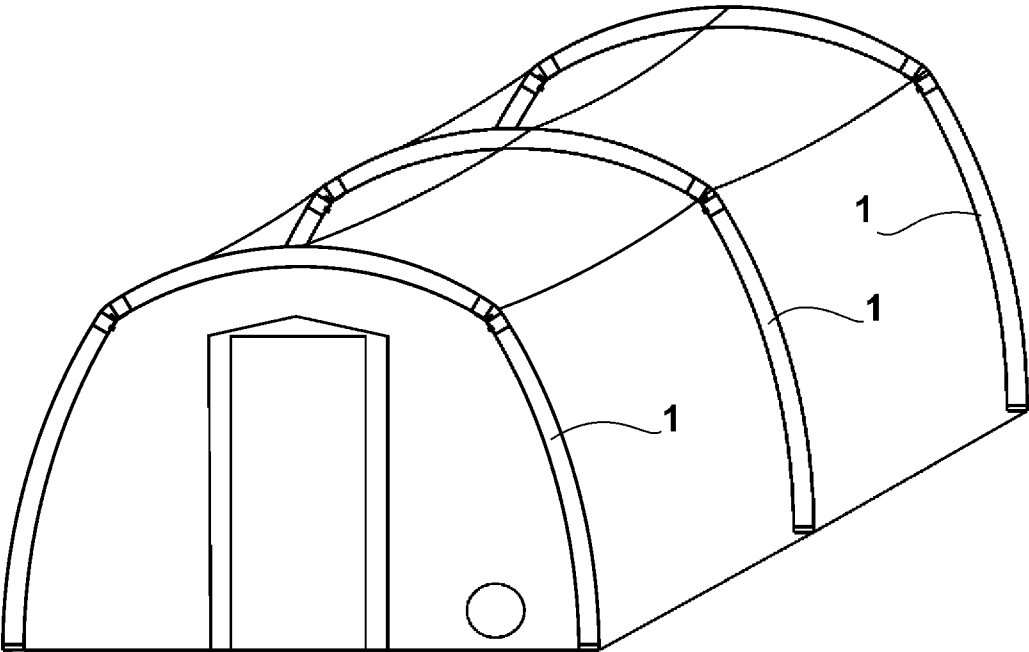


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/SK2019/050006

A. CLASSIFICATION OF SUBJECT MATTER

INV. E04H15/20 E04B1/00 E04C2/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E04H E04C E04B A63J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/083653 A1 (HILBERT CLINT J [US]) 4 July 2002 (2002-07-04) paragraphs [0057], [0065]; figures 1, 2, 2b -----	1-13
X	DE 20 2016 104291 U1 (WESTFIELD OUTDOORS GMBH [DE]) 12 August 2016 (2016-08-12) the whole document -----	1-13
X	WO 90/15208 A1 (STEWKIE LTD [GB]) 13 December 1990 (1990-12-13) the whole document -----	1-13
X	WO 2014/168590 A1 (ZEPELIN S R O [SK]) 16 October 2014 (2014-10-16) the whole document -----	1-13



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

9 October 2019

Date of mailing of the international search report

16/10/2019

Name and mailing address of the ISA/

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Valenta, Ivar

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/SK2019/050006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002083653	A1	04-07-2002	NONE
DE 202016104291	U1	12-08-2016	AU 2017101045 A4 07-09-2017 CN 207776554 U 28-08-2018 DE 202016104291 U1 12-08-2016 EP 3279410 A1 07-02-2018 US 2018038127 A1 08-02-2018
WO 9015208	A1	13-12-1990	AU 5728290 A 07-01-1991 WO 9015208 A1 13-12-1990
WO 2014168590	A1	16-10-2014	AU 2014251428 A1 19-11-2015 BR 112015025546 A2 18-07-2017 CA 2908433 A1 16-10-2014 CN 105308248 A 03-02-2016 EP 2984258 A1 17-02-2016 JP 2016518540 A 23-06-2016 RU 2015145324 A 16-05-2017 SK 500302013 U1 03-09-2013 US 2016305149 A1 20-10-2016 WO 2014168590 A1 16-10-2014