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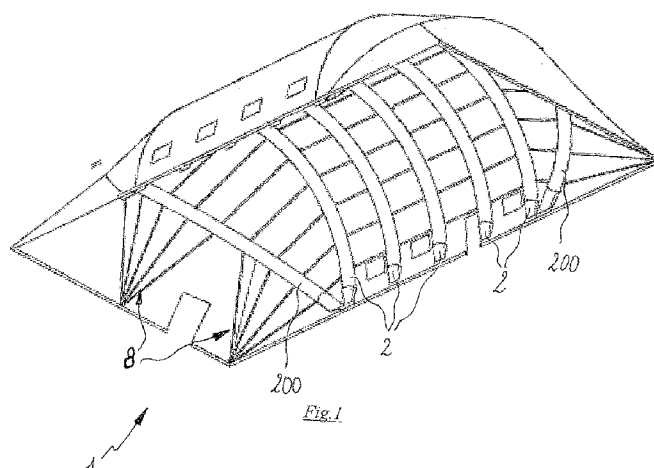
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(54) **Title:** INFLATABLE ROOF



(57) **Abstract:** The inflatable roof (1) according to the present invention comprises a plurality of inflatable arches (2) which can be engaged with the ground below, a cover sheet (9) covering the structure and which can be engaged with the inflatable arches (2), and means (3) adapted to keep the inflatable arches pressurized, which are operatively connected to the inflatable arches. The inflatable roof is characterized in that it comprises a plurality of parallel longitudinal belts (8) spaced apart from one another, in which each longitudinal belt is engaged with each inflatable arch (2) and the free ends are rigidly engaged with the ground below. Moreover, the roof is characterized in that it comprises a plurality of transverse belts (10), each of which being engaged and running along the ends of an inflatable arch, simultaneously being engaged with all the longitudinal belts (8). Thereby, the longitudinal (8) and transverse belts (10) define a weft for supporting the roof, which is comprised between the inflatable arches and the cover sheet, thus integrally covering the structure.



DESCRIPTION

INFLATABLE ROOF

The invention of the present invention lies in the field of inflatable roofs for covering outdoor environments, in particular sports facilities, but also canteens, restaurants and building sites.

Inflatable roofs are movable types of structures whose object is to ensure outdoor environments or surfaces are protected from the atmospheric agents. Inflatable roofs of known type consist of an inflatable structure with a single air chamber, comprising a plurality of communicating lintels, having semi-circular or portal section.

Such structures also comprise a cover sheet which may directly be engaged on the lintels or may be part of the structure itself. Finally, such roofs comprise an inflating apparatus with which the entire structure is kept pressurized.

Such a type of roof has some drawbacks.

A first problem of such inflatable roofs is the risk of collapsing of the entire structure, which may occur in the event one lintel alone breaks, because such structures are formed by a single air chamber. Moreover, such structures do not have reinforcing elements adapted to strengthen the structure itself. Accordingly, the maximum extension of such inflatable structures is limited to the maximum load that each lintel may carry.

It is the object of the present invention to provide an inflatable roof which resolves the drawbacks of inflatable roofs of known type.

In greater detail, it is the main object to provide an inflatable roof which is not subject to collapsing in case one or more lintels subsides.

It is a further object of the present invention to provide an inflatable roof provided with reinforcing elements adapted to strengthen the structure and increase the maximum extension obtainable.

Such objects are achieved by the inflatable roof according to the present invention, which comprises a plurality of inflatable arches which can be engaged with the ground below, a cover sheet covering the structure and which can be engaged with the inflatable arches, and means adapted to keep the inflatable arches pressurized.

The inflatable roof is characterized in that it comprises a plurality of parallel longitudinal belts spaced apart from one another, in which each longitudinal belt is engaged with each inflatable arch and the free ends are rigidly engaged with the ground below. Moreover, the roof is characterized in that it comprises a plurality of transverse belts, each of which being engaged at the ends of an inflatable arch, thus entirely travelling along it, and simultaneously being engaged with all of the longitudinal belts. Thereby, the longitudinal and transverse belts define a

weft for supporting the roof, comprised between the inflatable arches and the cover sheet, thus integrally covering the structure.

These and further objects are achieved by the inflatable roof according to the present invention, which is described in a preferred, non-limiting embodiment of further developments within the scope of the invention, with the aid of the accompanying drawings, which illustrate the following drawings:

Fig. 1 is an axonometric view from the bottom, of the inflatable roof;

Fig. 2 is an axonometric view from the top, of the inflatable roof;

Fig. 3 is an axonometric view of the compressor and the connection duct;

Fig. 4 is an axonometric view of the end portion of an inflatable arch at the assembly step with the support base;

Fig. 5 is an axonometric view of the end portion of an inflatable arch assembled to the support base and to the flooring below;

Fig. 6 is a detailed view of the connection between an inflatable arch and the cover sheet.

With reference to the accompanying drawings, the inflatable roof according to the present invention is indicated as a whole with numeral 1.

The inflatable roof 1 comprises a support frame consisting of a plurality of inflatable arches 2 and a cover sheet 9, which may integrally or partly cover the support frame.

The inflatable arches 2 are independent from one another, i.e. they have independent air chambers so as to avoid the collapse of the structure in case one or more arches 2 collapses. Alternatively, the inflatable arches 2 may be provided with a single air chamber. The material forming the inflatable arches 2 may be a polymeric material, e.g. heat sealed PVC, coated polyester or Hypalon, special materials such as VXN X-ply, vectranfiber, composite materials with carbon fiber contents. By using materials with increased resistance, an increase in the maximum internal pressure of each lintel is obtained, and accordingly the maximum load which each inflatable arch 2 may carry, increases. The diameter of each arch preferably is 80 cm, but it may vary according to the load to be carried.

The inflatable arches 2 are kept pressurized due to means adapted to keep the inflatable arches 2 pressurized, which are only activated when there is a need to bring the arches back to the optimal pressure. In a first embodiment of the invention, such means consist of a single compressor 3 connected to each arch 2 by means of a single duct 4, which makes the pressure inside duct 4 itself, and accordingly inside the connected arches 2, uniform (to the value set).

The number and span of the arches 2 vary as the dimensions of the inflatable roof 1 vary.

The inflatable arches 200, placed at the two ends of the structure, are positioned at a 45° angle with respect to the ground below the structure. Such a configuration allows the downward pulling action exerted by the support belts (which will be described in detail later) to be contrasted.

The inflatable arches 2 are engaged with the ground below by means of support bases 5. In particular, each uninflated end 201 of each inflatable arch 2 has the shape of a wedge, which is integrally contained in and engaged with a pair of support bases 5 by means of pins 6. With reference to figure 4, the support bases 5 may consist of squared section metal bars which can be engaged with the ground below by means of stakes 7, chemical plugs or by means of a liquid-fillable base tube.

The inflatable roof 1 comprises a reinforcing structure consisting of a plurality of longitudinal belts 8 and a plurality of transverse belts 10. As shown in the accompanying drawings, the longitudinal belts 8 are positioned parallel to one another and each longitudinal belt 8 is simultaneously engaged with each inflatable arch 2. Moreover, the free ends of each longitudinal belt 8 are engaged with the ground below by means of stakes, underground plinths or pins fastened with chemical resin.

The inflatable roof 1 further comprises a plurality of transverse belts 10, each engaged at the ends of an inflatable arch 2 so as to integrally travel along it from one end to the other. The transverse belts 10 intersect and are engaged with the longitudinal belts 8 so as to define a weft for supporting the roof, which is comprised between the inflatable arches 2 and the cover sheet 9. The transverse belts 10 are engaged at the ends of the inflatable arches 2, in particular at the support bases 5, and are firmly tightened by means of quick-release buckles.

The belts 8 and 10 form a support core for the inflatable arches 2 and for the cover sheet 9, and the number, dimension and material thereof varies according to the traction required and to the dimension of the structure.

The belts 8 and 10 preferably may be made of one of the following materials: Meraklon, nylon, Kevlar or PVC coated fabric strips.

The inflatable roof 1 is provided with a cover sheet 9 preferably made of PVC coated polyester. The cover sheet 9 is an independent element from the frame consisting of the arches and may also be made in several sections to be joined by means of Velcro, zippers, clips. To increase the resistance, sheet 9 is engaged for the entire length thereof to the longitudinal belts 8 which perform the dual function of reinforcing the cover sheet 9 and spacing apart and carrying the arches 2.

The cover sheet 9 is engaged with the inflatable arches 2 by means of enveloping bands 11, which are tightened to the inflatable arch 2 by means of a buckle 111. Moreover, the enveloping bands 11 intersect the longitudinal 8 and transverse 10 belts and are closed by means of Velcro.

5 Moreover, the cover sheet 9 is anchored to the ground by means of a series of steel eyelets along the base perimeter to avoid the wind from blowing underneath the sheet, entering the structure.

 The internal pressure of the arches 2 may vary due to thermal shocks or due to the effect of the wind, and a compressor 3 and over-pressure safety valves are used to keep the pressure
10 constant at a set value. Compressor 3 is connected to each arch by means of duct 4, and the pressure is kept constant in each arch 2.

 In order to adjust the pressure supplied by compressor 3, an outlet pressure gauge of the compressor is used in order to set the value thereof. If an arch should lose the connection with compressor 3, a safety valve arranged at the inlet of each arch would avoid air from leaking
15 while accordingly keeping unchanged the internal pressure of the arch in which the disconnection occurred. The valves used are safety valves and thereby in the event one of the arches 2 collapses, the valve would avoid the deflation of the other arches. Other types of valves with different couplings may also be used, such as for example the ones for air chambers. Finally, the arches 2 may be provided with over-pressure valves to avoid bursting due to the
20 malfunctioning of the compressor, in addition to safety valves to be applied on duct 4 which maintains the pressure.

 Finally, a water-fillable perimeter base tube may also be added to weigh down the structure to the ground without using fixed anchors, and the arches and base tube will maintain the independence of the air chambers 2.

CLAIMS

1. An inflatable roof (1) comprising a plurality of inflatable arches (2) which can be engaged
5 with the ground below, a cover sheet (9) which can be engaged with the inflatable arches (2),
and means (3) adapted to keep the same inflatable arches (2) pressurized and operatively
connected to the arches, the inflatable roof (1) characterized in that it comprises a plurality of
parallel longitudinal belts (8), spaced apart from one another, each longitudinal belt (8) being
engaged with each inflatable arch (2) and the free ends being rigidly engaged with the ground
10 below, and characterized in that it comprises a plurality of transverse belts (10), each of said
transverse belts (10) being engaged with the ends of an inflatable arch (2) by integrally
travelling along it, and simultaneously being engaged with all of the longitudinal belts (8), the
belts (8 and 10) defining a weft for supporting the roof comprised between the inflatable
arches (2) and the cover sheet (9), which integrally covers the structure.
- 15 2. An inflatable roof according to claim 1, wherein the cover sheet (9) is engaged with the
inflatable arches (2) by means of enveloping bands (11), said bands (11) being tightened to
the inflatable arch (2) by means of a buckle (111) and Velcro and being engaged with the
longitudinal (8) and transverse (10) belts.
3. An inflatable roof (1) according to claim 1 and 2, wherein the belts (8) and (10) are made of
20 one of the following materials: Meraklon, nylon, Kevlar or PVC coated fabric strips.
4. An inflatable roof according to the preceding claims, wherein the inflatable arches (2) are
engaged with the ground below by means of support bases (5), the end (201) of each
inflatable arch (2) being wedge-shaped and being integrally contained in, and engaged with a
pair of support bases (5) by means of pins (6), and the support bases (5) being anchored to the
25 ground.
5. An inflatable roof according to claim 4, wherein the end of each transverse belt (10) is
engaged with the pair of support bases (5), which in turn is engaged with the end (201) of
each inflatable arch (2) by means of quick-release buckles (211) adapted to adjust the tension
of each transverse belt (10).
- 30 6. An inflatable roof according to the preceding claims, wherein the inflatable arches (2) have
independent air chambers.
7. An inflatable roof according to the preceding claims, wherein the inflatable arches (2) are
made of one of the following types of materials: polymeric materials or composite materials
with carbon fiber contents.

8. An inflatable roof according to the preceding claims, wherein the means (3) adapted to keep the inflatable arches (2) pressurized comprise a compressor provided with a pressure gauge for setting the pressure in the arches (2), said compressor being connected to each inflatable arch (2) by means of a single duct (4), the latter being connected to each inflatable arch (2) by means of branch lines (41), each arch (2) being provided with a safety valve adapted to avoid air from leaking from each arch (2), thus keeping the internal pressure unchanged, and with an over-pressure valve adapted to limit the maximum pressure reached in each arch.
9. An inflatable roof according to the preceding claims, wherein the ends of the longitudinal belts (8) are engaged with the ground below by means of stakes, underground plinths or pins fastened with chemical resin.
10. An inflatable roof according to the preceding claims, wherein the cover sheet (9) is engaged with the ground below by means of a series of steel eyelets, the latter being positioned at the base perimeter of the roof.

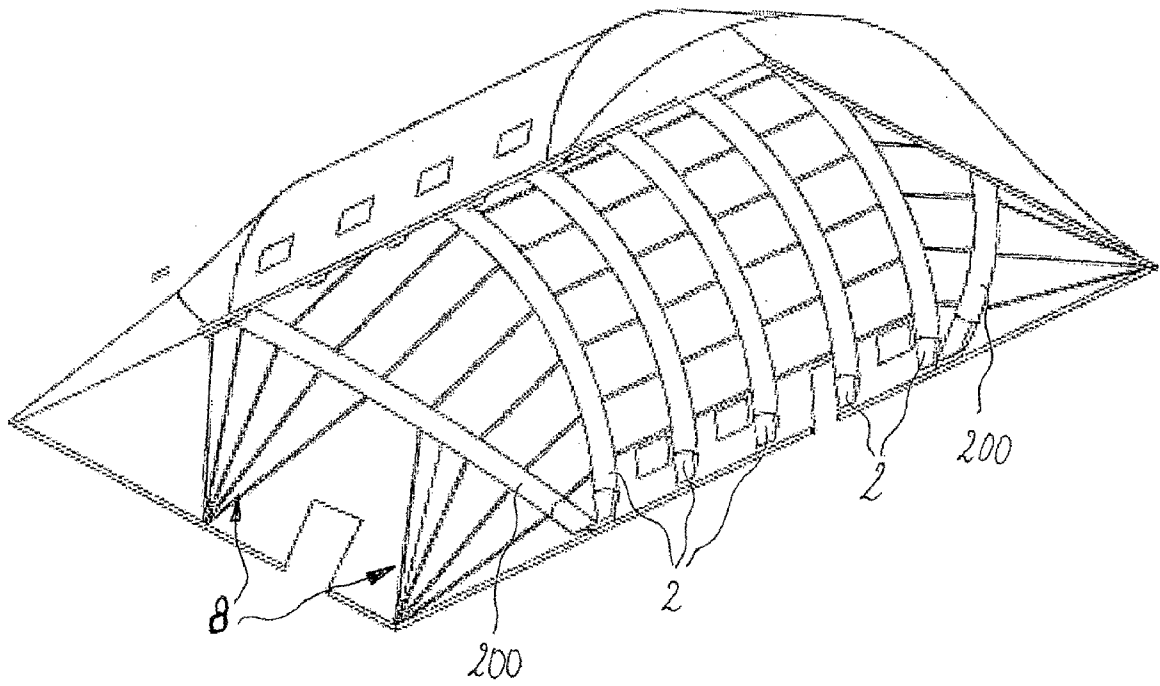


Fig. 1

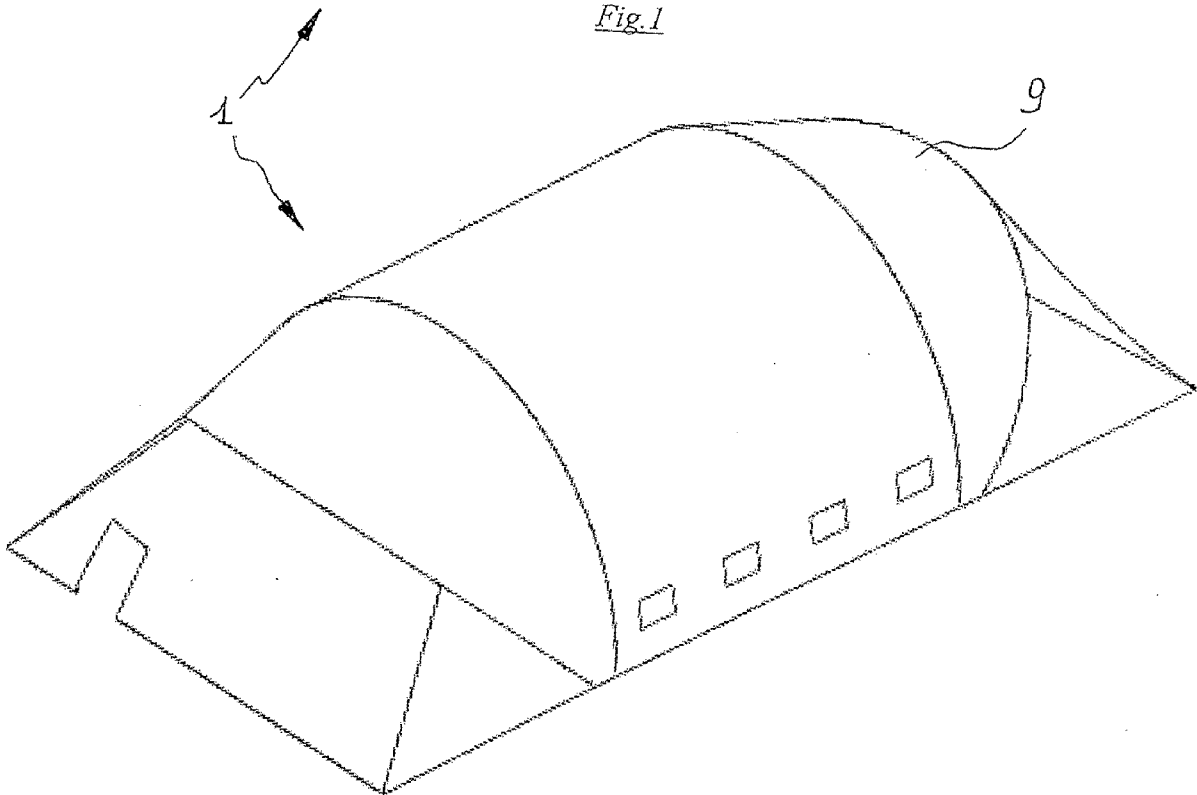


Fig. 2

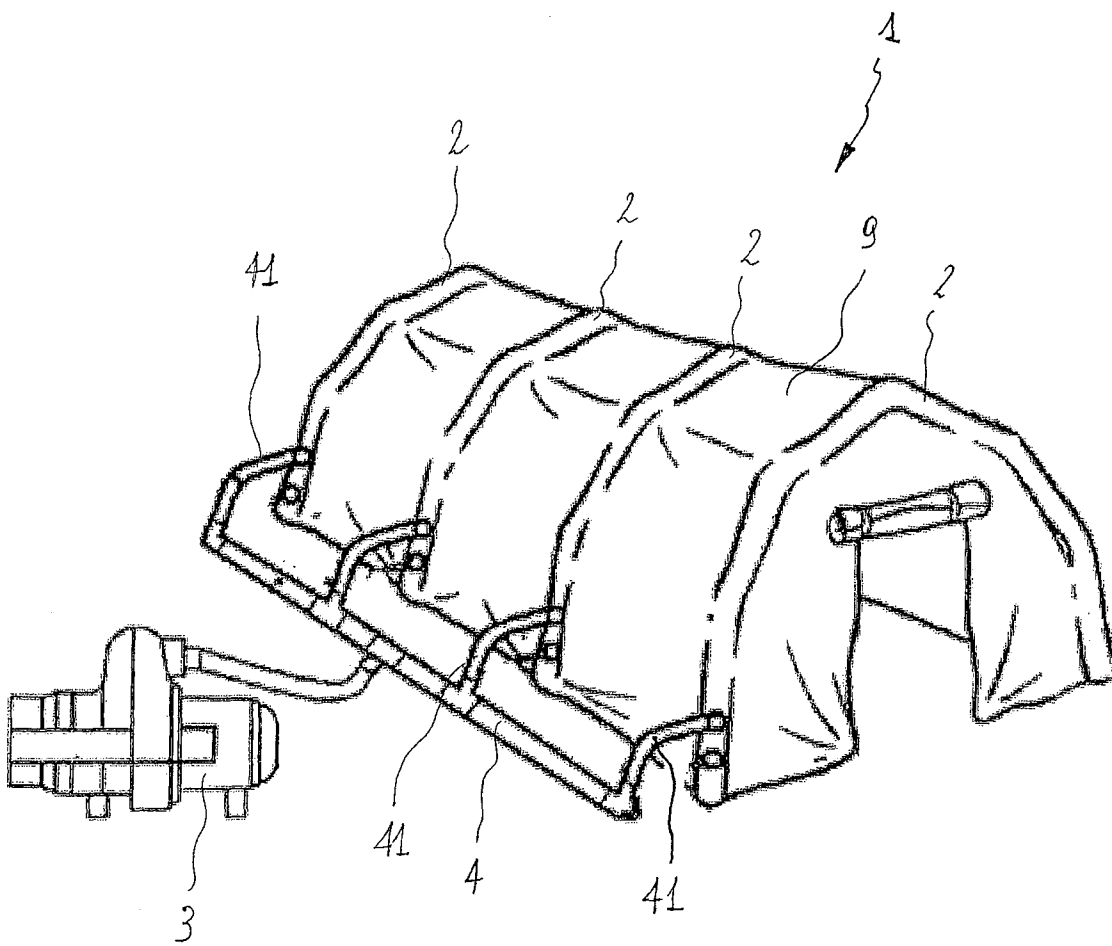


Fig.3

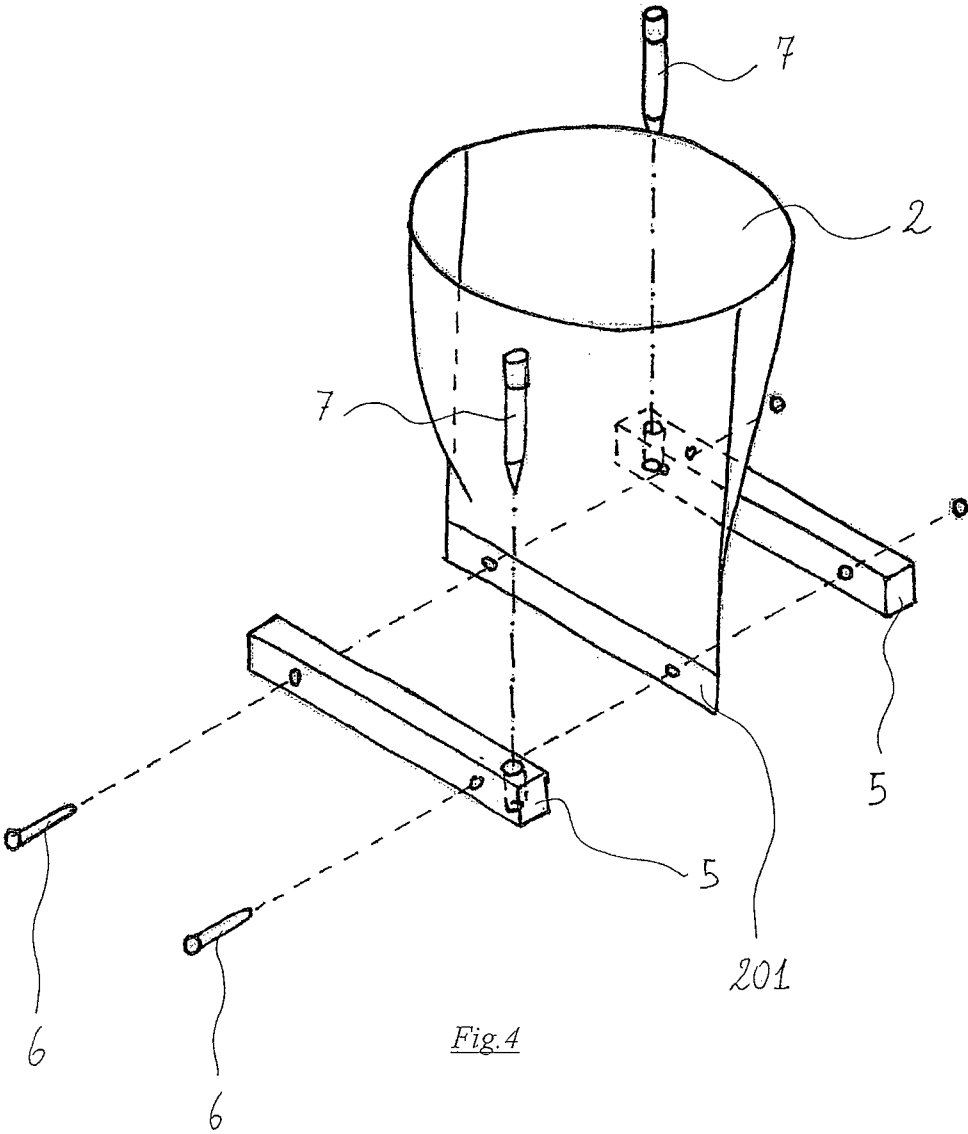


Fig.4

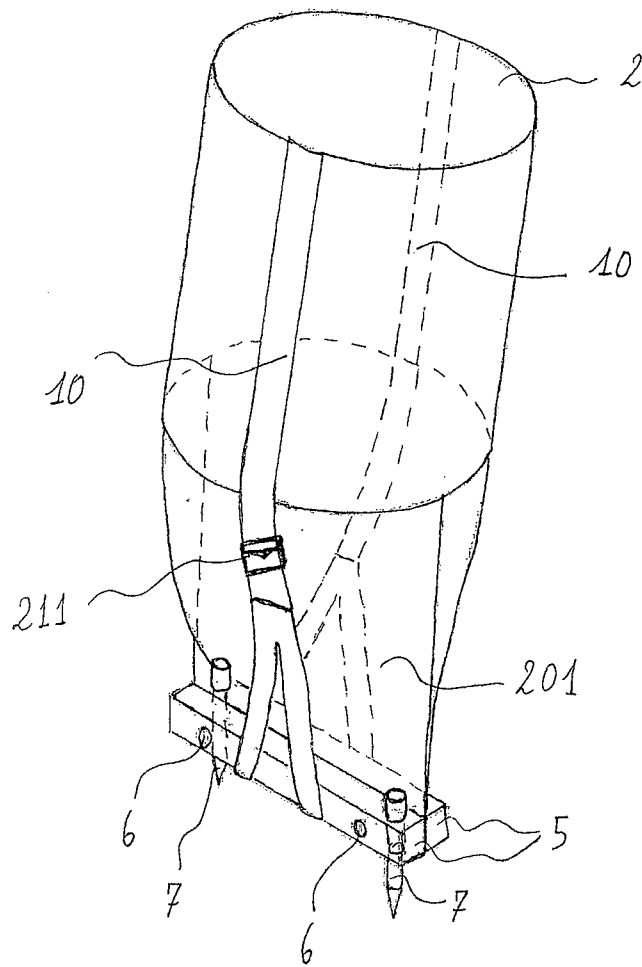


Fig.5

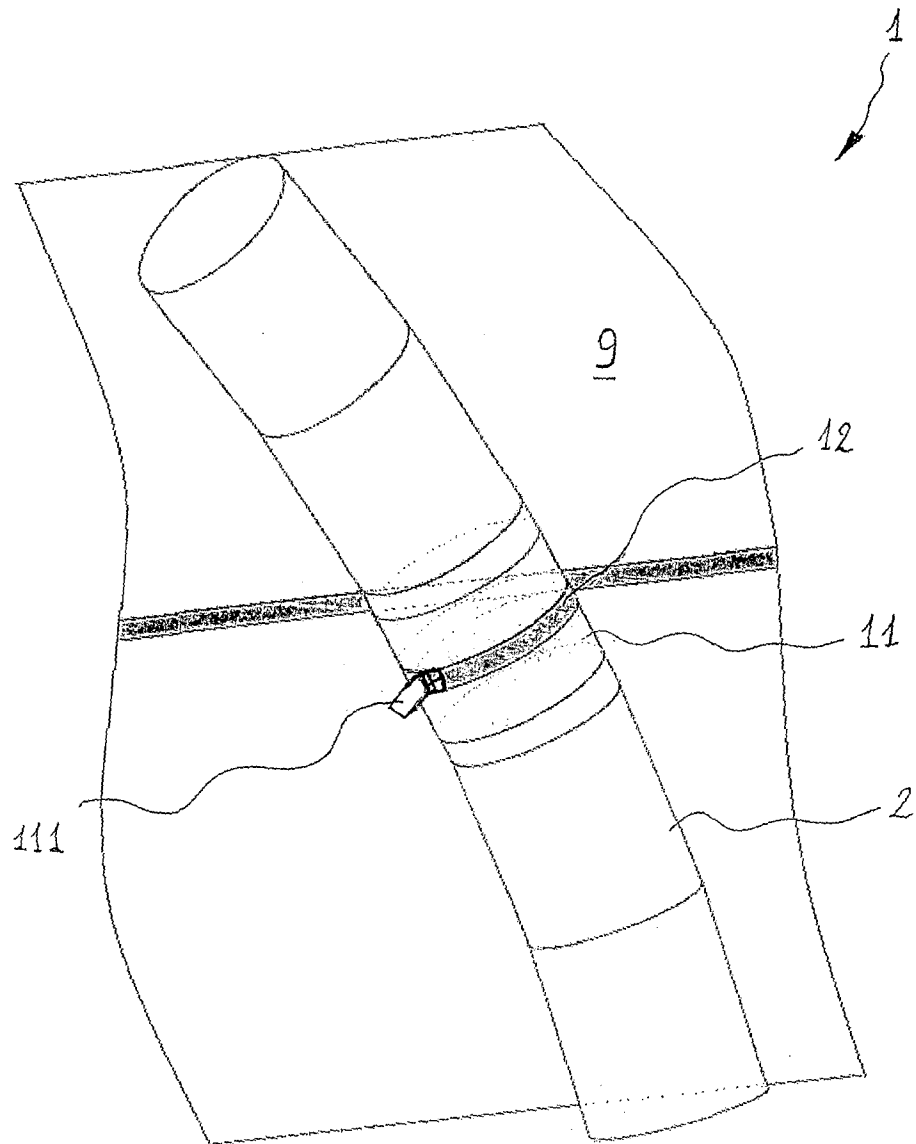


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2017/000092

A. CLASSIFICATION OF SUBJECT MATTER
 INV. E04H15/20 E04B7/08
 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 E04B

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 865 372 A (LUCIEN M., HARANGER J.) 21 May 1941 (1941-05-21) page 1, line 41 - page 2, line 28; figures 1-4	1-10
A	----- US 2015/315808 A1 (CRONK DAVID C [US]) 5 November 2015 (2015-11-05) paragraphs [0025], [0030], [0031]; figure 2	1-10
A	----- US 2010/139175 A1 (WARNER HAROLD [CA] ET AL) 10 June 2010 (2010-06-10) figures 11-14	1-10
A	----- DE 10 2007 055818 B3 (SKYWALK GMBH & CO KG [DE]) 26 February 2009 (2009-02-26) figures 1-5	1



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

23 May 2017

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06/06/2017

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2017/000092

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 865372	A	21-05-1941	NONE
US 2015315808	A1	05-11-2015	NONE
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