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(54) **DEVICE FOR PROTECTION AGAINST SLIPPAGE OF SOFT MATERIAL**

(57) Device (11) for protection against slippage of soft material, comprising: a substantially rectilinear longitudinal rod (13) provided at one of its ends with first anchoring means (15') for anchoring to the ground; oscillating arms (19) adapted to assume a resting configuration and a working configuration, wherein the angle α formed by the arms (19) and the rod (13) when in the resting configuration is smaller than the angle β formed by the arms (19) and the rod (13) when in the working configuration; a slider (21) slidable along at least part of said rod (13) and provided with rotatable engaging means (23) for said arms (19), said slider (21) being adapted to slide between a position of the rod (13) which is proximal to said first anchoring means (15') and corresponds to the resting configuration of the arms (19) and a position which is distal relative to said first anchoring means (15') and corresponds to the working configuration of said arms (19); an upstream rope (27) attached at its one end to one of the arms (19) and at its opposite end to the rod (13) and at least one downstream rope (29) attached at its opposite ends to two adjacent arms, wherein said ropes (27,29) assume a released configuration when the arms (19) are in the resting configuration and are tensioned when the arms (19) are in the working configuration.

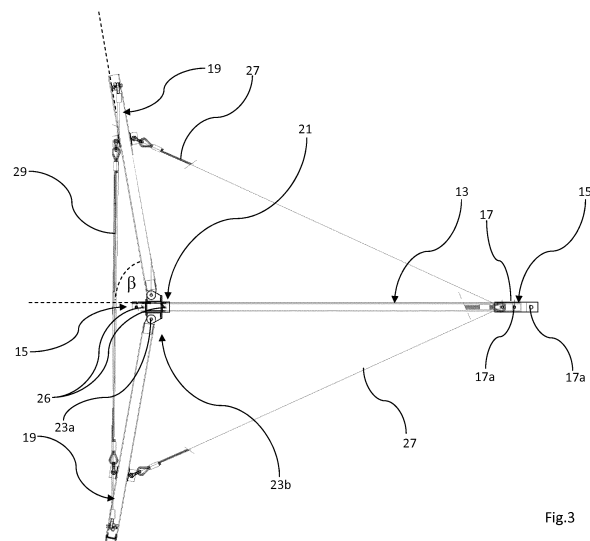


Fig.3

Description

Technical Field

[0001] The invention relates to a device for protection against slippage of soft material. More particularly, the invention relates to a protection device that can be used for preventing soft material located on a ground from slipping downstream. The invention finds particular application in the making of barriers designed to stabilize the snowpack in a detachment zone, thus preventing triggering of avalanches.

Prior Art

[0002] Within the field of devices for protection against slippage of soft material it is known to use structures of different kinds, for instance comprising modular elements that are made of a metal mesh and are provided with supporting poles, usually anchored to a basement provided in the ground. The modular elements usually consist of metal beams connected to one another so as to form a supporting frame for the metal net. The modular elements are usually assembled directly at the site of the final installation. This technique requires long installation times and therefore is unsuitable for creating barriers quickly, for example in case of emergencies. In the past, protection devices were developed that were capable of assuming a resting or transport configuration and a working or operative configuration. These devices are essentially made in the form of umbrellas. An example of a known device of this type is described in WO2011117790 (A1). This device substantially comprises a holding-back structure having oscillating arms hinged to a bracket attached to the main rod. A metal net is arranged on the arms. The structure can assume an open operative configuration or a closed, resting configuration. In the open configuration, the arms are substantially coplanar to one another and the net lies on a plane, whereas in the closed configuration the arms lie parallel to the main rod and the net is folded around the rod as happens with the fabric of an umbrella.

[0003] The resting configuration is provided for facilitating transport of the device from the manufacturing or storage site to the site where the device is to be installed. In this kind of devices, between the oscillating arms and the rod there are further provided metal ropes, having the purpose of countering the thrust exerted against the net by the material to be retained. The ropes are attached to the distal ends of the arms and the central rod.

[0004] However, the devices of the kind described above require use of particularly strong structural elements made of steel, which increase the weight thereof. A first object of the invention is therefore to provide a device of the umbrella-like type for retaining soft material, which does not exhibit the prior art drawbacks and is suitable for retaining material of various kinds, in particular snow. Another object of the invention is to solve the

problem of how to obtain an umbrella-like device that can be easily transported and installed.

[0005] The umbrella-like devices of the described type are intended for being mounted with their rod and ropes facing upstream, i.e. towards the side from which the material to be retained comes. Because of this arrangement, the ground located on the upstream side of the device is occupied by the rod and the ropes. In addition, the material retained by the device accumulates on the upstream side, thus covering the rod and the ropes. These known retaining systems are therefore unsuitable for being used for retaining soft material, which must be subsequently removed. Furthermore, due to this arrangement, the known devices are unsuitable for being repositioned after use. Indeed, the material that has accumulated on the rod and on the ropes frequently damages the device, thus jeopardizing the possibility of re-using it. Moreover, the removal of the material accumulated on the upstream side, which removal is usually effected with mechanical means, almost always causes damages to the structure of the device.

[0006] A further object of the invention is therefore to overcome the problem of how to make an umbrella-like device of the aforementioned type reversible, i.e. usable both with the central rod oriented upstream and with the central rod oriented downstream.

[0007] Another object of the invention is to provide a device of the aforementioned type that is strong and reliable and can possibly be repositioned even several times after each use, if necessary.

[0008] An additional object of the invention is to provide a protection device that is easy and quick to install. A not least object of the invention is to provide a protection device which is adapted to be industrially manufactured on a large scale.

Disclosure of the Invention

[0009] The aforementioned and other objects are achieved with the device for protection against slippage of soft material as claimed in the appended claims.

[0010] The device according to the invention is capable of assuming a closed or resting configuration and an open or working configuration. The closed configuration is of advantage for transport and storage of the device. According to a preferred embodiment of the invention, the device comprises a substantially rectilinear longitudinal rod provided with first anchoring means for anchoring to the ground. The rod is preferably arranged centrally in the device and the first anchoring means are arranged at one of the ends of the rod. Anchoring of the device to the ground can be effected for instance by means of at least one anchoring guy wire penetrating deeply into the ground.

[0011] The device further comprises oscillating arms, preferably four in number. The arms can assume a resting configuration and a working configuration. When the arms are in the resting position, the angle formed by the

arms and the rod is smaller than the angle formed by the arms and the rod when the arms are in the working position. In a preferred embodiment of the invention, the arms assume an arrangement approximately parallel to the rod when they are in the resting position and an arrangement approximately perpendicular to the rod when they are in the working position. According to the invention, the rod advantageously comprises a slider that can slide along at least part of the rod. The slider comprises rotatable engaging means for the oscillating arms. The rotatable engaging means allow the arms to oscillate on a plane parallel to their axis and consist preferably of hinge pins. The rod may consist for instance of a tube having a cylindrical or square cross-section or of a profile with substantially any cross-section shape. The slider is preferably a sleeve surrounding the rod or it may consist of a carriage slidable along a seat provided in the rod. According to the invention, the slider can slide between a position proximal to the first anchoring means and a position distal relative to said first anchoring means. The proximal position corresponds to the resting configuration of the oscillating arms and the distal position corresponds to the working configuration of said arms. Still according to the invention, for each arm there is provided a rope attached to an arm and to the rod. The upstream ropes are attached to their respective arms at a distance from the slider of approximately 2/3 of the length of the arm. The upstream rope is also preferably attached to the rod near or at the first anchoring means.

[0012] This rope is referred to as upstream rope because it faces that side of the device which, in a preferential, though not exclusive, way, faces upstream of the arms relative to a slope on which the device is installed. For each pair of adjacent arms, at least one rope attached to both arms of each pair is further provided. For the same reasons set forth above, this rope is referred to as downstream rope, as it faces that side of the device which, in a preferential, though not exclusive, way, faces downstream of the arms relative to a slope on which the device is installed. According to the invention, the ropes are in a released configuration when the arms are in the resting configuration and are tensioned when the arms are in the working configuration. A flexible net can advantageously be provided on the arms in order to define a substantially planar surface for retaining the material so as to prevent slippage thereof downstream of the device.

[0013] In an embodiment variant, both ends of the rod are provided with anchoring means and the device can therefore advantageously be installed with either of the anchoring means arranged upstream of the arms.

Brief Description of the Drawings

[0014] Some preferred embodiments of the invention will be described by way of non-limiting examples with reference to the annexed drawings, in which:

- 1a Fig.1 is a plan view of the device when closed;

- 1a Fig.2 is a plan view of the device of Fig. 1 when partially open;
- 1a Fig.3 is a plan view of the device of Fig. 1 when open;
- 1a Fig.4 is a schematic front view of the device of Fig. 1 when open.

Description of some preferred embodiments of the invention

[0015] Referring to Figs. 1 to 3, there is illustrated a preferred embodiment of the device for protection against slippage of soft material according to the invention. The device has been indicated as a whole with reference numeral 11. The device 11 comprises a substantially rectilinear longitudinal rod 13. The rod 13 is arranged substantially centrally in the device 11. First anchoring means 15' for anchoring the device to the ground are provided at one of the ends of the rod 13. In the illustrated embodiment, the rod 13 is made of steel and has a square cross-section. Other materials, such as steel alloys, as well as other cross-sections, such as circular or oval cross-sections, are in any case possible. The first anchoring means 15' comprise a bracket 17 fixed, for instance by welding, to one of the ends of the rod 13. The bracket 17 comprises at least one hole 17a, two holes in the shown example, for passage of a corresponding fixing bolt for fixing said bracket to a basement provided in the ground for securing the device 11 in its working condition. The device 11 further has four oscillating arms 19. The arms 19 can oscillate so as to assume a resting configuration (Fig.1) and a working configuration (Fig.3). In the resting configuration the arms 19 form with the rod 13 an angle α smaller than the angle β formed when the arms 19 are in their working configuration. The resting configuration corresponds to the configuration in which the device 11 is closed and the working configuration corresponds to the configuration in which the device 11 is open. According to the invention, the angle α preferably ranges between 0 and 30° and still more preferably between 0 and 20° and the angle β preferably ranges between 60 and 100° and still more preferably is approximately 80°. The device 11 further comprises a slider 21 slidable along at least part of the rod 13. The slider 21 is provided with rotatable engaging means 23 for the arms 19. In the illustrated example, said means 23 comprise hinges 23a welded to the slider 21 and provided with hinge pins 23b passing transversely through the arms 19. The slider 21 is adapted to slide between a position proximal to said first anchoring means 15' and corresponding to the resting configuration of the arms 19 and a position which is distal relative to said first anchoring means 15' and corresponds to the working configuration of said arms 19. In the illustrated embodiment, the slider 21 comprises a sleeve 25 surrounding the rod 13. The sleeve 25 can be locked to the rod 13 by means of radial screws 26. Corresponding bores for engagement of the radial screws 26 can further be provided along one of the

generatrices of the rod 13.

[0016] Each arm 19 is provided with a rope 27 attached at its one end to the arm 19 and at its opposite end to the rod 13. This rope 27 is referred to as upstream rope because it is arranged upstream of the arms 19 when the device 11 is installed on a slope and the rod 13 is arranged parallel to the slope line with the first anchoring means 15' arranged upstream. One of the ends of the rope 27 is attached to the rod 13 near or at the first anchoring means 15' and the other end of the rope 27 is attached to the corresponding arm 19 at a distance from the slider 21 of approximately 2/3 of the length of the arm 19. For each pair of adjacent arms 19 at least one rope 29 attached to both arms 19 of each pair is further provided. This rope 29 is referred to as downstream rope because it is arranged downstream of the arms 19 when the device 11 is installed in the manner set forth above. The ropes 27 and 29 assume a released configuration when the arms 19 are in the resting configuration and are tensioned when the arms 19 are in the working configuration. The ropes 27 and 29 can be attached to their corresponding arms 19 and to the rod 13 by known means, for example by means of threaded bolts 31a secured in brackets 31b welded to the arms 19 and to the rod 13. The ropes 27 and 29 are also provided with a thimble 33a and a rope clamp 33b for passage of the threaded bolts. Preferably, an shackle-like element 31c is provided between the bolts 31a and the corresponding thimble. The ropes 27 and 29 may also comprise dissipator devices, capable of absorbing the tensile force applied to the opposite ends of the corresponding rope.

[0017] As better visible in Fig.4, the illustrated embodiment comprises two upstream ropes 29 for each pair of adjacent arms 19. A net 35 is further arranged on the ropes 29 and attached to the arms 19. When the device 11 is installed on a ground, for instance a mountain slope, the ropes 27 define, together with the net 35 and the arms 19, a protective structure for preventing soft material located on a ground, such as in particular snow or ice, from slipping downstream.

[0018] Referring again to Figs. 1 to 3, second anchoring means 15" for anchoring to the ground, substantially identical to the first means 15', are preferably provided at the opposite end of the rod 13 for allowing mounting of the device 11 rotated of 180° with the second means 15" upstream of the arms 19. This second arrangement causes the downstream ropes to be positioned upstream and the upstream ropes 27 to be positioned downstream. This second arrangement allows to bear a load usually smaller with respect to the first arrangement in which the first anchoring means 15' are arranged upstream of the arms 19.

[0019] The invention as described and illustrated is susceptible to several variations and modifications, falling within the same inventive principle.

Claims

1. Device (11) for protection against slippage of soft material, comprising:

- a substantially rectilinear longitudinal rod (13) provided at one of its ends with first anchoring means (15') for anchoring to the ground;
- oscillating arms (19) adapted to assume a resting configuration and a working configuration, wherein the angle α formed by the arms (19) and the rod (13) when in the resting configuration is smaller than the angle β formed by the arms (19) and the rod (13) when in the working configuration;
- a slider (21) sliding along at least part of said rod (13) and provided with rotatable engaging means (23) for said arms (19), said slider (21) being adapted to slide between a position of the rod (13) which is proximal to said first anchoring means (15') and corresponds to the resting configuration of the arms (19) and a position which is distal relative to said first anchoring means (15') and corresponds to the working configuration of said arms (19);
- an upstream rope (27) attached at its one end to one of the arms (19) and at its opposite end to the rod (13) and at least one downstream rope (29) attached at its opposite ends to two adjacent arms, wherein said ropes (27,29) assume a released configuration when the arms (19) are in the resting configuration and are tensioned when the arms (19) are in the working configuration.

2. Device according to claim 1, wherein a first end of the upstream rope (27) is attached to the rod (13) in the proximity of the first anchoring means (15') or at said means.
3. Device according to claim 2, wherein the second end of the rope (27) is attached to the corresponding arm (19) at a distance from the slider (21) of approximately 2/3 of the length of the arm (19).
4. Device according to claim 1 or 2 or 3, wherein in total the oscillating arms (19) are four in number.
5. Device according to any of the preceding claims, wherein the angle α ranges between 0° and 30° and the angle β ranges between 60° and 100°.
6. Device according to claim 1, wherein the rotatable engaging means (23) comprise hinges (23a) welded to the slider (21) and provided with hinge pins (23b) passing transversely across the arms (19).
7. Device according to claim 6, wherein the slider (21)

comprises a sleeve (25) surrounding the rod (13).

8. Device according to any of the preceding claims,
wherein there are two downstream ropes (29) for
each pair of adjacent arms (19). 5
9. Device according to any of the preceding claims,
wherein a net (35) is further provided arranged on
the ropes (29) and attached to the arms (19). 10
10. Device according to any of the preceding claims,
wherein second anchoring means (15") for anchor-
ing to the ground are provided at the end of the rod
(13) opposite to the first anchoring means (15') for
allowing mounting of the device (11) rotated of 180°. 15

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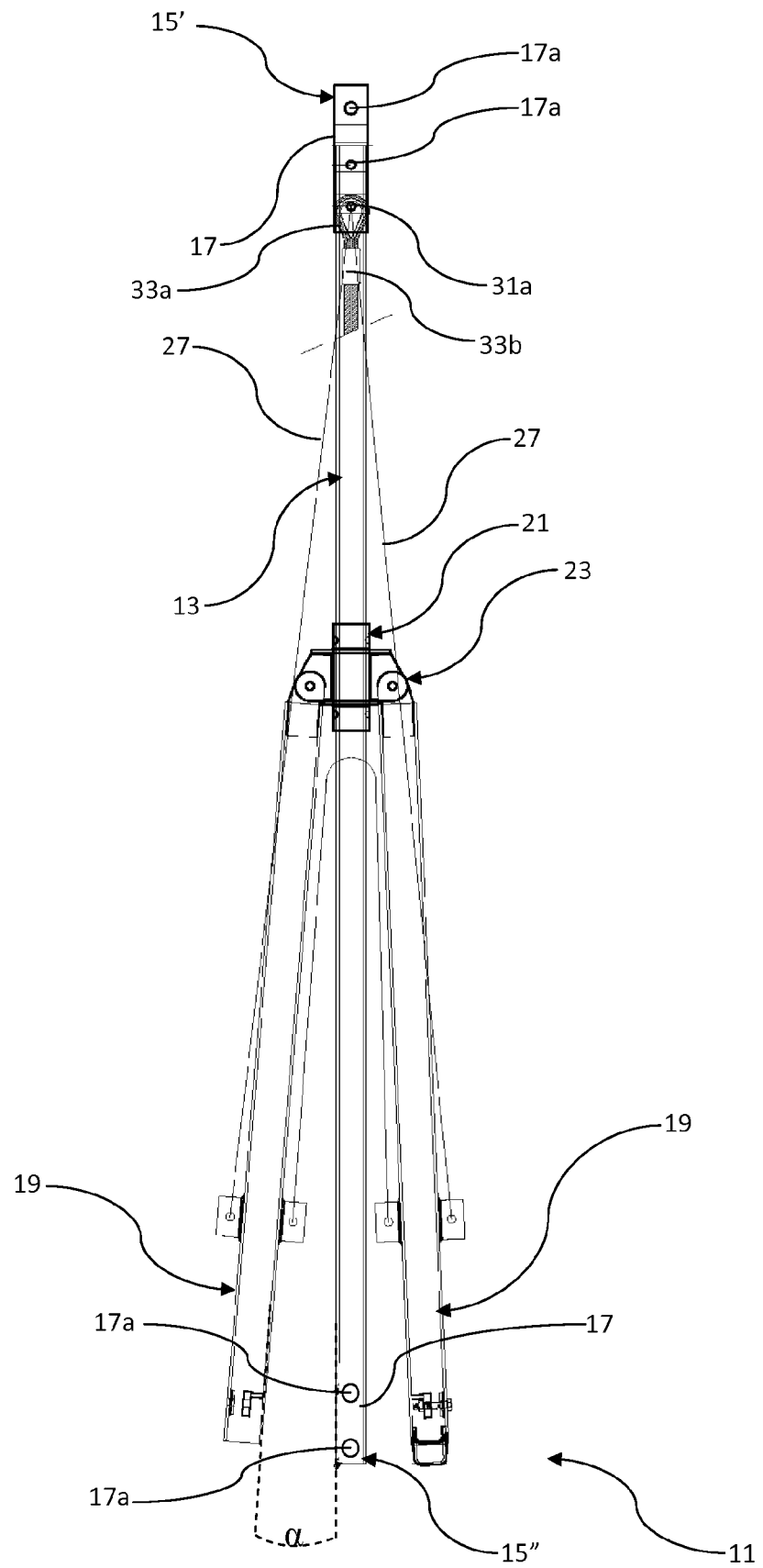


Fig.1

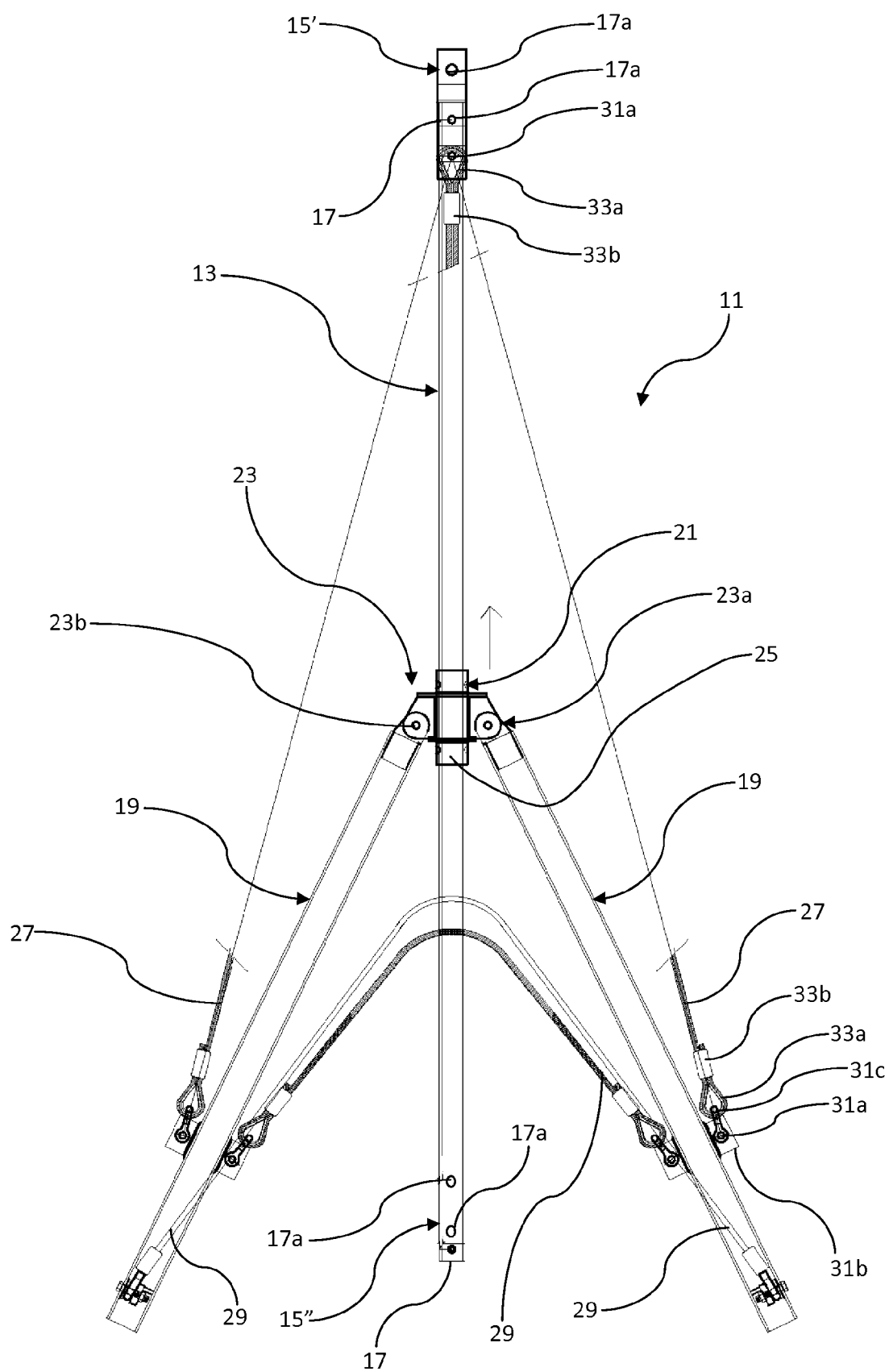


Fig.2

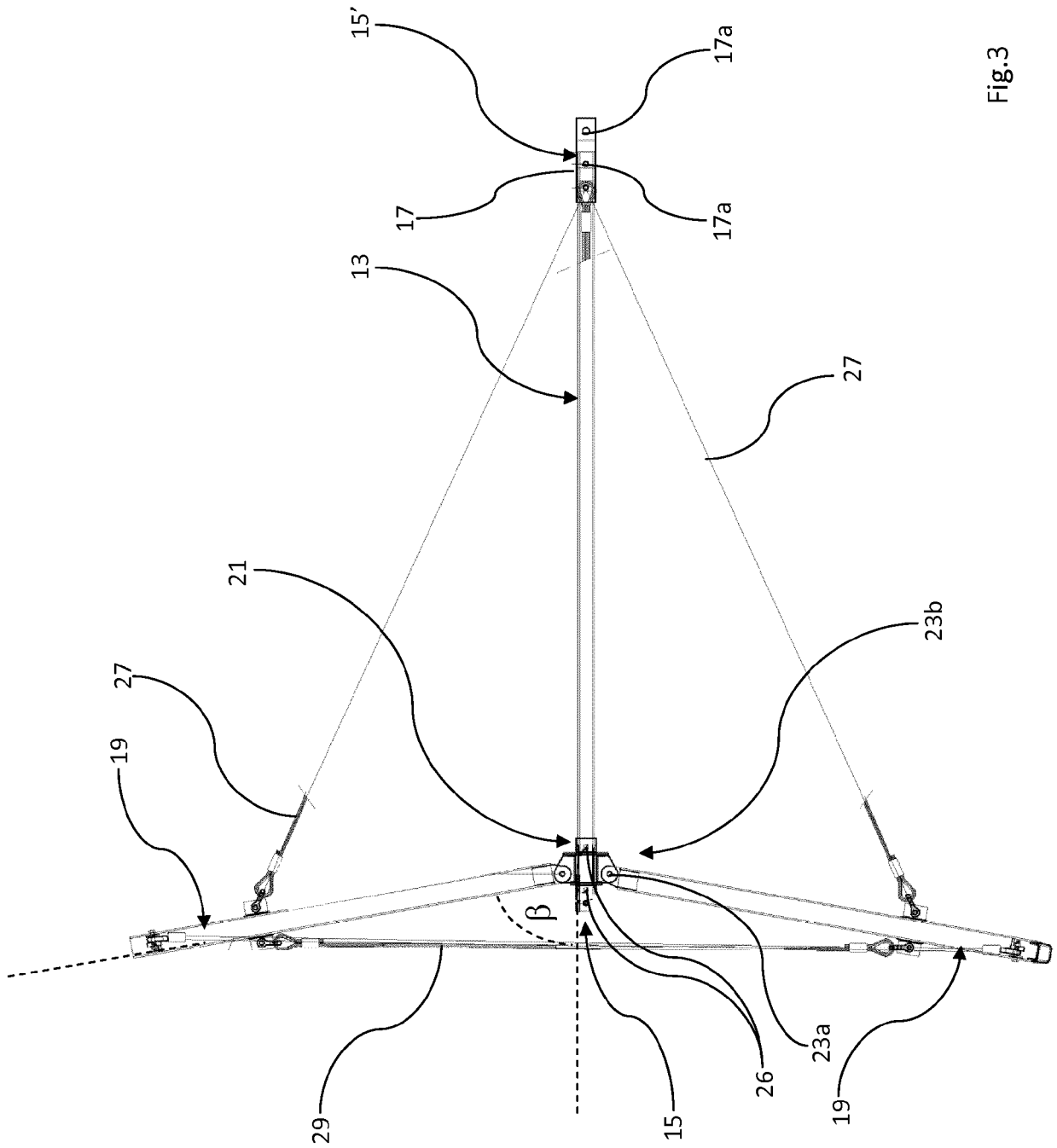


Fig.3

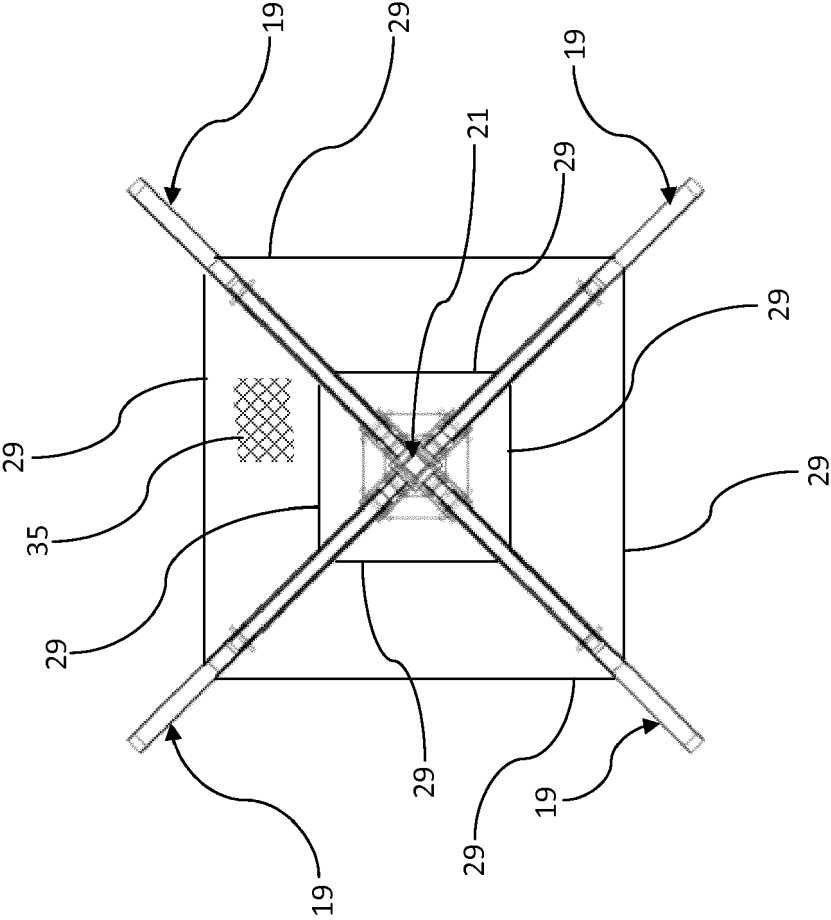


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 15 00 3575

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	WO 2011/117790 A1 (LASAR S R L [IT]; SANTORUM ALBERTO [IT]; SANTORUM GABRIELE [IT]) 29 September 2011 (2011-09-29) * the whole document *	1	INV. E01F7/04
A	EP 1 921 210 A1 (BENTOFORM S R L [IT]) 14 May 2008 (2008-05-14) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			E01F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 May 2016	Examiner Stern, Claudio
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			

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EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 00 3575

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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24-05-2016

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