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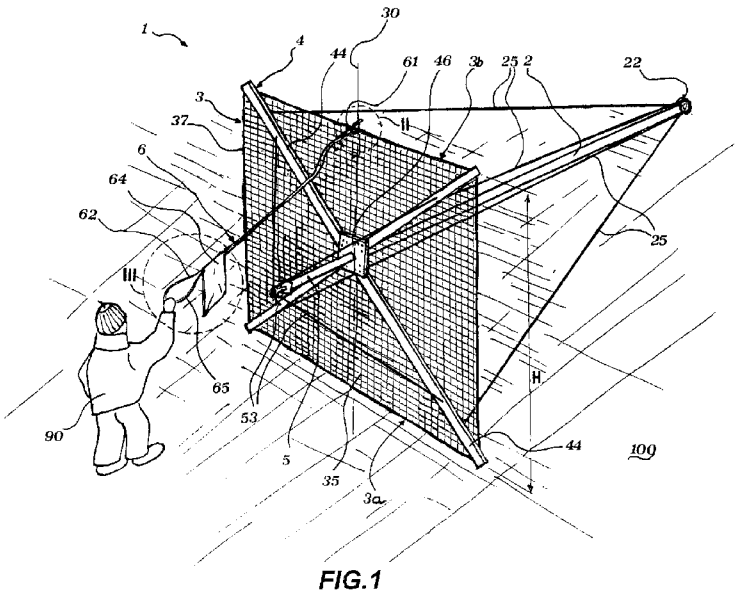


FIG.1

(57) **Abstract**: A retaining device (1) for retaining snow, avalanches, earth, rocks or similar materials, comprising a retaining barrier (3) and a support strut (2) connected to the retaining barrier (3). The retaining device (1) further comprises a flexible suspension member (6) for hoisting and transporting the retaining device (1), said flexible suspension member (6) having a first portion (61), which is mounted on the retaining barrier (3) and/or on the support strut (2), and a second portion (62), which comprises connection means (65, 651, 652, 653, 654). The retaining device (1) is prefabricated so as to include the flexible suspension member (6). The connection means (65, 651, 652, 653, 654) are configured for a connection to a hoisting apparatus (95, 98).

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RETAINING DEVICE

DESCRIPTION

The present disclosure relates to a retaining device. In particular, it relates to a device intended to be used for retaining snow, avalanches, earth, rocks, embankments, or for making filtering dams, i.e. a so-called avalanche, snow, landslide, rock protection or stabilization device, or the like.

Retaining devices for protection against avalanches or landslides or for stabilization purposes are generally known.

For example, international patent application No. WO 03/060237 A1 describes a snow-slip preventing system consisting of a plurality of blocks of concrete or wood, which are joined together by a load-bearing steel rope to form a line to be positioned on a slope of a mountain. The blocks are mounted to the load-bearing rope at the bottom of the mountain and the so-obtained line is then positioned by means of a helicopter. The load-bearing rope has a structural function for the snow-slip preventing system; in fact the load-bearing rope structurally connects all the blocks to each other and supports them, both at the installation site on the slope of the mountain and during the positioning by means of the helicopter. Each block is connected to the load-bearing rope also by means of tie cables.

Other examples of retaining devices for protection against avalanches or landslides or for stabilization purposes are described in Italian patent No. IT 1 288 181 and in European patent application No. EP 1 921 210.

In particular, an example of a known retaining device comprises a support frame consisting of metal beams, to which a retaining mesh is fixed. The support frame rests on the ground along one side and is supported by a strut or leg which is secured to the ground, so as to form a tilted T-shaped structure. Basically, this known device has a substantially pyramidal shape.

In practice, the retaining mesh is arranged substantially perpendicular, or otherwise tilted, with respect to the ground, so as to stop, or at least to limit, the advancing movement of the snow or other material to be retained.

In this way, by arranging several rows of such retaining devices along the slopes of the mountains, it is possible to limit the formation of avalanches or landslides or in any case to limit significantly the mass thereof.

Although advantageous in many respects, these known retaining devices have some drawbacks which are yet to be overcome.

In particular, one drawback relates to the difficulty of transportation of the retaining device in order to carry it to a site of installation, for example on a slope of a mountain.

It should be considered that such retaining devices, owing to their very function, must often be installed in hostile locations which are difficult to access, such that often a helicopter is used in order to transport them to the site of installation.

According to one transportation method, the retaining device in an almost completely pre-assembled condition, is hoisted by a helicopter and transported from a storage site to an installation site.

This requires operations of coupling and uncoupling between the retaining device and a cable that is lowered from the helicopter for hoisting the device.

The inventor of the subject of the present disclosure has noticed that, since the retaining devices have relevant dimensions, which usually are larger than the tallness of the workers, and the coupling must be carried out in a position as barycentric as possible or at least balanced, often the workers are forced to climb the retaining device or to place themselves at some height from the ground in order to be able to couple the helicopter cable to a suitable coupling point of the retaining device. A similar problem arises when the retaining device is to be uncoupled on the site of installation; this is made even more difficult by the fact of being in a hostile location.

The inventor has therefore understood that there is an issue of lacking safety and of potential risk of accidents to the workers in charge of the above operations of coupling and uncoupling. In addition to this, there is also a discomfort for the workers when carrying out these operations.

The present disclosure is therefore intended to overcome the drawbacks mentioned above in relation to the prior art and/or to achieve further advantages.

This is obtained by providing a retaining device according to independent claim 1. Particular embodiments of the subject of the present disclosure are defined in the corresponding dependent claims.

Specifically, the subject of the present disclosure is a retaining device comprising a retaining barrier, a support strut connected to the retaining barrier and a flexible suspension or hoisting member that allows the connection of the device to a hoisting apparatus to which the retaining device is suspended during a transportation step.

The flexible suspension member has a first portion, which is mounted on the retaining barrier and/or on the support strut, and a second portion comprising means for connection to the hoisting apparatus. For example, the hoisting apparatus is a helicopter or a winch mounted on a helicopter and provided with a hooked rope.

The flexible suspension member has an elongated shape and is useful for providing a worker with a coupling point of the retaining device to a hooked rope that is lowered from the helicopter, such a coupling point being easy to reach without the

need to climb the retaining device or to be at some height from the ground.

The flexible suspension member is a load-bearing member, i.e. it is strong enough to support the weight of the whole retaining device during the hoisting and the transportation of the latter. For example, the flexible suspension member comprises a metal wire cable or a strand of a suitable material and cross-section.

The flexible suspension member acts as a load-bearing member only during the hoisting (and transportation) of the retaining device; the flexible suspension member, in fact, is not a part of the structural elements (i.e. support frame, strut, tie members, retaining mesh, ...) of the retaining device and is therefore idle when the retaining device is in a warehouse or at the installation site.

The retaining device together with the respective flexible suspension member are apt to adopt a same configuration, i.e. a same mutual position, both in a warehouse condition and in an operative condition at the installation site.

In practice, the flexible suspension member is in a traction condition only during the hoisting of the retaining device; on the contrary, the flexible suspension member is in a slack or unloaded condition in an operative condition at the installation site and/or in a warehouse condition.

Therefore, the flexible suspension member may be sized to support only the weight of the retaining device, with an advantage of cost and weight. In fact it is not required that the flexible suspension member has also to support the weight of snow or other retained material when the retaining device is operative at the installation site.

In other words, the flexible suspension member is a quick coupling/uncoupling system that allows a worker to perform the operations of coupling/uncoupling of the retaining device to the helicopter while remaining on the ground, therefore in a safe condition and in a position that does not force the worker to be in potentially dangerous conditions. Moreover, these operations are much easier and faster in comparison with the prior art.

Thus, a basic concept of the present disclosure is to provide an optimal coupling point (i.e, a dedicated coupling point that is satisfactory from the point of view of the handling and of the weight distribution during the hoisting) that is within the reach of a worker in charge with the operations of coupling and uncoupling. In other words, the flexible suspension member is a member that is at a man-level, which is easily reachable by the worker, when the retaining device is in a resting condition in a warehouse or at the installation site (for example on the side of a mountain).

The flexibility of the flexible suspension member is useful to have a coupling point which is easily and freely movable by the worker, according to the needs and to the

position of the hooked rope of the hoisting apparatus. Furthermore, the flexible suspension member can be folded up, reducing its overall encumbrance, when it is not used (for example when the retaining device is in a warehouse or at the installation site).

In one embodiment, the flexible suspension member has a length sufficient to ensure that the worker is in every moment at a safe distance from the structural elements forming the retaining device. This is useful for increasing the operational safety, because it greatly reduces the risk that the worker is accidentally hit by such structural elements during the hoisting of the retaining device.

The retaining device is already provided with the quick coupling/uncoupling system when it is in the warehouse place, so as to be ready for transportation to the site of installation or of setting up; for example, the manufacturer supplies the retaining device with the flexible suspension member already mounted on it, i.e. the retaining device is prefabricated so as to include the flexible suspension member beforehand. Thanks to this, the operations to be performed during the step of installation on site are reduced, because the retaining device is very ready to be hoisted and transported.

The first portion of the flexible suspension member is mounted on the retaining barrier in a locked way or in a removable way. Furthermore, the first portion of the flexible suspension member can be static with respect to the retaining barrier, or it can have a play or another limited possibility of relative displacement.

In one embodiment, the second portion of the flexible suspension member is free, i.e. it is not tied to the retaining barrier and is movable by the worker to reach the hook lowered from the helicopter. This is useful to make the coupling operations even easier, because it allows a certain tolerance in the positioning of the helicopter.

In one embodiment, the retaining device comprises an element for spotting a position of the second portion of the flexible suspension member, which is useful to facilitate the helicopter pilot during the approach to the coupling point of the retaining device. For example, the spotting element is a phosphorescent coloured flag, of about 50 cm, which is fastened to the flexible suspension member near the second portion.

In one embodiment, the first portion of the flexible suspension member is mounted on a top region of the retaining barrier. This is useful to reduce to a minimum the swings and turns of the retaining device during the hoisting, because in this way the hoisting force is more balanced with respect to the barycentre of the device. Furthermore, if the length of the flexible suspension member is smaller than the height of the retaining barrier, the flexible suspension member remains raised from

the ground when the device is on the ground, and there is no risk for a worker to stumble over it or for the flexible suspension member to be damaged by a prolonged contact with the dampness of the ground.

Further advantages, characteristic features and the modes of use of the subject of the present disclosure will become clear from the following detailed description of a preferred embodiment thereof, provided by way of example and not for limitative purposes.

It is clear, however, that each embodiment of the subject of the present disclosure may have one or more of the advantages listed above; in any case it is not required for each embodiment to have simultaneously all the advantages listed.

Reference shall be made to the figures in the accompanying drawings in which:

- Figure 1 shows a perspective view of a retaining device according to the present disclosure, during a step operated by a worker;
- Figure 2 shows an enlarged view of a detail II of the retaining device of Figure 1;
- Figures 3A, 3B, 3C and 3D show enlarged views of respective alternative embodiments of a detail III of the retaining device of Figure 1;
- Figure 4 shows a perspective view of the retaining device of Figure 1 during a step of transportation by means of a helicopter;
- Figures 5A, 5B, 5C and 5D show respective alternative embodiments of the retaining device of Figure 1, during a transportation step.

With reference to the accompanying figures, a retaining device according to the present disclosure is denoted by reference number 1.

Said retaining device 1 may be used in different fields: for example it may be used to retain snow (so-called snow protection device), for protection against avalanches (so-called avalanche protection device), for stabilizing or retaining earth or embankments (so-called stabilization device), for protection against falling rocks (so-called rockfall or landslide protection device), for making filtering dams or for other similar uses.

In the embodiment shown, the retaining device 1 is a snow protection device and is intended to be positioned on a slope of a mountain and here fixed according to the known modes, with the aim of stopping or retaining a downhill movement of snow coming from the uphill side of the retaining device 1.

The retaining device 1 comprises a retaining barrier 3, having a mainly two-dimensional extension, and a support strut 2 connected to the retaining barrier 3. In particular, a first end of the support strut 2 is fixed (in case, via an articulated joint or a ball joint) in a central region of the retaining barrier 3. Tie members 25 (for example metal wire ropes) connecting the second end 22 of the support strut 2 to

the retaining barrier 3 are also provided. The retaining device 1 has therefore a substantially pyramidal shape.

When the retaining device 1 is installed at the installation site, the support strut 2 and the retaining barrier 3 substantially are in a tilted T-shaped arrangement or configuration, wherein the support strut 2 forms the core of the T-shape and the retaining barrier 3 forms the flange of the T-shape. In other words, the retaining device 1 is positioned on an installation ground in such a configuration that the retaining barrier 3 has a side 3a, or bottom side, resting on the ground and the second end 22 of the support strut 2 rests on the ground, to which it is bound through suitable anchoring means.

The support strut 2 acts as a prop or support for the retaining barrier 3, in order to prevent the latter from being overturned or moved under the weight of the material to be retained.

Figure 1 shows a retaining device 1 resting on a warehouse yard 100 before transportation to a site of installation or a site of setting up. When the retaining device 1 is installed at the installation site, it rests on the ground substantially in the same configuration as shown in Figure 1.

In the example, the retaining barrier 3 comprises a support frame 4, a retaining mesh 35 associated with the support frame 4 and a perimetral cable 37 (for example a metal wire rope, a cable or other similar element) arranged along the perimeter of the retaining mesh 35, i.e. along the perimeter of the retaining barrier 3.

The perimetral cable 37 is associated with the retaining mesh 35, for example passing through the meshes of the latter, and is fastened to the support frame 4 by means of proper hooks. For example, the perimetral cable 37 allows to fasten the retaining mesh 35 to the support frame 4 and, by properly stretching the perimetral cable 37, it further allows to make the retaining mesh 35 more rigid and less deformable under load.

In the example shown, the support frame 4 comprises four arms 44 and central plates 46. The arms 44 are arranged radially or as an X and extend from the central plates 46 to which they are fastened. In particular, this radial arrangement is substantially planar; for example, the arms 44 are coplanar with each other. In particular, the support strut 2 is fastened to a central plate 46 facing the support strut 2 itself.

In the example, the retaining device 1 further comprises a rod 5 which extends from the opposite side of the support strut 2 with respect to the retaining barrier 3. A first end of the rod 5 is fastened to the retaining barrier 3, in particular to a central plate 46 facing the rod 5 itself, and a second end of the rod 5 is connected to the retaining

barrier 3 through second tie members 53.

The rod 5 and the second tie members 53 are useful in particular for a snow retaining device; anyway, they are to be considered optional.

For further constructional and operational details and for possible different embodiments of the retaining device described up to this point, reference is made to European patent application No. EP1921210, which is here enclosed by reference.

The retaining device 1 according to the present disclosure further comprises a flexible suspension member 6, which allows a connection of the retaining device 1 to a hoisting apparatus as for example a helicopter 95 and/or a winch 98. The flexible suspension member 6 is therefore a hoisting member to carry out the hoisting (and the transportation, for example by means of a helicopter) of the retaining device 1.

In practice, as evident from what is here described and shown in the figures, the flexible suspension member 6 is operative and in traction during the hoisting of the retaining device 1, whereas the flexible suspension member 6 is non-operative and in a slack or unloaded condition when the retaining device 1 is in an operative condition on site and/or in a warehouse condition. In other words, the flexible suspension member 6 has the function of making easier the hoisting of the retaining device 1 and the transportation to the site of installation, but it has no structural or supporting function when the retaining device 1 is mounted on the installation site.

The retaining device 1 and its flexible suspension member 6 can therefore adopt a same configuration or position relative to each other, both in a warehouse condition and in an operative condition on site. In fact, in both conditions the flexible suspension member 6 is idle and therefore, for example, it can be left hanging or folded up to reduce its encumbrance.

Therefore, the retaining device 1 can be installed on site in a configuration, or condition, which is the same as a warehouse configuration, or warehouse condition.

The flexible suspension member 6 has an elongated shape and, for example, is a metal wire rope. In general, it can be anyway a cable, a rope, a cord, a band or a similar flexible member.

The flexible suspension member 6 has a traction mechanical strength which is sufficient to bear the weight of the retaining device 1, thus the retaining device 1 can be suspended by means of the flexible suspension member 6. Hence, the retaining device 1 can be hoisted and transported by connecting the flexible suspension member 6 to a rope 96 of a winch 98 mounted on the helicopter 95. In particular, the rope 96 of the winch 98 is provided with a hook 97, which preferably can be opened via an electrical control. Therefore, the rope 96 can be disconnected from the flexible suspension member 6 via an opening command sent by a pilot 91 of the

helicopter 95.

The flexible suspension member 6 has a first portion which is mounted or fastened on the retaining barrier 3 and a second portion which comprises means 65 for a connection to the hoisting apparatus, in particular to the hook 97 of the rope 96 of the winch 98. In other words, the connection means 65 are configured for a connection or coupling to the hoisting apparatus.

In the embodiment shown, in which the flexible suspension member 6 is a simple rope, said first portion is a first end 61 of the flexible suspension member 6 and said second portion is a second end 62 of the flexible suspension member 6. In particular, the second end 62 is a free end of the flexible suspension member 6, i.e. it is an end that is movable with respect to the retaining barrier 3 according to the needs, because it is not tied or fastened to the retaining barrier 3 itself. In fact, the flexible suspension member 6 is tied to the retaining barrier 3 only by its first portion or first end 61.

In the embodiment shown, the first end 61 is mounted on the perimetral cable 37, for example by means of a high-resistance shackle 68; the first end 61 is associated with the shackle 68 through a bend or loop of the rope 6, which is clamped by a sleeve 69.

The mounting of the first end 61 on the perimetral cable 37 is useful for implementing a mounting that does not require to provide hooks or specific fastening elements on the retaining barrier 3. Furthermore, it is useful for implementing a mounting on a barycentric axis in a simple way, as discussed later.

In particular, the first end 61 is mounted on a top region of the retaining barrier 3, i.e. it is mounted on the perimetral cable 37 of a top side 3b of the retaining barrier 3. Even more in particular, the first end 61 is mounted at the middle region, i.e. substantially half-way, of the top side 3b. Thanks to this, the fastening point or connection point between the flexible suspension member 6 and the retaining barrier 3 is located substantially aligned on a barycentric vertical axis 30 of the retaining barrier 3.

In particular, such a barycentric vertical axis 30 is defined as a vertical axis passing through the center of gravity of the retaining barrier 3 when the retaining device 1 is resting on a ground at the installation site.

The connection means 65 provided at the second end 62 may include a connecting element such as a ring 651, a hook 652, a snap hook, a loop 653 of the flexible suspension member 6 (in case, provided with thimble and / or blocked by a sleeve 69), a bend 654 of the flexible suspension member 6 (in case, blocked by a sleeve).

The flexible suspension member 6 has a length L between the first portion and the

second portion, that is, between the first end 61 and the second end 62. When the retaining device 1 is resting on a ground at the installation site or on a yard 100 before transportation, the length L is such as to enable a worker 90 to reach the second end 62 (and in particular the connection means 65) with a hand while remaining on the ground or on the yard 100.

In practice, it is meant that the second end 62 is at a so-called "man-level", both when the retaining device 1 is located in a warehouse (or in a warehouse condition) and when the retaining device 1 is in an operative condition at the installation site.

Therefore, the worker 90 can grab the second end 62 without the need to climb the retaining device 1 or to use ladders or other means to get up in height, because the second end 62 is at such a level or height from the ground that it is reachable from the hand of the worker 90 who is on the same ground.

Preferably, if the first end 61 is mounted on the top side 3b of the retaining barrier 3 as shown in the figures, the length L of the flexible suspension member 6 is smaller than the height H of the retaining barrier 3, so that the second end 62 remains raised from the ground and does not originate a risk of stumble for the workers 90.

For example, the length L is between 240 and 280 cm, while the height H of the retaining barrier 3 is between 325 and 385 cm.

The second end 62 also comprises a spotting element for spotting the position of the second end 62. For example, the spotting element is a flag 64 of phosphorescent or fluorescent colour, or of another easily visible colour. In one embodiment, the flag 64 has a length of 50 cm.

As shown in the figures, the flag 64 is fastened to the second end 62, so that the location of the connection means 65 is made easily visible to the worker 90 and the helicopter pilot 91.

A mode of handling and transporting a retaining device 1 according to the present disclosure is described below.

The retaining device 1 is initially in a warehouse place, for example on a yard 100. When there is the need to transport the device 1 to a site of installation, a helicopter 95 is sent to the warehouse place; the helicopter 95 is positioned in the air at a certain height above the retaining device 1 and the rope 96 of the winch 98 is lowered towards the device 1. A precise positioning of the helicopter 95 is also favoured by the presence of the coloured flag 64, which shows to the helicopter pilot 91 where the rope 96 should be lowered to be coupled to the connection means 65.

A worker 90, remaining on the yard 100 near the device 1 (i.e., without the need to climb or to use ladders), grasps the second end 62 of the flexible suspension member 6 and connects the hook 97 of the rope 96 to the connection means 65 of

the flexible suspension member 6.

The fact that the second end 62 is freely movable relative to the retaining barrier 3 is useful to facilitate this connection operation, as it makes the worker 90 able to easily reach the hook 97 with the second end 62 even if the helicopter 95 is not positioned exactly over the device 1, or if the rope 96 is moved by the wind.

When the connection is made, the rope 96 is pulled back by the winch 98. The retaining device 1 is thus raised from the ground and, while remaining suspended, is transported by the helicopter 95 to the site of installation.

At the site of installation, the retaining device 1 is lowered by the winch 98 until the bottom side 3a touches the ground. Further rope 96 is uncoiled to lower the connection means 65 at least until the latter are within the reach of the worker 90. The flexible suspension member 6 is disconnected from the hook 97 by means of an electrical system for opening the hook 97, or the connection means 65 are manually uncoupled by a worker 90. In the second case, thanks to the sufficient length L of the flexible suspension member 6, the worker 90 can operate while remaining on the ground, without the need to climb or to use ladders for carrying out the uncoupling operation.

In alternative embodiments, the flexible suspension member 6 is mounted on the retaining barrier 3 in more than one point.

For example, the flexible suspension member 6 can split into two branches 6a, 6b, each having a first portion 61a, 61b that is mounted on a respective region of the perimetral cable 37 or of the support frame 4 (Figures 5A and 5D).

In another embodiment (Figure 5B), the flexible suspension member 6 is a rope having two ends or first portions 61a, 61b, which are mounted on the retaining barrier 3, and an intermediate region, or second portion 62, which is provided with connection means 65; for example, the second portion 62 of the rope goes through a ring 651, where it makes a bend.

In other alternative embodiments, the first portion or first end 61 of the flexible suspension member 6 is mounted on the support strut 2 or on the support frame 4 (Figures 5C and 5D), in particular on one or more of the arms 44 (Figure 5D).

Also in the here mentioned embodiments, it is useful that the first portion 61 (or the first portions 61a, 61b) of the flexible suspension member 6 is mounted on the retaining barrier 3 according to a configuration such that, during the hoisting or suspension of the retaining device 1 via the flexible suspension member 6 (i.e., when the retaining device 1 is suspended to the helicopter 95 and then the flexible suspension member 6 is taut by the weight of the retaining device 1), the second portion 62 of the flexible suspension member 6 is substantially aligned with the

barycentric vertical axis 30 of the retaining barrier 3.

This is useful for minimizing the turns and swings of the retaining barrier 3 and of the entire device 1 during the hoisting, also in order to prevent a worker 90 from being accidentally struck by the device 1 during the hoisting operation. In fact, this barycentric alignment is useful for ensuring that the bottom side 3a of the retaining barrier 3 remains substantially parallel to the ground during the hoisting and during transportation. In addition, vice versa, when the device 1 is lowered on the installation site, the entire bottom side 3a simultaneously touches the ground; this is useful for avoiding dangerous swings of the device 1 at the time of contact with the ground.

The subject of the present disclosure has been described hitherto with reference to preferred embodiments thereof. It is understood that other embodiments relating to the same inventive idea may exist, all of these falling within the scope of protection of the claims which are provided hereinbelow.

CLAIMS

1. A retaining device (1) for retaining snow, avalanches, earth, rocks or similar materials, comprising a retaining barrier (3) and a support strut (2) connected to the retaining barrier (3),
characterized in that
the retaining device (1) further comprises a flexible suspension member (6) for hoisting and transporting the retaining device (1), said flexible suspension member (6) having a first portion (61), which is mounted on the retaining barrier (3) and/or on the support strut (2), and a second portion (62), which comprises connection means (65, 651, 652, 653, 654), said connection means (65, 651, 652, 653, 654) being configured for a connection to a hoisting apparatus (95, 98),
the retaining device (1) being prefabricated so as to include the flexible suspension member (6).
2. The retaining device (1) according to claim 1, wherein said second portion is a free end (62) of said flexible suspension member (6), said free end (62) being movable relative to the retaining barrier (3).
3. The retaining device (1) according to claim 1 or 2, wherein the retaining device (1) together with the respective flexible suspension member (6) is apt to adopt a same configuration both in a warehouse condition and in an operative condition at the installation site.
4. The retaining device (1) according to any one of the preceding claims, wherein the flexible suspension member (6) is in a traction condition when the retaining device (1) is in a hoisted and transport condition, and wherein the flexible suspension member (6) is in a slack or unloaded condition when the retaining device (1) is in an operative condition at the installation site and/or in a warehouse condition.
5. The retaining device (1) according to any one of the preceding claims, wherein said flexible suspension member (6) has a length (L), said length (L) being such that, when the retaining device (1) is resting on a ground (100), the second portion (62) is at a height reachable by a hand of a worker (90) who is on the same ground (100), or at a man-level.
6. The retaining device (1) according to any one of the preceding claims, further comprising an element (64) for spotting a position of said second portion (62).
7. The retaining device (1) according to claim 6, wherein said spotting element is a phosphorescent or fluorescent coloured flag (64), the flag (64) being fastened to said second portion (62).

8. The retaining device (1) according to any one of the preceding claims, wherein said connection means (65) comprises a connecting element selected from a group composed by: ring (651), hook (652), snap hook, loop (653) of the flexible suspension member (6), bend (654) of the flexible suspension member (6).
9. The retaining device (1) according to any one of the preceding claims, wherein said first portion (61) of the flexible suspension member (6) is mounted on a top region (3b) of the retaining barrier (3).
10. The retaining device (1) according to claim 9, wherein the flexible suspension member (6) has a length (L) and the retaining barrier (3) has a height (H), said length (L) being smaller than said height (H), the flexible suspension member (6) being raised from a ground (100) which the retaining device (1) rests on.
11. The retaining device (1) according to any one of the preceding claims, wherein the retaining barrier (3) comprises a support frame (4), a retaining mesh (35) associated with the support frame (4), and a perimetral cable (37) arranged along the perimeter of the retaining mesh (35), said first portion (61) of the flexible suspension member (6) being mounted on said perimetral cable (37).
12. The retaining device (1) according to claim 9 or 10 and according to claim 11, wherein said first portion is an end (61) of the flexible suspension member (6) and is mounted on said perimetral cable (37) in a middle region of a top side (3b) of the retaining barrier (3).
13. The retaining device (1) according to any one of claims 1 to 10, wherein the retaining barrier (3) comprises a support frame (4), said first portion (61) of the flexible suspension member (6) being mounted on said support frame (4).
14. The retaining device (1) according to any one of the preceding claims, wherein the retaining barrier (3) has a barycentric vertical axis (30) when the retaining device (1) is resting on a ground (100), and wherein the first portion (61) of the flexible suspension member (6) is mounted on the retaining barrier (3) with a configuration such that the second portion (62) of the flexible suspension member (6) is substantially aligned with said barycentric vertical axis (30) when the retaining device (1) is suspended through the flexible suspension member (6).
15. The retaining device (1) according to any one of the preceding claims, wherein said flexible suspension member (6) is a cable, a rope, a cord, a band or a similar flexible member.
16. A method for manufacturing a retaining device (1) according to any one of claims 1 to 15, comprising the step of mounting the flexible suspension member (6) on the retaining barrier (3) and/or on the support strut (2), so as to obtain a

prefabricated retaining device (1), prior to a step of transporting the retaining device (1) to a site of installation or of setting up.

17. The method according to claim 16, wherein the flexible suspension member (6) lies associated with the retaining barrier (3) and/or with the support strut (2) while the retaining device (1) is in a warehouse condition.

18. The method according to claim 16 or 17, wherein the retaining device (1) is installed at the installation site in a configuration, or condition, that is the same as a warehouse configuration, or warehouse condition.

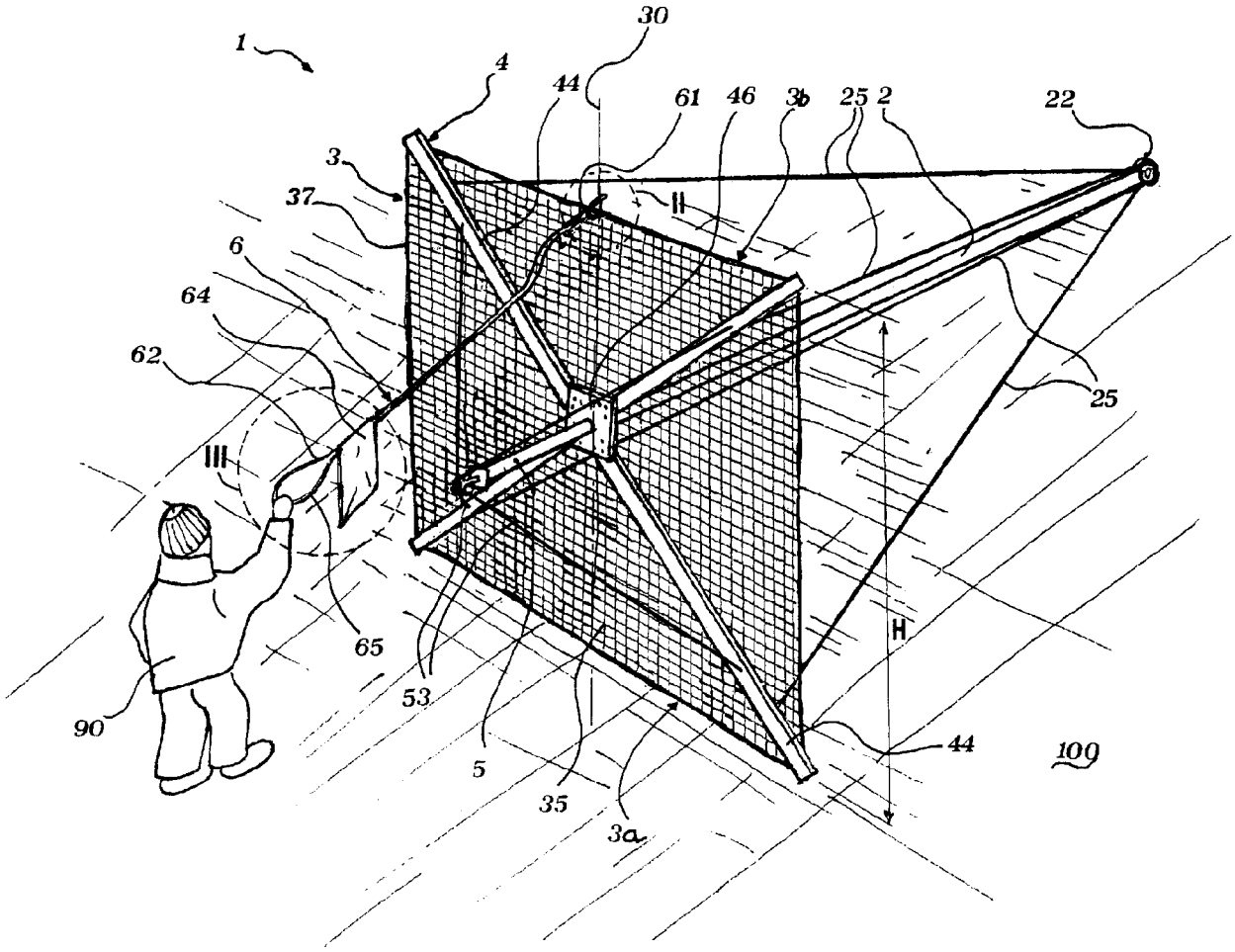

1
4
30
44
61
46
3b
25
2
22
3
37
II
6
64
62
III
25
65
H
53
90
5
44
100
35
3a

FIG.1

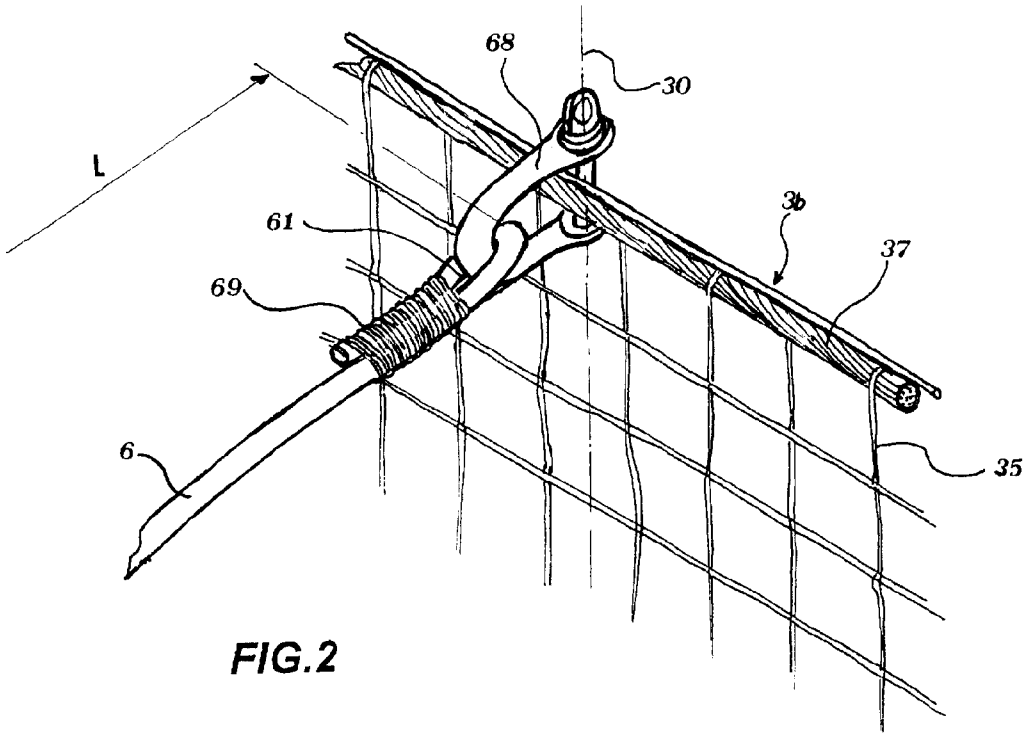

68
30
L
3b
61
37
69
6
35

FIG.2

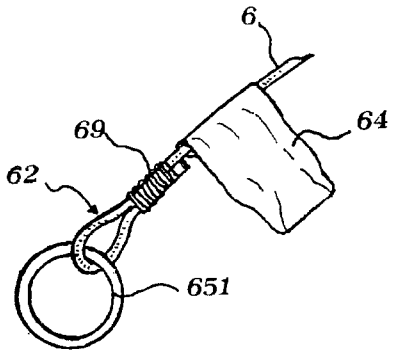


FIG.3A

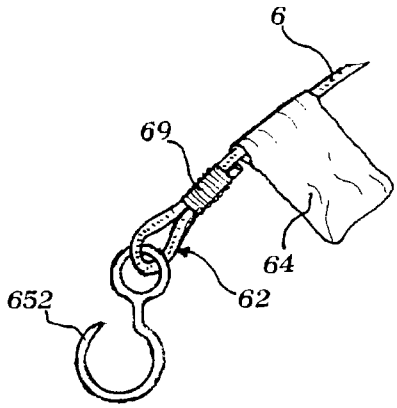


FIG.3B

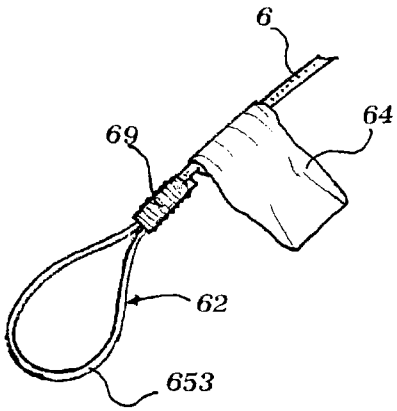


FIG.3C

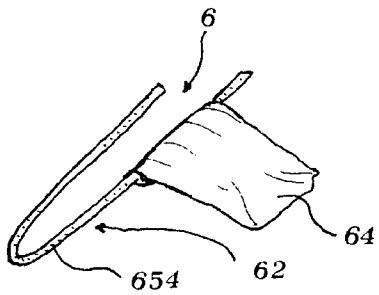


FIG.3D

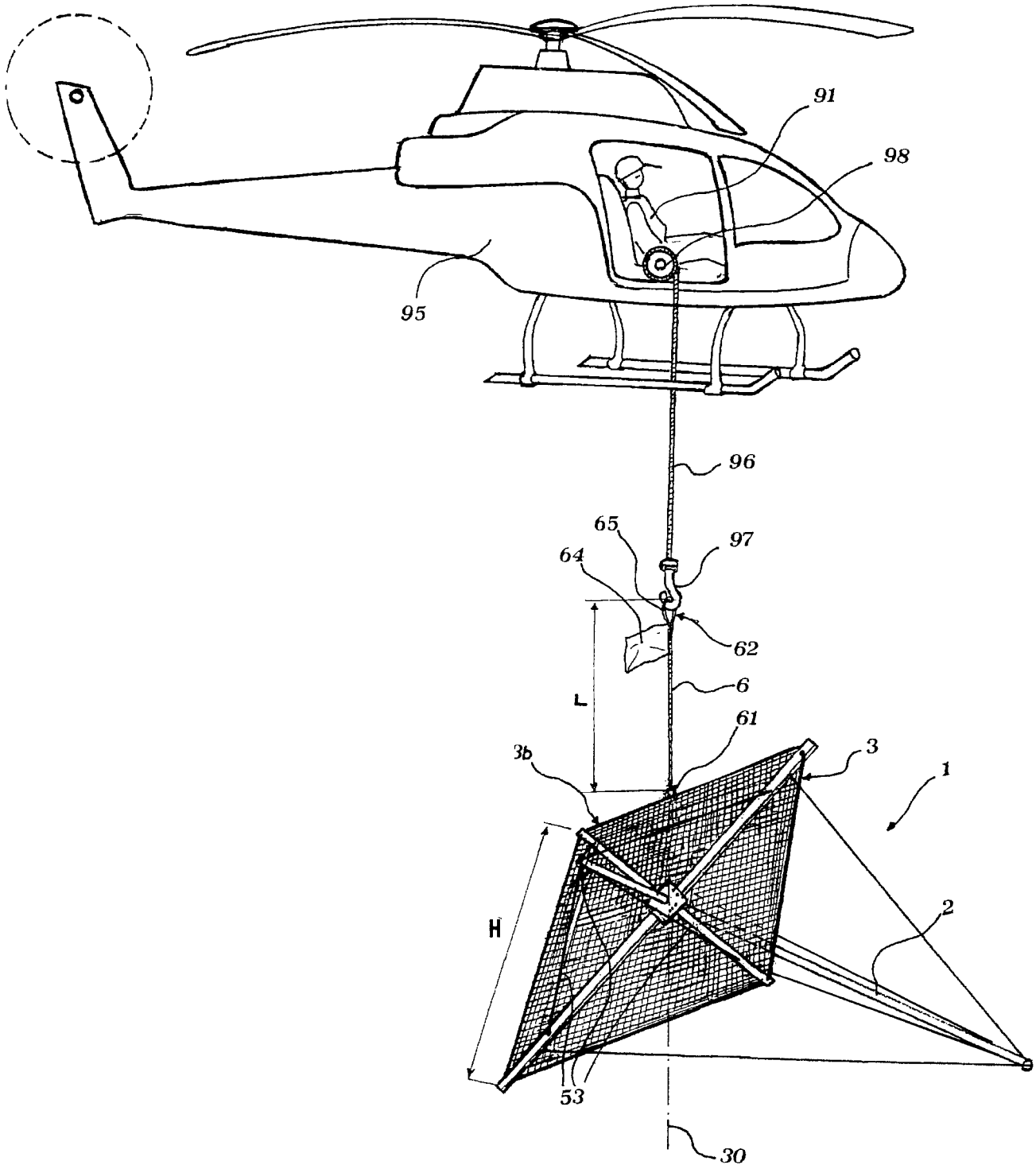


FIG.4

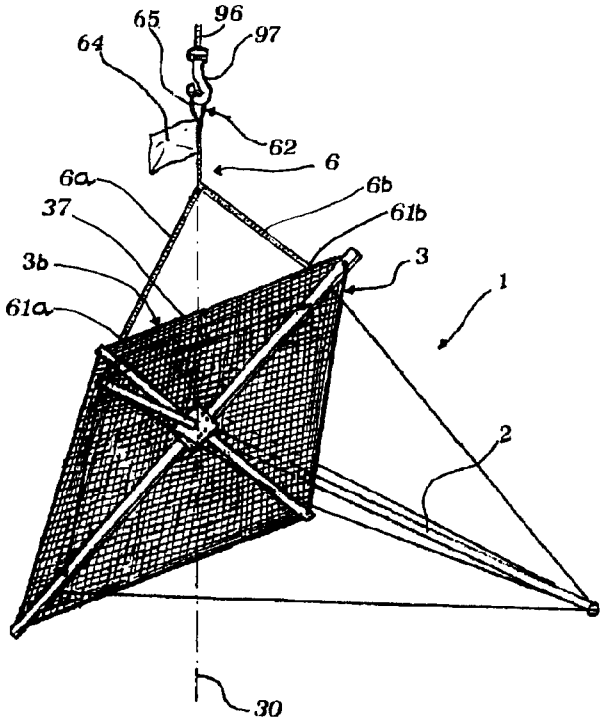


FIG. 5A

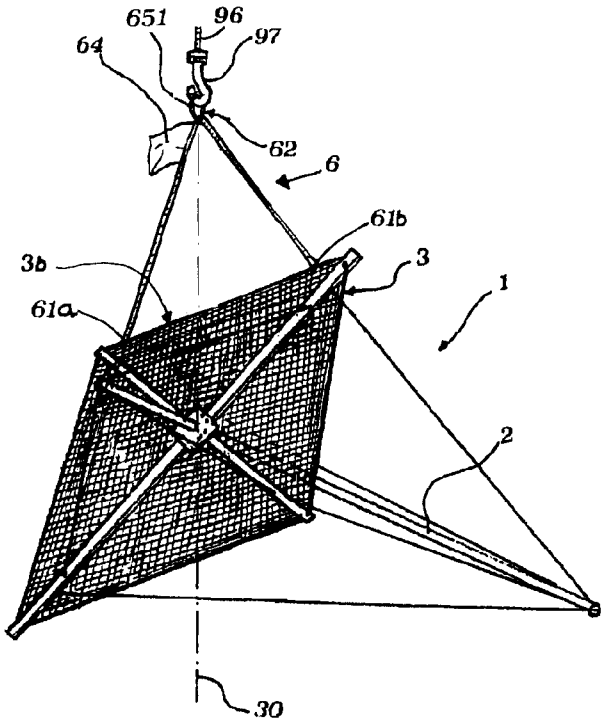


FIG. 5B

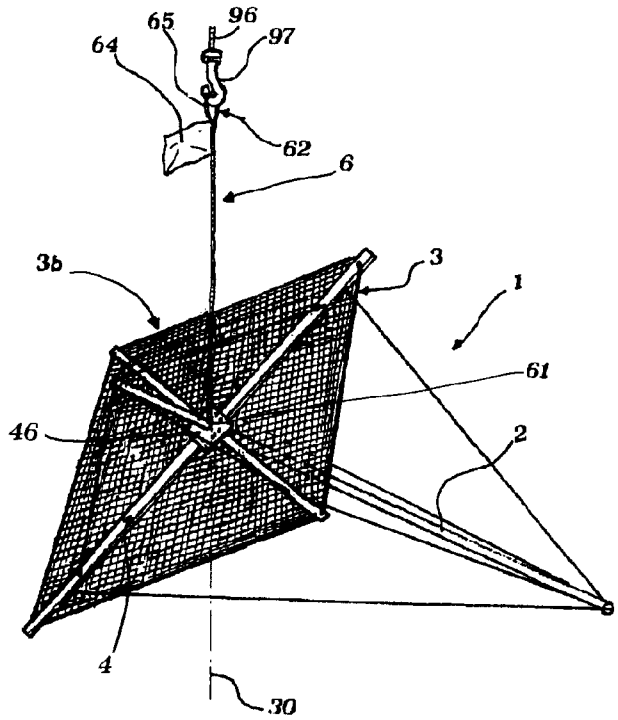


FIG. 5C

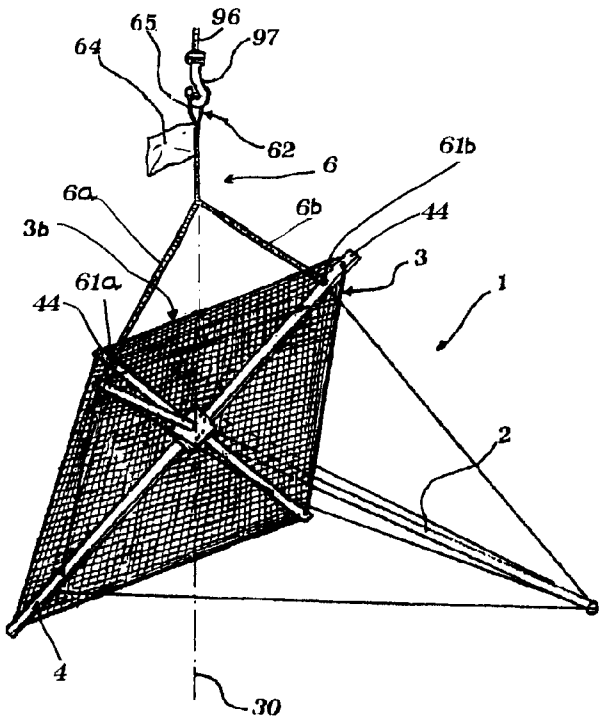


FIG. 5D

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2012/053606

A. CLASSIFICATION OF SUBJECT MATTER
INV. E01F7/04 B64D1/22
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)
E01F B64D B66C

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	CH 674 998 A5 (STREIFF AG MATHIAS) 15 August 1990 (1990-08-15) column 3, line 57 - line 59; figures 1,3,11,12 columns 1,3-6 column 2, line 51 - line 58 column 5, line 16 - line 22; claim 16 -----	1-18

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 October 2012	23/10/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Topcuoglu, Sadik Cem

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2012/053606

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CH 674998 A5	15-08-1990	NONE	