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(54) **Fall protection**

(57) Fall protection. It has an anchoring point (10), a part (1) of metal sheet with radially from inside to outside a raised part (4), a bridging part (3) and at lower level a ring part (2) with mechanical mounting means (6,7). The bridging part (3) provides a collapsible zone and has a curved shape, such as spherical cap like. It has also a sheet, membrane or foil (17) and a covering part (21), wherein the part (1) is covered by the foil (17) of larger diameter above which a covering part (21) of metal sheet is mounted.

Anchoring point (10) for mounting to a fall protection, with a substantial U-shape in side view and a hole (11,12) in one or both legs of the U.

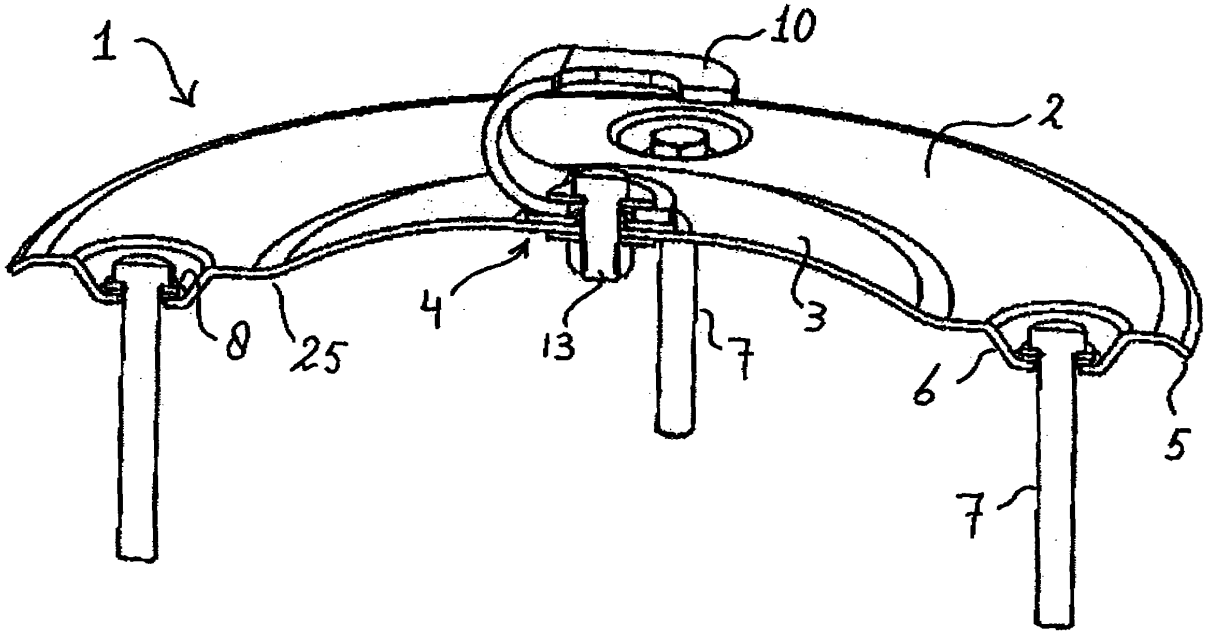

Fig. 1

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Description

[0001] This invention relates to a fall protection providing an anchoring point at e.g. the roof of a building and to which a person can be hooked with a cable.

[0002] Technical background is e.g. provided by NL-1027728 or EP-1803871 (07105360.1). They disclose a disc or flap of bituminous foil or such roof covering material, sandwiched between two mutually nested profiled metal discs of equal shape and dimension with each a flat circumferential edge and in the raised centre of it an anchoring eye mounted to it. The mounting bolt of this eye provides the clamping force with which the flap is clamped between the metal discs. The metal discs are possibly mutually riveted with through the flap penetrating nails. This fall protection is fixed by adhering the flap to the roof covering of the sub surface. The shock of a fall is caught by from the sub surface delaminating of the flap en by withdrawing the flap from between the two metal discs, possibly combined with tearing of the flap at the nails. According to an alternative the lower disc has a substantial larger diameter and is in its not by the upper disc covered part provided with radial cuts such that the sheet material can deform in said area to arrest a fall. An advantage is that for its mounting to the sub surface it is not required to make a hole in the roof covering and isolation material between the roof covering and the supporting structure can remain in place. A disadvantage is that a mounting with the aid of adhesion is less trustworthy.

[0003] The object of this invention is a fall protection with one or more of the following properties: designed to be provided onto a roof wherein between the roof covering and the supporting sub structure a package of thermal isolating material, e.g. of hard foam or different, possibly compressible, material, is present, without locally removal of the isolating material unto the supporting sub structure; adapted to be provided onto a roof wherein between the roof covering and the supporting sub structure an isolating layer is absent; designed to be mounted with the aid of mechanical mounting means; providing a reliable, long life mounting; over load due to e.g. arresting a fall clearly visible; water tight; to mount onto a flat roof, a slanting roof or gable; substantial better bearing of the forces during arresting a fall.

[0004] According to the invention this object is met by the features as according to the attached main claim.

[0005] The fall protection has one or more of the following: a profiled disc made of a single metal sheet; a central anchoring means, such as eye, preferably turnable; a preferably flat circumferential or ring part; a downward extending edge, such as outer edge, preferably projecting below the ring part; one or more mounting holes with preferably substantial equal angular spacing and/or equal distance to the centre; a raised central part with preferably the centre as highest point; a central raised flat part or plateau; the raised part has an upward extending bridging part, e.g. obliquely, curved, non-linear or bowed; one or more lowered parts, preferably locally below the ring part and/or outer edge; the mounting of the anchoring means has one or more loose rings or discs placed on the mounting pin and provided at the one and/or other side of the sheet part; a shape of the bridging part, e.g. as part of a sphere, dome or a flattened sphere, with a radius between 135 and 155 mm or a shape with a dimension fitting within those limits or a shape with a diameter more then 7.5 of 8 or 10 times larger then its height; the bridging part connects via a curve with opposite radius to the circumferential part; a diameter of the plateau 4 of approximately 60 mm; a sheet thickness between 1 and 3 mm, preferably about 2 mm; made of galvanised steel zendzimir) ; the part which contains the mounting means keeps a spacing with the sub surface; a flap of foil; the flap extends to the bridging part or covers it; the birding part is substantially completely covered by a cap with preferably substantially corresponding shape; the bridging part and cap are mutually nested and/or keep the flap sandwiched, preferably compressing the flap over a large surface; the bridging part and cap are mutually connected by a central means; the cap is water tight; the flap is fixed, preferably adhered or is loose; the flap is only at the location of the outer circumferential edge of the cap clamped by it; the cap has at the outer circumferential edge a flange extending substantially parallel to the circumferential part; the flap can be folded back to get access to the mechanical mounting means; the external diameter of the plateau is smaller than a third part of the external diameter of the bridging part; the bridging part is wider than the ring part; the disc or at least the bridging part and/or the cap is an uninterrupted sheet part; if mounted the mounting means penetrate through the roof covering and isolation layer and are fixed to the bearing sub structure and preferably compress the isolation layer and roof covering between said part and the sub structure.

[0006] Thus the invention uses according to a preferred embodiment the inventive feature of permanently deformation of the bridging part to arrest a fall. The bridging part as known from NL-1027728 or EP-1803871 is not allowed to deform permanently otherwise the flap can escape which is extremely undesirable.

[0007] The invention relates thus to an anchoring means for use with a fall protection. This means can possibly be added to the fall protection of the invention. This means has one or more of the following features: made from a flat metal sheet of preferably (stainless) steel; a preferably flat foot part with preferably a hole; a preferably flat hooking part with preferably a hole; a bore hole; a elongated hole; a bridging part with round, angled or straight shape; a narrowing or widening of the bridging part with preferably round change overs; a substantially L- or U-shape in side view; the one leg shorter then the other leg; the holes are aligned; the one hole extends at one or both sides beyond the other hole. This means will deform obviously due to e.g. arresting a fall (e.g. bends open), such that a clear indication is obtained that the

fall protection must be changed.

[0008] The enclosed drawing shows preferred embodiments of the invention, in:

Fig. 1 a perspective sectional view of a first embodiment;
Fig. 2 a perspective view from below;
Fig. 3 a sectional side view of a detail;
Fig. 4 a perspective side view of a detail;
Fig. 5 a sectional side view;
Fig. 6 three different views of a detail;
Fig. 7A a top view of an intermediate product for the detail of fig. 6;
Fig. 7B a perspective of the detail of fig. 6;
Fig. 8 a perspective of a second embodiment; and
Fig. 9 a sectional side view of a part of a third variant.

[0009] The fall protection of Fig. 1 comprises a from a single metal sheet made profiled disc 1 in the centre of which a separate anchoring eye 10 is mounted to be turnable around the mounting pin 13(bolt).

[0010] The disc 1 has a flat ring part 2 with downwards extending external edge 5 projecting below part 2. The part 2 contains four holes with equal angular spacing and equal distance to the pin 13 of the eye 10. In each hole a mechanical mounting element 7 (bolts) is inserted with sufficient length to penetrate through the isolation layer and into the bearing sub structure. With the bolts 7 the disc 1 is clamped against te sub surface.

[0011] From part 2 inwards the disc 1 raises to obtain the highest level at pin 13. This raised part comprises in the centre a plateau 4 and between plateau 4 and part 2 a bridging part 3 with spherical shape. The part 3 connects to part 2 through a connection 25 with opposite curvature.

[0012] The holes or bores for the bolts 7 are each present within an own lowered part 6, such that the head of the bolt is sunk in the part 2. During mounting the lowered parts 6 will locally compress the isolation material below it, or can be accommodated in therefore provided local recesses in the sub surface. Below the bolt head there is a sealing ring 8.

[0013] In fig. 2 one can see that between the nut 14 put onto the pin 13 and the plateau 4 a disc 15 is sandwiched.

[0014] Fig. 3 shows in detail the mounting of the eye 10 to the plateau 4. The eye 10 has a bore 12 penetrated by the pin 13. Between the eye 10 and plateau 4 there is a disc 16 and between the eye 10 and the bolt head of the pin 13 a disc 15 is sandwiched. The discs 15 and 16 prevent early rupture of the plateau 4 and they allow the eye 10 to turn. The eye 10 provides a substantially radial load for the disc 1. The discs 15 and 16 extend far beyond the head and nut of pin 13.

[0015] Due to the manner in which the eye 10 is mounted to the disc, the mounting of the disc 1 to the sub surface by the mechanical mounting means and by the shape of the disc 1, the bridging part 3 will function as a collapsible or deformation zone during arresting a fall.

[0016] The bridging part is curved according to the radius between 135 and 155 mm. The diameter of the plateau 4 is about 60 mm. The disc 1 has a thickness of 2 mm and is made of galvanised steel (zendzimir).

[0017] If the disc 1 is mounted to a flat sub surface with the lowered parts 6 accommodated in the sub surface while the edge 5 bears onto the sub surface, the part 2 is located at a distance above the sub surface. Because of that part 2 has deformation space to arrest a fall.

[0018] Fig. 4 shows the disc 1 in combination with a flap 17 for proper sealing. The flap 17 is made of foil and is stuck to the edge 5 in a water tight manner and is stuck to the roof covering. The flap 17 can also cover more of the disc 1, e.g. extend to part 3 as fig. 5 shows. Fig. 5 also shows the flat sub surface 20, to illustrate space S between it and part 2. Thus the egde 5 can be tightly clamped onto the sub surface to provide a proper seal. Or the disc 1 can bear onto the sub surface through the lower parts 6, or with both 5 and 6. Fig. 5 shows also how the pins 7 are fixed in the supporting sub structure 30 of reinforced concrete and extend through the layer of isolating hard foam 31 between 20 and 30. By tightening the bolts 7 the isolation 31 is locally compressed at the sunken parts 6 such that said parts 6 are partly sunk in the roof.

[0019] Fig. 6 and 7 show the eye 10 in detail. Fig. 7a shows a flat part cut from sheet with a bore 12 and elongated hole 11 in the foot part 10L and the hooking part 10U, respectively. These parts 10L and 10U are flat in the completed product. The piece 18 between the parts 10L, 10U is bent to the round shape as shown in fig. 6. The piece 18 has a narrowing connecting through round intermediate parts to the parts 10L and 10U. In stead of a narrowing the piece 18 can also contain a widening. The curved shape of the piece 18 and the narrowing/widening of it provides the eye 10 the desired deformability. In an alternative the piece 18 can be substantially straight in the completed condition and continues into the parts 10U and 10L through local folds as shown in fig. 7B. Thus the eye 10 has a substantial U shape in side view with the one leg 10L shorter compared to the other leg 10U. As shown in top view of fig. 6, the holes 11, 12 are in line and hole 11 extends beyond hole 12 at both sides.

[0020] In an alternative eye 10, the hole 12 can be present in the piece 18 and each part 10U and 10L has a hole 11. The eye 10 is then mounted to the plateau 4 with the piece 18, wherein the pin 13 penetrates hole 12, such that both parts 10L and 10U extend up and can each serve to hook a cable.

[0021] Fig. 8 shows an alternative wherein eye 10 is replaced by a ring 19 fixed to the head of pin 13, such as known as such with other fall protections. Otherwise this variant is equal to the above.

[0022] Fig. 9 shows a variant differing from the one of fig. 5 since part 3 is covered with a cap 21 with corresponding shape and made of metal sheet material. Sheet

thickness is exaggerated. Part 3 and cap 21 are mutually nested and maintain a substantial equal distance of about the thickness of the flap 17. The outer edge of the cap 21 keeps the flap 17 clamped onto the disc 1, in the area where the parts 2 and 3 merge. With the pin 13 the parts 3 and 21 are mutually mounted. By providing that the connection between eye 10 and cap 21 is water tight, no rain can come below cap 21 such that it is not required that flap 17 is mounted to disc 1 in a water tight manner. Thus flap 17 is provided loose between parts 3 and 21, however in an alternative can be adhered to disc 1 and/or cap 21, e.g. in the area where parts 2 and 3 merge. This variant is preferably provided in pre-assembled state, such that in the factory at ideal circumstances eye 10 is mounted and tested.

[0023] At the outer circumferential edge a flange 22 is provided to cap 21, overlapping with and extending parallel to part 2 and helping with clamping of flap 17.

[0024] In a alternative of fig. 9 the flap 17 can have a smaller central opening, such that it extends over a part of part 3. Parts 3 and 21 are then shaped such that the flap 17 is merely clamped at the location of the circumferential edge of part 21, such as in fig. 9. As an alternative the shape of parts 3 and 21 can be such that flap 17 is clamped by 3 and 21 across a large surface.

[0025] If the flap 17 overlaps part 2 is with the embodiment of fig. 5 and 9, the flap 17 must be loose from part 2 such that the holes 6 are accessible to be able to mount part 1 by folding back flap 17.

[0026] In the variant of fig. 9 in the detail of fig. 3 the cap 21 is provided between plateau 4 and part 16, while between cap 21 and plateau 4 an additional disc 15 and a piece of foil of flap 17 are located on top of each other while both are penetrated by pin 13, such that cap 21 is sandwiched between disc 16 and additional disc 15 while plateau 4 is sandwiched between the piece of foil of flap 17 and the in fig. 3 illustrated disc 15 immediately above nut 14. The foil piece has a diameter substantially equal to that of disc 15 and 16.

[0027] From the drawing it is clear that the outer diameter of plateau 4 is smaller than a third part of the outer diameter of the bridging part 3, that the bridging part 3 is wider than the ring part 2; that disc 1 is an uninterrupted sheet part, apart from the holes for the pins 7 and 13.

[0028] Further variants are possible, e.g.: cap 21 can have a diameter equal to that of part 3, or smaller than it. Part 3 can have a different shape, e.g. conic. Edge 5 can project below the sunk parts 6. Plateau 4 can be non-flat. More or less than four holes 6 can be present. Disc 1 can be non-round, such as angled, square or multi angled.

Claims

1. Fall protection with an anchoring point (10), a part (1) of metal sheet with radially from inside to outside a raised part (4), a bridging part (3) and at lower level a ring part (2) with mechanical mounting means (6, 7), wherein the bridging part (3) provides a collapsible zone.

2. Fall protection according to claim 1, wherein the part (3) has a curved shape, such as spherical cap like.

3. Fall protection according to claim 1 or 2, with a downward directed edge (5) and/or one or more local sunk parts (6) such that a gap (S) between ring part (2) and sub surface (20) exists.

4. Fall protection according to any of claims 1-3, with also a sheet, membrane or foil (17) and a covering part (21), wherein the part (1) is covered by the foil (17) of larger diameter above which a covering part (21) of metal sheet is mounted.

5. Fall protection according to claim 4, wherein the ring part (2) is free from the covering part (21) and/or the foil (17) is clamped between parts (1, 2).

6. Fall protection according to any of claims 1-5, wherein the anchoring point (10), part (1) and possibly part (21) are mounted by a common pin (13) with two bosses at both sides of parts (1, 10, 21) and the pin penetrates sheets (15, 16) with there between the parts (1 and possibly 21) and part (10), respectively.

7. Fall protection according to any of claims 1-6, with an anchoring point (10) with a substantially U-shape in side view and a hole (11, 12) in one or both legs of the U; and/or the part (3) provides no collapsible zone.

8. Anchoring point (10) for mounting to a fall protection, e.g. according to any of claims 1-7, with an anchoring point (10) with a substantial U-shape in side view and a hole (11, 12) in one or both legs of the U; or assembly of a roof structure and fall protection mounted to it.

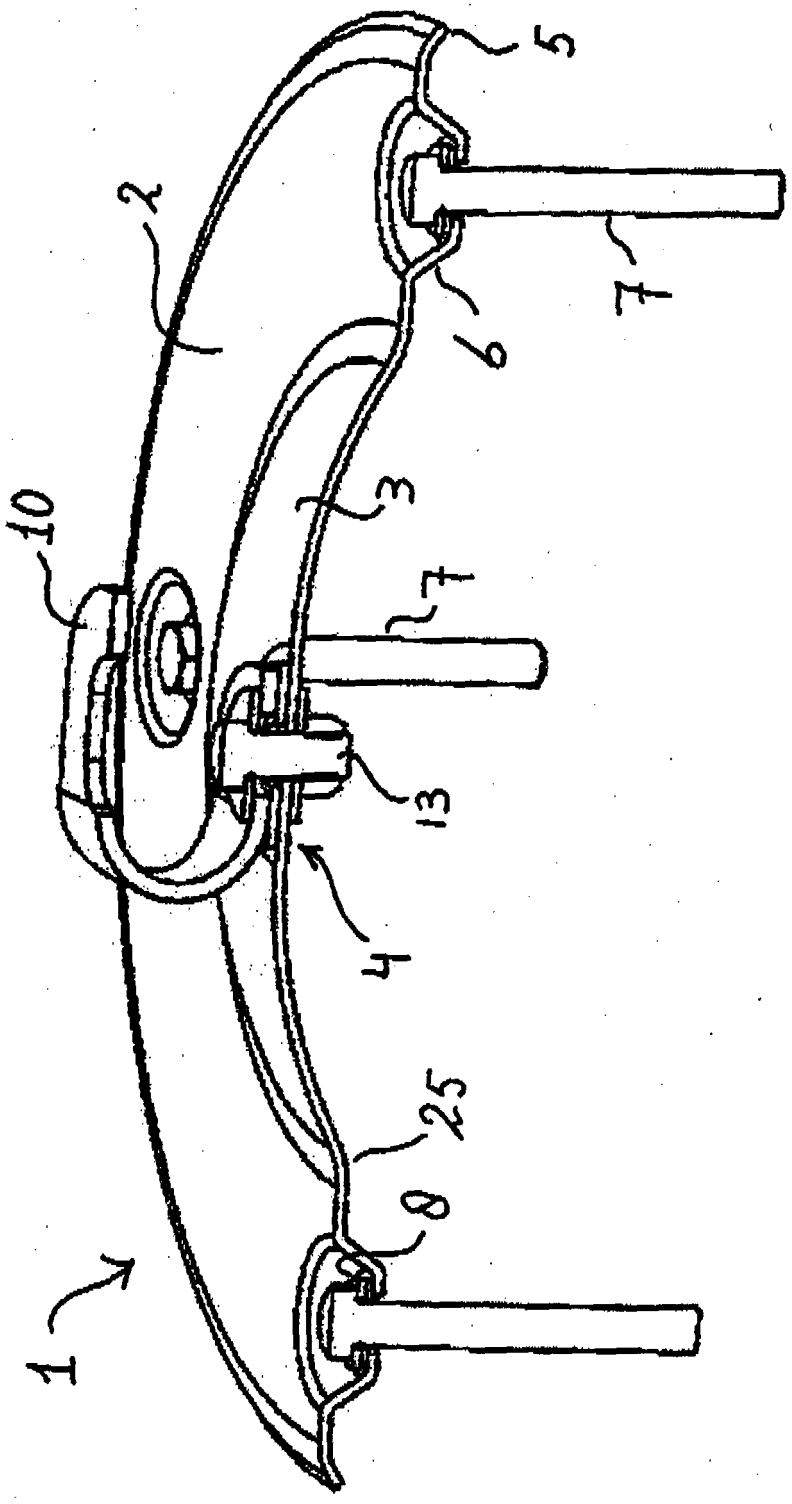

Fig. 1

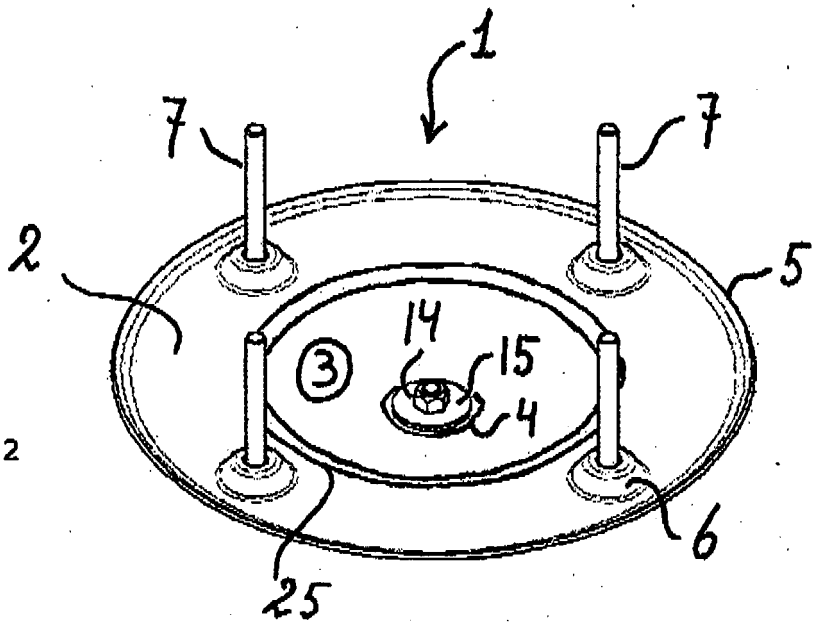

Fig. 2

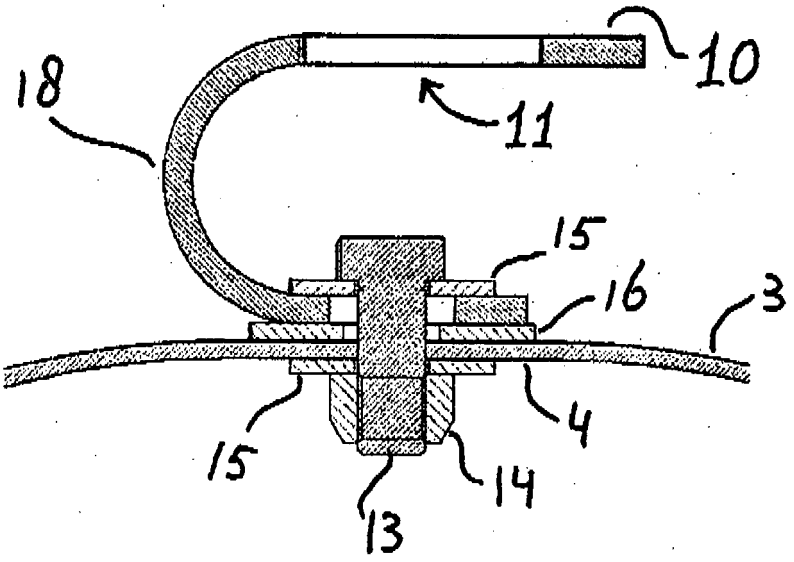

Fig. 3

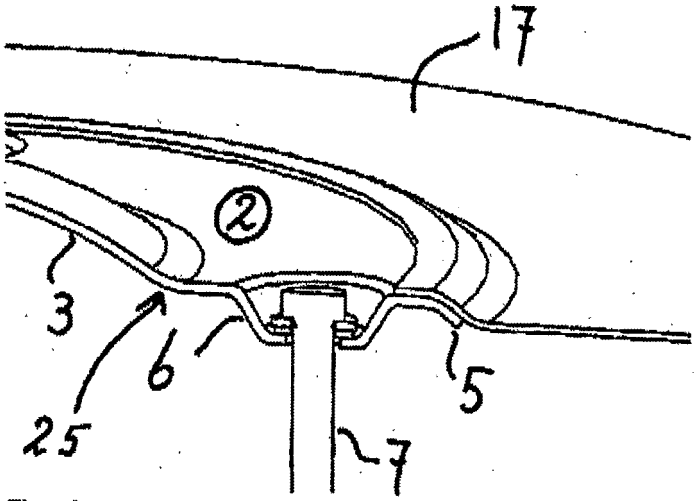

Fig. 4

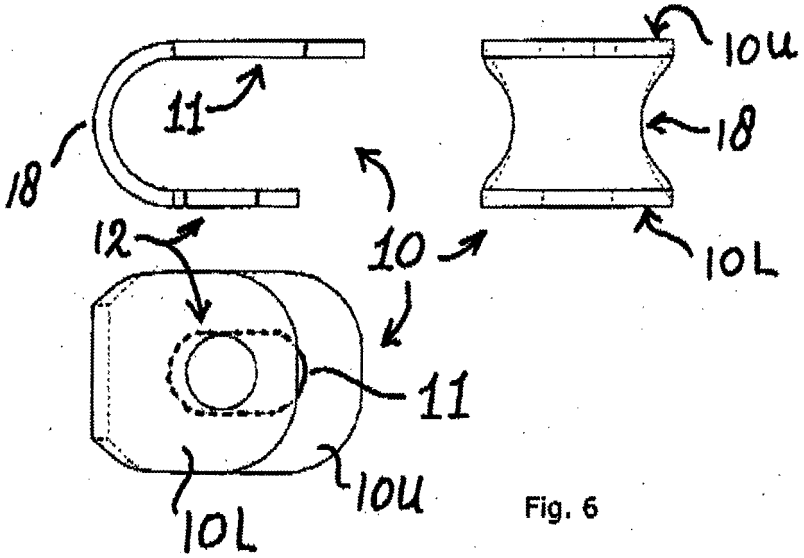

Fig. 6

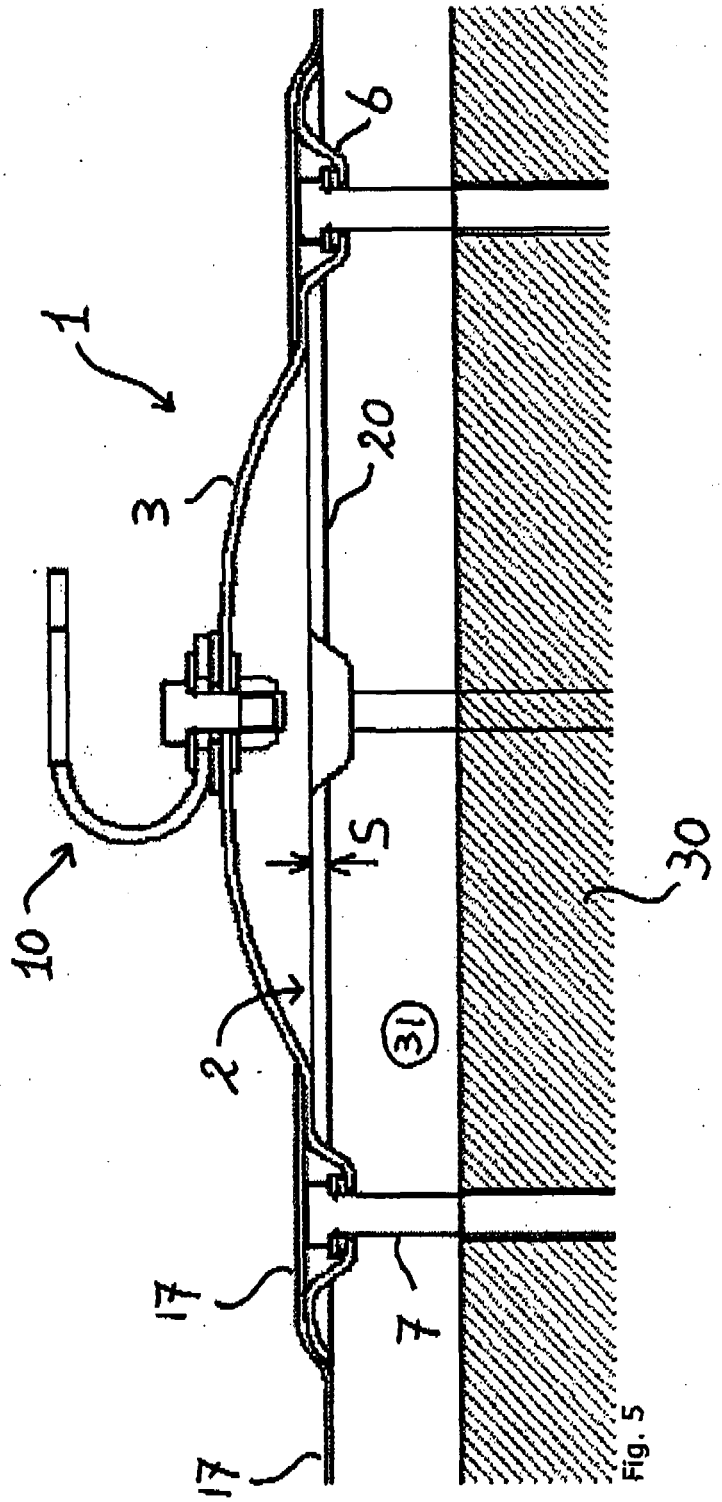

Fig. 5

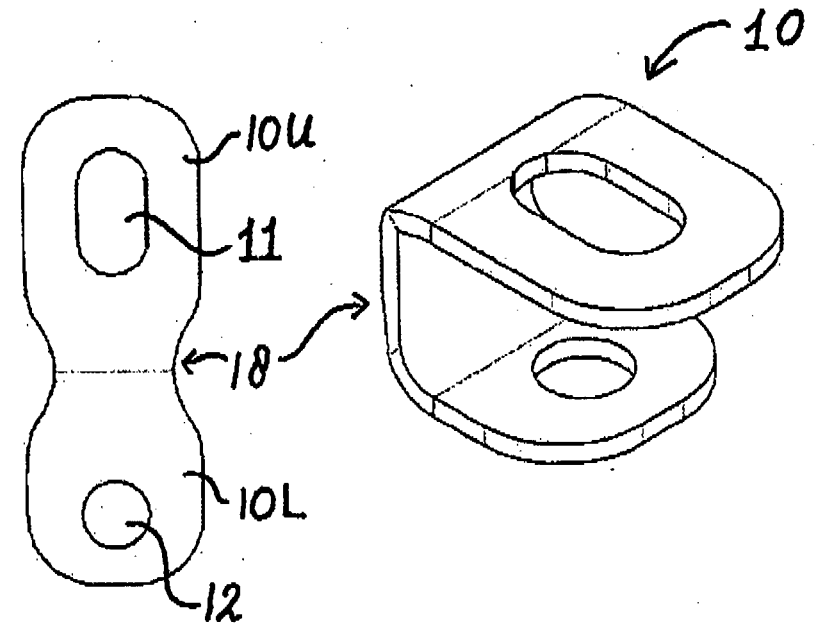

Fig. 7A

Fig. 7B

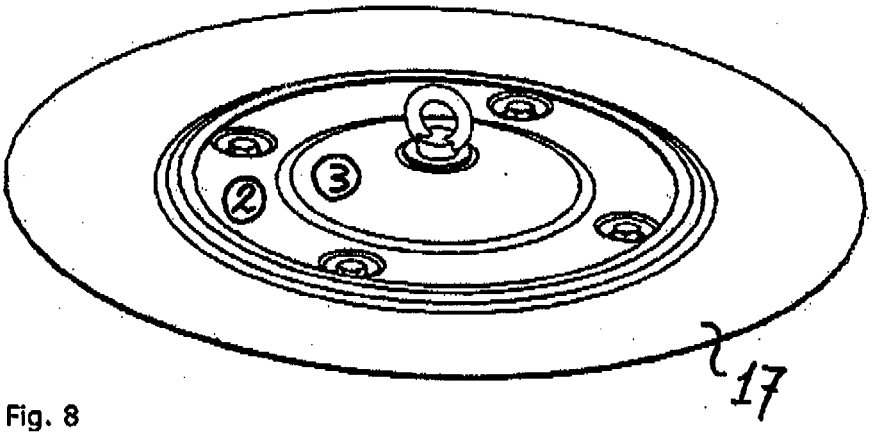

Fig. 8

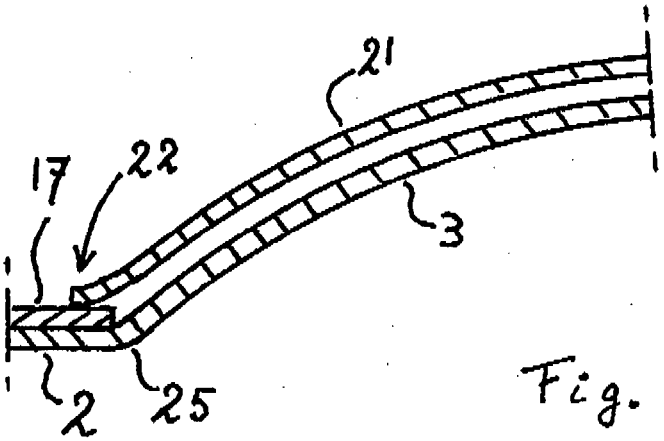

Fig. 9

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- EP 1803871 A **[0002] [0006]**
- EP 07105360 A **[0002]**