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## DESCRIPTION

**[0001]** The present invention relates to an attachment for arranging a safety system on a sloping roof. More particularly, it relates to a safety system to be arranged on a sloping roof which is provided with roof covering elements such as roof tiles.

**[0002]** From US 6.354.399, it is known for a rail to be used which can be clamped to battens. A cable can then be attached to the rail for fixing with a harness. Due to the manner of fixing, a construction of this type is not suitable for use on sloping roofs with roof covering elements.

**[0003]** In WO 02/44496, a further system with a rail is described, wherein this rail is fixed externally to a roof covering element embodied as a sheet piling profile.

**[0004]** In US 2002/0148682, a further external rail system is described. EP 0.099.298 describes a suspension system for scaffolding and the like which extends through closable openings disposed in a specially embodied closable casing. The positioning of a closable casing of this type and the associated rail construction is critical and incurs high costs. EP 0099298 discloses a system for attaching scaffolding platforms to building comprising an elongate plate and attachment bodies according to the preamble of claim 1. An object of the present invention is to provide an attachment for a safety system which can be used on a sloping roof, wherein roof covering elements such as roof tiles are present. Roof covering elements of this type have insufficient strength to mount the safety system. This means that a feed-through must be produced in some way through the roof for the safety system.

**[0005]** This creates a sealing problem. Another object of the present invention is to provide an attachment with which it is possible to avoid sealing problems as much as possible. The above objects are achieved by a sloping roof according to claim 1.

**[0006]** According to the present invention, an attachment is provided which is to be disposed at a required, precisely predefined position on the roof. This means that, in contrast to the prior art, the opening in the roof covering is not adapted to the attachment, but it is now possible, on the basis of a previously disposed opening in the roof covering, to position the associated attachment there. According to an aspect of the invention, it is possible for openings of this type in the roof covering, such as tiles, to be factory-made. As a result, they can be disposed in an optimum position without the risk of a substantial loss or leakage in the manufacture of openings and the like. A loss of this type occurs above all in the case of ceramic or concrete tiles in which openings are later made. Due to the precise definition of the opening, it is also possible in simple fashion to provide a sealing of the feed-through, and to ensure watertightness of the tile and the connection of adjacent tiles.

**[0007]** Furthermore, with the attachment according to the invention, a force or torque on the profile in the direction away from the roof or rotating around the longitudinal centreline of the elongated profile is no longer absorbed by an attachment body extending above the upper

surface of the profile, as is known in the prior art. According to the present invention, it is proposed to allow gripping between the attachment body and the elongated profile to take place in such a case at a lower level, i.e. closer to the roof construction or other base. To that end this, both the profile and the attachment bodies are embodied in such a way that this gripping takes place at a level relatively close to the fixing of the attachment bodies on the roof. As a result, the torque on the attachment body which occurs during the loading described above can be substantially limited, as a result of which the loading on the attachment means, such as screws, with which the attachment body is fixed to the roof construction, is reduced and the strength of the underlying construction can thus be lower, whereas the requirements imposed with regard to fall protection can nevertheless be met.

**[0008]** The invention can be implemented in practice in various ways.

**[0009]** According to a particular embodiment of the present invention, the attachment bodies are not integral with the elongated profile, but are movable in relation to it. As a result, they can be adapted in optimum fashion to the fixing function, i.e. they can have a greater material thickness without the entire profile having to have a greater material thickness of this type. Moreover, an optimum introduction of forces can thereby be implemented.

**[0010]** According to the invention the profile has a grip position for the attachment bodies, said grip position being located between said lower surface and said upper surface, and said attachment bodies are embodied to grip said profile at said grip position, wherein a force acting in the direction from the lower surface to the upper surface is absorbed by the attachment bodies in the grip position. It is possible to provide the profile with flanges and, more particularly, a lower flange on which a lip protruding from the attachment body grips in order to hold the elongated profile in position in this way. According to a different variant, a groove is present in the profile, into which a lip from the attachment body protrudes. Obviously, the profile can be provided with a protruding part which protrudes into a groove of the attachment body.

**[0011]** In all cases, the attachment body is adjustable in relation to the elongated profile, so that it is possible to fix the attachment body in an optimum position (in terms of strength) on the roof and to have freedom in the disposition of the elongated profile. The attachment body always grips on the elongated profile lower than the upper surface in order to limit the forces acting on the attachment body.

**[0012]** It is possible to dispose two attachment bodies at a position, between which the profile is accommodated. It is also possible to connect this attachment body in any given way.

**[0013]** The attachment body will generally be provided with openings, through which fixing means such as screws extend. This part with openings is preferably disposed in a block-shaped part from which a lip possibly extends.

**[0014]** The construction height of the system is kept as low as possible in order to prevent

interference with any roof covering which may be present. To do this, the attachment body is preferably lower than the upper surface of the elongated profile in the fitted position.

**[0015]** Any given safety system can be fixed to the elongated profile. Eyes and the like are envisaged here, to which, for example, a harness of a person located on the roof or construction of a part located on the roof can be fixed. As the elongated profile is fixed to the roof at various positions with the attachment bodies described above, a force acting on the elongated profile is distributed over the different attachment bodies and is introduced in this way without excessive loading of the fixing means such as screws in the underlying roof construction.

**[0016]** According to a particular embodiment of the present invention, the safety system comprises a cable, bar, rail or the like which extends, for example, parallel to the profile but located at a distance therefrom. A cable of this type is connected at least at one end, but preferably at both ends, to the profile. A connection of this type can be made with a support which is attached on the one hand to the profile and on the other hand to the cable. With the construction described above with a flange or groove, a support of this type can be movable on the one hand along the profile, but can, on the other hand, be fixed to it in a simple manner, such as by means of clamps.

**[0017]** If the cable has an appropriate length, it is also possible to dispose two fixings located at a distance with associated profiles which do not extend over the entire length of the cable. In the event of a substantial loading (fall) on the cable, bar or the like, the cable or bar will bend in the middle and the force will be evenly distributed over both fixings. The resulting force on the fixings will be directed inwards, i.e. towards the middle of the cable or bar.

**[0018]** If the profile is located under the roof covering and the cable described above has to extend above it, a roof covering feed-through is necessary. This can also be disposed on the elongated profile. More particularly, it can also be present in the adjustable manner described above in relation to the profile.

**[0019]** A roof feed-through of this type or other part of the construction of the cable fixing can be embodied in such a way that, if a defined loading is exceeded, specific parts thereof give away, as a result of which the introduction of the force from the cable into the profile takes place in an optimum manner at the strongest point of the profile or the fixing thereof to the underlying roof construction.

**[0020]** According to a particular embodiment of the present invention, the attachment bodies are disposed at positions of the roof construction with increased mechanical strength. More particularly, this relates to a sloping roof such as a roof on which tiles or the like are disposed with tile battens. Here, the cable described above can be used near to any gutter which may be present, whereby regularly recurring work can be carried out on the gutter in a safe manner in that the persons located in/on the gutter are fixed to the cable with a belt and can move freely backwards and forwards in the gutter along the cable.

**[0021]** The invention will be explained in detail below on the basis of the example embodiments shown in the drawing. In the drawings:

Fig. 1 shows schematically the application of a first embodiment on a sloping roof;

Fig. 2 shows a detail of the construction shown in Fig. 1;

Fig. 3 shows a perspective view of a variant of the construction shown in Fig. 1 and Fig. 2;

Fig. 4 shows the use of the safety system on the variant shown in Fig. 3;

Fig. 5 shows a detail of the complete cable feed-through of which only a part is shown in Fig. 4;

Fig. 6 shows a sloping roof provided with a protection according to one of the Figures 3-5.

**[0022]** Fig. 1 is a building denoted in its entirety as 1, of which only a part is shown.

**[0023]** The building is provided with a sloping roof on which the invention is used. It must be understood that the present invention can also be used with other types of sloping roofs, but also with flat roofs or on (vertical) walls.

**[0024]** The roof comprises tile batten supports 14, on which tile battens 4 are disposed, on which a roof covering such as tiles 3 is placed. A gutter 6 is present on the underside of the roof.

**[0025]** Near to the underside, an elongated profile 5 is present between the tile battens 4, details of said profile being shown in Fig. 2.

**[0026]** Fig. 2 shows that the profile 5 has an upper side 7 and a lower side 8. A groove-shaped receptacle 9 is located between said sides. The profile shown here comprises, for example, aluminium and is manufactured through extrusion. It will be understood that the profile may comprise any material, and is preferably a metallic material such as (stainless) steel, aluminium alloy and the like.

**[0027]** As shown in Fig. 2, the profile 5 is held in place by two attachment bodies or attachment blocks 10. Each block is provided with openings 12 for the accommodation through said openings of screws 13 which are screwed into the tile batten supports 14. Each attachment body or attachment block 10 is provided with a lip 11 which can be accommodated in a tight-fitting manner in the groove 9. This creates a firm connection between the attachment block 10 and the profile 5, whereas the profile 5 is movable in any event during assembly in relation to the attachment block 10.

**[0028]** Fig. 2 also shows a force denoted as  $F$  and a torque denoted as  $M$ . These are forces/torques which act on the profile in the event that substantial loading takes place thereon

such as the exertion thereon of a force in the event that the attachment becomes effective.

**[0029]** According to the invention, this force or torque is absorbed close to the lower surface 8 in the attachment block 10 so that the torque acting there is relatively limited and the forces/torques introduced into the block 10 are relatively limited. As a result, less demanding requirements are imposed on the fixing of the attachment block 10 on the tile batten support 14, as a result of which a relatively thin material thickness can suffice for the tile batten support. In Fig.3 the elongated profile is denoted in its entirety as 25. It has an upper surface 27 and a lower surface 28. In this case, the lower surface 28 is formed by a flange extending from the profile. The part between the flange and the upper surface 27 is denoted as 29. An attachment body or attachment block which is provided with a lip 31 which grips on the upper side of the flange 34 is denoted as 30. As with the embodiment described above, this block 30 is also provided with a lip 31 and openings 32 to accommodate screws 33.

**[0030]** These attachment blocks 30 can be fixed to a roof construction in the manner described above.

**[0031]** In Fig. 4, the construction shown in Fig. 3 is extended with a safety system. This comprises a cable 37 which is fixed at the end to a cable attachment 36. This cable attachment 36 is fixed on the one hand to the end of the cable and on the other hand is fixed to the elongated profile 25 with a partially visible clamping part 39 which, for example, is clamped against the cable attachment with screws which are disposed through the opening 38 and is thus clamped to the elongated profile.

**[0032]** As this cable 37 of the safety system has to extend beyond the roof covering 3, a feed-through is necessary. This feed-through comprises a cable feed-through 41. This is also a system provided with a clamping part 43 and openings 42, through which bolts can extend, said clamping part being clamped on the elongated profile 30. A feed-through sleeve 44 is present, which is attached to the cable feed-through 41 with the aid of a collapsible fixing 45.

**[0033]** For the feed-through, the roof covering is provided with an opening 60. This can be factory-made, i.e. an opening is disposed under optimum conditions in a standard position in a roof covering element such as a roof tile. The attachment according to the present invention can be positioned as required in both the vertical direction and the horizontal direction of the roof so that the feed-through for the cable 37 can always be positioned precisely in the centre of such opening.

**[0034]** It will be understood that the other end of the cable can be fixed in a corresponding manner to the same or to a different elongated profile, or can be attached in any other manner.

**[0035]** Details of the sleeve 44 with the feed-through shown in Fig. 5. This shows that the collapsible fixing 45 comprises a weld spot and bolts 40 are disposed through the opening 42.

**[0036]** The closure in relation to the roof covering is obtained with a sealing 46. This comprises

a sealing washer 47 which may comprise lead material, roof covering material or any other material. In the case of roof tiles, it extends under the overlying tile and overlaps the relevant tile in which the opening is made. A union nut 48 is present which can be screwed onto the screw thread of a stationary part 49, between which a sealing washer 47 can be squeezed in place on part 49. Furthermore, a sleeve 50 is present.

**[0037]** If, in the manner described above, use is made of a factory-made opening in the roof covering element such as a roof tile 3, the dimensions thereof are precisely defined, as a result of which, together with the possibility of optimum positioning of the cable feed-through, sealing with a relatively simple system is possible. In this case, standardised plastic plugs can be used.

**[0038]** Fig. 6 shows the construction according to the earlier figures, wherein the roof covering 3 is fitted. The cable 37 extends beyond the roof near to the roof gutter 37. Obviously, it can be disposed at any other position. A person 53 is shown who has to carry out work in the roof gutter 6, such person being attached to the cable with an eye 51 (to be opened and closed) and a harness 52.

**[0039]** If the person concerned falls from the gutter, an impact loading will be exerted on the harness 52 and thus on the cable 37. In the case of a substantial loading, the weld 45 will (partially) give way and the force exerted on the cable 37 will be introduced directly into the cable attachment 36 as close as possible to the lower side of the profile 25. A part of the fall energy is absorbed by the movement of the cable and the collapsing of the roof covering. In a manner such as this, the loading on the profile 25 and therefore on the attachment blocks 30 is limited, as a result of which a relatively low strength of the tile batten supports 14 is sufficient to absorb these forces via the relevant screws. In this way, it is possible to route an external cable tautly stretched, i.e. without sagging, along the roof without excessive loadings acting on the attachments of the cable.

**[0040]** In addition to the above, persons skilled in the art will readily conceive of variants which lie within the scope of the invention as described in the accompanying claims. It is possible to dispose the attachment blocks at any other location.

## **REFERENCES CITED IN THE DESCRIPTION**

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### **Patent documents cited in the description**

- US6354399B [0002]
- WO0244496A [0003]
- US20020148682A [0004]
- EP0099298A [0004] [0004]

## Patentkrav

- 5 1. Skråtag, som er forsynet med en tagdækning, der omfatter adskilte elementer (3) og et sikkerhedssystem med fastgørelse, hvor fastgørelsen omfatter en aflang profil (5,25), som i brugspositionen omfatter en nedre overflade (8,28) og en fri øvre overflade (7, 27) og fastgørelseslegemer (10, 30), der holder profilen (5, 25) på plads i forhold til en bund, hvor fastgørelseslegemerne er forsynet med åbninger (12, 32) til at optage fastgørelsesmidler (13, 33), og hvor profilen er forbundet med sikkerhedssystemet (37), hvor sikkerhedssystemet strækker sig gennem tagdækningen (3), **kendetegnet ved, at** profilen har en gribeposition (9,29) til fastgørelseslegemerne, hvor gribepositionen er anbragt mellem den nedre overflade og den øvre overflade, og fastgørelseslegemerne er indrettede til at gribe om profilen ved gribepositionen, hvor en kraft, der virker i retningen fra den nedre overflade til den øvre overflade, absorberes af fastgørelseslegemerne i gribepositionen.
- 10 2. Skråtag ifølge krav 1, hvor et af de adskilte elementer (3) er forsynet med en fabriksmonteret åbning (60).
- 20 3. Skråtag ifølge et af de foregående krav, hvor sikkerhedssystemet omfatter et kabel (37), som strækker sig ud over tagdækningen, der ved begge ender strækker sig gennem tagdækningen og altid er forbundet med en fastgørelse ifølge et af de foregående krav.
- 25 4. Skråtag ifølge et af de foregående krav, hvor højden af fastgørelseslegemet (10, 30) er mindre end højden af profilen.
- 30 5. Skråtag ifølge et af de foregående krav, hvor sikkerhedssystemet omfatter en bærer (36, 41), som skal klemmes fast på profilen.

6. Skråtag ifølge krav 5, hvor bæreren (36, 41) kan bevæges langs profilen og kan klemmes fast på profilen.

7. Skråtag ifølge krav 5 eller 6, hvor bæreren omfatter en kabelfastgørelse.

5

8. Skråtag ifølge et af kravene 5-7, hvor bæreren omfatter en tagdækningsgennemføring (41).

10

9. Skråtag ifølge krav 8, hvor tagdækningsgennemføringen omfatter en kabelføring (44), der er forsynet med en tætningsspændeskive (47).

10. Skråtag ifølge et af de foregående krav, hvor fastgørelseslegemerne er anbragt ved positioner af tagkonstruktionen med forøget mekanisk styrke.

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11. Skråtag ifølge krav 10, hvor positionerne med forøget mekanisk styrke omfatter taglæggebærere (14).

12. Skråtag ifølge et af de foregående krav, med taglægter (14), hvor profilen (5, 25) er anbragt mellem to hosliggende taglægter (4).

20

13. Skråtag ifølge et af kravene 10-12 i kombination med krav 7 og 8, hvor kabelgennemføringen (41) er anbragt i en afstand fra kabelfastgørelsen (36).

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14. Skråtag ifølge et af de foregående krav, hvor fastgørelseslegemerne (10, 30) er bevægelige i forhold til den aflange profil.

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15. Skråtag ifølge et af de foregående krav, hvor profilen kan forbindes med et sikkerhedssystem, hvor profilen (5, 25) har en gribe-position (9, 29) til fastgørelseslegemerne (10, 30), hvor gribe-positionen er anbragt mellem den nedre overflade og den øvre overflade, og fastgørelseslegemerne er indrettede til at gribe om profilen ved gribe-positionen, hvor der i gribe-positionen absorberes

en kraft, som virker i retningen fra den nedre overflade til den øvre overflade, af fastgørelseslegemerne.

# DRAWINGS

Fig 1

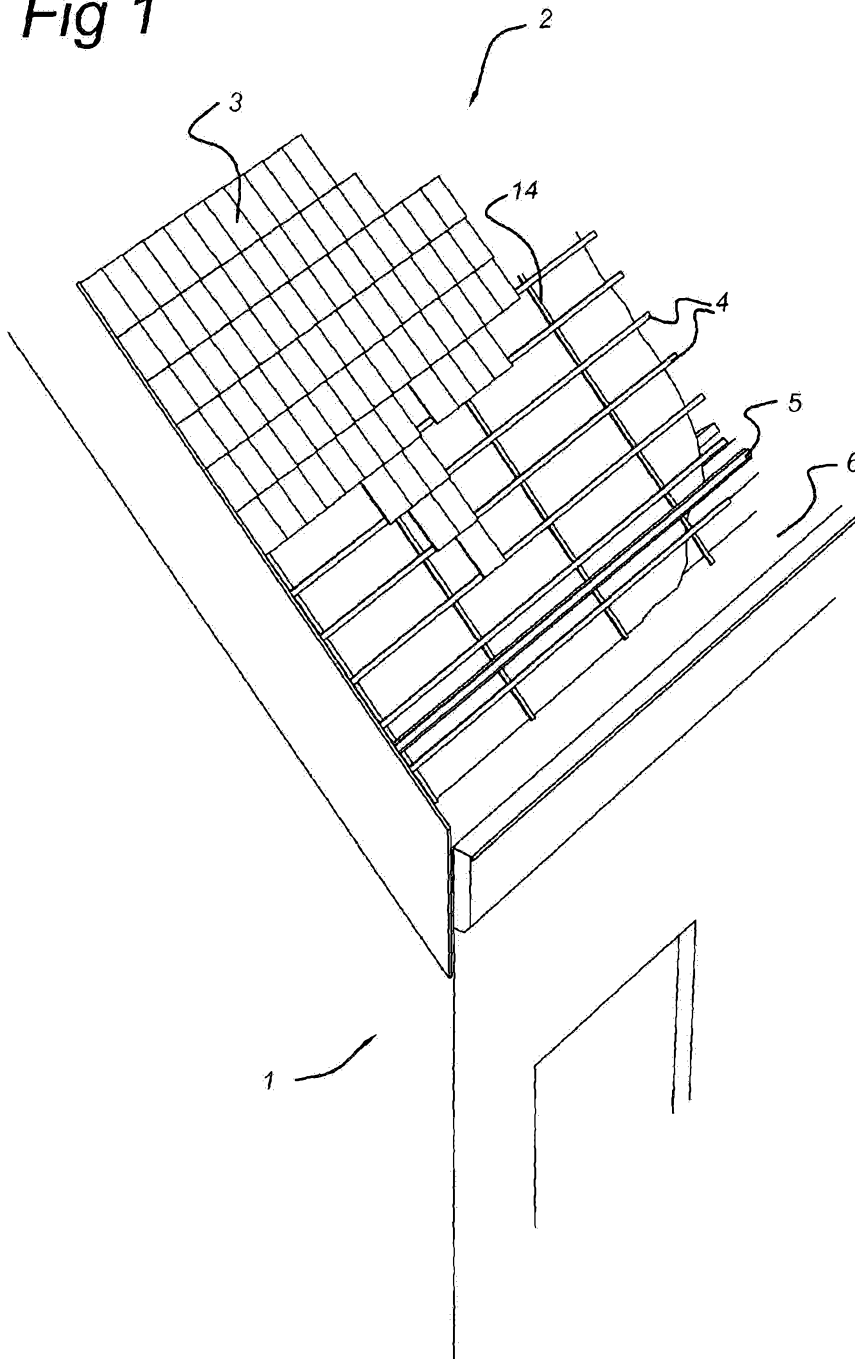


Fig 2

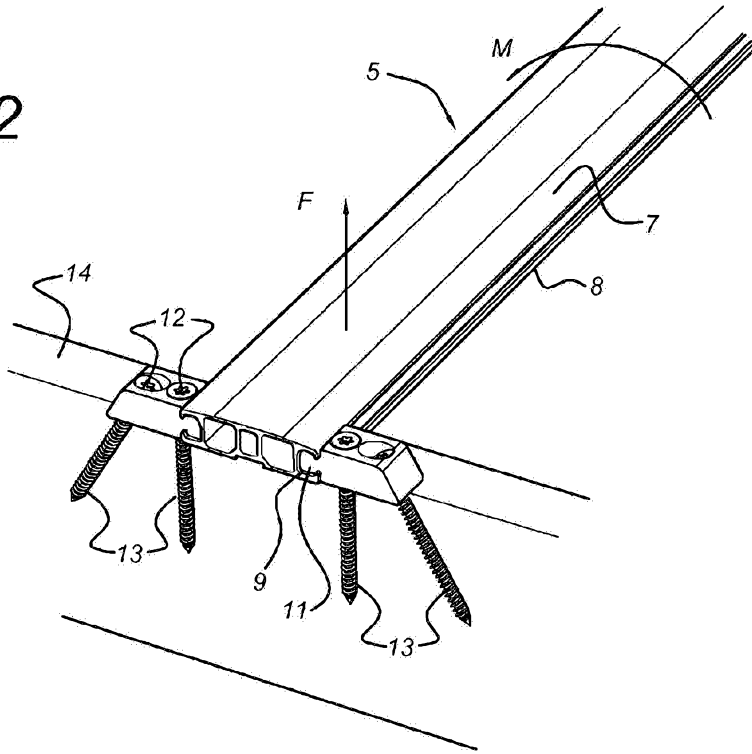
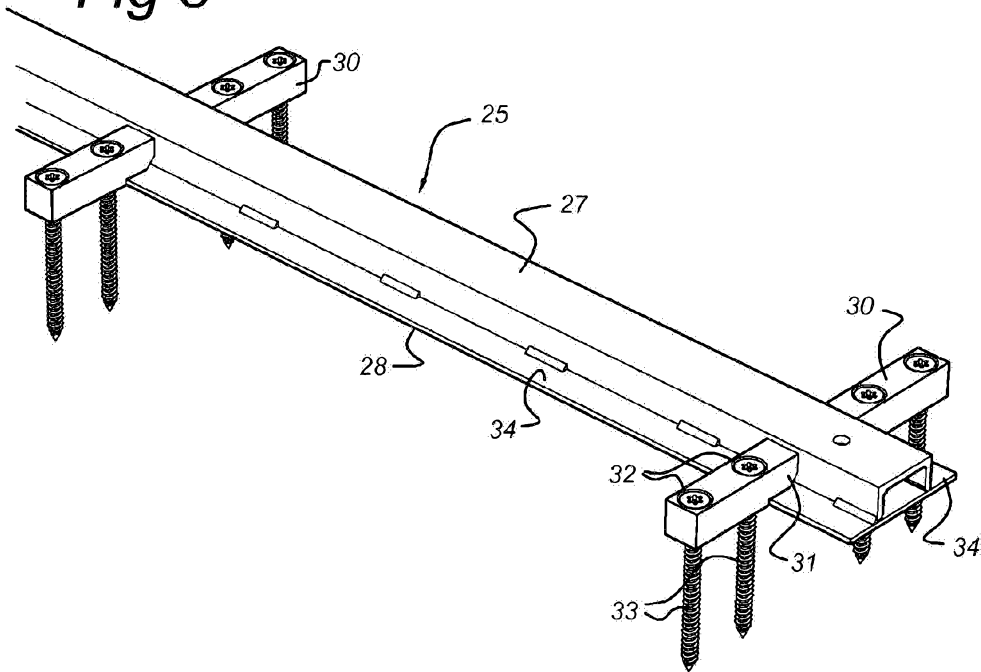


Fig 3



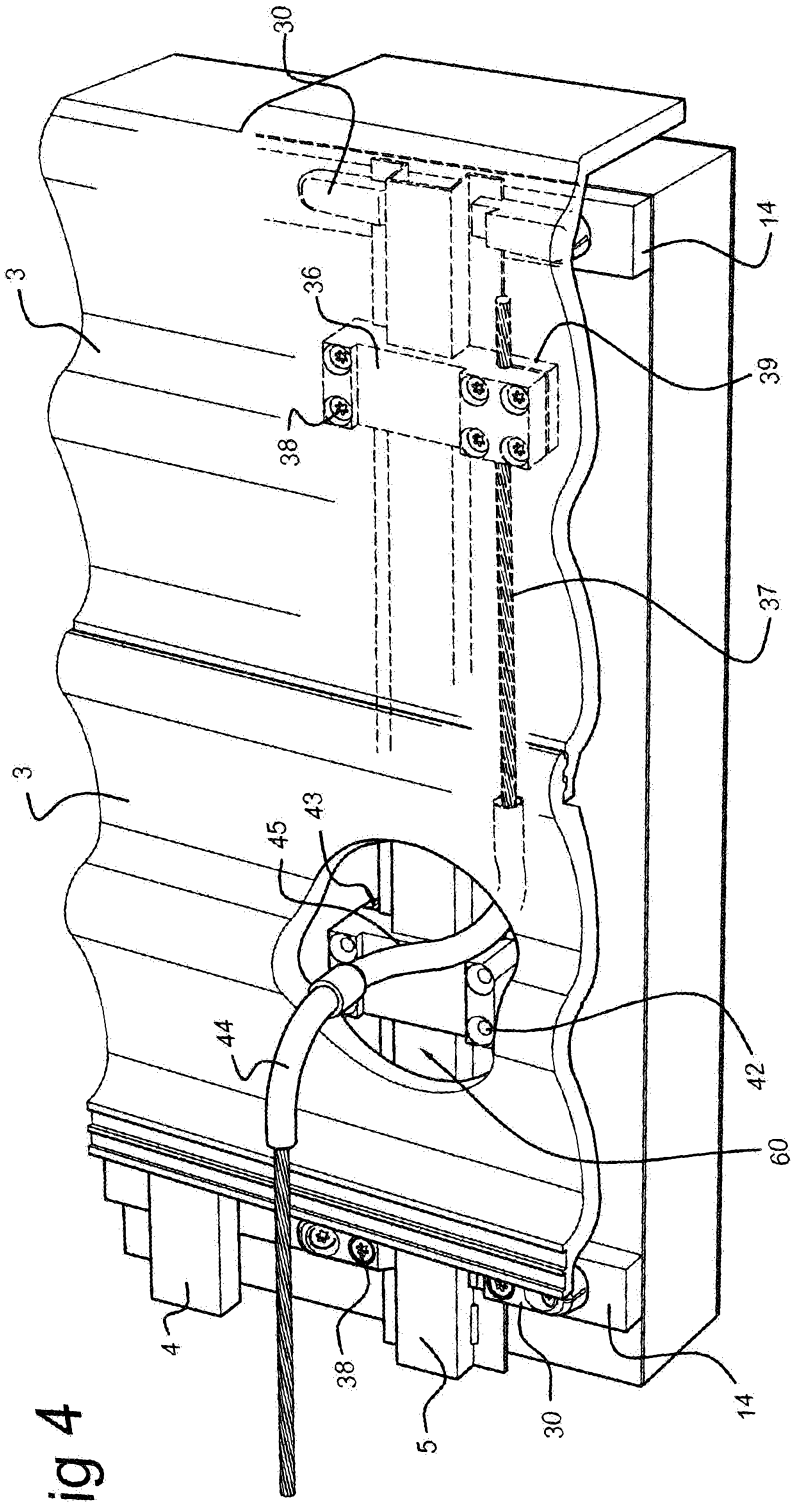


Fig 4

Fig 5

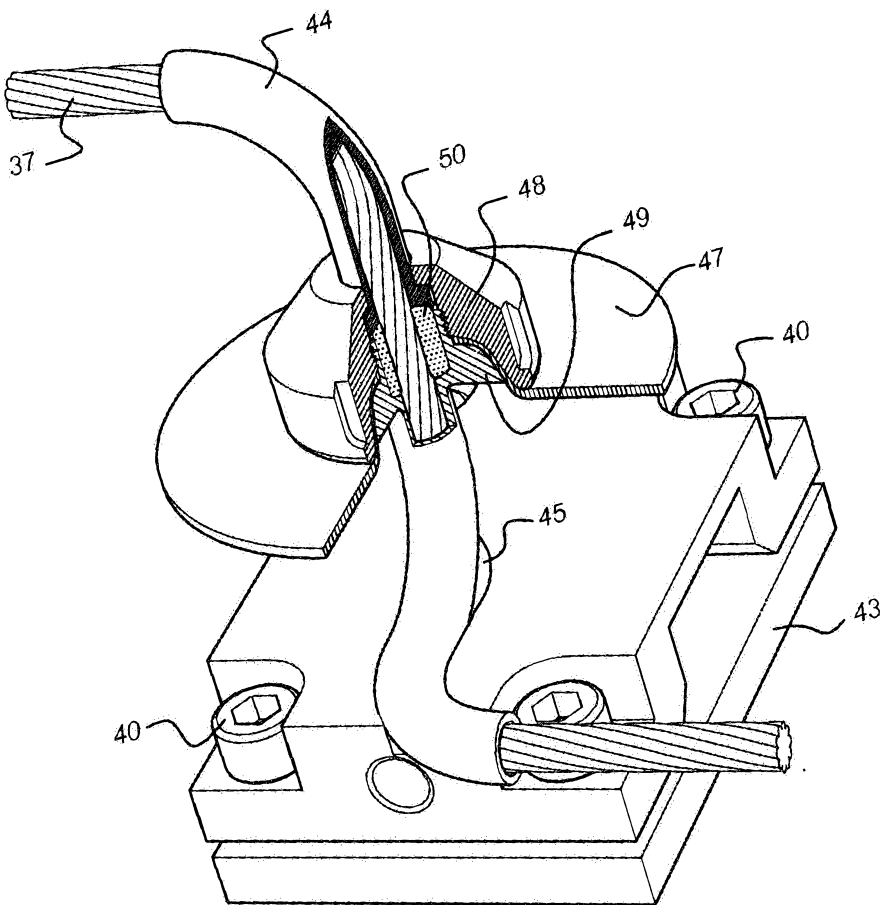


Fig 6

