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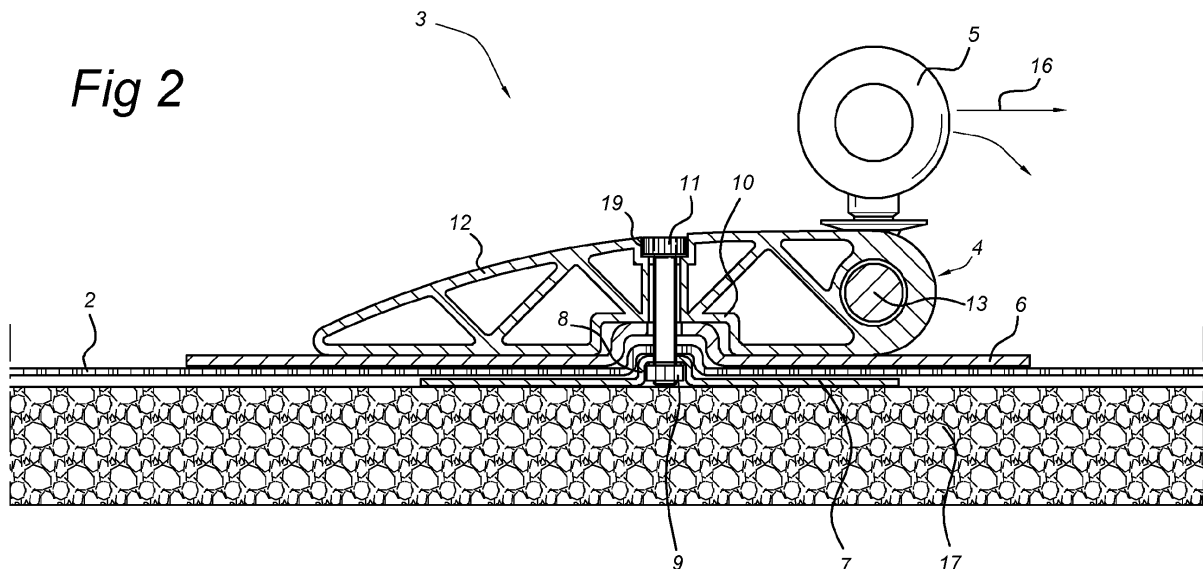
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(54) **Roof provided with a safety device**

(57) Roof (1) provided with a safety device (3). The safety device (3) consists of a base plate (7) to be placed underneath the roof covering (2) of the roof (1) and a supporting part (4) situated above the latter. The supporting part (4) is clamped to the base plate (7) when the roof covering (2) is placed in between. The base plate

(7) can be positioned underneath the roof covering (2) by making a cut in the latter. The supporting part (4) may be provided with a sealing covering (6) in order to seal such a cut after it has been made. In addition, the supporting part (4) may comprise a profile to which a pivotable attachment means is fitted for attaching a safety line thereto.



## Description

**[0001]** The present invention relates to a roof provided with a roof covering and a safety device which engages thereon.

**[0002]** A roof of this type is generally known in the state of the art. By way of example, EP 2,167,758 in the name of the patent proprietor is mentioned, in which a safety device with a supporting part and a sealing covering secured thereto is described. Said sealing covering is attached to the existing roof covering by bonding.

**[0003]** It has been found that the peak load which can act on a safety device is exerted on the roof covering material by such an adhesive bond and that the roof covering material is sufficiently strong to absorb such peak loads.

**[0004]** As a result thereof, it is possible to install a safety device for absorbing peak loads on an existing roof and more particularly a flat roof without having to drill through the roof structure.

**[0005]** It has also been found that if a permanent load acts on the safety device, such a construction does not work. Such a permanent load may, for example, be formed by coupling a number of safety devices by means of a cable, in which case an individual who is situated on the roof can attach themselves to such a cable. Such a cable should preferably be taut so that it does not touch the roof covering. It has been found that when it is installed on the existing roof covering by means of bonding, glueing or the like, this will always result in creep in the long run, particularly at slightly elevated temperatures, as a result of which the cable will touch the roof.

**[0006]** A solution has been provided in the prior art for this problem as well and reference is made in this respect to the unpublished application 1,038,186 in the name of the patent proprietor. In this case, the roof structure situated underneath is drilled through in a large number of locations in order to provide sufficient strength to absorb both peak load and static load.

**[0007]** W02007/089139 A2 discloses a fall protection system for an individual on a roof. The system is connected to the roof covering by means of a pin which is introduced into a hole in the roof covering, which results in a disadvantageous load concentration on the roof covering.

**[0008]** EP1698747 A2 also discloses a fall protection system for an individual on a roof. The system is connected to the structure of the roof covering which is situated underneath by means of, for example, screws. In certain circumstances, this connection to the structure situated underneath is undesirable.

**[0009]** It is an object of the present invention to provide a roof with a safety device in which the part of the roof structure situated near the roof covering does not have to be modified, that is to say does not have to be provided with, for example, openings or fastening means. On the other hand, it is an object to provide a safety device which can absorb relatively large loads, both static and dynam-

ic.

**[0010]** According to the present invention, this object is achieved by a roof provided with a roof covering web rendering the roof surface watertight and a safety device engaging thereon, which safety device comprises a base part which is fitted underneath said roof covering and a supporting part which is fitted on said roof covering, wherein fastening means are present which extend through said roof covering and clamp said supporting part and base part to one another when accommodating said roof covering.

**[0011]** According to the present invention, the safety device consists of a base part and a supporting part. According to the present invention, the base part is fitted underneath the existing roof covering and the supporting part is arranged on the existing roof covering. By drilling through preferably only the roof covering, it is possible to fit fastening means by means of which the base part is pulled against the supporting part, as a result of which the existing roof covering is clamped in a very secure manner.

**[0012]** As the fastening means can exert large forces, it is only necessary to use a single or a few fastening means and no further measures are necessary to close off the drill holes which have been made if the surface area is sufficient and both the supporting part and the base part are shaped correspondingly. After all, since roof covering generally consists of slightly deformable material, sealing can be effected by pulling two relatively large surfaces against each other at the location of the fastening means.

**[0013]** The base part can be fitted underneath the roof covering in any conceivable way.

**[0014]** The supporting part comprises a carrier part and a sealing covering which extends around the latter, wherein the base part is provided with a rib and the carrier part with a recess accommodating the rib, said carrier part being elongate. As a result thereof, it is possible to transform the exerted point load on the attachment means which is caused by a fall or the like into a line load which is distributed over a relatively large surface area of the existing roof covering, as a result of which very high loads are possible.

**[0015]** According to an advantageous embodiment of the present invention, a cut is made in the roof covering, as a result of which the base part can be pushed underneath the roof covering. Thus, the person fitting the safety device can place the base part very accurately in the desired position after the roof covering has been fitted.

**[0016]** Since, according to present invention, the roof structure situated underneath will not be subjected to drilling through or the like, it is not necessary to take into account the circumstances of the part of the roof structure which is situated underneath the base part, such as whether or not the parts are load-bearing parts. In principle, this is identical to the remaining part of the roof structure which is situated underneath the roof covering.

**[0017]** The cut in question may be a single straight cut

through which the base part is pushed in like some kind of envelope. It is also possible to configure this cut to be U-shaped, as a result of which a part of the roof covering can be folded up slightly, thus making introduction of the base part easier. The latter is important in case the base part is not flat but is provided with relief of some kind. This may, for example, comprise one or more ribs which are positioned underneath corresponding recesses in the supporting part for clamping the roof covering between the ribs and recesses, thus producing an even stronger engagement of the roof covering between the supporting part and the base part. Such ribs may extend substantially at right angles to the intended direction of load of the safety device. It is also possible to use local indentations or dimples instead of or in addition to ribs, in which case the fastening means are fitted at the location of the dimples.

**[0018]** If the cut extends beyond or outside the supporting part after it has been made, it is necessary to ensure that it is watertight. According to the invention, this can be achieved in a particularly simple manner in a preferred embodiment by constructing the supporting part from a carrier part and a sealing covering extending around the latter. The carrier part may be, for example, an aluminium profile or different metal and/or plastic profile which is provided with attachment means for introducing the forces into the safety device. By way of example, a structure is mentioned in which an eyelet or other attachment means is present which is pivotable about a substantially horizontal axle which is situated in the carrier part and preferably at a position as close as possible to the surface of the roof or the roof covering. In its normal position, the eyelet will be situated above the carrier part and in an emergency situation, the eyelet will fold down in the direction in which the force is applied. The distance between the horizontal pivot pin and the roof covering is very small, so that the tilting moment on the attachment means caused by the force is very small, as a result of which the existing roof covering is in principle only subjected to a pulling force. The above-described sealing covering may comprise a web of flexible bituminous or adhesive material which ensures that the remaining part of the roof covering is sealed in a manner known in the prior art. As said sealing covering is also sealed with respect to the carrier part, the sealing at the location of the fastening means is less critical, as described above.

**[0019]** According to a further advantageous embodiment of the present invention, the base part is fitted through the above-described cut first and then the roof covering is sealed by any kind of method, but before the supporting part is applied. This may be achieved, for example, by providing a partly adhesive or bituminous material over the cut which may be cut to size by the respective individual in situ. In this case, only the openings for the fastening means which are to be fitted subsequently or the fastening means themselves which extend from the support part (bolts) are visible after the base part and

sealing have been fitted.

**[0020]** Obviously, the cut for introducing the base part has to be made in such a manner that when a pulling force is exerted on the carrier part or the attachment means arranged thereon, said pulling force is transmitted into the roof covering. This means that, in the direction of the force, the cut is preferably situated on or before the point of engagement of the force on the carrier part (in the vertical direction). If the cut is U-shaped, this is true in particular for the body part of the U.

**[0021]** The invention also relates to an assembly comprising a safety device with a supporting part provided with a sealing covering, and a base part and fastening means for clamping the base part against the supporting part when accommodating roof covering material in between. The invention also relates to a method for installing a safety device on a roof with roof covering, comprising making a cut in said roof covering, introducing a base part via said cut, fitting a supporting part on said roof covering at the location of the base part and engaging said roof covering in a clamping manner by attaching said supporting part to said base part.

**[0022]** The invention will be described below in more detail with reference to an exemplary embodiment illustrated in the drawing, in which:

Fig. 1 diagrammatically shows a flat roof provided with a number of safety devices according to the invention;

Fig. 2 shows a detailed view of a cross section of a safety device according to the invention in the mounted position;

Fig. 3 shows the safety device from Fig. 2 in the dismantled position;

Figs. 4a-e show how the safety device is installed on an existing flat roof.

Fig. 5a shows a perspective view of a particular embodiment of a part of the safety device according to the invention,

Fig. 5b shows a top view of the safety device from Fig. 5a.

**[0023]** The invention will be described in more detail below by means of an example in which reference is made to a horizontal flat roof 1. It will be understood that the roof 1 may be at a slight angle. What is important is that such a roof is provided with one or more webs of roof covering 2 which may or may not be fixedly attached to the roof. Instead of fixed attachment means on the roof, it is possible to use ballasting or another way of affixing to ensure the roof covering 2 remains in place, even with wind loads acting on the roof. The roof covering is preferably a sheet-type material web. By way of example, a web of bituminous material with fabric is mentioned. Another possibility is a plastic (EPDN) material which may or may not be provided with a (fabric) reinforcement. Such a web of roof covering material makes the roof covering watertight.

**[0024]** According to the present invention, a number of safety devices 3 are present. Each safety device consists of a supporting part 4 which is arranged above the roof covering 2 and provided with a tilting eyelet 5 to which a line can be attached by means of which a person situated on the roof can secure themselves. Instead of a line, a continuous cable may be provided between various safety devices 3, in which case a person situated on the roof can secure themselves to said cable. In addition, it is possible to replace the tilting eyelet by any type of structure which makes it possible, for example, to place a safety fence.

**[0025]** In all cases, it is important that the safety device 3 is installed in such a manner that it can absorb forces in the direction of arrow 16.

**[0026]** Fig. 2 shows details of a safety device 3 in the fitted state. It can be seen that a base part 7 is situated underneath the roof covering 2 and that this is situated, just like the roof covering 2, on the part 17 of the roof structure situated underneath which is not modified in any way at the location of the base part 7. In general, this will be the upper side of a roof structure, such as the top side of an insulating layer or some other boarding. Base part 7 is a substantially flat part which is provided with one or more ribs or convex shapes 8 in which nuts or the like may be fitted at predetermined fixed positions. Instead of ribs, it is also possible to use indentations (dimples) or the like. The fastening means can then be arranged in the centre of such indentations. In special cases, the base part 7 may be attached to the structure situated underneath, but it is preferable not to do this.

**[0027]** On the roof covering 2, there is a supporting part 4 which is made up of a carrier part 12 which is configured as an elongate wing-shaped profile. On the carrier part 12, a sealing covering 6, such as a web of bituminous or adhesive material, is attached which extends beyond the profile on all sides around the profile. The profile 12 is provided with openings 19 in which bolts 11 are inserted which are connected to nuts 9. In addition, one or more recesses 10 are provided at the location of the openings 19 and preferably extend along the entire length of the wing profile 12, which recesses 10 are configured in accordance with rib 8 or slightly larger.

**[0028]** When tightening the bolt 11, the base plate 7 will be pulled towards the profile 12 due to the presence of nut 9 and, in the process, accommodate in a clamping manner at least the roof covering 2 and optionally the sealing covering 6 in between if this extends across the entire surface of the profile 12. However, the latter is not imperative. Due to the presence of the rib 8 and the recess 10, the roof covering will be clamped in between very securely in any case. If desired, several bolts 11 are provided in line, as a result of which said clamping force is increased further. It will be understood that the base part may be provided with bolts extending through the roof covering to which the supporting part is attached by means of nuts.

**[0029]** Fig. 3 shows a detailed view of the various parts

which make up the safety device.

**[0030]** When force is exerted on the eyelet 5 in the direction of arrow 16, it will come to lie flat by pivoting about axle 13. Subsequently, a pulling force will be transmitted to profile 12 on roof covering 2, during which hardly any tilting takes place. However, it is also readily conceivable not to fit such a tilting eyelet 5. After all, as long as the safety device and the roof covering are attached to one another in an optimum manner, which is achieved, according to the present invention, by clamping the roof covering between the base plate 7 and the supporting part 4 or profile 12, some displacement of the roof covering away from the roof in case of emergency can take place without causing problems. This is due to the fact that parts of the roof covering situated further away are fitted to the roof in such a way that such a fall load can be readily absorbed. That is to say that the tilting effect which was deemed to be very damaging in the prior art, both with safety devices attached to the roof and safety devices glued to the roof, does not have any impact with the present invention.

**[0031]** After the supporting part 4 or profile 12 has been attached to the base plate 7, the sealing covering can be sealingly attached to the existing roof covering. This may be effected by means of blowtorching, glueing or the like.

**[0032]** It is also possible to omit the sealing covering. In this case, the roof will be made watertight in a customary way by arranging a web of material across the cut after the base part has been introduced through the cut. Subsequently, the supporting part will be fitted without covering and attached to the roof in the manner described above. Obviously, a combination of both operations is possible, that is to say that the roof is sealed before the supporting part is fitted, and the supporting part is fitted with the covering and further bonding and sealing is carried out, thus providing double protection.

**[0033]** By means of Fig. 4, an example of fitting the safety device according to the present invention will be given.

**[0034]** Fig. 4a shows how a U-shaped cut 15 is made in a roof covering 2. Instead of a U-shaped cut 15, it is also possible to make a single straight cut. Fig. 4b shows the opening of the flap which has been produced in this way. Fig. 4c diagrammatically shows how the base part 7 is introduced in the direction of arrow 20. The base part 7 can be placed in the space situated underneath the flap, but it is also possible to slide this further to a deeper position underneath the roof covering. In the case of a single straight cut, the base part will preferably be situated completely below the roof covering underneath the cut. However, it is also possible for a part of the base plate 7 to remain extending above the roof covering 2.

**[0035]** This leads to the situation as shown in Fig. 4d. Now, the supporting part 4 can be displaced in the direction of arrow 21 and be placed on to the base part and the roof covering 2 situated. After or before this, the roof covering 2 is drilled through at the location of the opening 19. This can be carried out using an awl, but it is also

possible to provide the bolt 11 with a (self-aligning) cutting end at its free end. Thereafter, the bolt 11 is introduced further into the opening 19 and positioned opposite nut 9. Subsequently, bolt 11 is tightened by means of tool 18 resulting in clamping of the base plate and profile 12. Then, as is shown in Fig. 4e, a blowtorch 22 can be used to adhere the sealing covering 6 to the existing roof covering 2. Glueing or another attachment means is also possible.

**[0036]** Fig. 5a and b show a particular embodiment of a part of a safety device according to the invention. The base plate assembly 26 consists of a number of base parts 7 shown in the preceding figures. The base parts 7 extend across the roof and are in this case arranged at a mutual angle and connected to each other. In the illustrated embodiment, every pair of three base parts 7 is arranged at a mutual angle of 120°. An advantage of this embodiment is the fact that the loadability of the safety device is improved and, in addition, is less dependent on the direction of the applied load.

**[0037]** During installation of the safety device, the base plate assembly 26 is rotated about its central axis 30 and a central opening 29 offers the freedom to slide the base plate assembly 26 underneath the roof covering 2 while the rotation is being carried out.

**[0038]** It will be clear that, while only the base plate assembly 26 consisting of a number of base parts 7 is shown in Figs. 5a and 5b, eventually as many profiles 12 from Fig. 3 are placed on the base parts 7. It is conceivable for this number of profiles 12 to also be assembled to form a profile assembly, the profile assembly being provided with one common and tilting eyelet 5 from Fig. 3. Upon reading the above, those skilled in the art will immediately be able to think of variants which are obvious after reading the above and are covered by the scope of the attached claims. In addition, rights are expressly sought for the variant embodiments which are described in the subclaims, separate from the independent claims.

## Claims

1. Roof (1) provided with a roof covering web (2) rendering the roof surface watertight and a safety device (3) engaging thereon, which safety device (3) comprises a base part (7) which is fitted underneath said roof covering (2) and a supporting part (4) which is fitted on said roof covering, wherein fastening means (11) are present which extend through said roof covering and clamp said supporting part (4) and base part (7) to one another when accommodating said roof covering (2), wherein said supporting part (4) comprises a carrier part (12) and a sealing covering (6) which extends around the latter, wherein said base part is provided with a rib (8) and the carrier part (12) with a recess (10) accommodating the rib, and wherein said carrier part (12) is elongate.

2. Roof according to Claim 1, wherein said sealing covering is connected to said roof covering (2).
3. Roof according to one of the preceding claims, wherein said carrier part (12) is provided with an attachment means (14) which is arranged thereon so as to be pivotable about a horizontal axle (13).
4. Roof according to one of the preceding claims, wherein said roof covering (2) is provided with a cut (15) at the location of said base part via which the base part (7) can be fitted underneath said roof covering (2).
5. Roof according to one of the preceding claims in combination with Claims 7 and 3, wherein said sealing covering extends beyond said cut (15).
6. Roof according to one of Claims 7 or 8, wherein said safety device (3) can be loaded in a first horizontal direction (16) and said cut (15) via which the base part (7) is placed underneath said roof covering extends at right angles thereto, and is situated closest to the point of engagement of said load.
7. Roof according to one of the preceding claims, wherein the part of the roof structure situated on said roof covering is identical, at the location of said base part, to the remaining surface of said roof which is situated underneath said roof covering.
8. Assembly comprising a safety device (3) with a supporting part (4) and a base part and fastening means for clamping the base part against the supporting part when accommodating roof covering material in between.
9. Assembly according to Claim 8, provided with a sealing covering.
10. Method for installing a safety device (3) on a roof (1) with roof covering, comprising making a cut (15) in said roof covering, introducing a base part (7) via said cut, fitting a supporting part (4) on said roof covering at the location of the base part and engaging said roof covering in a clamping manner by attaching said supporting part to said base part.
11. Method according to Claim 10, wherein said cut (15) is made watertight after said base part has been fitted.
12. Method according to Claim 11, wherein making said cut (15) watertight comprises placing a sealing covering (6) which is connected to said supporting part over said cut and attaching it.

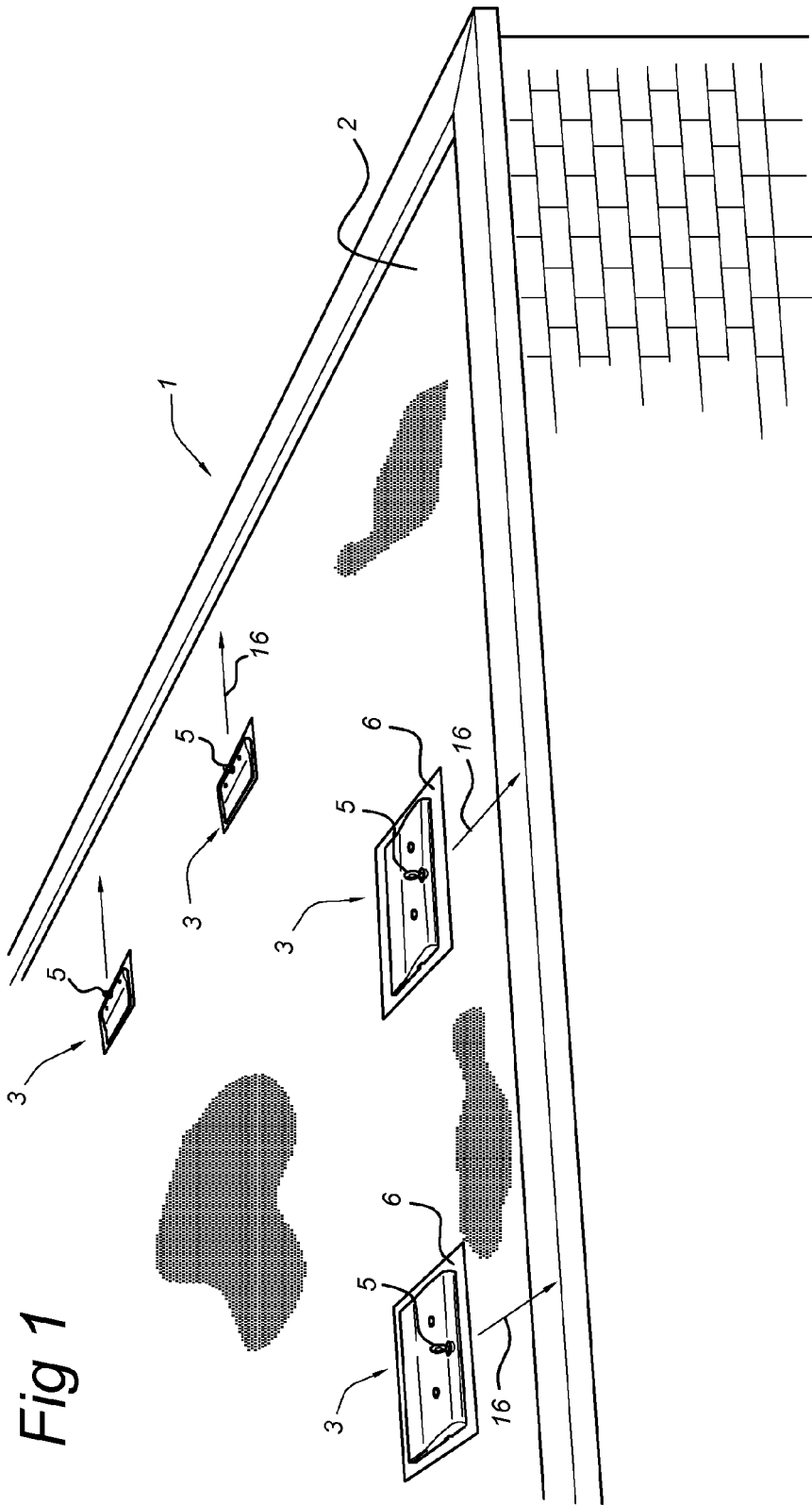


Fig 1

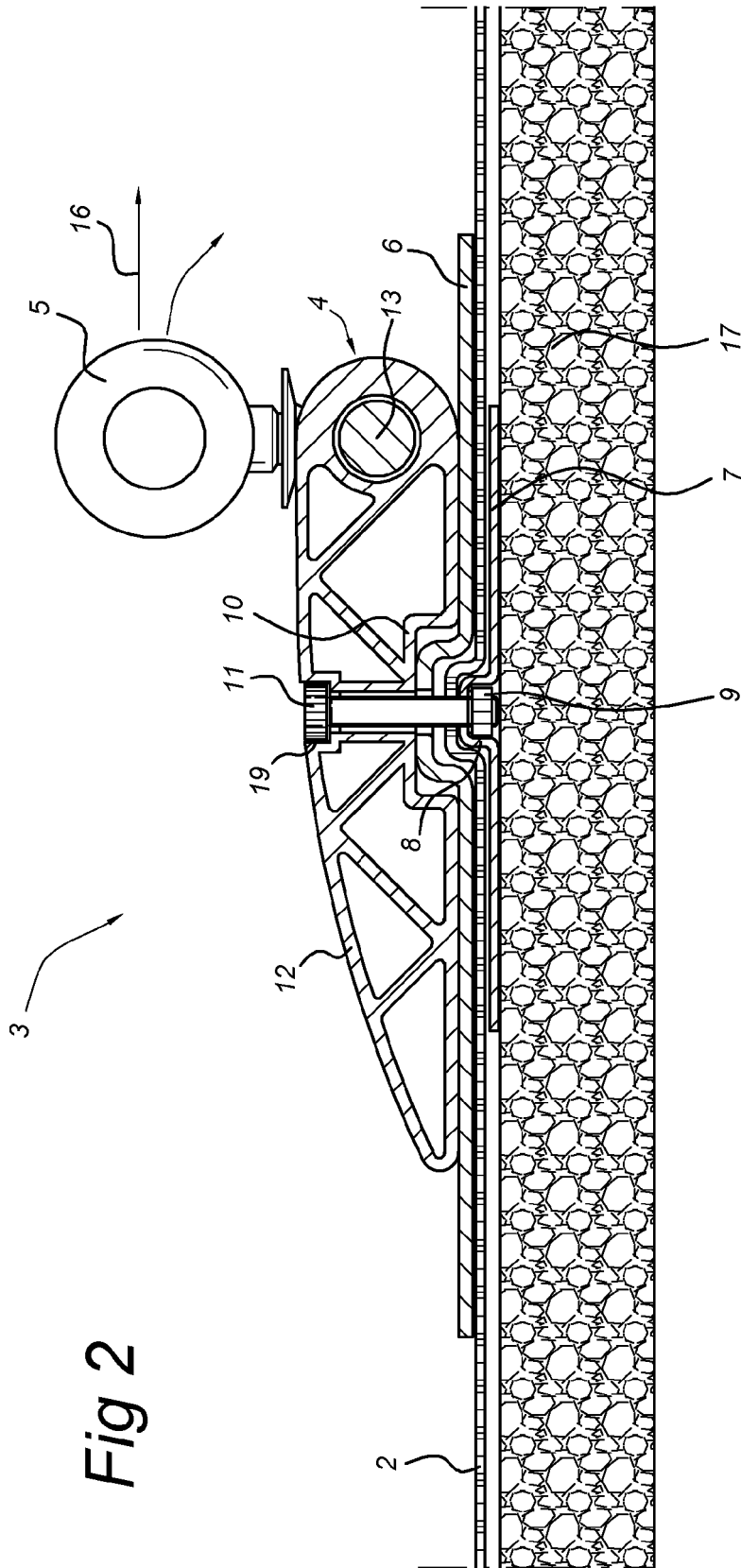


Fig 2

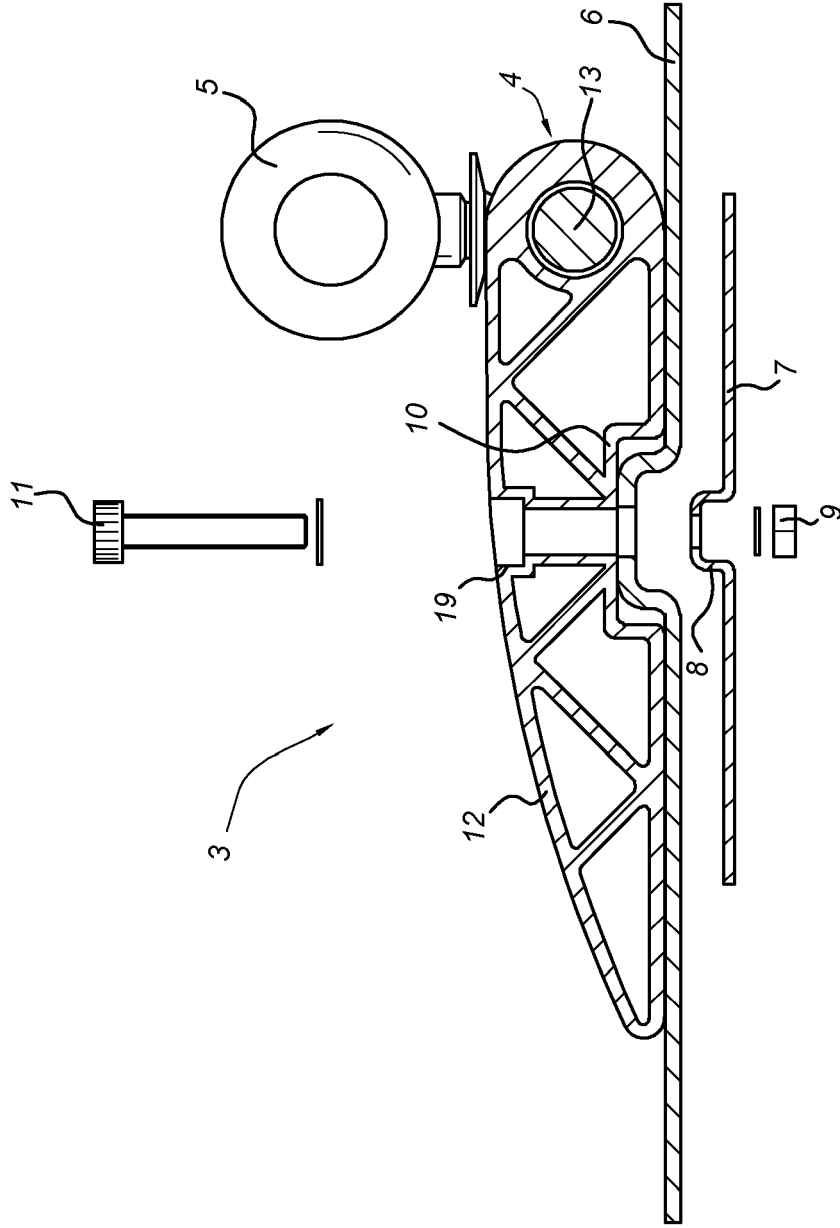
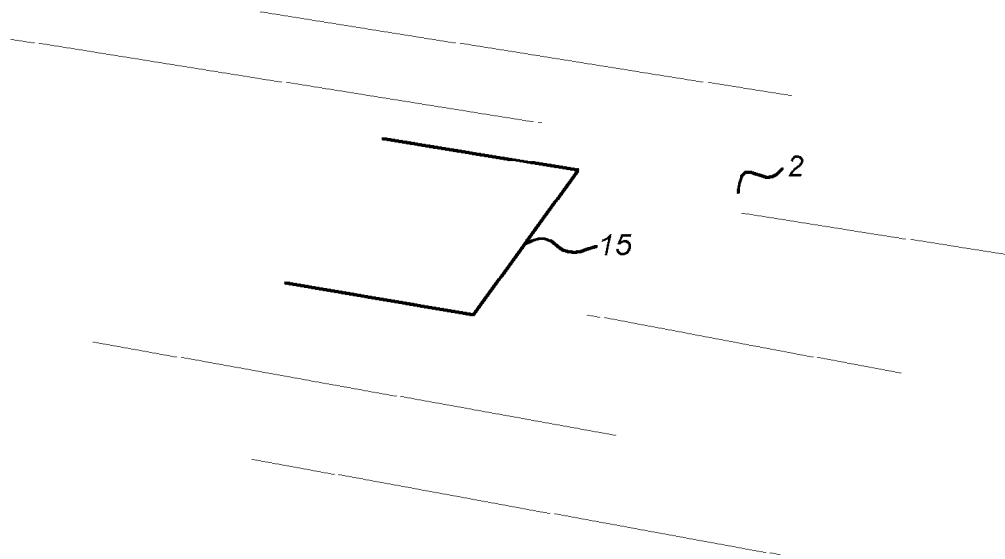


Fig 3

*Fig 4a*



*Fig 4b*

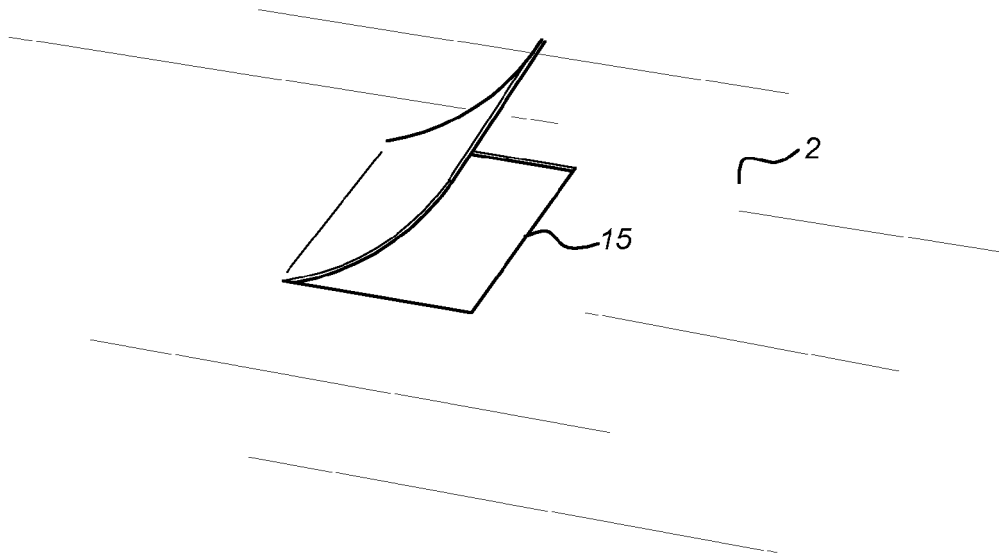


Fig 4c

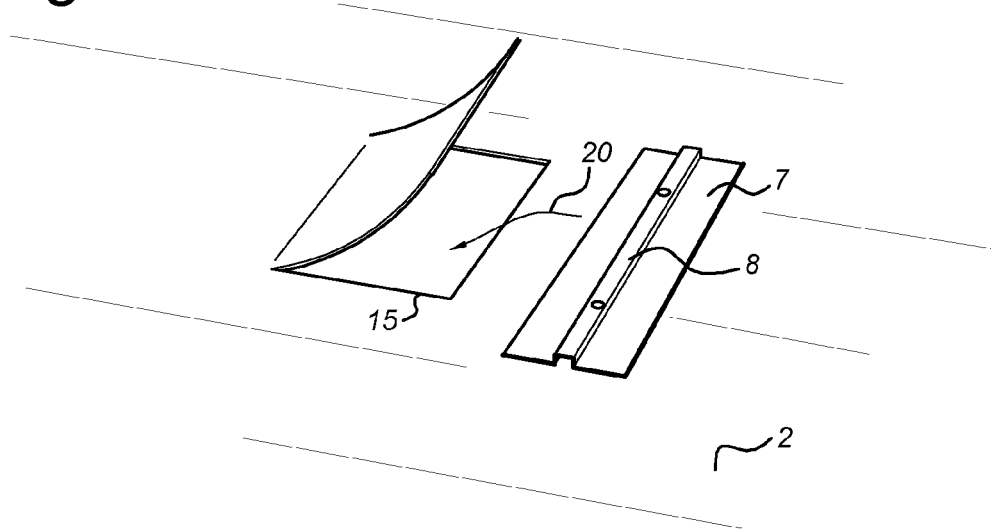


Fig 4d

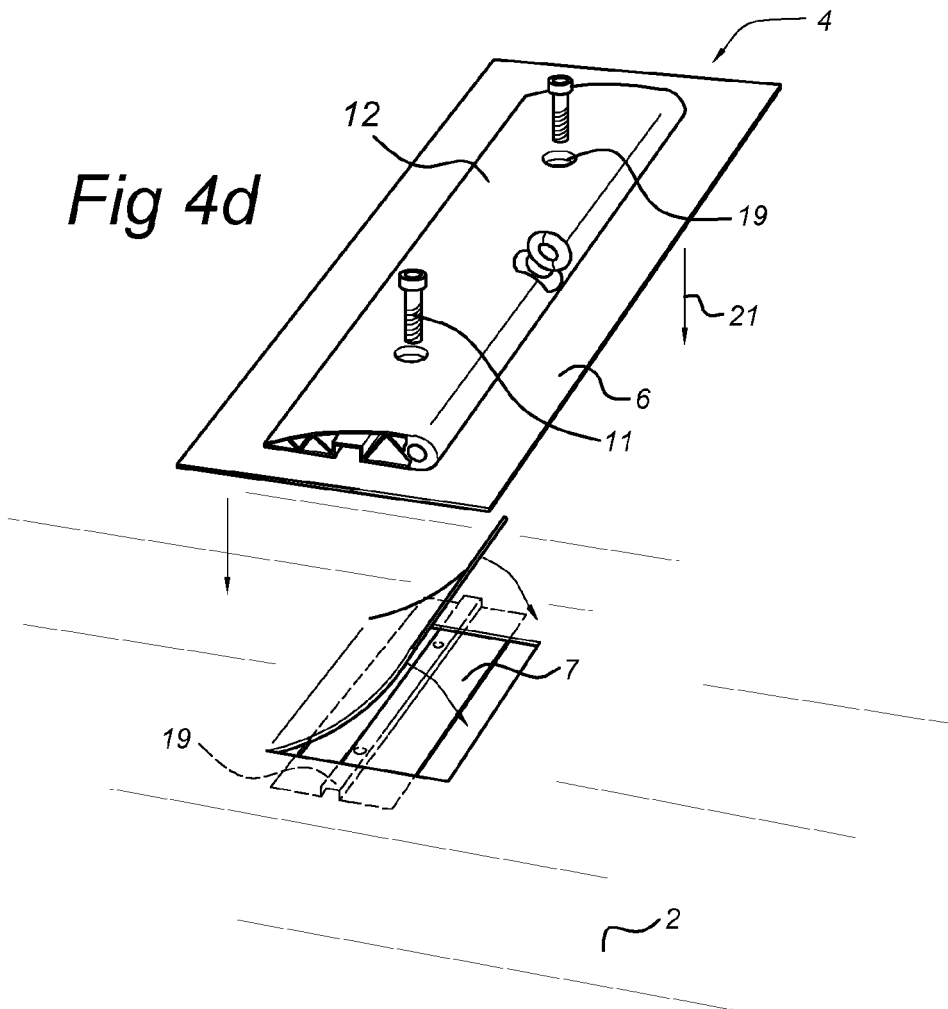


Fig 4e

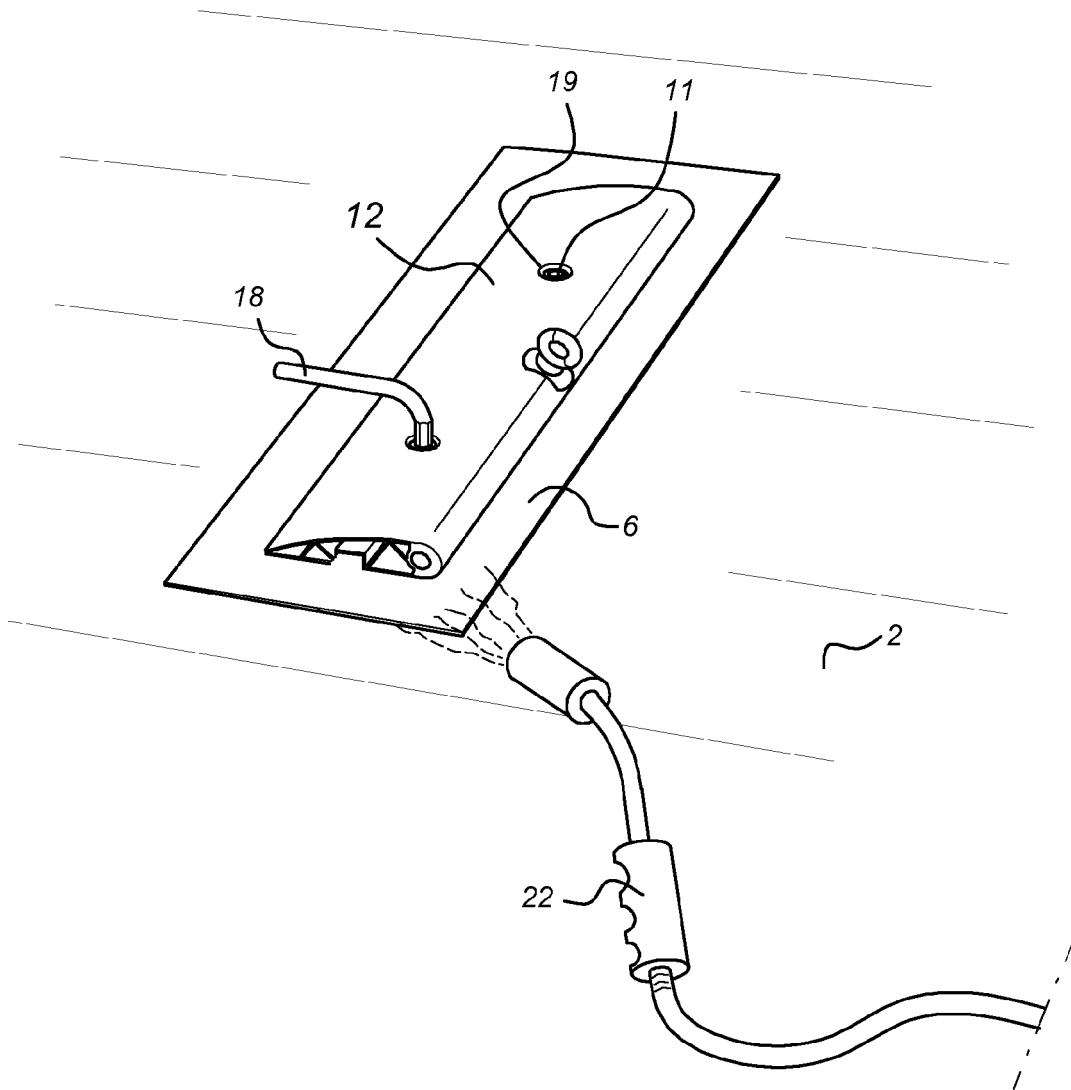


Fig 5a

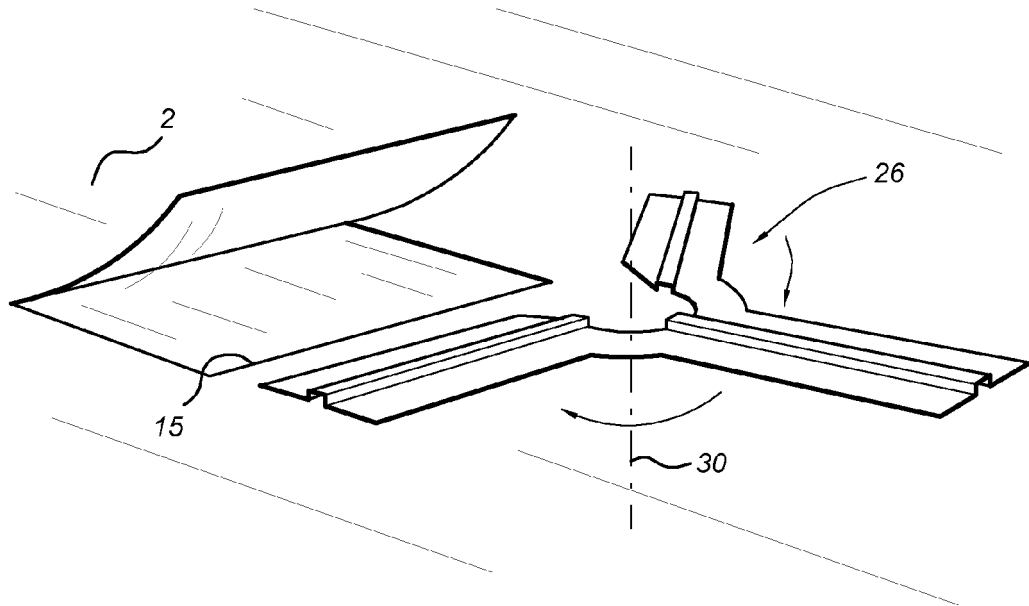
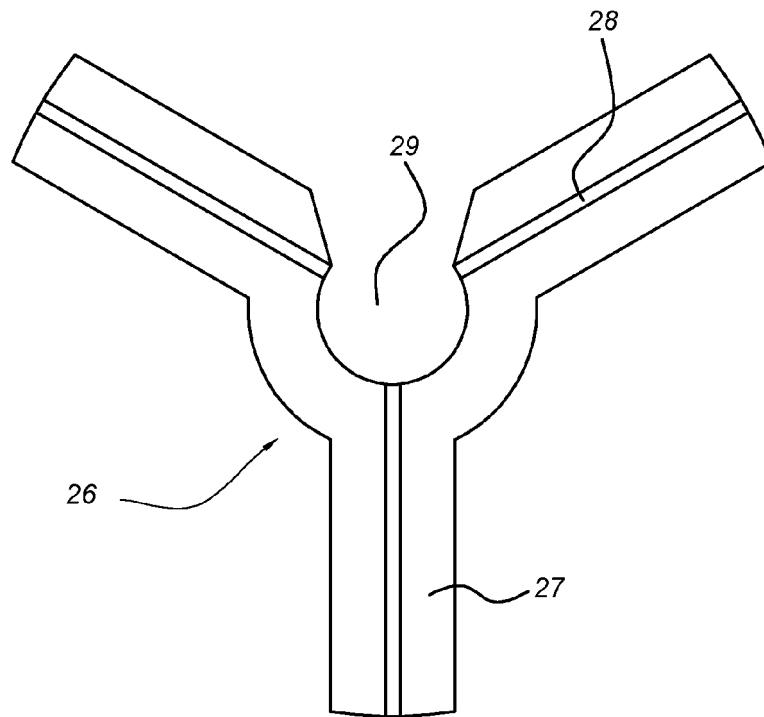


Fig 5b





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Place of search The Hague		Date of completion of the search 24 July 2012	Examiner Andlauer, Dominique
CATEGORY OF CITED DOCUMENTS		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	
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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