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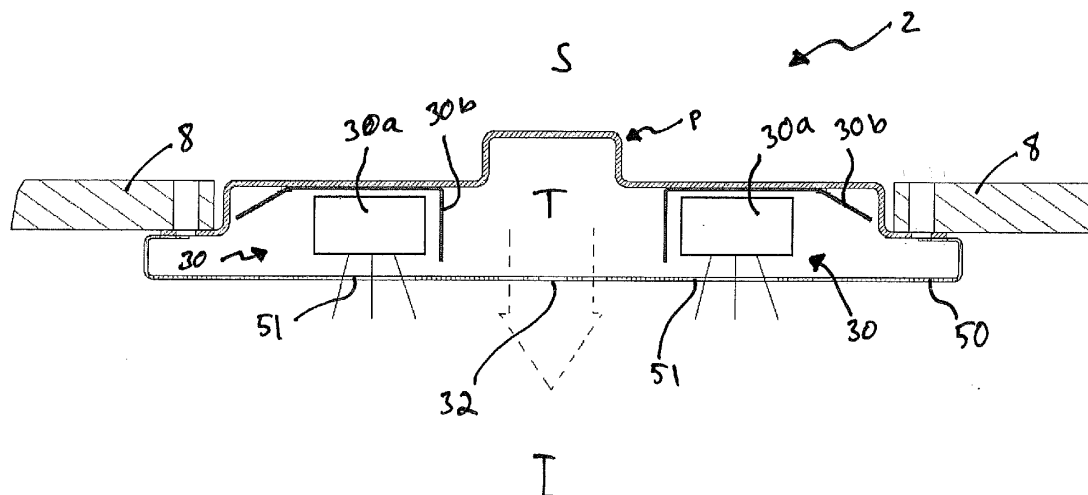
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(54) **ELEVATOR CAR AND ELEVATOR**

(57) The invention relates to an elevator car, which comprises a free interior (I) for receiving a load, which interior (I) is bounded by at least the walls, roof, floor and preferably also door arrangement comprised in the elevator car, a frame structure, which frame structure comprises a horizontal elongated rigid roof beam (2) in connection with the roof of the elevator car, which roof beam (2) extends across the roof of the car above the interior (I), and which roof beam (2) is an elongated channel profile member, which has essentially the same continuous

cross-sectional profile in the longitudinal direction. The roof beam (2) is a downward-opening, elongated, channel profile member, the width of the cross-sectional profile of which is essentially larger than the height. The interior (T) of the channel profile member (2) can be configured to function as a space for one or more functions of the car affecting the conditions of the interior (I) of the elevator car (1), including lighting and/or ventilation. The invention also relates to an elevator, which comprises an elevator car of the aforementioned type.

Fig. 3c



Description

FIELD OF THE INVENTION

[0001] The object of the invention is an elevator car and an elevator, more particularly an elevator car and an elevator applicable to the transporting of people and/or of freight.

BACKGROUND OF THE INVENTION

[0002] Elevator cars are conventionally formed to comprise a load-bearing frame structure, i.e. a car sling, which comprises a lower horizontal beam system and an upper horizontal beam system, as well as a vertical beam system of a first side and a vertical beam system of a second side, which beam systems are connected to each other so that they form a closed ring, inside which is an interior comprised in a car box fixed to the beam systems, which interior can receive goods and/or passengers for conveying them in the interior of the elevator car. Conventionally the car box has been essentially fully inside the aforementioned ring. Also known in the art are elevator cars, in which the beams participating in forming the aforementioned ring structure are integrated as a part of the wall structures, roof structures or floor structures that bound the interior of the car box. This type of solution is presented in, among others, publications EP1970341A1 and WO9933743A1. Utilizing the solutions, a shallow roof structure can be achieved. In the solution of publication EP1970341A1, the upper horizontal beam system, *inter alia*, has been formed from two parallel horizontal beams, instead of one horizontal beam. In the solution presented the horizontal beams are on view, and components external to the elevator car, such as the car suspension means, are disposed alongside them. In the solution presented in publication WO9933743A1 there is one roof beam, which is broad. The vertical space usage is very effective, but nevertheless some free space remains unutilized.

[0003] The outer surface of the roof of the elevator car is generally formed from plates that are firmly and rigidly supported on the upper horizontal beam system. According to prior art, there is a separate roof panel in the elevator cars, below the upper horizontal beam system and the aforementioned plates forming the outer surface. The roof panel can be a single-piece or multi-piece roof panel, and the bottom surface of it forms a planar surface bounding the interior of the car. The roof panel is generally quite thin in terms of its thickness, e.g. a plate-type structure less than 50 mm thick, into which luminaires are integrated. For the servicing of the luminaires or other components of the roof or for opening the roof trap, the roof panel is generally fixed into its position with an openable locking, which can be opened from inside the car for taking the roof panel down. The roof panel structure has increased the total thickness of the roof structure by the amount of its own thickness plus possible fastening clear-

ances. Also, in connection with the aforementioned solutions according to prior art, the use of this type of conventional method produces a rather thick roof entity.

[0004] Generally speaking, one problem with solutions according to prior art, among others, can be considered to be non-optimal space usage. More particularly the roof structure of an elevator car has not been optimized as an entity sufficiently from the standpoint of space usage. All the essential factors have not been simultaneously taken into account to an adequate extent, more particularly the placement of structures and components external to the elevator car, the space-efficiency and durable construction of the beam system of the frame structure, and also, importantly, the placement of structures and components internal to the elevator car. Thus the overall structure of the roof has not been optimal, more particularly the free vertical interior of the elevator car and the free vertical space of the part of the hoistway above the elevator car have not been maximal. Reducing or increasing the total thickness of the structure of the roof thus directly affects the size of the interior of the elevator car or, correspondingly, the size of the safety space that is above the elevator car between the roof of the car and the roof of the elevator hoistway. Each millimeter by which the interior of an elevator car can be increased is important.

AIM OF THE INVENTION

[0005] The aim of the invention is to eliminate, among others, the aforementioned drawbacks of prior-art solutions. More particularly the aim of the invention is to produce an elevator, the roof structure of the elevator car of which is extremely compact in the vertical direction. The aim of the invention is further to produce one or more of the following advantages, among others:

- An elevator car and elevator are achieved in which the total thickness of the roof of the elevator car is low.
- An elevator car and elevator are achieved in which the planar top surface of the roof, e.g. a standing surface for a serviceman, is very close to the bottom surface of the roof bounding the interior of the elevator car. In other words, the structural thickness between the interior of the elevator car and the standing platform is small and the parts of a serviceman that extend to highest above the elevator car, more particularly the head, can be kept as low as possible while working on the roof, e.g. when driving on service drive. The space needed by a serviceman does not therefore extend to high above the interior of the elevator car.
- An elevator car and elevator are achieved, the structures of the roof structure of which elevator car, and the functions in connection with the roof of which, are more efficient than before in their usage of space.
- An elevator is achieved, the distance between the

bottom surface bounding the interior of said elevator car and the roof of the elevator hoistway is small when the elevator car is in its upper position.

SUMMARY OF THE INVENTION

[0006] The invention is based on the concept that the space efficiency of an elevator car of an elevator can be increased if the elevator car is formed to comprise a frame structure, the roof beam of which is a downward-opening, elongated, channel profile member, the width of the cross-sectional profile of which is essentially larger than the height. In this way a rigid structure can be achieved, which has an interior that can be utilized for functions affecting the interior of the car, such as for creating air ducting for ventilation or for accommodating a light source and/or a reflective surface for the lighting. With a broad structure it is also possible to simply form a part of the standing surface of the roof.

[0007] In one basic embodiment of the concept of the invention the elevator car comprises a free interior for receiving a load, e.g. for receiving passengers and/or freight, which interior is bounded by at least the walls, roof, floor and preferably also door arrangement comprised in the elevator car, and a frame structure, which frame structure comprises a horizontal elongated rigid roof beam in connection with the roof of the elevator car, which roof beam extends across the roof of the car above the interior, and which roof beam is an elongated channel profile member, which has essentially the same continuous cross-sectional profile in the longitudinal direction. The roof beam is a downward-opening, elongated, channel profile member, the width of the cross-sectional profile of which is essentially larger than the height.

[0008] Preferably the interior of the channel profile member is configured to function as a space for one or more functions of the car affecting the conditions of the interior of the elevator car, including lighting and/or ventilation. In this way the interior of a roof beam can be utilized and a shallow structure can be formed over the center area of the interior of the car, which structure delivers a number of functions, the structures on the sides of which structure can be formed to be simple and thin.

[0009] Preferably the channel profile member forms a part of the inner wall of the casing, into which casing a luminaire is disposed. In this way efficient use of the area of the beam is achieved.

[0010] The width/height ratio of the cross-sectional profile is preferably at least 4. In this way the beam can be formed to be shallow, when the interior of it is of sufficient volume for accommodating other functions. Nevertheless, it is advantageous that the width/height ratio is less than 20, more preferably less than 10.

[0011] The height of the cross-sectional profile is preferably 20-60 mm, preferably 25-50 mm. In this way the total thickness of the roof of the elevator car is shallow, however being rigid owing to the wide channel shape.

[0012] Preferably beside the roof beam, preferably on

both sides of the roof beam, is a roof plate of the elevator car, the top surface of which forms a part of the visible top surface of the elevator car and/or the bottom surface of which forms a part of the visible bottom surface of the roof bounding the free interior of the elevator car. The structure is advantageous because the roof plates beside the shallow roof beam do not increase the total thickness essentially or at all. It is advantageous to support the roof plates in the vertical direction on the aforementioned roof beam. The thickness of the roof plates is preferably smaller than the height of the roof beam, preferably at most 20 mm.

[0013] Preferably the base of the channel profile member forms an elongated ridge extending upwards from the roof of the elevator car. The ridge preferably tapers upwards. In this way the tripping hazard caused is minor. Preferably the ridge comprises a flat top surface.

[0014] Preferably the elevator car comprises suspension means of the elevator car separate from the roof, in which case especially large forces are not exerted on the roof structure. Preferably the means are on the bottom part of the elevator car, preferably they comprise a diverting pulley system, most preferably a diverting pulley system that is arranged to guide the hoisting roping descending from above to the elevator car to pass under the elevator car and back upwards. When the elevator car is supported from its bottom part, the roof beam system bears less load than if the supporting were supported directly on the roof beam.

[0015] Preferably the roof beam is a downward-opening channel profile member, which has an interior, and that in connection with the roof of the elevator car is one or more luminaires, which are arranged to illuminate the interior of the elevator car, and the structure of which luminaire, more particularly the light source of the luminaire and/or the reflector of the luminaire, is at least partly, preferably mostly, more preferably wholly, in the interior of the channel profile member. In this way the whole cross-section of the roof of the elevator car can be efficiently utilized in both the transverse direction and the vertical direction.

[0016] Preferably the elevator car comprises a ventilation arrangement, wherein the air is conducted between the interior of the car and the space outside the car, more particularly between the interior of the car and the elevator hoistway, via the interior of the channel profile member. In this way the interior of the channel can be utilized for an air-conditioning function. For this purpose it is advantageous that the elevator car comprises ducting between the interior of the car and the space outside the elevator car (elevator hoistway), which ducting comprises an air duct leading from the space outside the car into the interior of the channel profile member and a duct leading from the interior of the channel profile member into the interior of the elevator car, for conducting air between the interior of the car and the space outside the car (elevator hoistway) via the interior of the channel, and preferably a ventilation device for transferring air in the air

ducting. Noise dampers, such as elastic members, e.g. of foamed polymer, can be installed in the interior of the channel profile member.

[0017] Preferably the roof beam is a downward-opening, elongated, channel profile member, which has an interior, which is bounded from above by the base of the channel profile member, and which interior in the lateral direction is bounded by the side walls of the channel profile member (between which side walls the interior of the channel is, and which side walls extend from the base downwards at a horizontal distance from each other). Preferably the base comprises one or more horizontal sections. The horizontal section (s) can each form a part of the visible top surface of the elevator car.

[0018] Preferably the channel profile member comprises a profile section extending from each side wall of the channel, from the bottom part of the side wall, towards the side, away from the interior of the channel profile member. In this way the structure of the roof profile member further stiffens in relation to vertical bending, the second moment of area significantly increasing as more cross-sectional area of the profile section is brought to a distance from the neutral axis. On top of each such profile section, resting on its top surface, a roof plate of the elevator car is preferably fitted, beside the channel profile member.

[0019] Preferably the base of the channel profile member comprises horizontal sections, and an elongated depression connecting them, which depression forms an elongated ridge on its opposite side (separating upwards from the horizontal sections). The ridge further stiffens the beam in relation to bending and torsion. Preferably the structure of the ridge/depression is such that the walls, which connect the horizontal section, of the ridge/depression extend upwards from the aforementioned horizontal sections. The channel profile member therefore comprises in its base a downward opening bottom channel. Preferably the horizontal section of the ridge forms a part of the visible top surface of the elevator car. Preferably the horizontal top surface of the ridge is at most 150 mm in width, preferably at most 100 mm, preferably approx. 30-50 mm. Preferably the transverse width of the ridge is preferably less than 200 mm, more preferably less than 150 mm, preferably approx. 40-120 mm (bevels can be created in the ridge, with which the width of the top surface can be limited to lower than this, which bevels at the same time reduce the tripping hazard).

[0020] Preferably beside the roof beam, preferably on both sides of the roof beam, is a roof plate of the elevator car. Preferably the top surface of each roof plate forms a part of the visible top surface of the elevator car and the horizontal top surface of the ridge is above the plane of the top surfaces of the aforementioned roof plates.

[0021] Preferably in connection with the roof is a cover plate, which forms a part of the visible bottom surface of the roof bounding the free interior of the elevator car, which cover plate is below the interior of the channel pro-

file member. If the interior of the channel is utilized for accommodating a luminaire, the cover plate comprises an area via which the luminaire illuminates the interior of the car, or the structure of the luminaire can extend through the cover plate (e.g. a recessed luminaire). In this way the cover plate can tightly cover the non-aesthetic parts of the utilized roof structure.

[0022] Preferably the top surface of the base of the channel profile member forms a part of the visible top surface of the elevator car.

[0023] Preferably the distance between the side walls of the channel profile member is at least 150 mm. In this way its width is advantageous for producing rigidity and the volume of its interior is sufficient for accommodating additional functions without an increase in thickness.

[0024] Preferably the channel profile member is bent from sheet. Preferably the channel profile member is bent from sheet of even thickness, the thickness of which is between 2-4 mm, preferably 2.5-3.5 mm. In this way the material thickness produces sufficient strength values for the elevator car and nevertheless the bends needed can still be made in the material, especially when it is a metal sheet that is in question.

[0025] Preferably the channel profile member is fabricated from an integral piece.

[0026] Preferably the channel profile member is of metal.

[0027] Preferably the frame structure comprises the aforementioned roof beam, the vertical beams of a first side and of a second side, and a floor beam system, which are connected to each other such that each of them forms a part of a ring-like frame structure, inside which is the interior of the elevator car.

[0028] Preferably in the interior of the channel profile member data lines and/or electric lines are led between a device of the elevator car and the control unit of the elevator car and/or an electricity source.

[0029] In one basic embodiment of the invention the elevator comprises an elevator hoistway, and an elevator car arranged to move in the elevator hoistway, which elevator car is according to any of the preceding claims.

[0030] Preferably the elevator car is suspended with hoisting roping circulating below the elevator car.

[0031] Preferably the elevator car is suspended with hoisting roping, which supports the elevator car via a diverting pulley system, which diverting pulley system is supported on the aforementioned frame structure, preferably via a beam fixed to the frame structure, which beam supports the frame structure. The diverting pulley system is preferably supported elsewhere than on the aforementioned roof beam, preferably on the side of the elevator car or on the bottom part of the elevator car. In this way the load exerted on the roof beam can be kept low.

[0032] The beam structure presented can be utilized in elevators having a different suspension ratio or different suspension type, such as in elevators of the undersling type presented or of the oversling type. The elevator

is most preferably an elevator applicable to the transporting of people and/or of freight, which elevator is installed in a building, to travel in a vertical, or at least essentially vertical, direction, preferably on the basis of landing calls and/or car calls. The aforementioned interior is most preferably suited to receive a passenger or a number of passengers. The elevator preferably comprises at least two, preferably more, floors to be served. Some inventive embodiments are also presented in the descriptive section and in the drawings of the present application. The inventive content of the application can also be defined differently than in the claims presented below. The inventive content may also consist of several separate inventions, especially if the invention is considered in the light of expressions or implicit sub-tasks or from the point of view of advantages or categories of advantages achieved. In this case, some of the attributes contained in the claims below may be superfluous from the point of view of separate inventive concepts. The features of the various embodiments of the invention can be applied within the framework of the basic inventive concept in conjunction with other embodiments. The additional features mentioned by each preceding embodiment can also singly and separately from the other embodiments form a separate invention.

LIST OF FIGURES

[0033] In the following, the invention will be described in detail by the aid of some embodiments with reference to the attached drawings, wherein

Fig. 1 diagrammatically presents an elevator according to the invention.

Fig. 2 presents the frame structure of an elevator car of an elevator according to the invention.

Fig. 3a presents a cutaway drawing of a preferred cross-sectional profile of the roof beam, cut at the point A-A of Fig. 2.

Fig. 3b presents a cutaway drawing of an alternative preferred cross-sectional profile of the roof beam, cut at the point A-A of Fig. 2.

Fig. 3c presents a cross-section of a finished roof at the point of the roof beam.

DETAILED DESCRIPTION OF THE INVENTION

[0034] Fig. 1 presents an elevator according to the invention, which elevator comprises an elevator hoistway S, and an elevator car 1 according to the invention arranged to move in the elevator hoistway, which elevator car 1 comprises an interior I, which is bounded by the walls, roof, floor and door arrangement of the elevator car. The elevator car is moved with a hoisting machine M via hoisting ropes 20. The elevator car 1 comprises a frame structure F (suggestively presented), which comprises one horizontal, elongated roof beam 2 in connection with the roof R of the elevator car 1, and the vertical

beams 3 of a first side and a second side, and a floor beam system 4, which are rigidly connected to each other such that each of them forms a part of a ring-like frame structure F, on the inside of which is the interior I of the elevator car. The roof beam 2 is in connection with the roof, i.e. it is integrated to be a part of the structure of the roof so that it forms a part of the roof structure bounding the interior. A preferred structure of the frame structure F (2,3,4,5,6) is presented in Fig. 2. In the preferred embodiment presented the frame structure F comprises one horizontal elongated rigid roof beam 2, which extends across the roof of the car above the interior I. The roof beam 2 is rigidly connected to the vertical beams 3 via the joint parts 5. The roof beam 2 is a downward-opening, elongated, channel profile member, which has essentially the same continuous cross-sectional profile in the longitudinal direction, and the width of its cross-sectional profile is essentially larger than the height. In this way the roof beam forms a shallow structure, which however has sufficient vertical bending rigidity owing to the large cross-sectional area. The channel shaping increases vertical rigidity. Downward opening makes possible a very thin roof structure, because in this way functions of the elevator car in connection with the interior I of the car can be disposed in the interior T of the channel profile. The beam 2 is preferably according to that presented in Fig. 3a. The roof structure is in this case preferably according to Fig. 3c.

[0035] The elevator car 1 is suspended with hoisting roping 20 circulating below the elevator car, more particularly with hoisting roping 20 that supports the elevator car 1 via the diverting pulley system 10, which diverting pulley system 10 is supported on the aforementioned frame structure F via a beam fixed to the frame structure, supported upon which beam the frame structure F rests. Suspension circulating below the car has the effect that the structure of the overhead beam can be formed to be lightweight. More particularly, the material thickness of it can be formed to be small, in which case sharp bends are simple to form and a shallow beam structure is achieved. The elevator car according to the invention can, however, be utilized also in an elevator having another type of suspension.

[0036] The width/height ratio of the cross-sectional profile, which is essentially continuously the same in the longitudinal direction of the profile beam 2, is preferably at least 4, preferably even more. In this case the rigidity and space-efficiency of the beam are good from the viewpoint of achieving a compact but rigid roof structure of the elevator car, at the same time achieving a space T that can be used for the functions of the interior of the elevator car. In its dimensions the beam is further preferably such that the height of its cross-sectional profile is 20-60 mm, preferably 25-50 mm. The distance between the side walls 21 of the channel formed by the beam 2, which is thus a channel profile member, is preferably at least 150 mm. It is, however, advantageous that the width is not very great, but instead it is advantageous

that the width/height ratio is less than 20, more preferably less than 10, because widening of the member, although it would make additional space between the walls, would take the walls 21 away from the center area of the elevator car, among other things increasing the cross-sectional area of the beam and the material belonging to it, increasing the rigidity, however, only slightly. The side walls 21 are preferably vertical. In the dimensions it is advantageous that the distance between the side walls 21, i.e. the width of the interior of the channel, is less than 60 mm, more preferably at most 40 mm.

[0037] Fig. 3a presents a cutaway drawing of the cross-sectional profile of the roof beam, cut at the point A-A of Fig. 2. The roof beam continues according to the cross-sectional profile at least essentially for the whole length of the roof beam. The roof beam 2 is an elongated channel profile member, which is fitted to be a part of the elevator car 1 such that it is open downwards. It has an interior T, which is bounded from above by the base (22,23,24) of the channel profile member, and the interior T is bounded in the lateral direction by the side walls 21 of the channel profile member, between which side walls the interior T thus is, and which side walls 21 extend from the base (22, 23, 24) downwards at a horizontal distance from each other. The base of the channel profile member could be horizontal, but preferably it comprises horizontal sections, and an elongated depression connecting them, which depression when the channel profile member 2 is placed to open downwards forms on its opposite side an elongated ridge p diverging upwards from the horizontal sections. Thus the walls 23 of the ridge/depression, which walls are connected by the horizontal section 24, extend upwards from the aforementioned horizontal sections 22. In this way the downward opening channel profile member 2 comprises a sort of a downward opening bottom channel, which forms a ridge p. The ridge p increases the second moment of area of the channel profile member effectively stiffening the structure against vertical bending and torsion. At the same time this additional stiffening (the ridge p) can be formed to be narrow, in which case it does not essentially reduce the top clearance of the elevator, in particular it can be formed to be so narrow that it is not pleasant to stand on it, in which case it does not form a higher-level flat area that can be stood upon. In this way the safety space of a serviceman working on the roof formed over the elevator car is the high space remaining on the sides of the ridge, above the flat areas that are below it. Preferably the horizontal section of the ridge p forms a part of the visible top surface of the elevator car. Preferably the top surface of the horizontal section 24 of the ridge p is above the top surfaces of the horizontal sections 22 by at most 50 mm. Thus the ridge does not in itself form an element bounding the top clearance nor a dangerous tripping hazard on the roof. Preferably the horizontal sections 22 of the base of the channel profile, which base thus also continues essentially as the same elongated part of the beam 2, each form a part of the visible top surface of the elevator car

1. Preferably the horizontal top surface of the ridge is at most 150 mm in width, more preferably at most 120 mm, preferably approx. 35-50 mm. Thus it is not tempting to step onto and stand on it. Likewise it is advantageous that the transverse width of the ridge is less than 200 mm, preferably approx. 40-120 mm (bevels can limit the width of the top surface to less than this), in which case the aforementioned properties bounding the top clearance are still avoided. It is advantageous that the top surface of the base (22,23,24) of the channel profile member forms a part of the visible top surface of the elevator car (1), as is presented in Fig. 3c. In this case the structure is shallow and simple because additional structures do not need to be present. As presented, beside the roof beam 2, on both sides of the roof beam, is a roof plate 8 of the elevator car, the top surface of which roof plate forms a part of the visible top surface of the elevator car and the horizontal top surface of the ridge p is above the plane of the top surfaces of the aforementioned roof plates 8. In this way only a narrow ridge p rises from the roof, around which ridge is a flat roof surface, at the point of which the roof structure is very thin. As stated above, the ridge is not indispensable, but instead the horizontal section 22 of the base of the channel could continue without a ridge/depression p from one wall 21 to the other. Fig. 3b presents an alternative cross-sectional profile, wherein the ridge p has the aforementioned bevels. The ridge p tapers upwards. In this way the total width and/or the height of the ridge p can be large without causing a significant tripping hazard. The horizontal section 24 can be fitted at a distance to the horizontal sections 22, 25, in which case the second moment of area is large. The angle α_1 between the ridge and the horizontal plane is preferably 110-130 degrees, preferably the 120 degrees presented in the drawing, in which case α_2 is 50-70 degrees, preferably the 60 degrees presented in the drawing. The solution of Fig. 3b can otherwise be utilized just like the solution of Fig. 3a, and can be installed as a part of the roof in a corresponding manner to what is presented in Fig. 3c.

[0038] Preferably the channel profile member 2 is fabricated by bending from sheet, preferably from sheet of even thickness, the thickness of which is between 2-4 mm, preferably 2.5-3.5 mm. In this way the channel profile member can be fabricated from an integral piece. The aforementioned channel shapes can thus be brought about in it. The material is preferably metal, preferably some metal intended for a rigid sheet or beam, and preferably comprises iron, being e.g. steel.

[0039] Fig. 3c presents a roof beam 2 at the point A-A of Fig. 2, also presenting the other structures of the roof R of the elevator car 1. The roof beam 2 is a downward-opening, elongated, essentially continuously similar, channel profile member, which has an interior T, which is therefore also elongated. These structures therefore continue essentially correspondingly in the longitudinal direction of the beam. In connection with the roof R of the elevator car 1 is one or more luminaires 30, which

are arranged to illuminate the interior I of the elevator car 1, which light source 30a of the luminaire 30 and/or reflector 30b of the luminaire is at least partly in the interior T of the channel profile member. The light source 30 of the luminaire can be a fluorescent tube, in which case it is advantageous that at the back of it is a reflector 30b, but the reflector is not indispensable. Alternatively, the light source 30a can be a LED component or a group of LED components. In this case the reflector 30b is not necessary, but it can be present. The aforementioned reflector 30b can be a reflection element part or a coating part. In this way the cross-section of the roof beam can be formed to comprise a free interior space, which can be utilized efficiently to achieve a very thin roof structure. The thin structure of the roof structure increases the space efficiency of the elevator, because the wasted space between the space above the roof of the elevator car and the interior I is small. In this way the distance between the top surface of the interior of the elevator car and the bottom surface of the roof of the elevator hoistway can be reduced. In the way presented there is preferably a suitable amount of luminaires 30 to form an elongated light source formation, e.g. which covers most of the length of the interior T of each beam 2. Means are connected to the aforementioned one or more luminaires for supplying energy to the aforementioned one or more luminaires (not presented), which means are e.g. electricity leads from an energy source. Also these can be led to travel in the interior T, but the most significant effect promoting compactness is if the structure of the luminaire itself is at least partly (preferably mainly or even wholly) in the interior T, which luminaire structure is not here deemed to include energy supply means, i.e. wirings or corresponding, but instead more particularly a light source and/or a possible reflector. In addition to, or as an alternative to, lighting the interior T can be used for conducting air between the interior of the car and the hoistway S. In this case the air is conducted between the interior I of the elevator car 1 and the space (elevator hoistway S) outside the car 1 via the interior T of the channel profile member. In this case the elevator car preferably comprises ducting between the interior of the car and the space outside the elevator car (elevator hoistway), which ducting comprises an air duct 40 leading from the space outside the car into the interior of the channel profile member and a duct leading from the interior of the channel profile member into the interior of the elevator car, for conducting air between the interior of the car and the space outside the car (elevator hoistway) via the interior of the channel, and preferably a ventilation device for transferring air in the air ducting. A possible ventilation device can be placed onto the roof of the elevator car. As presented in Fig. 2 a duct 40 leads into the interior T, above which duct a ventilation device can be installed. A corresponding device can be installed on the other end of the beam 2 in a corresponding manner. Of the devices, one can supply air into the interior of the elevator car and the other can suck air out, or otherwise

both operate in the same direction, in which case the opposing effect can be implemented in other ways, e.g. by means of additional ducting. An arrow is drawn in Fig. 3c to describe the passage of air from the interior T of the channel profile member 2 into the interior I' A and through the cover plate 50. The ventilation ducts 40, which lead from the space S outside the car into the space T, and the ventilation ducts 32, which lead from the space T into the interior I of the car 1 are preferably at different points in the lateral direction such that air travels a horizontal distance, preferably in the longitudinal direction of the beam 2, when it travels between the ducts 40 and 32. In this way a labyrinthine route is formed for the air and e.g. the transmission/production of noises in the space T can be controlled more easily. Sound damping, for example, can also be installed in the space T.

[0040] The duct 40 presents a hole leading through the channel profile member in the vertical direction. Alternatively, the air can be guided between the space S outside the car and the interior T by guiding the air into/out of the profile element via an open butt end of the channel shape. Air can be guided inside the profile element to the desired point by the aid of its walls 21 and base (e.g. the sections 22) or by the aid of means, such as piping, placed inside the interior T.

[0041] Preferably in connection with the roof R is also a cover plate 50, which forms a part of the visible bottom surface of the roof R bounding the free interior (I) of the elevator car 1, which cover plate (50) is below the interior T of the channel profile member. In this way it at least mostly conceals the beam 2 from being seen in the interior and encloses the interior T. The cover plate 50 preferably comprises a window 51, via which a luminaire illuminates the interior, or the structure of the luminaire can extend through the cover plate (e.g. when it is a question of a luminaire, e.g. a LED luminaire, embedded into the cover plate), if the interior T is used in the aforementioned manner for the structure of the luminaire 30. When the interior T is used for conducting air in the aforementioned manner between the interior I and the hoistway S, the air can be conducted through the cover plate between the interior T and the interior I. For this purpose air ducts 32 can be led from the interior I into the interior T, which air ducts in the figure travel through the cover plate 50. The cover plate 50 can be composed of one part or of a number of parts joined to each other. The cover plate can be formed to be even flatter in the vertical direction than what is presented, e.g. it can be installed closer to the beam 2. It is also possible to dispose a luminaire structure 30a and/or 30b wholly inside the interior T so that at the points of these structures there is no ridge reducing the interior.

[0042] Beside the roof beam 2, preferably on both sides of the roof beam 2, is a roof plate 8 of the elevator car 1. The structure of each roof plate 8 continues in the lateral direction to outside the figure towards the edges of the elevator car, and there can be a number of them side-by-side, continuing up to the edges of the elevator

car, or if it is desired the roof plate presented can be large and can extend up to the edge. The top surface of each aforementioned roof plate 8 forms a part of the visible top surface of the elevator car 1 and the bottom surface of it forms a part of the visible bottom surface of the roof R bounding the free interior I of the elevator car 1. The roof plate 8 is preferably supported in the vertical direction on the roof beam 2. For this purpose the channel profile member preferably comprises a profile section, visible in the figures, extending from each side wall 21, from the bottom part of the side wall, towards the side, away from the interior T of the channel profile member, on top of which profile section, resting on its top surface, a roof plate of the elevator car is fitted, beside the channel profile member. The top surfaces of the roof plates 8 are preferably standing platforms, i.e. they comprise a standing area on their top surface, immediately above which standing area is a space free of the parts of the elevator car 1 and free of the ropes of the elevator, for enabling standing on top of the aforementioned standing area at least when the elevator car 1 is situated at a distance from the top end of the elevator hoistway S. The top surfaces of the roof plates 8 are preferably essentially on the same plane with the horizontal sections 22 of the base of the channel profile member. In this way a step to the top surface of the roof does not form at this point and the safety space above the roof is high over a wide area.

[0043] The frame structure F is a load-bearing frame structure, and is thus suited to bearing most of the forces exerted on the elevator car 1. The frame structure F, as an entity, is preferably according to that presented in Fig. 2. Wall paneling, a floor and/or roof paneling, which is/are not presented in Fig. 2, is/are intended to be fixed to the frame structures 2,3,4,5,6 presented. When desired, they can be configured to participate to some extent in stiffening the overall structure. The roof beam 2 in its length is such that it essentially covers the length of the elevator car (as measured in the longitudinal direction of the roof beam), i.e. at least 80% of the length of the elevator car. Namely, owing to the joint of the butt ends of the beam to the rest of the frame structure F, the beam can be made to be slightly shorter than the length of the car. In its profile the profile element continues essentially the same, i.e. being able to comprise a small amount of holds or bends for a fixing. The cross-sectional profile continues as the same preferably for essentially the whole length of the beam, preferably for at least 80% of the length of the beam. For example, for the butt end fixings or for the holes 40, some material can be removed at these points in the profile. The roof beam 2 extends across the roof of the car above the center area of the interior I, at a horizontal distance from the wall/door panel that bounds the interior (when viewing the vertical projection) on the sides of said center area. When viewing the vertical projection of the elevator car, the beam 2 is preferably centered at least such that the horizontal distance of the beam from the walls of the elevator car in

the direction of the beam differ from each other by at most 30%. Preferably the beam is in the direction of two wall/door panels that bound the interior on opposite sides of the elevator car.

[0044] In the interior T data lines and/or electric lines can, in addition or alternatively, be led, e.g. for conducting electricity and/or data to devices on the roof of the elevator car or in connection with the roof from the control unit of the elevator car or from an electricity source regardless of the more precise location of the devices. The devices can be a fan or a luminaire and/or for service-drive control means (not presented) for the elevator car.

[0045] It is obvious to the person skilled in the art that the invention is not limited to the embodiments described above, in which the invention is described using examples, but that many adaptations and different embodiments of the invention are possible within the frameworks of the inventive concept defined by the claims presented below.

Claims

1. Elevator car (1), comprises a free interior (I) for receiving a load, which interior (I) is bounded by at least the walls (W), roof (R), floor (L) and preferably also door arrangement (D) comprised in the elevator car (1), a frame structure (F), which frame structure (F) comprises a horizontal elongated rigid roof beam (2) in connection with the roof (R) of the elevator car (1), which roof beam (2) extends across the roof (R) of the elevator car (1) above the interior (I), and which roof beam (2) is an elongated channel profile member, which has essentially the same continuous cross-sectional profile in the longitudinal direction, **characterized in that** the roof beam (2) is a downward-opening, elongated, channel profile member, the width of the cross-sectional profile of which is essentially larger than the height, and **in that** the interior (T) of the channel profile member (2) is configured to function as a space for one or more functions of the car affecting the conditions of the interior (I) of the elevator car (1), including lighting and/or ventilation.
2. Elevator car according to claim 1, **characterized in that** the width/height ratio of the cross-sectional profile is at least 4.
3. Elevator car according to any of the preceding claims, **characterized in that** the height of the cross-sectional profile is 20-60 mm, preferably 25-50 mm.
4. Elevator car according to any of the preceding claims, **characterized in that** beside the roof beam (2), preferably on both sides of the roof beam (2), is a roof plate (8) of the elevator car (1), and preferably the top surface of the roof plate (8) forms a part of

the visible top surface of the elevator car (1) and/or the bottom surface of it forms a part of the visible bottom surface of the roof (R) bounding the free interior (I) of the elevator car (1).

5. Elevator car according to any of the preceding claims, **characterized in that** it comprises suspension means (7,10) of the elevator car that are separate from the roof, which suspension means are preferably on the bottom part of the elevator car (1), and which preferably comprise a diverting pulley system, most preferably a diverting pulley system that is arranged to guide the hoisting roping (20) descending from above to the elevator car (1) to pass under the elevator car (1) and back upwards. 10
6. Elevator car according to any of the preceding claims, **characterized in that** the roof beam (2) is a downward-opening channel profile member, which has an interior (T), and **in that** in connection with the roof (R) of the elevator car (1) is one or more luminaires (30), which are arranged to illuminate the interior (I) of the elevator car (1), and the structure of which luminaire (30), more particularly the light source (30a) of the luminaire and/or the reflector (30b) of the luminaire, is at least partly in the interior (T) of the channel profile member. 20
7. Elevator car according to any of the preceding claims, **characterized in that** the elevator car comprises a ventilation arrangement, wherein the air is conducted between the interior (I) of the elevator car (1) and the space (S) outside the elevator car (1), more particularly between the interior (I) of the car and the elevator hoistway (S), via the interior (T) of the channel profile member (2). 25
8. Elevator car according to any of the preceding claims, **characterized in that** the roof beam (2) is a downward-opening, elongated, channel profile member, which has an interior (T), which is bounded from above by the base (22,23,24) of the channel profile member, and which interior (T) in the lateral direction is bounded by the side walls (21) of the channel profile member. 30
9. Elevator car according to the preceding claim, **characterized in that** the channel profile member comprises a profile section (25) extending from each side wall (21), from the bottom part of the side wall, towards the side, away from the interior (T) of the channel profile member (2), on top of which profile section, resting on its top surface, a roof plate (8) of the elevator car is preferably fitted, beside the channel profile member (2). 40
10. Elevator car according to claim 8 or 9, **characterized in that** the base (22,23,24) of the channel profile 45

member (2) comprises horizontal sections, and an elongated depression connecting them, which depression forms an elongated ridge (p) on the rear side of the channel profile member, said ridge separating upwards from the horizontal sections. 5

11. Elevator car according to any of the preceding claims, **characterized in that** the channel profile member (2) is bent from sheet, preferably from sheet of even thickness, the thickness of which is between 2-4 mm, preferably 2.5-3.5 mm, and which sheet is preferably metal sheet. 10
12. Elevator car according to any of the preceding claims, **characterized in that** the frame structure (F) comprises the aforementioned roof beam (2), the vertical beams (3) of a first side and of a second side, and a floor beam system (4), which are connected to each other such that each of them forms a part of a ring-like frame structure (2,3,4,5,6), on the inside of which is the interior (I) of the elevator car (1). 15
13. Elevator car according to any of the preceding claims, **characterized in that** in the interior (T) data lines and/or electric lines are led between a device of the elevator car and the control unit of the elevator car and/or an electricity source. 20
14. Elevator, which comprises an elevator hoistway (S), and an elevator car (1) arranged to move in the elevator hoistway (S), which elevator car (1) is according to any of the preceding claims. 25
15. Elevator according to the preceding claim, **characterized in that** the elevator car is suspended with hoisting roping (20) passing below the elevator car. 30

Fig. 1

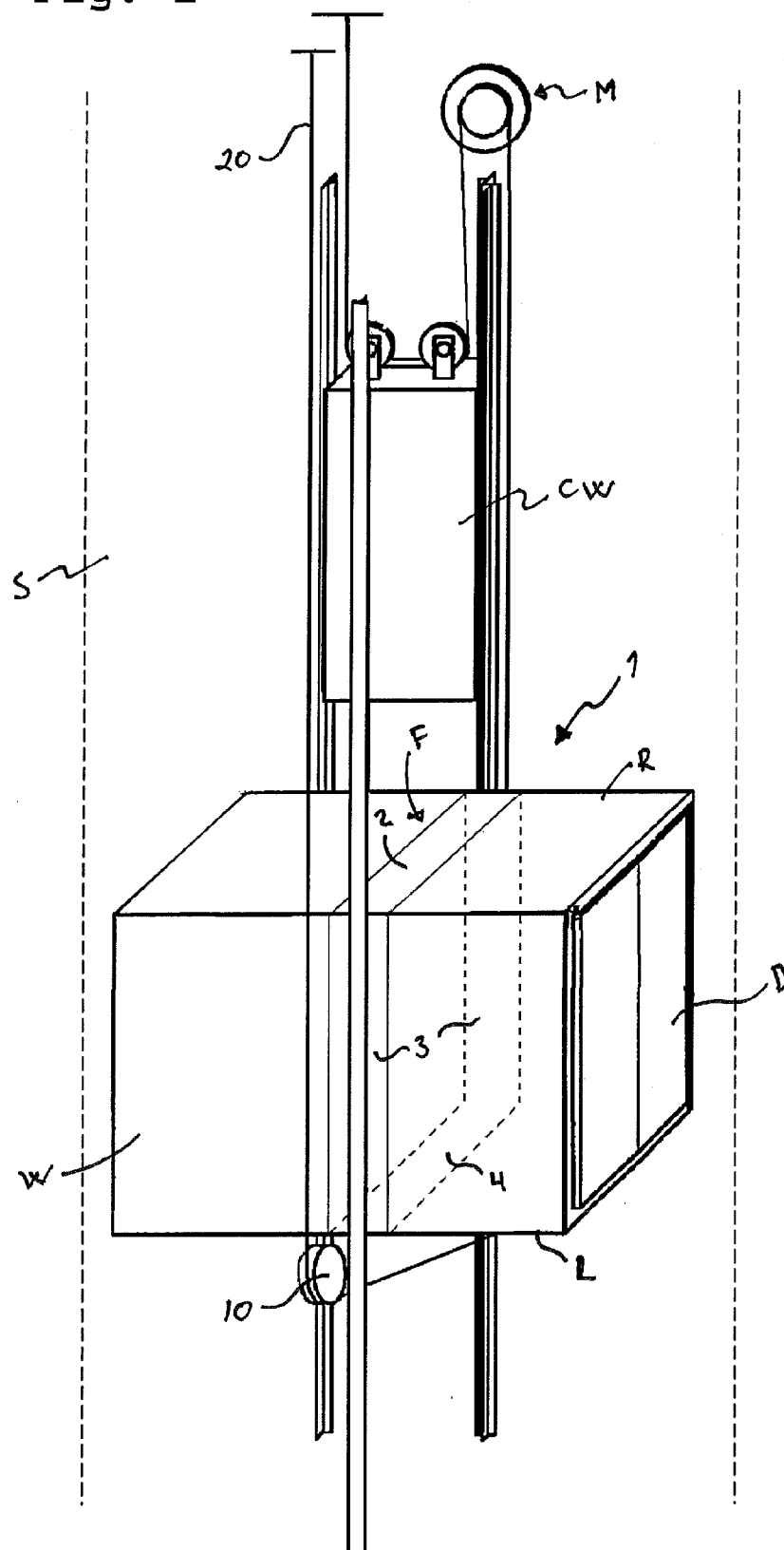


Fig. 2

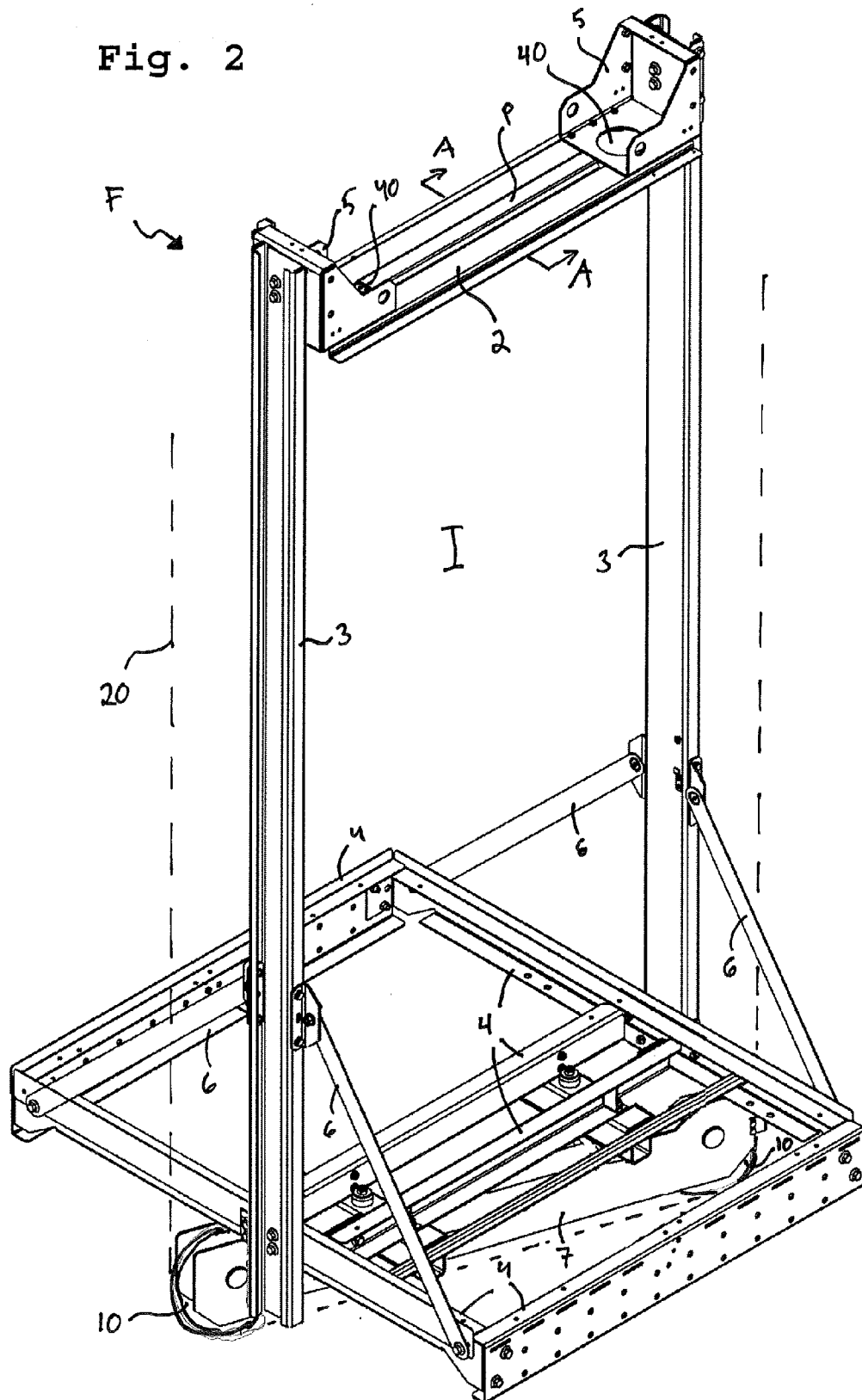


Fig. 3a

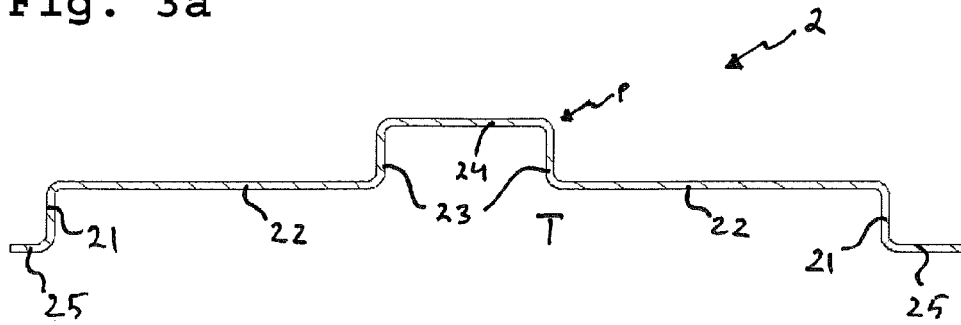


Fig. 3b

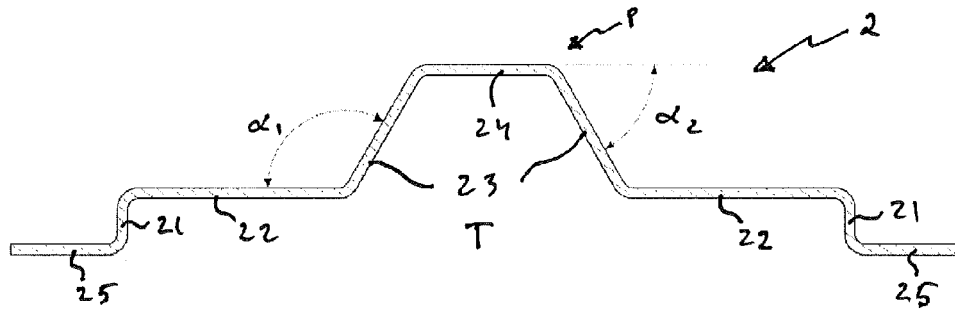
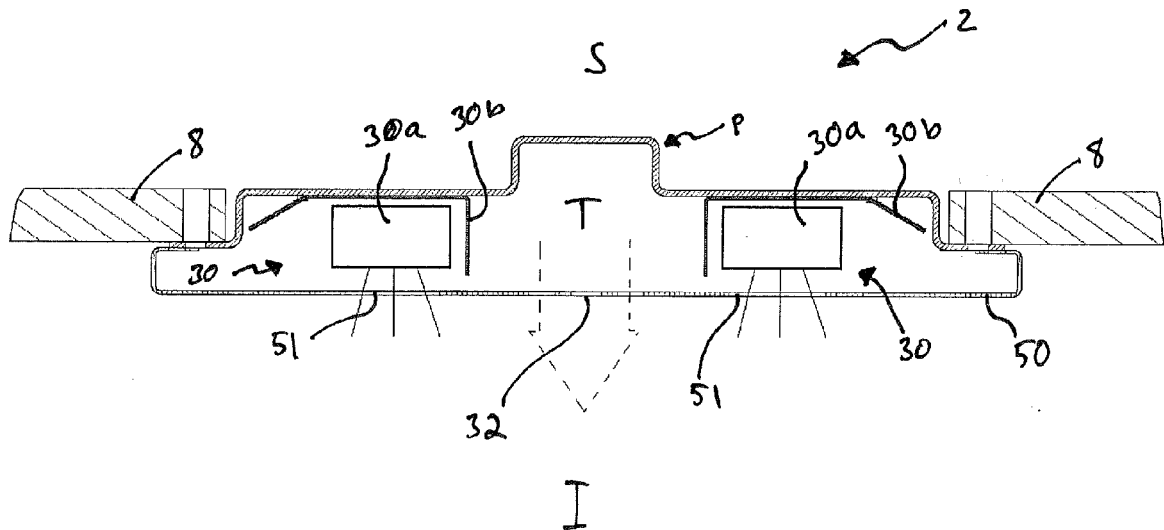


Fig. 3c





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Place of search The Hague		Date of completion of the search 5 December 2016	Examiner Nelis, Yves
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