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(54) PROTECTIVE HELMET WITH LIGHTING DEVICE

SCHUTZHELM MIT BELEUCHTUNGSVORRICHTUNG

CASQUE DE PROTECTION AVEC UN DISPOSITIF D'ÉCLAIRAGE

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates generally to helmets for use in various situations and environments, and in particular to a protective helmet equipped with a lighting device.

Description of the Related Art

[0002] Certain individuals, e.g., firefighters, are required to wear a helmet to protect themselves. A helmet typically comprises a shell on which various elements such as one or more screens, a breathing mask, etc. are mounted. It may be beneficial for the helmet to be fitted with a lighting device in certain situations, notably in the presence of smoke or when the ambient lighting is not strong enough.

[0003] According to a first known type of helmet, the lighting device is mounted on the outside of the shell using a fixing device. First, this entails making a certain number of holes in the shell, weakening its structure. Further, such a lighting device is an added-on appendage, which protrudes significantly beyond the outside of the helmet. Because the lighting device protrudes and is unprotected, there is an accompanying risk that this device may become damaged or may catch on various surrounding elements.

[0004] According to a second known type of helmet, the lighting device is fully integrated into the structure of the helmet. For example, light-emitting diodes (LEDs) may be mounted in openings or orifices made in the shell. This avoids the aforementioned disadvantages associated with the external bulkiness of the lighting device; but, unlike the first type of helmet described hereinabove, this type of mounting arrangement makes maintenance operations, such as the replacement of the LEDs, considerably more complicated. Further, such a helmet is not alterable and has always to be used with the lighting device.

[0005] A helmet with a lighting device is described in Patent US 5,003,973.

SUMMARY OF THE INVENTION

[0006] Generally, provided is a protective helmet and lighting device that addresses and/or overcomes some or all of the potential drawbacks associated with existing helmets utilizing or including lighting devices and similar arrangements.

[0007] To this end, and in one preferred and non-limiting embodiment, the invention relates to a protective helmet including: a shell exhibiting a longitudinal plane of symmetry and including left and right lateral portions, a through-orifice or opening being formed in at least one

of the lateral portions; and a lighting device including: at least one module which includes a housing exhibiting a front wall that is transparent and containing at least one light source positioned facing said transparent front wall; an electrical power supply device and an electronic control device both connected to the light source or sources and each positioned in at least one housing mounted on the shell; the module being configured to be removably fitted inside the opening of the lateral portion of the shell, so that the rear part of the module is situated inside the shell and the front part of the module is situated outside the shell, where that the light source can emit a beam toward the outside of the shell.

[0008] According to one preferred and non-limiting embodiment, the opening passes through the lateral portion of the shell in a transverse direction. The module can be fitted inside this transversally arranged opening substantially tangentially to the lateral portion of the shell.

[0009] Thus, provided is a self-contained lighting device, which may or may not be fitted onto the shell of the helmet, according to the choices and requirements of the user. A new helmet can therefore be supplied with a factory-fitted lighting device, or this device can be mounted at a later date on a helmet that initially did not have any lighting. Because of the self-contained and removable nature of the lighting device, the present invention makes it possible to supply a helmet that is modifiable, in which the lighting device comes as an option. Maintenance operations are thereby also made considerably easier because the helmet can remain operational even in the temporary or complete absence of the lighting device.

[0010] Still further, and in one preferred and non-limiting embodiment, the lighting device is fitted through an opening or orifice in the shell (partly on the inside and partly on the outside), such that the volume of the lighting device is minimized both: (1) on the inside, improving user comfort and allowing the potential fitting of various internal elements such as ear protection; and (2) on the outside, such that the lighting device is less exposed and better protected. The risks of the device becoming damaged or catching on some surrounding element are therefore considerably reduced.

[0011] According to one preferred and non-limiting embodiment, the lateral portion may include an inward depression in which the opening or orifice is formed and a plate, which at least partially covers the depression facing the opening or orifice and which lies substantially flush with those zones of the shell that are situated around the depression. Thus, the module is protected under the plate and, in addition, does not form an element that protrudes out from the helmet. This contributes to the fact that the helmet, provided with its lighting device, can be used in difficult conditions, notably in explosive atmospheres, in the presence of smoke, and/or at extreme temperatures. For example, system operation should be guaranteed between -20 °C and +100 °C, and preferably, in a temperature range from -30 °C to +260 °C, the lighting device should not undergo any degradation detrimental

to the health of the wearer or to the integrity of the helmet.

[0012] In one preferred and non-limiting embodiment, the plate includes a lateral wall that is opaque and a front wall and/or a lower wall that is/are transparent - depending on the orientation of the beam emitted by the light source. Thus, that part of the module that is outside the helmet is situated in a substantially enclosed space, and is therefore well protected. The opacity of the plate hides the module and any other elements that might be situated in this zone, thus improving the aesthetic nature of the helmet. The opacity also allows the plate to maintain its appearance, such that any scratching thereon is less visible than it would be on a transparent wall.

[0013] The plate may include an opaque lateral wall having a transparent front edging and/or a lower edging. While this does not provide the user of the helmet a better view of certain locations, it does help him to be seen better by other individuals located beside him. As an alternative, it would be possible to have a lateral wall that is completely opaque, with no transparent zones, but instead fitted with openings allowing the light beam or beams to emerge downward, forward, and/or laterally.

[0014] According to one preferred and non-limiting embodiment, in the fitted position, the front part of the module is substantially adjacent the outer face of the shell and the rear part of the module is substantially adjacent the inner face of the shell. Based upon this arrangement, the volume of the module is further reduced. In practice, the module can be inserted into the opening in the shell substantially tangentially, with a slight inclination with respect to the lateral portion of the shell. Provision may be made for the lateral portions of the shell to be inclined toward one another with respect to the longitudinal plane of symmetry, and for the module to be arranged substantially parallel to said plane.

[0015] According to another preferred and non-limiting embodiment, the module includes a substantially parallelepiped portion and an appendage, which contains the light source or sources, and which protrudes forward and outward from the roughly parallelepiped portion, in the fitted position. This makes it possible for the module to be positioned as close as possible to the shell both on the inside and on the outside. In addition, with this layout, it is possible to create, between the appendage and the substantially parallelepiped portion, a shoulder that acts as an end stop.

[0016] One module may be arranged to generate a first light beam directed forward and a second light beam directed downward. For that purpose, the module may include a first light source able to emit a first light beam directed forward and a second light source able to emit a second light beam directed downward. As an alternative or in addition, the module may include a single light source associated with an optical device designed to produce, from the beam emitted by the single light source, a first light beam directed forward and a second light beam directed downward. In one preferred and non-limiting embodiment, the two beams, each one forming a

cone, partially overlap so as to provide complete illumination of a zone of oval or circular outline approximately 1 or 2 meters from the wearer of the helmet. The beams, for example, form cones with a vertex angle of the order of 20° to 40°, for example, of about 30°.

[0017] The light source or sources and the optical device, if present, are, for example, arranged so that, in the position of use: the axis of the first light beam is substantially parallel to the longitudinal plane of symmetry and inclined downward, with respect to the horizontal, by an angle (α) of between 0° and 15°, for example, of about 11°. The first beam thus provides lighting high up, but which does not dazzle anybody looking at the wearer of the helmet, the first beam being situated below eye level; and/or the axis of the second light beam is: (i) inclined downward, with respect to the horizontal, by an angle (β) of between 20° and 40°, for example, of about 30°, and (ii) inclined inward, with respect to the longitudinal plane of symmetry, by an angle (γ) of between 0° and 10°, or between 0° and 5°. The second beam thereby provides lighting low down, directed toward the hands.

[0018] The module may include a removable-locking arrangement or removable-locking means that removably locks it in the position in which it is fitted in the opening or orifice. This removable-locking arrangement or means, for example, include at least one end stop intended to collaborate with an edge of the opening or orifice. The advantage of this arrangement is that the attachment does not require any additional hole in the shell or any screw-type fastener.

[0019] In practice, there are a number of possible preferred and non-limiting embodiments of the invention, including: (1) a single module containing in one housing the light source or sources, the electrical power supply device and the electronic control device; (2) two lateral modules, each one placed in an opening of one lateral wall of the shell, each module being independent of the other and containing in one housing the light source or sources, the electrical power supply device and the electronic control device; and/or (3) a single module or two lateral modules each containing, in one housing, the light source or sources whereas the electrical power supply device and the electronic control device are arranged in a casing separate from the housing, for example, at the rear of the helmet, and connected by a cable to the module or to the two modules.

[0020] According to another preferred and non-limiting embodiment, an opening is formed in each of the lateral portions of the shell and the lighting device includes two lateral modules, which are connected by an electric cable, each module including a housing exhibiting a front wall that is transparent and containing at least one light source positioned facing the transparent front wall, an electrical power supply device, and an electronic control device each being housed in at least one of the housings, each module being intended to be removably fitted into the opening of a respective lateral portion of the shell, so that the rear part of the module is situated inside the shell

and the front part of the module is situated outside the shell, where the light source can emit a beam toward the outside of the shell, the cable being held inside the shell in the fitted position. This then yields a one-piece self-contained and substantially symmetric lighting device. It is therefore possible to obtain symmetric lighting and to balance the weight of the helmet. Another advantage of this embodiment lies in the fact that it is possible to have a single electric power supply device and a single electronic control device, which reduces both weight and cost.

[0021] Furthermore, the cable connection is robust and avoids the risks of interference, particularly in the presence of a magnetic field. In addition, because the cable is housed inside the shell and the power supply device is housed in a module, there is no need to allocate a specific location for these elements or to provide the corresponding fixing arrangement. This allows the bulkiness of the helmet and the number of parts and holes needed for fitting the lighting device to be further reduced. In addition, this makes for fewer elements projecting out from the shell which may become damaged or to catch on things. For example, the cable may be fixed to the rear of each of the modules and, in the position of use, may run along the interior face of the shell, behind the head of the wearer. Arrangements may be provided for holding the cable in this position, either using specific configurations provided on the shell or through the presence of elements such as interior padding elements, which can be used to wedge the cable in place. Thus, advantageously, there is no need to provide holes in the shell in order to attach the cable. In one preferred and non-limiting embodiment, the electrical power supply device is housed in the housing of one of the modules, whereas the electronic control device is housed in the housing of the other of the modules. This makes it possible roughly to balance the volume and weight of the two modules.

[0022] In one preferred and non-limiting embodiment, provided is a protective helmet, including: a shell having a left lateral portion, a right lateral portion, and a longitudinal plane of symmetry, wherein an opening is formed in at least one of the left lateral portion and the right portion; and a lighting device, including: at least one module including a housing having a front wall that is substantially transparent and at least one light source positioned facing the front wall; and an electrical power supply device and an electronic control device connected to the at least one light source and positioned in at least one housing mounted on the shell; wherein the module is further configured to be positioned at least partially in the opening of the at least one lateral portion of the shell, and wherein a rear part of the module is at least partially positioned inside the shell and a front part of the module is at least partially positioned outside the shell, such that the at least one light source can emit a beam toward the outside of the shell.

[0023] In another preferred and non-limiting embodiment, provided is a protective helmet, including: a shell

having a left lateral portion, a right lateral portion, and a longitudinal plane of symmetry, wherein an opening is formed in each of the left lateral portion and the right portion; and a first lighting device and a second lighting device connected by an electric cable, each light source including: at least one module including a housing having a front wall that is substantially transparent and at least one light source positioned facing the front wall; and an electrical power supply device and an electronic control device connected to the at least one light source and positioned in at least one housing mounted on the shell; wherein the module is further configured to be positioned at least partially in the opening of a respective lateral portion of the shell, and wherein a rear part of the module is at least partially positioned inside the shell and a front part of the module is at least partially positioned outside the shell, such that the at least one light source can emit a beam toward the outside of the shell.

[0024] In a still further preferred and non-limiting embodiment, provided is lighting device for a protective helmet a shell having at least one lateral portion and at least one opening, wherein an opening is formed in the at least one lateral portion, the lighting device including: at least one module including a housing having a front wall that is substantially transparent and at least one light source positioned facing the front wall; and an electrical power supply device and an electronic control device connected to the at least one light source and positioned in at least one housing mounted on the shell; wherein the module is further configured to be positioned at least partially in the opening of the at least one lateral portion of the shell, and wherein a rear part of the module is at least partially positioned inside the shell and a front part of the module is at least partially positioned outside the shell, such that the at least one light source can emit a beam toward the outside of the shell.

[0025] These and other features and characteristics of the present invention, as well as the methods of operation and functions of the related elements of structures and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following description and the appended claims with reference to the accompanying drawings, all of which form a part of this specification, wherein like reference numerals designate corresponding parts in the various figures. It is to be expressly understood, however, that the drawings are for the purpose of illustration and description only and are not intended as a definition of the limits of the invention. As used in the specification and the claims, the singular form of "a", "an", and "the" include plural referents unless the context clearly dictates otherwise.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026]

Fig. 1 is a perspective view of a helmet fitted with a lighting device according to the principles of the

present invention;

Fig. 2 is a detailed perspective view of the helmet of Fig. 1, showing a lateral portion of the shell of the helmet;

Fig. 3 is a perspective view of the lighting device of Fig. 1;

Fig. 4 is a perspective view of a first module of the lighting device of Fig. 1, viewed laterally from the inside;

Fig. 5 is a perspective view of the first module of the lighting device of Fig. 4, viewed laterally from the outside;

Fig. 6 is a perspective view of the first module of the lighting device of Fig. 4, viewed laterally from above;

Fig. 7 is a perspective view of the a second module of the lighting device of Fig. 1, viewed laterally from the inside with the housing closed;

Fig. 8 is a perspective view of the second module of the lighting device of Fig. 7, viewed laterally from the outside;

Fig. 9 is a perspective view of the second module of the lighting device of Fig. 7, viewed laterally from the inside with the housing open;

Fig. 10 is a side schematic view of the position of two light sources of a helmet fitted with a lighting device according to the principles of the present invention;

Fig. 11 is a top schematic view of the position of two light sources of a helmet fitted with a lighting device according to the principles of the present invention;

Fig. 12 is a perspective view of a shell of the helmet showing the openings or orifices made in the lateral portions according to the principles of the present invention;

Fig. 13 is a detailed perspective view of a shell with a mounted lighting device according to the principles of the present invention;

Fig. 14 is a side view of a helmet fitted with the lighting device according to the principles of the present invention;

Fig. 15 is a sectional view of the helmet of Fig. 14;

Fig. 16 is a schematic view of a user wearing a helmet fitted with a lighting device according to the principles of the present invention; and

Fig. 17 is a schematic view of a user wearing a helmet fitted with a lighting device according to the principles of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0027] For purposes of the description hereinafter, the terms "end", "upper", "lower", "right", "left", "vertical", "horizontal", "top", "bottom", "lateral", "longitudinal" and derivatives thereof shall relate to the invention as it is oriented in the drawing figures. However, it is to be understood that the invention may assume various alternative variations and step sequences, except where ex-

pressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification, are simply exemplary embodiments of the invention. Hence, specific dimensions and other physical characteristics related to the embodiments disclosed herein are not to be considered as limiting.

[0028] The present invention relates to a helmet and a lighting device, as illustrated in certain preferred and non-limiting embodiments in Figs. 1-17.

[0029] As illustrated in one preferred and non-limiting embodiment in Fig. 1, a helmet 1 includes a rigid shell 2 and may additionally include a face shield 3. The helmet 1 may also include an eye shield, and an impact-absorbing cap, a lining aimed at the comfort of the wearer, an adjustable headband, and a chinstrap (not depicted). The shell 2, intended to cover the head of the wearer, is, for example, made of a composite or thermoplastic material. It has a longitudinal plane of symmetry P. The helmet 1 is described in the position of use, namely in the position it occupies when in place on the head of the wearer standing upright and straight, as depicted in Figs. 16 and 17. The transverse direction Y is defined as being the direction orthogonal to the plane P, this direction therefore being substantially horizontal. The longitudinal direction X is defined as being the direction orthogonal to Y and substantially horizontal, and the direction Z is the vertical direction. The term "inside" is used to denote an element closer to the head of the wearer, as opposed to the term "outside". The terms "upper", "lower", "top", and "bottom" are used with reference to the direction Z. The terms "front" and "rear" are used with reference to the direction X. The terms "lateral", "left", "right", and "transverse" are used with reference to the direction Y.

[0030] As shown in one preferred and non-limiting embodiment, the shell 2 has a spherical overall shape and has a face opening 4 for the face of the wearer. The shell 2 includes: a front portion 5, situated above the face opening 4, an upper portion 6, a rear portion 7 extending from the upper portion 6 as far as the nape of the wearer, and a left lateral portion and right lateral portion 8, each extending from the upper portion 6 on each side of the face opening 4. The lateral portions 8 of the shell 2 can be inclined towards one another with respect to the longitudinal plane of symmetry P, as can be seen in Fig. 13.

[0031] As may be seen, for example, in Fig. 12, each lateral portion 8 has an inward depression 9. In addition, as illustrated in Fig. 1, a plate 10 is fixed to each lateral portion 8 of the shell 2 so as to at least partially cover this depression 9. In Figs. 12 to 14, the plate 10 is not depicted in order to leave certain features of the invention visible, particularly the lighting device and the corresponding openings or orifices in the shell 2. Advantageously, provision may be made for the plates 10 to lie substantially flush with those zones of the helmet 1 that are situated around the depression 9, so that in this zone the shell 2 has an external surface with practically no discontinuity. The plate 10 may also serve to attach a

device for connecting a breathing mask.

[0032] A through-orifice or opening 12 is formed in each of the lateral portions 8 of the shell 2. In the embodiment depicted, as may be seen more particularly in Fig. 12, the opening or orifice 12 has a rear portion 13 of substantially rectangular overall shape, and a front portion 14 of substantially rectangular overall shape (but of narrower width). The opening or orifice 12 is elongated in a direction 11, which, in the position of use, is inclined downward and forward with respect to the horizontal (X) by an angle of between 35° and 55°, for example, of about 45° (see Fig. 17). The opening or orifice 12 has a rear edge 15, which in this embodiment, is substantially straight and a front edge 16, which is curved. The openings or orifices 12 are preferably formed in the depressions 9 of the lateral portions 8 of the shell 2. Each plate 10 covers the corresponding depression 9 opposite the opening or orifice 12, and thus with the lateral portion 8, creates a space that is substantially closed (except at the rear).

[0033] In this preferred and non-limiting embodiment, each plate 10 includes a lateral wall 17 that is opaque and several transparent zones that allow light through, including: a front wall 18 which, in the position of use, is partly oriented downward (Fig. 17); a lower wall 19 which, in the position of use, is partly oriented rearward (Fig. 17); a front edging 20 and a lower edging 21 of the lateral wall 17, which are respectively positioned with respect to the front wall 18 and lower wall 19. According to one preferred and non-limiting embodiment of the invention, the helmet 1 may also, as required, be fitted with a lighting device 22 that is mounted on the shell 2. The lighting device 22, illustrated, for example, in Fig. 3, includes two lateral modules 23, 24, positioned at a right module and a left module, respectively, which are connected by an electrical cable 29.

[0034] Although the description is given for the case of a lighting device including two modules connected by a cable, it will be noted that the invention is not restricted to this embodiment; but that, more generally, the lighting device according to one preferred and non-limiting embodiment of the invention includes: (i) at least one module, which in a housing contains at least one light source and which is mounted in an opening or orifice of a lateral portion of the shell; and (ii) an electrical power supply device and an electronic control device, which are both connected to the light source or sources and each of which is located in at least one casing mounted on the shell, where the casing may be separate from or the same as the housing.

[0035] In the embodiment depicted, each module 23, 24 includes a housing 25, which has a substantially parallelepiped portion 26 situated at the rear, and an appendage 27 that protrudes forward and outward from the portion 26, in the fitted position. The cable 29 is fixed to the rear of each of the modules 23, 24. In one preferred and non-limiting embodiment, the maximum dimensions of the modules are as follows: thickness (along Y) of

about 15 mm, length (along the axis 11 in the fitted position) of about 80 mm, and width of about 40 mm. The weight of each module 23, 24 preferably does not exceed 100 g (not including the electrical power supply device).

[0036] Housed in the housing 25 and, more specifically, in the appendage 27, is at least one light source, typically a light-emitting diode (LED). In the embodiment depicted, each housing 25 contains a first LED 31 and a second LED 32. As an alternative, a single light source could be provided, associated with an optical device to produce two beams from the beam emitted by the single light source. In order for the light emitted by the LEDs 31, 32 to be able to pass through, the housing 25 and, more specifically, the appendage 27, has a transparent front wall 28 opposite which the LEDs 31, 32 are positioned.

[0037] A first module, in this embodiment the right-hand module 23 illustrated in Figs. 4-6, includes an electronic control device 35 housed in the housing 25. This module 23 also includes an actuator, such as a button 36, which is designed to be easy to operate, using a gloved hand, simply by pressing it. The button 36 may preferably be situated below the housing 25, on the inside of the shell 2 when the lighting device 22 is in the fitted position. A second module, in this instance the left-hand module 24 illustrated in Figs. 7 to 9, includes an electrical power supply device 37 housed in the housing 25. This may be a battery or power cells, which may or may not be rechargeable.

[0038] To make the electrical power supply device 37 easier to replace, it is preferable for the housing 25 of this module 24 to be able to be opened simply, without the loss of parts. To achieve this, and in one preferred and non-limiting embodiment, provided is a housing 25 that includes a base 38 and a pivoting cover 39, which can be held in the closed position by mutual clipping members 40. The electrical power supply device 37 can be changed without having to remove the lighting device 22 from the shell 2. Advantageously, the autonomy of the electrical power supply device 37 may be at least 5 hours (in the case of rechargeable batteries) up to 10 hours (in the case of disposable batteries) at 100% nominal output power and a temperature of 20 °C. A specific pattern of flashing of the LEDs 31, 32 may be provided in order to inform the user of the remaining level of power.

[0039] In this preferred and non-limiting embodiment, each module 23, 24 is removably mounted in the opening or orifice 12 of a lateral portion 8 of the shell 2. In operation, a module 23, 24 is inserted into the corresponding opening or orifice 12 from the inside of the shell 2, from the rear forward, substantially in the direction 11 in which the opening or orifice 12 extends. When the lighting device 22 is in the fitted position on the shell 2, the rear part of the module 23, 24 is located inside the shell 2 and the front part of the module 23, 24 is located outside the shell 2. For example, as depicted in Figs. 14 and 15, the substantially parallelepiped portion 26 of the module 23, 24 is situated inside the shell 2, while the appendage 27 is

situated outside the shell 2, such that the LEDs 31, 32 can emit light to the outside of the shell 2.

[0040] On account of the geometry of the module 23, 24, in the fitted position, the front part of each module 23, 24 is substantially adjacent the outer face 41 of the shell 2, and the rear part of each module 23, 24 is substantially adjacent the inner face 42 of the shell 2. This is due, in particular, to the position of the appendage 27, which protrudes forward and outward in relation to the portion 26, and to the slightly curved profile of the module 23, 24, when viewed from above, as illustrated in Fig. 6. Thus, when the lateral portions 8 of the shell 2 are inclined toward one another with respect to the longitudinal plane of symmetry P, the modules 23, 24 are then positioned roughly parallel to the plane P (see Fig. 13).

[0041] There are a number of possible arrangements that may be made to ensure that the modules 23, 24 are correctly positioned in the openings or orifices 12. First, and in one preferred and non-limiting embodiment, the outline of the opening or orifice 12 (i.e., the substantially rectangular rear portion 13 and the narrower rectangular front portion 14) correspond to the shape of the module 23, 24 (i.e., to the portion 26 and the appendage 27 respectively). In addition, and in another preferred and non-limiting embodiment, an end stop is used to limit the insertion travel of the module 23, 24 into the opening or orifice 12, and to inform the user that the module is correctly in position. In one preferred and non-limiting embodiment, the end stop includes a shoulder 43 arranged on the inside of the module 23, 24, between the portion 26 and the appendage 27. This shoulder 43, for example, includes, on its front face, a protrusion situated at the front of the housing 25. In the fitted position, the shoulder 43 comes into abutment against the edge 45 of the opening or orifice 12 situated between the rear 13 and front 14 portions of the opening or orifice 12.

[0042] Further, in another preferred and non-limiting embodiment, each module 23, 24 includes an arrangement for removable locking in the fitted position in the corresponding opening or orifice 12. This arrangement may include the aforementioned shoulder 43. Further, a spigot 44 may be provided, protruding outward from the housing to the rear of the shoulder 43. This spigot 44 is positioned so that it comes into abutment against the rear edge 15 of the opening or orifice 12, as illustrated in Fig. 14. Thus, the module 23, 24 is held in place in the opening or orifice 12, which it cannot leave unexpectedly. However, simply by pulling the module 23, 24 or the cable 29 backward, the user can make the spigot 44 pass behind the rear edge 15, and thereby extract the module 23, 24 from the opening or orifice 12. The robustness of the cable 29 and of the system that connects it to the modules 23, 24 is such that, under normal conditions of use and up to a certain limited number of pulls, there is no risk of it pulling out. In the fitted position, as depicted notably in Fig. 13, the cable 29 is housed inside the shell 2. More specifically, in the position of use, the cable 29 extends along the interior face of the shell 2, behind the head of

the wearer of the helmet 1. Its length is preferably configured so that it does not drop below the lower edge of the helmet 1. By way of example, the length of the cable 29 may be less than 35 cm.

[0043] The light sources, in this instance the LEDs 31, 32, are now described more specifically hereinafter. In one preferred and non-limiting embodiment, the modules 23, 24 are identical with respect to the layout of the LEDs 31, 32 in order to provide lighting that is symmetric about the plane P. When the modules 23, 24 are mounted on the shell 2 and the plates 10 are in position, the LEDs 31, 32 are situated opposite transparent zones of the plates, more specifically opposite the front wall 18 and the lower wall 19 (Fig. 17). As illustrated in Figs. 10, 11, 16 and 17, each module 23, 24 includes a first LED 31 able to emit a first light beam 51 directed forward and a second LED 32 able to emit a second light beam 52 directed downward.

[0044] As used herein, the term "beam" refers to one or more rays of light, preferably forming a cone and having an axis, respectively a first axis 53 and a second axis 54. The beams 51, 52 for example form cones with vertex angles of the order of 20° to 40°, for example of around 30°. For reasons of compactness, and in one preferred and non-limiting embodiment, provision is made for the first LED 31 to be located below the second LED 32. In the position of use, the axis 53 of the first light beam 51 is substantially parallel to the longitudinal plane of symmetry P and is inclined downward, with respect to the horizontal, by an angle (α) of between 0° and 15°, for example of around 11°. Further, in the position of use, the axis 54 of the second light beam 52 is: inclined downward, with respect to the horizontal, by an angle (β) of between 20° and 40°, for example of around 30°; and inclined inward, with respect to the longitudinal plane of symmetry, by an angle (γ) of between 0° and 10°, for example between 0° and 5°.

[0045] Accordingly, the helmet 1 can be fitted with a lighting device 22 that provides lighting in its near vicinity, such as around 40 to 60 cm for example, both forward, in the natural direction of the gaze (based on the first beam 51) and toward the hands (based to the second beam 52). As illustrated in Fig. 16, the two beams 51, 52 on one and the same side of the helmet 1 may partially overlap in order to allow the total illumination of a zone 55 of oval or circular contour, approximately 1 or 2 m from the wearer of the helmet 1. This zone 55 extends over an angle θ (in a vertical plane substantially in the middle of the two beams) of between 40° and 60°, for example, on the order of 50° (see Fig. 17). For preference, at a range of 2 m, the two modules 23, 24 may provide uniform lighting over a circle of diameter 1 m. The power may be 24 lux at 2 m (e.g., 4 LEDs focused at a single point).

[0046] In this manner, the present invention provides an improvement with respect to existing systems and arrangements by supplying a modifiable helmet that can, as required, be fitted with a close-lighting device that is

compact, robust, and easy to fit and to remove. The presently-described invention is not restricted to the embodiment described hereinabove by way of example but that it encompasses all technical equivalents and variants of the arrangements described and combinations thereof.

[0047] Although the invention has been described in detail for the purpose of illustration based on what is currently considered to be the most practical and preferred embodiments, it is to be understood that such detail is solely for that purpose and that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover modifications and equivalent arrangements that are within the scope of the appended claims. For example, it is to be understood that the present invention contemplates that, to the extent possible, one or more features of any embodiment can be combined with one or more features of any other embodiment.

Claims

1. A protective helmet comprising:

a shell exhibiting a longitudinal plane of symmetry (P) and comprising left and right lateral portions (8), an opening (12) formed in at least one of the lateral portions (8);

a lighting device (22) comprising:

at least one module (23, 24) which comprises a housing (25) exhibiting a front wall (28) that is transparent and containing at least one light source (31, 32) positioned facing said transparent front wall (28) ;
an electrical power supply device (37) and an electronic control device (35) both connected to the light source or sources and each positioned in at least one housing (25) mounted on the shell (2);

the module (23, 24) being intended to be fitted, removably, inside the opening (12) of the lateral portion (8) of the shell (2) so that the rear part of the module (23, 24) is situated inside the shell (2) and so that the front part of the module (23, 24) is situated outside the shell (2), so that the light source (31, 32) can emit a beam (51, 52) toward the outside of the shell (2).

2. The helmet as claimed in claim 1, wherein the lateral portion (8) comprises an inward depression (9) in which the opening (12) is formed and a plate (10) which at least partially covers the depression (9) facing the opening (12) and which lies substantially flush with those zones of the shell (2) that are situated around the depression (9).

3. The helmet as claimed in claim 2, wherein the plate

(10) comprises a lateral wall (17) that is opaque and a front wall (18) and/or a lower wall (19) that is/are transparent.

4. The helmet as claimed in claim 2 or 3, wherein the plate (10) comprises an opaque lateral wall (17) having a front edging (20) and/or a lower edging (21) that is/are transparent.

5. The helmet as claimed in one of claims 1 to 4, wherein, in the fitted position, the front part of the module (23, 24) is substantially adjacent the outer face (41) of the shell (2) and the rear part of the module (23, 24) is substantially adjacent the inner face (42) of the shell (2).

6. The helmet as claimed in one of claims 1 to 5, wherein the lateral portions (8) of the shell (2) are inclined toward one another with respect to the longitudinal plane of symmetry (P) and wherein the module (23, 24) is arranged substantially parallel to said plane (P).

7. The helmet as claimed in one of claims 1 to 6, wherein the module (23, 24) comprises a substantially parallelepiped portion (26) and an appendage (27) which contains the light source or sources (31, 32) and which protrudes forward and outward from the substantially parallelepiped portion (26), in the fitted position.

8. The helmet as claimed in one of claims 1 to 7, wherein the module (23, 24) comprises a first light source (31) able to emit a first light beam (51) directed forward and a second light source (32) able to emit a second light beam (52) directed downward.

9. The helmet as claimed in one of claims 1 to 7, wherein the module (23, 24) comprises a single light source associated with an optical device designed to produce, from the beam emitted by the single light source, a first light beam (51) directed forward and a second light beam (52) directed downward.

10. The helmet as claimed in claim 8 or 9, wherein the light source or sources (31, 32) and the optical device, if present, are arranged so that, in the position of use, the axis (53) of the first light beam (51) is substantially parallel to the longitudinal plane of symmetry (P) and is inclined downward, with respect to the horizontal, by an angle (α) of between 0° and 15°.

11. The helmet as claimed in one of claims 8 to 10, wherein the light source or sources (31, 32) and the optical device, if present, are arranged so that, in the position of use, the axis (54) of the second light beam (52) is: inclined downward, with respect to the horizontal, by an angle (β) of between 20 and 40°, for

example of around 30°; and inclined inward, with respect of the longitudinal plane of symmetry (P), by an angle (γ) of between 0 and 10°, or even of between 0 and 5°.

12. The helmet as claimed in one of claims 1 to 11, wherein the module (23, 24) comprises removable-locking means (43, 44) that removably lock it in the position in which it is fitted in the opening (12), the removable-locking means comprising for example at least one end stop intended to collaborate with an edge of the opening (12).
13. The helmet as claimed in one of claims 1 to 12, wherein a opening (12) is formed in each of the lateral portions (8) of the shell (2) and wherein the lighting device (22) comprises two lateral modules (23, 24) which are connected by an electric cable (29), each module (23, 24) comprising a housing (25) exhibiting a front wall (28) that is transparent and containing at least one light source (31, 32) positioned facing said transparent front wall (28), an electrical power supply device (37) and an electronic control device (35) each being housed in at least one of the housings (25), each module (23, 24) being intended to be fitted removably into the opening (12) of a respective lateral portion (8) of the shell (2) so that the rear part of the module (23, 24) is situated inside the shell (2) and so that the front part of the module (23, 24) is situated outside the shell (2), so that the light source (31, 32) can emit a beam (51, 52) toward the outside of the shell (2), the cable (29) being held inside the shell (2) in the fitted position.
14. The helmet as claimed in claim 13, wherein the cable (29) is fixed to the rear of each of the modules (23, 24) and wherein, in the position of use, the cable (29) runs along the interior face of the shell (2), behind the head of the wearer.
15. The helmet as claimed in claim 13 or 14, wherein the electrical power supply device (37) is housed in the housing (25) of one of the modules (23, 24) and wherein the electronic control device (35) is housed in the housing (25) of the other of the modules (23, 24).

Patentansprüche

1. Schutzhelm, umfassend:

eine Schale, die eine Längssymmetrieebene (P) aufweist und linke und rechte Seitenabschnitte (8) umfasst, eine Öffnung (12), die in zumindest einem der Seitenabschnitte (8) gebildet wird;
eine Beleuchtungsvorrichtung (22), umfassend:

zumindest ein Modul (23, 24), das ein Gehäuse (25) umfasst, das eine Vorderwand (28) aufweist, die transparent ist und zumindest eine Lichtquelle (31, 32) enthält, die der besagten transparenten Vorderwand (28) zugewandt ist;
eine Stromversorgungsvorrichtung (37) und eine elektronische Steuerungsvorrichtung (35), die beide mit der Lichtquelle oder -quellen verbunden sind, die jeweils in zumindest einem Gehäuse (25) positioniert sind, das auf der Schale (2) montiert ist; wobei das Modul (23, 24) vorgesehen ist, um abnehmbar innerhalb der Öffnung (12) des Seitenabschnitts (8) der Schale (2) montiert zu werden, sodass sich der hintere Teil des Moduls (23, 24) innerhalb der Schale (2) befindet und sodass sich der vordere Teil des Moduls (23, 24) außerhalb der Schale (2) befindet, sodass die Lichtquelle (31, 32) einen Strahl (51, 52) in Richtung der Außenseite der Schale (2) emittieren kann.

2. Helm nach Anspruch 1, wobei der Seitenabschnitt (8) eine Vertiefung (9) nach innen umfasst, in der die Öffnung (12) gebildet wird, und eine Platte (10), die zumindest teilweise die Vertiefung (9) abdeckt, der Öffnung (12) zugewandt ist, und die im Wesentlichen bündig mit diesen Zonen der Schale (2) liegt, die sich um die Vertiefung (9) herum befinden.
3. Helm nach Anspruch 2, wobei die Platte (10) eine Seitenwand (17) umfasst, die die opak ist, und eine Vorderwand (18) und/ oder eine untere Wand (19), die transparent ist/ sind.
4. Helm nach Anspruch 2 oder 3, wobei die Platte (10) eine opake Seitenwand (17) umfasst, die eine vordere Einfassung (20) und/ oder eine untere Einfassung (21) aufweist, die transparent ist/ sind.
5. Helm nach einem der Ansprüche 1 bis 4, wobei in der montierten Position der vordere Teil des Moduls (23, 24) im Wesentlichen an die Außenfläche (41) der Schale (2) angrenzt und der hintere Teil des Moduls (23, 24) im Wesentlichen an die Innenfläche (42) der Schale (2) angrenzt.
6. Helm nach einem der Ansprüche 1 bis 5, wobei die Seitenabschnitte (8) der Schale (2) im Verhältnis zur Längssymmetrieebene (P) zueinander geneigt sind, und wobei das Modul (23, 24) im Wesentlichen parallel zur besagten Ebene (P) angeordnet ist.
7. Helm nach einem der Ansprüche 1 bis 6, wobei das Modul (23, 24) einen im Wesentlichen quaderförmigen Abschnitt (26) und einen Ansatz (27) umfasst,

der die Lichtquelle oder -quellen (31, 32) enthält und der in der montierten Position nach vorne und außen aus dem im Wesentlichen quaderförmigen Abschnitt (26) hervorspringt.

8. Helm nach einem der Ansprüche 1 bis 7, wobei das Modul (23, 24) eine erste Lichtquelle (31) umfasst, die in der Lage ist, einen ersten Lichtstrahl (51) zu emittieren, der nach vorne gerichtet ist, und eine zweite Lichtquelle (32), die in der Lage ist, einen zweiten Lichtstrahl (52) zu emittieren, der nach unten gerichtet ist.
9. Helm nach einem der Ansprüche 1 bis 7, wobei das Modul (23, 24) eine einzige Lichtquelle umfasst, die einer optischen Vorrichtung zugeordnet ist, die gestaltet ist, um aus dem Strahl, der von der einzigen Lichtquelle emittiert wird, einen nach vorne gerichteten ersten Lichtstrahl (51) und einen zweiten nach unten gerichteten Lichtstrahl (52) zu erzeugen.
10. Helm nach Anspruch 8 oder 9, wobei die Lichtquelle oder -quellen (31, 32) und die optische Vorrichtung, falls vorhanden, angeordnet sind, sodass in der Nutzungsposition die Achse (53) des ersten Lichtstrahls (51) im Wesentlichen parallel zur Längssymmetrieebene (P) verläuft und im Verhältnis zur Horizontalen um einen Winkel (α) zwischen 0° und 15° nach unten geneigt ist.
11. Helm nach einem der Ansprüche 8 bis 10, wobei die Lichtquelle oder -quellen (31, 32) und die optische Vorrichtung, falls vorhanden, angeordnet sind, sodass in der Nutzungsposition die Achse (54) des zweiten Lichtstrahls (52) ist: im Verhältnis zur Horizontalen um einen Winkel (β) zwischen 20° und 40° , beispielsweise um etwa 30° nach unten geneigt; und im Verhältnis zur Längssymmetrieebene (P) um einen Winkel (γ) zwischen 0 und 10° , oder gar zwischen 0 und 5° nach innen geneigt.
12. Helm nach einem der Ansprüche 1 bis 11, wobei das Modul (23, 24) lösbare Verschlussmittel (43, 44) umfasst, die es lösbar in der Position verschließen, in der es in der Öffnung (12) montiert ist, wobei die lösbaren Verschlussmittel beispielsweise zumindest einen Endanschlag umfassen, der vorgesehen ist, um mit einer Kante der Öffnung (12) zusammenzuwirken.
13. Helm nach einem der Ansprüche 1 bis 12, wobei eine Öffnung (12) in jedem der Seitenabschnitte (8) der Schale (2) gebildet wird, und wobei die Beleuchtungsvorrichtung (22) zwei Seitenmodule (23, 24) umfasst, die durch ein Elektrokabel (29) verbunden sind, wobei jedes Modul (23, 24) ein Gehäuse (25) umfasst, das eine Vorderwand (28) aufweist, die transparent ist und zumindest eine Lichtquelle (31,

32) enthält, die der besagten transparenten Vorderwand (28) zugewandt ist, eine Stromversorgungsvorrichtung (37) und eine elektronische Steuerungsvorrichtung (35), die beide mit der (den) Lichtquelle oder -quellen verbunden sind, die jeweils in zumindest einem der Gehäuse (25) aufgenommen sind, wobei jedes Modul (23, 24) vorgesehen ist, um abnehmbar innerhalb der Öffnung (12) eines jeweiligen Seitenabschnitts (8) der Schale (2) montiert zu werden, sodass sich der hintere Teil des Moduls (23, 24) innerhalb der Schale (2) befindet und sodass sich der vordere Teil des Moduls (23, 24) außerhalb der Schale (2) befindet, sodass die Lichtquelle (31, 32) einen Strahl (51, 52) in Richtung der Außenseite der Schale (2) emittieren kann, wobei das Kabel (29) in der montierten Position innerhalb der Schale (2) gehalten wird.

14. Helm nach Anspruch 13, wobei das Kabel (29) an der Rückseite eines jeden der Module (23, 24) befestigt ist, und wobei in der Nutzungsposition das Kabel (29) entlang der Innenseite der Schale (2) hinter dem Kopf des Trägers verläuft.

15. Helm nach Anspruch 13 oder 14, wobei die Stromversorgungsvorrichtung (37) im Gehäuse (25) eines der Module (23, 24) aufgenommen ist, und wobei die elektronische Steuerungsvorrichtung (35) im Gehäuse (25) des anderen der Module (23, 24) aufgenommen ist.

Revendications

1. Casque de protection comprenant :

- une coque (2) présentant un plan de symétrie longitudinal (P) et comportant des portions latérales (8) gauche et droite, un orifice (12) traversant étant ménagé dans au moins l'une des portions latérales (8) ;
- un dispositif d'éclairage (22) comprenant :

- au moins un module (23, 24) qui comporte un boîtier (25) présentant une paroi avant (28) transparente et contenant au moins une source lumineuse (31, 32) disposée en regard de ladite paroi avant (28) transparente ;
- un dispositif d'alimentation électrique (37) et un dispositif de commande électronique (35) connectés à la ou aux sources lumineuses et disposés chacun dans au moins un logement (25) monté sur la coque (2) ;

le module (23, 24) étant destiné à être monté, de façon amovible, dans l'orifice (12) de la portion latérale (8) de la coque (2), de sorte que la partie arrière

- du module (23, 24) soit située à l'intérieur de la coque (2) et que la partie avant du module (23, 24) soit située à l'extérieur de la coque (2), afin que la source lumineuse (31, 32) puisse émettre un faisceau (51, 52) vers l'extérieur de la coque (2).
2. Casque selon la revendication 1, **caractérisé en ce que** la portion latérale (8) comporte un renforcement (9) vers l'intérieur, dans lequel est ménagé l'orifice (12), et une plaque (10) qui recouvre au moins partiellement le renforcement (9) en regard de l'orifice (12) et qui affleure sensiblement les zones de la coque (2) situées autour du renforcement (9).
 3. Casque selon la revendication 2, **caractérisé en ce que** la plaque (10) comprend une paroi latérale (17) opaque et une paroi avant (18) et/ou une paroi inférieure (19) transparente.
 4. Casque selon la revendication 2 ou 3, **caractérisé en ce que** la plaque (10) comprend une paroi latérale (17) opaque possédant une bordure avant (20) et/ou une bordure inférieure (21) transparente.
 5. Casque selon l'une des revendications 1 à 4, **caractérisé en ce que**, en position montée, la partie avant du module (23, 24) est sensiblement adjacente à la face extérieure (41) de la coque (2) et la partie arrière du module (23, 24) est sensiblement adjacente à la face intérieure (42) de la coque (2).
 6. Casque selon l'une des revendications 1 à 5, **caractérisé en ce que** les portions latérales (8) de la coque (2) sont inclinées l'une vers l'autre par rapport au plan de symétrie longitudinal (P) et **en ce que** le module (23, 24) est disposé sensiblement parallèlement audit plan (P).
 7. Casque selon l'une des revendications 1 à 6, **caractérisé en ce que** le module (23, 24) comporte une portion (26) globalement parallélépipédique et un appendice (27) qui contient la ou les sources lumineuses (31, 32) et qui fait saillie de la portion (26) globalement parallélépipédique vers l'avant et vers l'extérieur, en position montée.
 8. Casque selon l'une des revendications 1 à 7, **caractérisé en ce que** le module (23, 24) comporte une première source lumineuse (31) apte à émettre un premier faisceau lumineux (51) dirigé vers l'avant et une deuxième source lumineuse (32) apte à émettre un deuxième faisceau lumineux (52) dirigé vers le bas.
 9. Casque selon l'une des revendications 1 à 8, **caractérisé en ce que** le module (23, 24) comporte une unique source lumineuse associée à un dispositif optique agencé pour produire, à partir du faisceau émis par l'unique source lumineuse, un premier faisceau lumineux (51) dirigé vers l'avant et un deuxième faisceau lumineux (52) dirigé vers le bas.
 10. Casque selon la revendication 8 ou 9, **caractérisé en ce que** la ou les sources lumineuses (31, 32) et l'éventuel dispositif optique sont agencés de sorte que, en position d'utilisation, l'axe (53) du premier faisceau lumineux (51) soit sensiblement parallèle au plan de symétrie longitudinal (P) et soit incliné vers le bas, par rapport à l'horizontale, d'un angle (α) compris entre 0° et 15°.
 11. Casque selon l'une des revendications 8 à 10, **caractérisé en ce que** la ou les sources lumineuses (31, 32) et l'éventuel dispositif optique sont agencés de sorte que, en position d'utilisation, l'axe (54) du deuxième faisceau lumineux (52) soit :
 - incliné vers le bas, par rapport à l'horizontale, d'un angle (β) compris entre 20 et 40°, par exemple voisin de 30° ;
 - et incliné vers l'intérieur, par rapport au plan de symétrie longitudinal (P), d'un angle (γ) compris entre 0 et 10°, voire entre 0 et 5°.
 12. Casque selon l'une des revendications 1 à 11, **caractérisé en ce que** le module (23, 24) comporte des moyens (43, 44) de blocage amovible en position montée dans l'orifice (12), les moyens (43, 44) de blocage amovible comprenant par exemple au moins une butée destinée à coopérer avec un bord (15, 16, 45) de l'orifice (12).
 13. Casque selon l'une des revendications 1 à 12, **caractérisé en ce qu'**un orifice (12) traversant est ménagé dans chacune des portions latérales (8) de la coque (2) et **en ce que** le dispositif d'éclairage (22) comprend deux modules (23, 24) latéraux reliés par un câble électrique (29), chaque module (23, 24) comportant un boîtier (25) présentant une paroi avant (28) transparente et contenant au moins une source lumineuse (31, 32) disposée en regard de ladite paroi avant (28) transparente, un dispositif d'alimentation électrique (37) et un dispositif de commande électronique (35) étant logés chacun dans au moins l'un des boîtiers (25), chaque module (23, 24) étant destiné à être monté, de façon amovible, dans l'orifice (12) d'une portion latérale (8) respective de la coque (2), de sorte que la partie arrière du module (23, 24) soit située à l'intérieur de la coque (2) et que la partie avant du module (23, 24) soit située à l'extérieur de la coque (2), afin que la source lumineuse (31, 32) puisse émettre un faisceau (51, 52) vers l'extérieur de la coque (2), le câble (29) étant logé à l'intérieur de la coque (2) en position montée.
 14. Casque selon la revendication 13, **caractérisé en**

ce que le câble (29) est fixé à l'arrière de chacun des modules (23, 24) et **en ce que**, en position d'utilisation, le câble (29) s'étend le long de la face intérieure de la coque (2), derrière la tête du porteur.

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15. Casque selon la revendication 13 ou 14, **caractérisé en ce que** le dispositif d'alimentation électrique (37) est logé dans le boîtier (25) de l'un des modules (23, 24) et **en ce que** le dispositif de commande électronique (35) est logé dans le boîtier (25) de l'autre des modules (23, 24).

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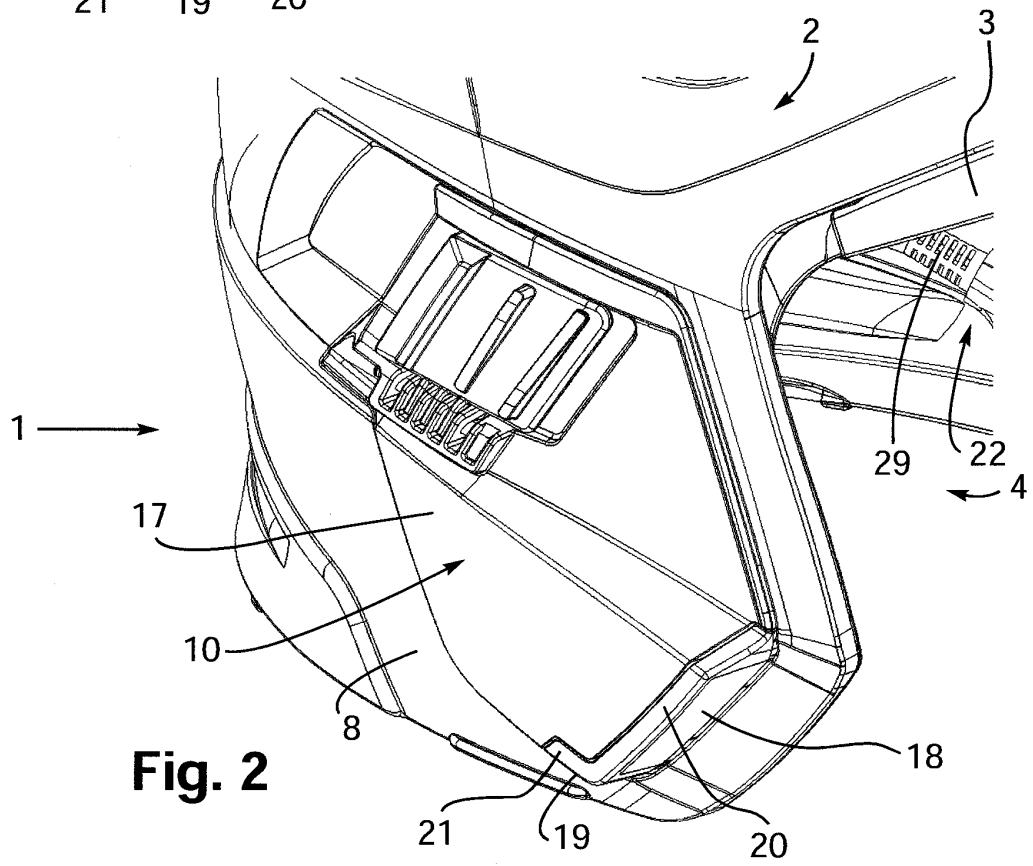
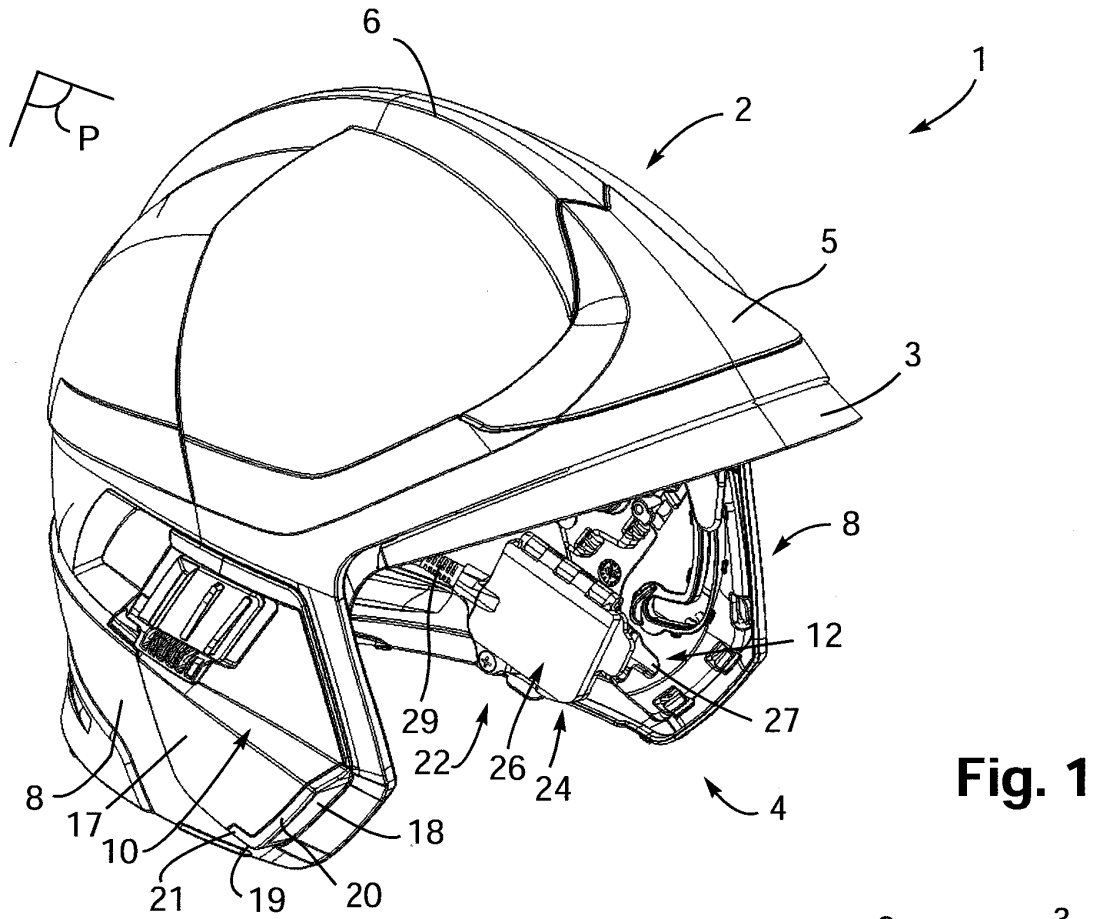
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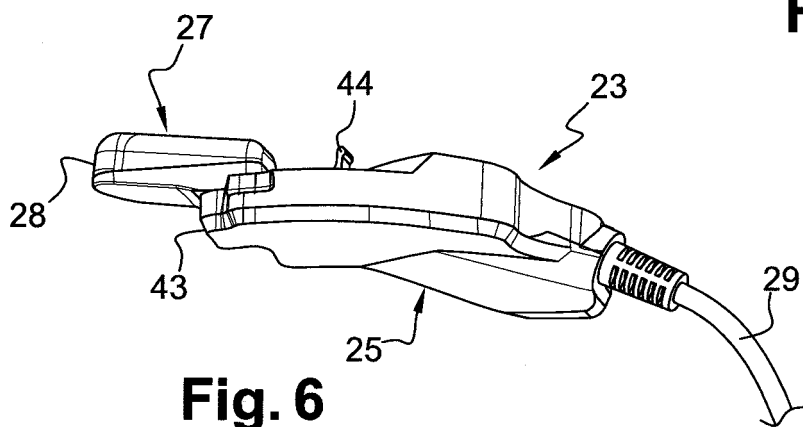
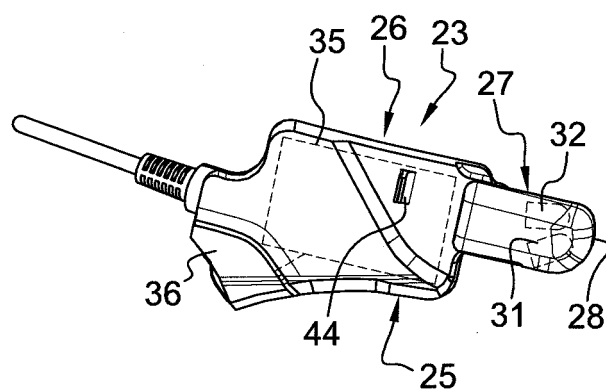
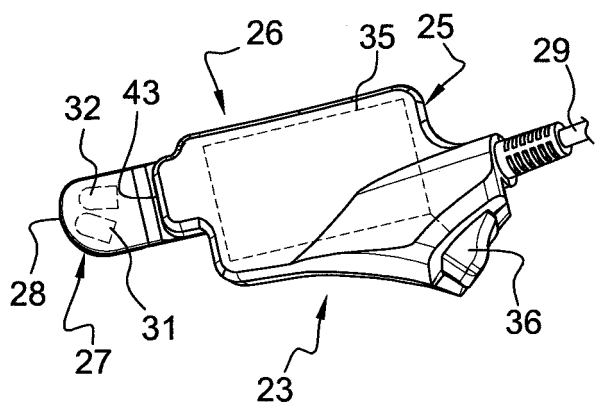
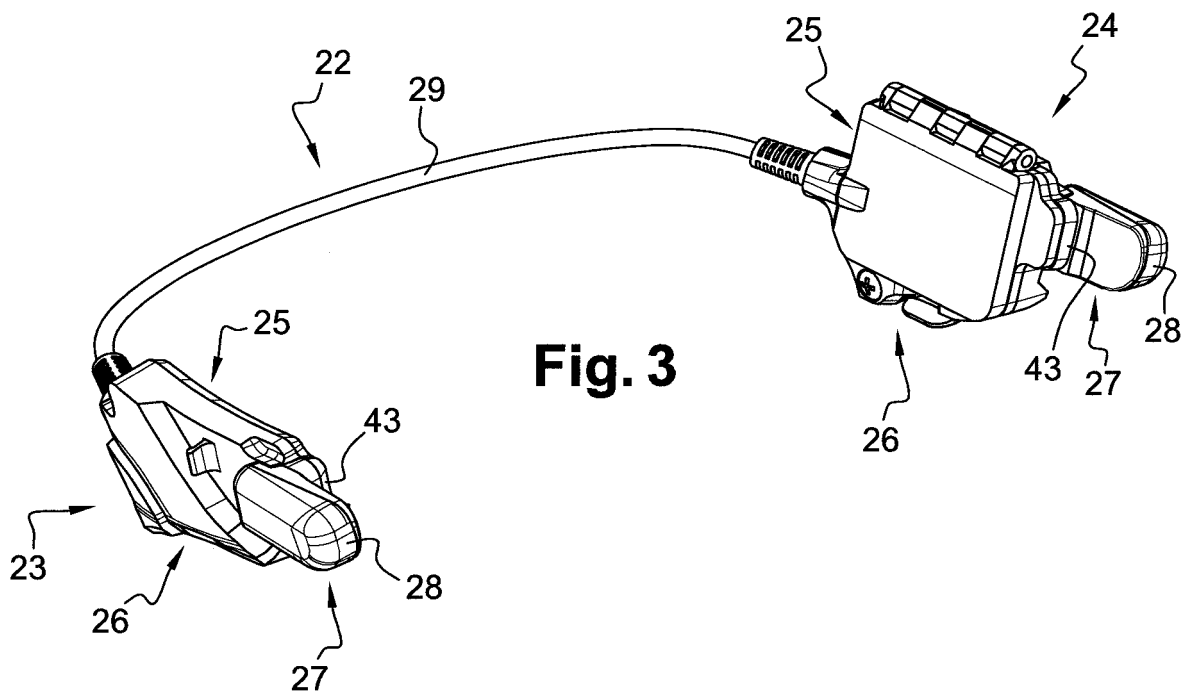
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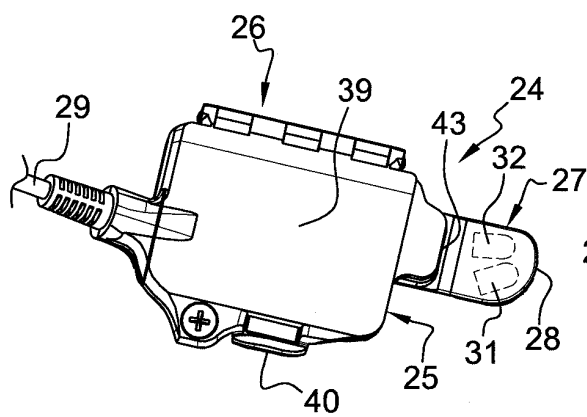


Fig. 7

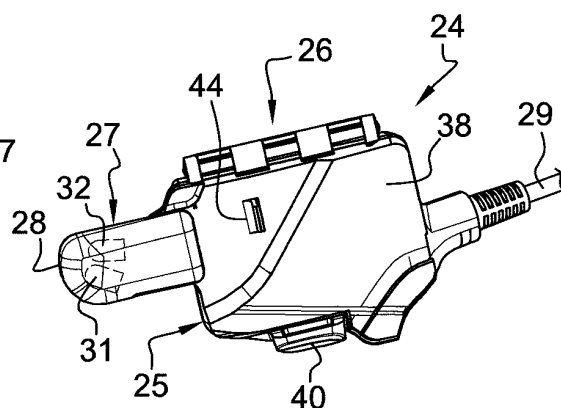


Fig. 8

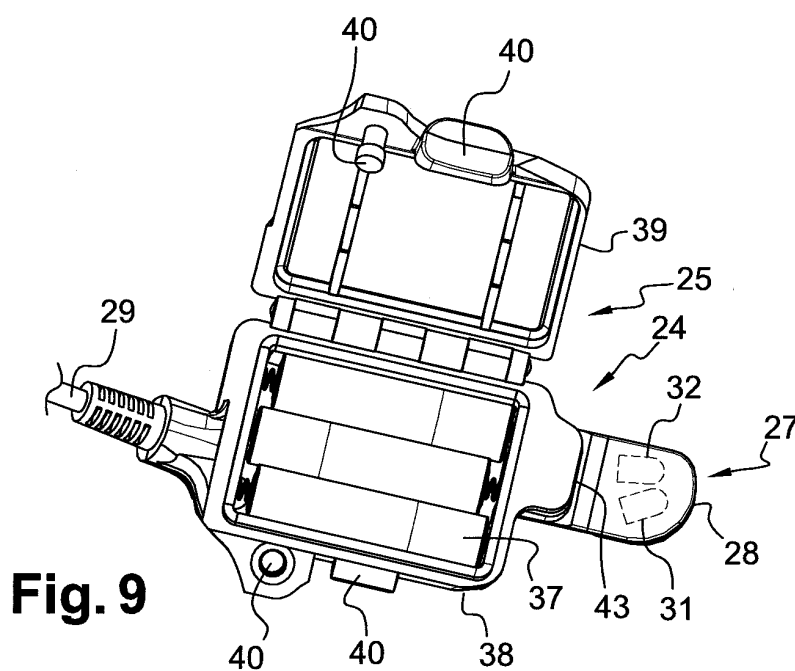


Fig. 9

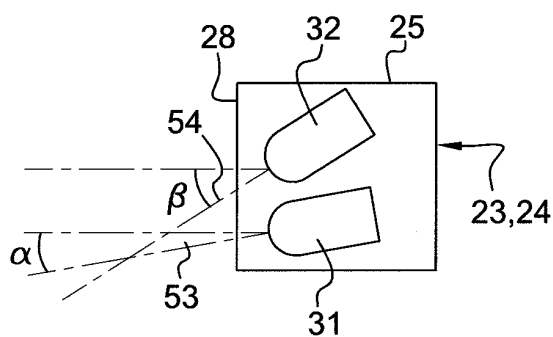


Fig. 10

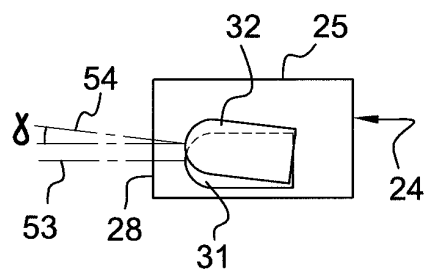


Fig. 11

Fig. 12

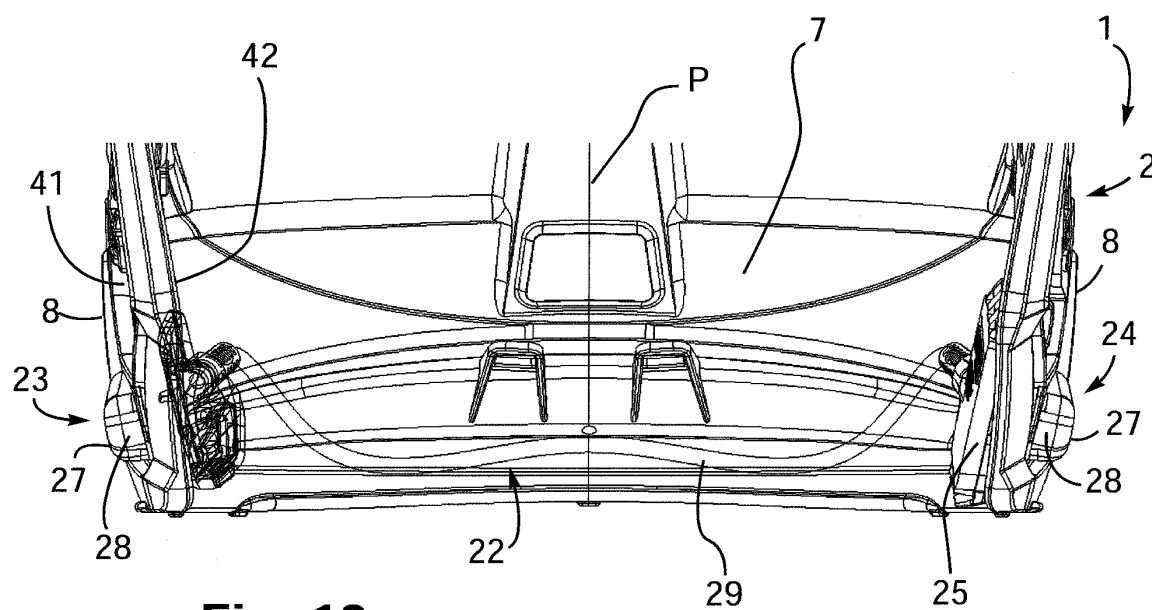
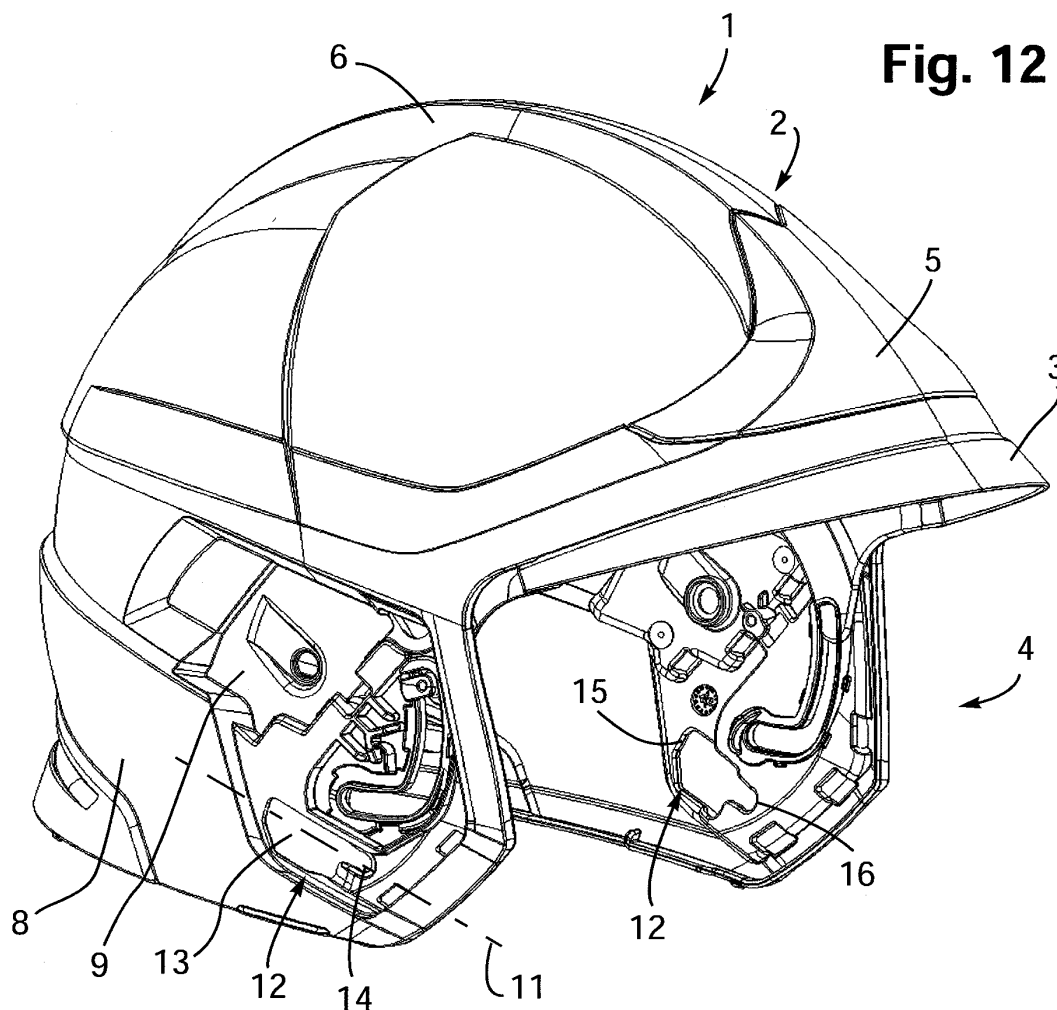


Fig. 13

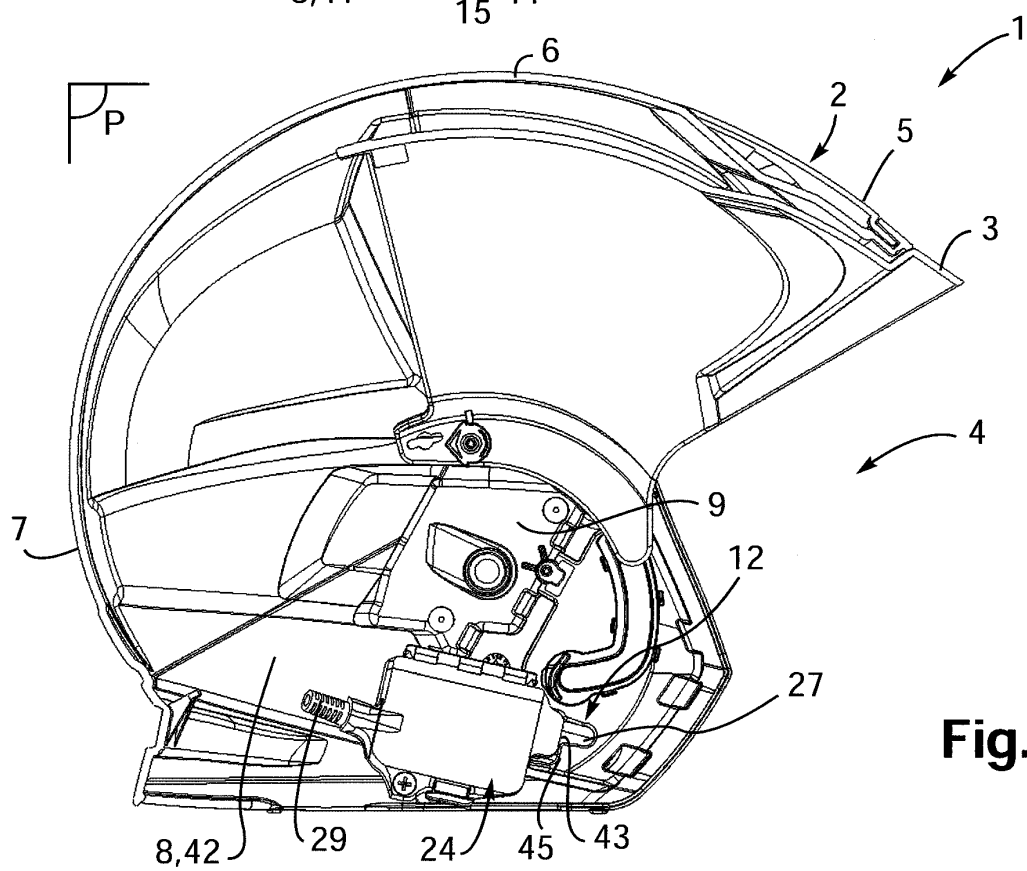
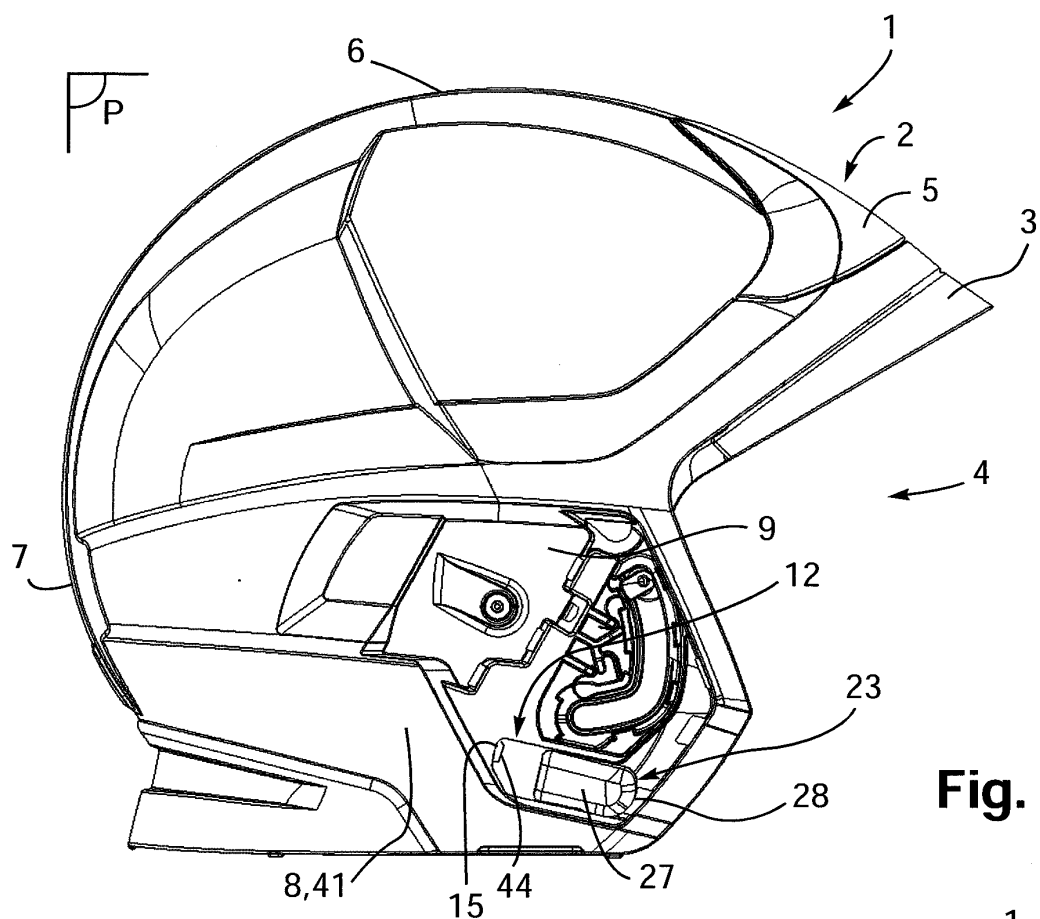


Fig. 16

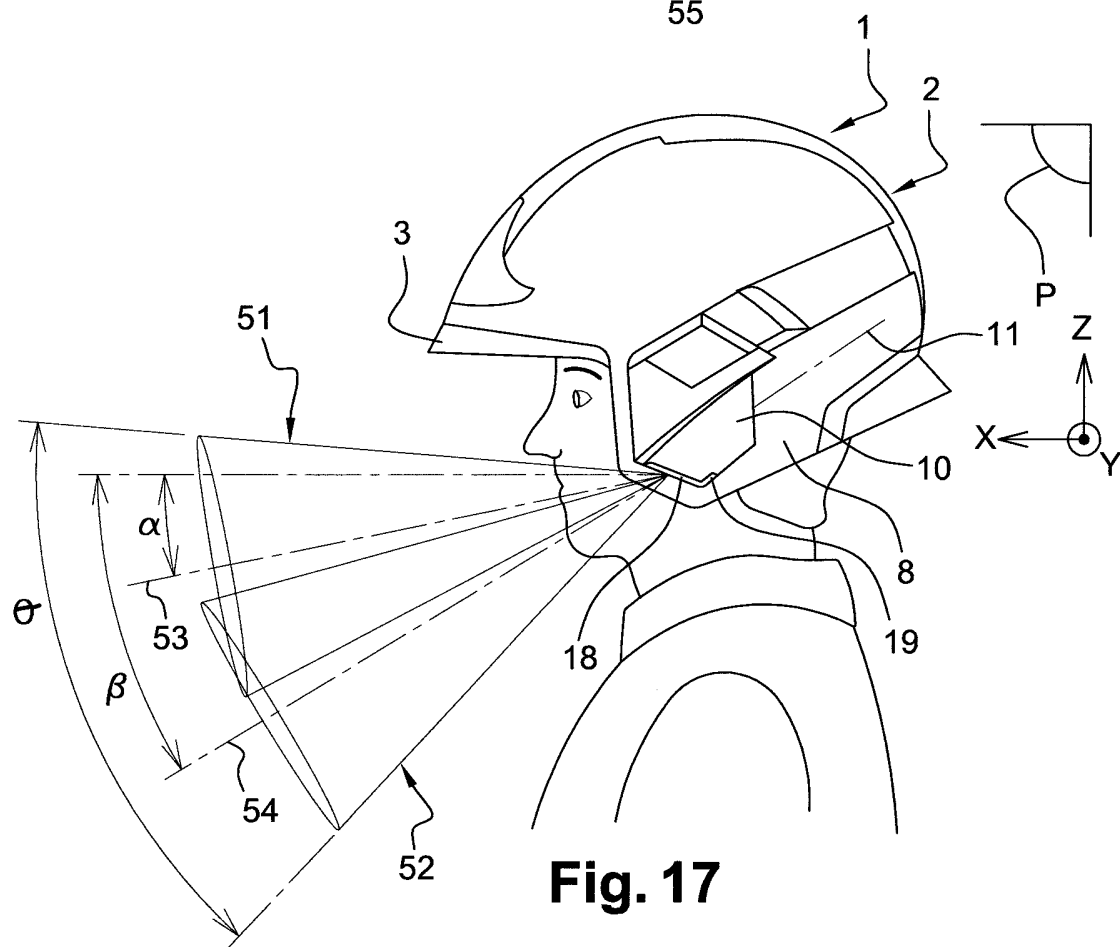
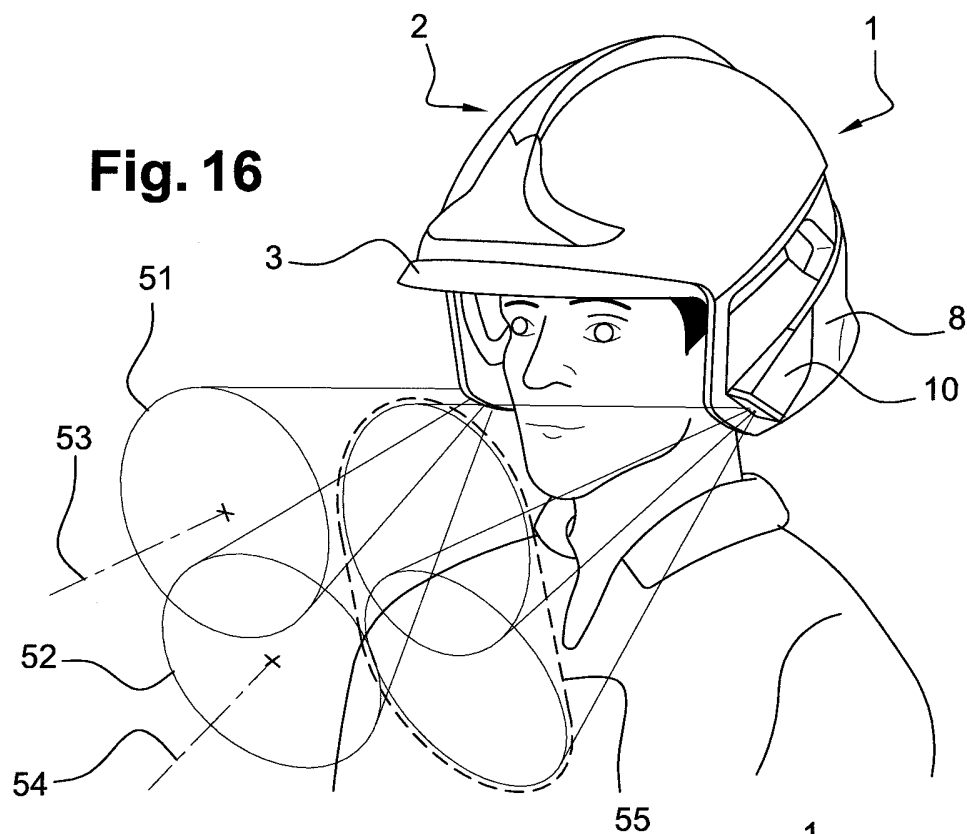


Fig. 17

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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