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(54) **HELMET WITH MICROPHONE-CARRYING ARM**

(57) A protective helmet (1), in particular for motor sports, is described, having an integrated audio communication system, comprising a rigid arm (3) in the shape of a chin guard carrying at its free end (3a) a microphone (20). The arm (3) is made as a piece separate from the shell (2) and is connected to the shell (2) by releasable coupling means (30, 10) so that it can, if necessary, be detached from the shell (2). The helmet (1) further comprises retaining means (4, 42; 5, 52; 61, 62; 72, 80, 86) for preventing unintentional release of said releasable coupling means (30, 10). The retaining means (4, 42; 5, 52; 61, 62; 72, 80, 86) comprise a screw (72) fixed to the arm (3) and protruding inwards with a head (76) thereof, an elastically flexible element (80) fixed to the shell (2) below the coupling portion (2a) and having a hole (84) in which the head (76) of the screw (72) engages, in the condition of attachment of the arm (3) to the shell (2), and a release member (86) operable by the user to elastically deform the elastically flexible element (80) so as to allow disengagement of the head (76) of the screw (72) from the hole (84).

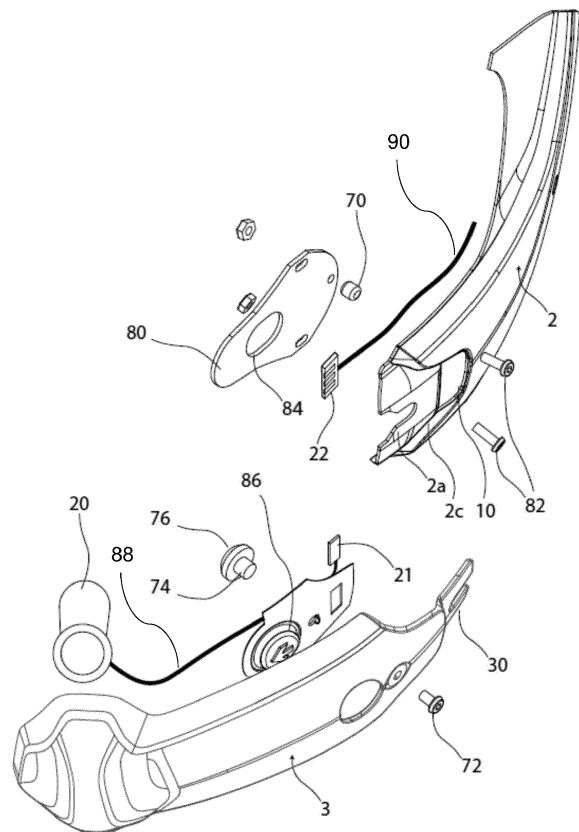


Fig.14

Description

Technical field of the invention

[0001] The present invention relates to the field of protective helmets, in particular to a protective helmet for motor sports with an integrated audio communication system.

State of the art

[0002] Protective helmets are known which comprise a rigid shell to be worn on the head to protect the same and which may or may not be provided with an eye visor. The helmets may have a rigid portion, called chin guard, extending from the shell to protect the chin and mouth, in which case they are known as full-face helmets. Helmets without a chin guard, on the other hand, are commonly known as open-face helmets or jet helmets.

[0003] Some helmets, especially those intended for sporting use, have an integrated audio communication system which enables the person wearing the helmet to communicate with other passengers on the vehicle (intercom) or with persons on the ground (telephone and/or radio system). The audio communication system comprises at least one loudspeaker placed in the shell, substantially aligned with the ear, and a microphone.

[0004] In known solutions, in case of open helmets the microphone is supported by a flexible stem extending from the shell towards the mouth of the user. Alternatively, open helmets are known in which the microphone is integrated in a rigid arm extending from a front portion of the shell in the form of a chin guard to face the user's mouth with its free end. This configuration is advantageous because, for example in carbon or fibreglass helmets, the arm is moulded together with the shell and therefore has a corresponding rigidity, as well as an aesthetic impact consistent with the rest of the helmet. In addition, unlike microphones supported by a flexible stem, it is particularly stable in the desired position, which is optimal for ensuring correct communication. The rigid arm in the form of a chin guard also provides a comfortable grip for the user, who can carry the helmet by holding it by the arm.

[0005] However, such known helmets have some drawbacks. When the helmet has a rigid arm in the form of a chin guard, in the event of an accident it has to be treated in particular situations like a full-face helmet, i.e. it has to be completely removed in order to free the wearer's face and provide the rescuers with freedom of intervention on the main airways (mouth and nose). This leads to a potential critical issue in the rescue intervention and may therefore jeopardize the rapidity of rescue.

[0006] WO 2020/230102, on which the preamble of independent claim 1 is based, discloses a helmet having a rigid arm bearing at its distal end a microphone of an integrated audio communication system, wherein the rigid arm is made as a separate piece from the shell and is

releasably connected thereto by a releasable coupling system, and wherein the helmet further comprises retaining means to prevent accidental opening of the coupling system. However, the coupling system of the helmet known from said prior art document, with the associated retaining means, is rather complex, bulky and heavy. Moreover, the retaining means of the helmet known from said prior art document are not capable of safely and reliably preventing accidental disconnection of the arm. In addition, this prior art document does not contain any teaching on how to realize the quick electrical connection of the microphone, which is essential to enable effective quick coupling of the arm.

Summary of the invention

[0007] It is an object of the present invention to provide a helmet with an integrated audio communication system that is not affected by the drawbacks of the prior art discussed above.

[0008] This and other objects are fully achieved according to the present invention by a helmet having the features defined in independent claim 1.

[0009] Other advantageous features of the invention are defined in the dependent claims, the subject-matter of which is intended to form an integral part of the following description. In summary, the invention is based on the idea of using, as retaining means to prevent accidental opening of the reversible coupling means, a screw fixed to the arm and protruding inwards with a head thereof, an elastically flexible element fixed to the shell below the attachment portion of the shell itself and having a hole in which the head of the screw engages, in the condition of attachment of the arm to the shell, and a release member operable by the user to elastically deform the elastically flexible element so as to allow the head of the screw to disengage from the hole.

[0010] By virtue of such a configuration of the retaining means, the coupling system is simpler, less bulky and lighter, but at the same time safer and more effective, than the prior art.

Brief description of the drawings

[0011] Further features and advantages of the helmet according to the invention will be more clearly apparent from the following description, given purely by way of non-limiting example with reference to the appended drawings, wherein:

- Figure 1 is an overall view of a helmet with a microphone-carrying rigid arm, shaped like a chin guard;
- Figure 2 shows in detail an attachment portion of the shell for attachment to the arm, with the arm being shown detached from this attachment portion of the shell;

- Figure 3 is a rear view of the detail of Figure 2;
- Figures 4a and 4b show a first embodiment (not forming part of the present invention) of retaining means for attaching the arm to the attachment portion of the shell, in a closed position (i.e. in the position where said retaining means prevent disengagement of the arm from the attachment portion of the shell), wherein Figure 4a is a sectional view of the arm and the attachment portion, and Figure 4b is a rear view of a slider forming part of said retaining means;
- Figures 5a and 5b correspond to Figures 4a and 4b, but show the retaining means in the open position (i.e. in the position where the retaining means enable the arm to be detached from the attachment portion of the shell);
- Figure 6 shows the arm detached from the attachment portion of the shell, in the case of the first embodiment of the retaining means of Figures 4a, 4b, 5a and 5b;
- Figures 7a and 7b show a second embodiment (not forming part of the present invention) of the retaining means, in the closed position and in the open position, respectively;
- Figures 8a to 8c show a third embodiment (not forming part of the present invention) of the retaining means, wherein Figure 8a is a perspective view of the arm disconnected from the attachment portion of the shell, and Figures 8b and 8c are longitudinal sectional views in which the retaining means are in the closed position and in the open position, respectively; and
- Figures 9 to 15 relate to a fourth embodiment of the retaining means, wherein Figure 9 is a perspective view of the arm, Figure 10 is a perspective view of the lateral portion of the shell to which the arm is intended to be coupled, Figures 11 and 12 show the arm and the above-mentioned lateral portion of the shell in the coupled condition and in the uncoupled condition, respectively, Figure 13 shows the elastically flexible element of the retaining means, Figure 14 is an exploded view of the arm and the aforementioned lateral portion of the shell, in which the related components of the integrated audio communication system are also shown, and Figure 15 is a sectional view of the arm and the aforementioned lateral portion of the shell, in the coupled condition, in which the related components of the integrated audio communication system are also shown.

Detailed description

[0012] With reference first to Figure 1, a helmet with

an integrated audio communication system is generally indicated 1.

[0013] The helmet 1 comprises a shell 2 for protecting a user's head. From a lateral portion of the shell 2 a rigid arm 3 extends in the form of a chin guard, in such a manner that a distal end 3a of the arm 3 is located, in use, near the mouth of the user. A microphone 20 of the audio communication system of the helmet 1 is supported on the distal end 3a of the arm 3.

[0014] According to an aspect of the invention, the arm 3 is detachably connected to the shell 2 by releasable coupling means. In particular, the arm 3 is provided, at a proximal end 3b thereof, with a first coupling member, preferably made as a male coupling member, arranged to releasably engage with a second coupling member, preferably made as a female coupling member, provided on the shell 2.

[0015] With reference to Figures 2 and 3, according to a preferred embodiment, the first coupling member is formed by a protruding tooth 30 extending from the proximal end 3b of the arm 3.

[0016] An attachment portion 2a for attachment of the arm 3 extends from the lateral portion of the shell 2. The aforementioned second coupling member is provided on the attachment portion 2a. In particular, according to a preferred embodiment, the second coupling member comprises a seat 10 into which the protruding tooth 30 of the arm 3 can be inserted.

[0017] The attachment portion 2a is offset with respect to the adjacent outer surface, indicated at 2b, of the lateral portion of the shell 2, that is, it defines an area of depression. A step 2c is thus formed between the outer surface 2b and the attachment portion 2a of the shell 2. The seat 10 is provided in the region of the step 2c.

[0018] The arm 3 is shaped in such a way that, when it is connected to the attachment portion 2a of the shell 2, an outer face 3c thereof is flush with the adjacent outer surface 2b of the lateral portion of the shell 2. During engagement, the protruding tooth 30 is inserted into the seat 10 and is housed below the outer surface 2b of the lateral portion of the shell 2.

[0019] In a preferred embodiment, the attachment portion 2a is made in one piece with the shell 2. Alternatively, the attachment portion 2a may be made separately from the shell 2 and subsequently connected to the shell by techniques that are known in the art and therefore are not described in detail herein.

[0020] When the arm 3 and the attachment portion 2a of the shell 2 are engaged with each other, the electrical connection of the audio communication system is also carried out, if such a connection is obtained by means of an electrical connector. With particular reference to Figure 3, on an inner face 3d of the arm 3, in the region of the proximal end 3b, a connector 21 for the microphone 20 is placed. A corresponding connector 22 for the loudspeaker is associated with the attachment portion 2a of the shell 2. The connection between the connectors 21 and 22 makes the electrical connection of the micro-

phone 20 to the remaining part of the intercom or electronics of the audio communication system. When the arm 3 is disengaged from the shell 2, the connection is interrupted.

[0021] As an alternative to a connection via electrical connectors, a connection via magnetic contact connectors or other types of connectors may be envisaged.

[0022] The connections, and in general the cables of the communication system, are concealed by the internal coating of the shell 2 and of the arm 3, which is made in a traditional way (e.g. in foam rubber or generically padded). If necessary, a keypad for controlling the communication system, as well as a battery, may also be arranged on the inner face 3d of the arm 3.

[0023] According to a further embodiment, the arm 3 may accommodate, in addition to the microphone, all the electronics of the communication system, i.e. a control keypad, a circuit board and a battery, if any.

[0024] Retaining means, which will be described in detail below, are provided to prevent unintentional disengagement of the aforementioned coupling means, and thus disconnection of the arm 3 from the shell 2.

[0025] According to a configuration, the retaining means comprise a pin integral with, and protruding from, the attachment portion 2a of the shell 2. The pin includes a head inserted into a corresponding hole made in the arm 3. A locking member is mounted on the arm 3 in the region of the hole to cooperate with the head of the pin. In particular, the locking member is movable between a closed position, in which it retains the head of the pin, thereby preventing the arm 3 from being detached from the shell 2, and an open position, in which it disengages from the head of the pin, thereby allowing the arm 3 to be detached from the shell 2.

[0026] In a first embodiment of the retaining means, shown in Figures 4a to 6, the pin, indicated with 4, has a head 40. A hole 41 for the head 40 of the pin 4 is made on the arm 3, so that in the condition of attachment of the arm 3 to the shell 2 the head 40 of the pin 4 protrudes through the hole 41 on the side of the outer face 3c of the arm 3. Above the hole 41, on the outer face 3c of the arm 3, a slider 42 operates in a sliding manner, which slider has a slotted seat 420 with an enlarged end 421 to allow the head 40 to extend therethrough and a section of reduced width 422 such as to allow the sliding engagement of the stem of the pin 4 but prevent the head 40 to pass therethrough. The slider 42 is therefore movable between the aforementioned closed position (Figures 4a and 4b), in which the head 40 of the pin 4 is in the region of the section 422 of the slotted seat 420 and is therefore constrained to the slider 42, so that the arm 3 cannot be detached from the attachment portion 2a of the shell 2, and the aforementioned open position (Figures 5a and 5b), in which the head 40 of the pin 4 is in the region of the enlarged end 421 of the slotted seat 420 and is therefore free to protrude from the hole 41, thereby allowing the arm 3 to be detached from the attachment portion 2a of the shell 2 (as shown in Figure 6).

[0027] The slider 42 may be provided with a biasing spring (not shown) which opposes its sliding and forces the slider to return to the closed position in case to external release force is applied.

[0028] In a second embodiment of the retaining means, shown in Figures 7a and 7b, the pin, indicated with 5, is integral with the attachment portion 2a of the shell 2 and protrudes therefrom outwardly with a head 50 that fits into a corresponding hole (not shown) in the arm 3. Associated with the hole is a slider 52, which is hinged on the arm 3 for rotation about a pivot point P spaced from the hole. The slider 52 has a slotted seat 520 comprising an enlarged end 521 of a size such as to allow the head 50 to extend therethrough and a section 522 with a reduced width which allows the stem of the pin 5 to slidably extend therethrough, but prevents the passage of the head 50. Therefore, when the head 50 is in the region of the enlarged end 521 (open position of the slider 52, as shown in Figure 7b), the pin 5 can be disengaged from the hole of the arm 5, and the arm 3 can thus be detached from the attachment portion 2a of the shell 2, while in any other position of the slider 52 (closed position, as shown in Figure 7a) the head 50 of the pin 5 is in the region of the section 522 of reduced width of the slotted seat 520, so that the pin 5 cannot be disengaged from the hole of the arm 5, with the consequence that the arm 5 cannot be detached from the attachment portion 2a of the shell 2.

[0029] Figures 8a to 8c show a third embodiment of the retaining means. In this case, the arm 3 has a slotted seat 60 in which a pin 61 is slidably engaged. The pin 61 includes a first head 610, facing outwards, having a diameter greater than the width of the slotted seat 60, and a second head 612, facing inwards, having the same diameter. A shaped housing 62 is formed on the attachment portion 2a, comprising an enlarged end 620 of such a size as to allow passage of the second head 612 of the pin 61 and a section 621 of reduced size that allows sliding engagement of the stem of the pin 61 but prevents the passage of the second head 612. When the second head 612 of the pin 61 is in the region of the enlarged end 620 (open position, shown in Figure 8c), the pin can be disengaged and, at the same time, the arm 3 detached from the attachment portion 21 of the shell 2. In any other position of engagement between the second head 612 and the housing 62, the pin 61 cannot be disengaged from the housing 62 (closed position, shown in Figure 8b) and therefore the arm 3 is stably connected to the shell 2. With reference now to Figures 9 to 15, a fourth embodiment of the retaining means will be described.

[0030] As in the other examples described above, the releasable connection between the arm 3 and the attachment portion 2a of the shell 2 is obtained by engagement between a first coupling member of the arm, which also in this case is formed by a protruding tooth 30, and a second coupling member of the attachment portion, which also in this case is formed by a seat 10. More specifically, according to this embodiment, the protruding tooth 30 has a fork shape, with a pair of prongs 30a be-

tween which, in the coupled condition (Figure 11), a pin 70 arranged on the inner side of the shell 2, near the seat 10, is inserted. The engagement of the pin 70 between the two prongs 30a of the protruding tooth 30 ensures a more stable connection between the arm 3 and the shell 2, in particular by preventing the arm from rocking up and down once it is coupled to the shell.

[0031] As in the other embodiments described above, once the arm 3 is coupled to the shell 2, suitable retaining means prevent accidental disconnection of the arm from the shell.

[0032] In the present case, the retaining means include, on the side of the arm 3, a screw 72 attached to the arm 3 and projecting inwards. Numerals 74 and 76 denote the stem and head of the screw 72, respectively. The retaining means further include, on the side of the shell 2, a slotted seat 78 provided at the free end of the attachment portion 2a and an elastically flexible element 80 fixed, for example by screws 82, to the shell 2 below the attachment portion 2a. As shown in Figures 12 and 15, in the coupled condition the stem 74 of the screw 72 engages in the slotted seat 78 of the attachment portion 2a, while the head 76 of the screw 72 engages in a hole 84 provided in the elastically flexible element 80. In this way, when the arm 3 is coupled to the attachment portion 2a of the shell 2, the retaining means prevent unintentional disconnection of the arm from the shell and also ensure a stable connection, without relative movements, between the arm and the shell.

[0033] Preferably, the pin 70 is mounted on the elastically flexible element 80, so that, when the pin 70 is inserted between the two prongs 30a of the protruding tooth 30, the arm 3 is self-centred on the elastically flexible element 80 and thus the distance between the pin 70 and the hole 84 of the elastically flexible element 80 is defined on the element 80 itself, instead of depending on the tolerances between the position of the pin 70 on the shell 2 and the fixing position of the elastically flexible element 80. In this case, the elastically flexible element 80 can be made of plastic material and also form the pin 70 in one piece.

[0034] To enable disconnection of the arm 3 from the attachment portion 2a of the shell 2, the arm 3 is provided with a release button 86 which, when pressed, acts on the elastically flexible member 80 causing it to flex downwards until the head 76 of the screw 72 is disengaged from the hole 84. The release button 86 is preferably made of an elastically deformable material, for example rubber or silicone, so that it is normally held in a raised position, in which it does not act on the elastically flexible element 80. Alternatively, the release button 86 might be associated with elastic means acting on the button itself so as to keep it normally in a raised position. The fact that the release button 86 is made of rubber or silicone makes it possible to reduce the number of components of the helmet which are made of plastic, thus reducing both the risks in case of fire and the risks of breakage.

[0035] As shown in Figures 14 and 15, also in this case

- as previously explained with reference to Figure 3 - the electrical connection between the microphone 20 carried by the arm 3 and the remaining part of the audio communication system of the helmet 1 is ensured by the connection between the connectors 21 and 22 associated with the microphone 20 and the loudspeaker, respectively. The connector 21 is mounted on an inner face 3d of the arm 3, at the proximal end 3b of the arm, and is connected by means of a cable 88 to the microphone 20, while the connector 22 is mounted on the attachment portion 2a of the shell 2 and is connected by means of a cable 90 to the loudspeaker (not shown) located in the shell 2. The two connectors 21 and 22 are configured to make a quick electrical connection when the arm 3 is coupled to the shell 2. When the arm 3 is disconnected from the shell 2, however, the two connectors 21 and 22 are disconnected from each other, thereby interrupting the connection between the microphone 20 carried by the arm 3 and the loudspeaker mounted in the shell 2. Preferably, the arm and the shell are made of carbon or fibreglass, which allows to obtain a lightweight helmet. The arm might alternatively be made of plastic, SMC (Sheet Moulding Compound) or C-SMC (Carbon-Sheet Moulding Compound).

[0036] The solution described allows the arm to be fitted/removed easily. This is an advantage also during rescue operations requiring the removal of the helmet or, in any case, the need for rapid access of medical personnel to the user's airways.

[0037] In addition, by virtue of the engagement of the male coupling member of the arm in its respective seat in the attachment portion of the shell and of the provision of the retaining means, the arm is firmly in position once it has been mounted, so that the helmet can be transported by gripping the arm.

[0038] The retaining means also ensure that the arm is firmly attached to the shell, preventing its unintentional disconnection. In particular, the fact that a double action, i.e. pressing the release button and pulling the arm, is required to disconnect the arm from the shell allows to eliminate, or at least greatly reduce, the risk of unintentional disconnection of the arm in the event of a collision with external parts.

[0039] The present invention has been described so far with reference to preferred embodiments thereof. It is to be understood that other embodiments may be envisaged, which share the same inventive core and are all encompassed by the scope of protection of the claims set forth below.

[0040] In particular, further embodiments may comprise the technical features of any of the following claims with the addition of one or more of the technical features described in the text or illustrated in the drawings, taken individually or in any combination thereof.

Claims

1. Helmet (1) with an integrated audio communication system, the helmet (1) comprising a shell (2) for protection of the head of a user, a rigid arm (3) extending as a chin guard from a lateral portion of the shell (2) so that a distal end (3a) of the arm (3) is located, in use, near the user's mouth, the arm (3) supporting on said distal end (3a) a microphone (20) of said audio communication system,

wherein the arm (3) is a piece separate from the shell (2) and is releasably connected to the shell (2) by reversible coupling means (30, 10) comprising a first coupling member (30) provided at a proximal end (3b) of the arm (3) opposite said distal end (3a) and a second coupling member (10) provided on an attachment portion (2a) of the shell (2), and wherein the helmet (1) further comprises retaining means (4, 42; 5, 52; 61, 62; 72, 80, 86) for preventing unintentional release of said releasable coupling means (30, 10), **characterised in that** said retaining means (4, 42; 5, 52; 61, 62; 72, 80, 86) comprise a screw (72) fixed to the arm (3) and protruding inwards with a head (76) thereof, an elastically flexible element (80) fixed to the shell (2) below the attachment portion (2a) and having a hole (84) in which the head (76) of the screw (72) engages, in the condition of attachment of the arm (3) to the shell (2), and a release member (86) operable by the user to elastically deform the elastically flexible element (80) so as to allow disengagement of the head (76) of the screw (72) from the hole (84).
2. Helmet according to claim 1, wherein said first coupling member (30) is formed by a tooth protruding from said proximal end (3b) of the arm (3) and wherein said second coupling member (10) is formed by a seat configured to receive said protruding tooth.
3. Helmet according to claim 2, wherein said first coupling member (30) has a fork-like shape, with a pair of prongs (30a) between which a pin (70) is inserted in the condition of attachment of the arm (3) to the shell (2), which pin (70) is arranged on an inner side of said lateral portion of the shell (2), close to said second coupling member (10).
4. Helmet according to claim 3, wherein the pin (70) is formed in one piece with the elastically flexible element (80).
5. Helmet according to claim 4, wherein the pin (70) and the elastically flexible element (80) are made of plastic material.
6. Helmet according to any one of the preceding claims, wherein the arm (3) is configured such that, in the condition of attachment to the shell (2), an outer face (3c) of the arm (3) is disposed flush with an adjacent outer surface (2b) of said lateral portion of the shell (2).
7. Helmet according to any one of the preceding claims, wherein the audio communication system further comprises a loudspeaker mounted in the shell (2) in such a position as to be aligned with the user's ear, and wherein the helmet further comprises, positioned on said first and second coupling members (30, 10), respectively, a first connector (21) for the microphone (20) and a second connector (22) for the loudspeaker, the connection of the arm (3) with the attachment portion (2a) of the shell (2) resulting also in the connection of said first and second connectors (21, 22) with each other.
8. Helmet according to any one of the preceding claims, wherein the shell (2) is made of carbon fibre or glass fibre and wherein the arm (3) is made of carbon fibre, glass fibre, plastic material, SMC or C-SMC.
9. Helmet according to any one of the preceding claims, wherein said release member (86) is made of an elastically deformable material, such as rubber or silicone.

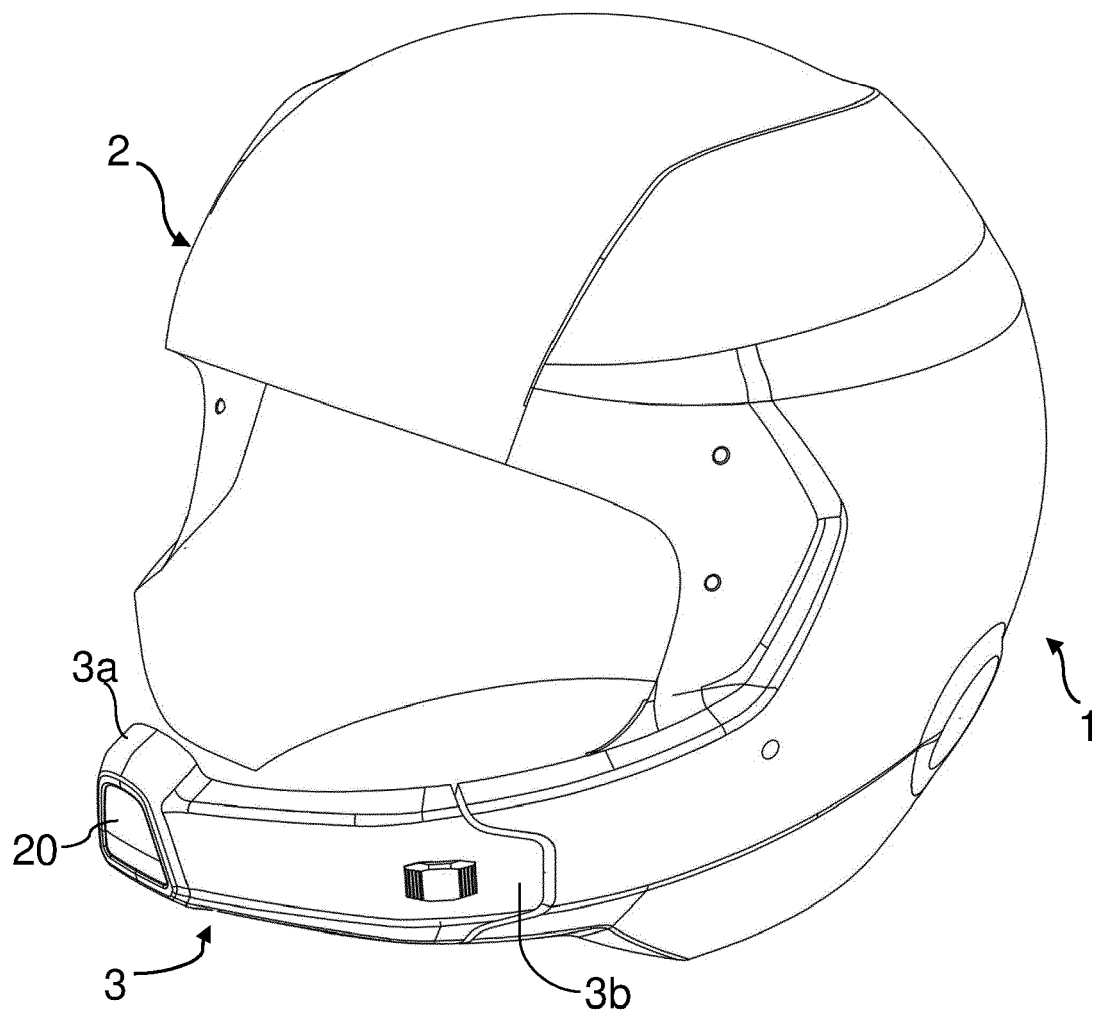


Fig.1

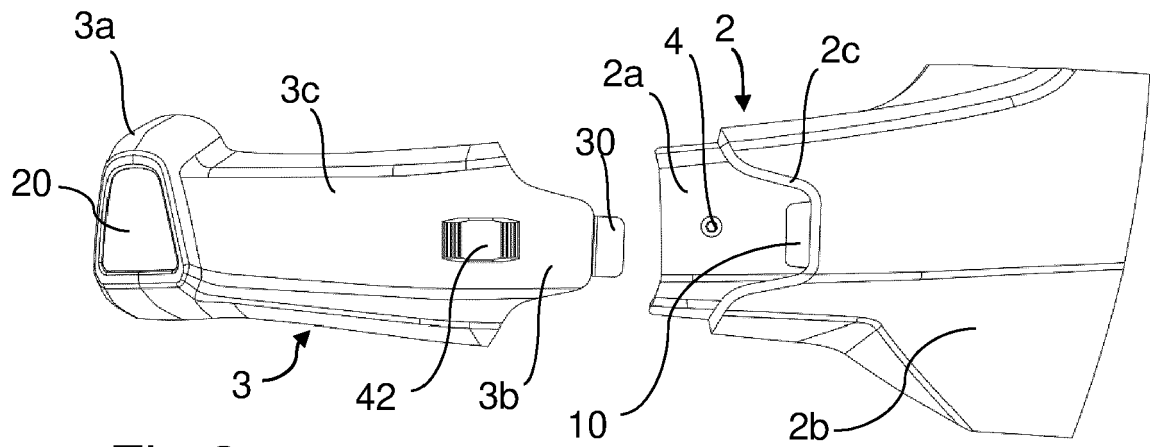


Fig.2

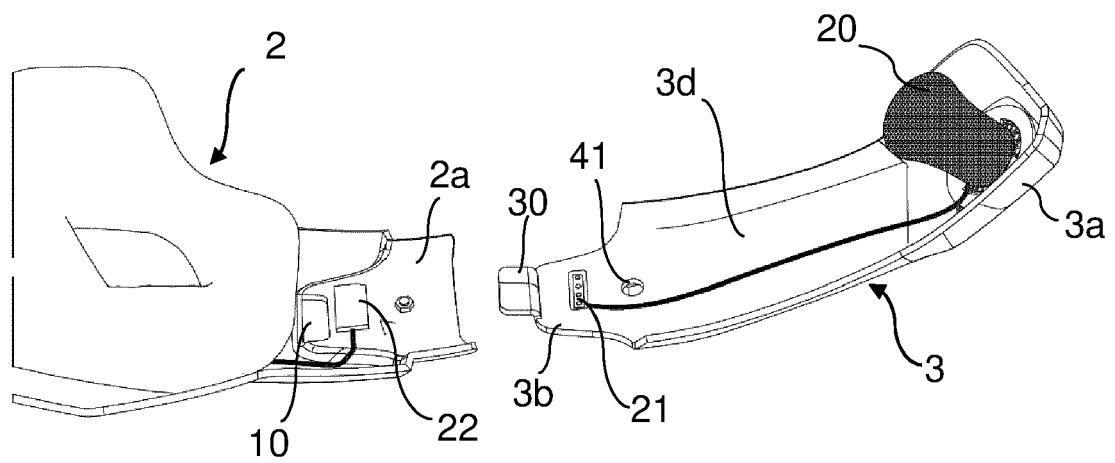


Fig.3

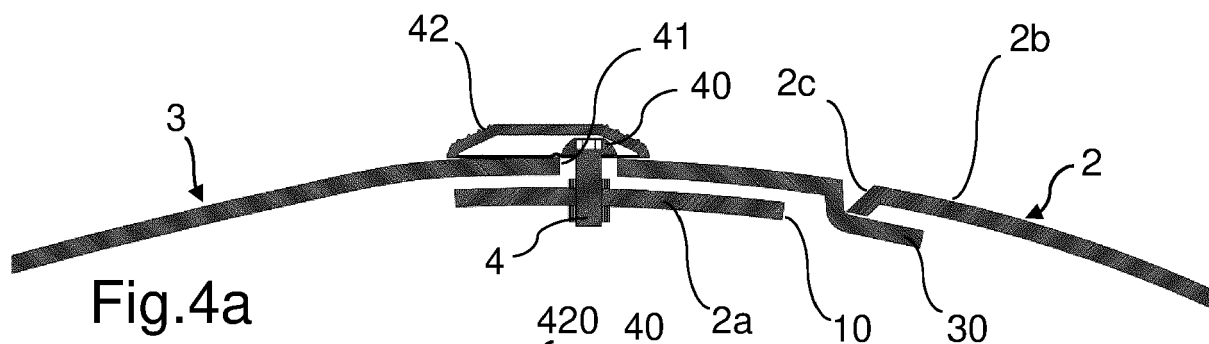


Fig. 4a

Fig. 4b

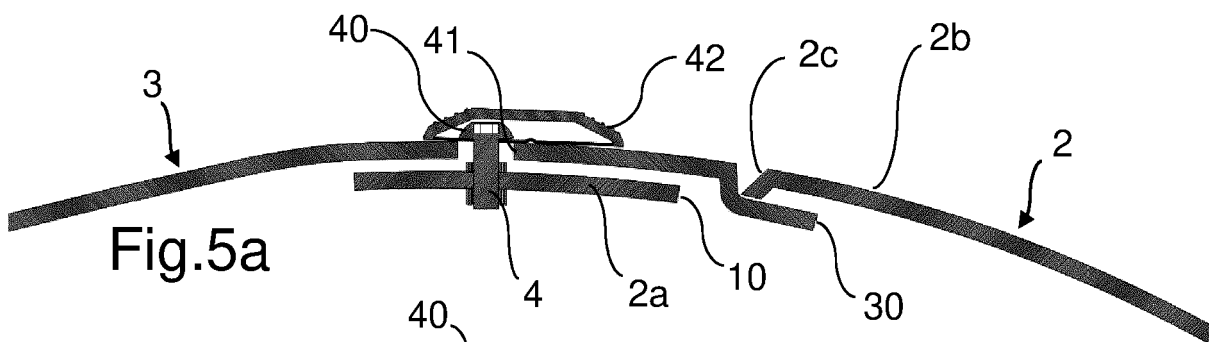
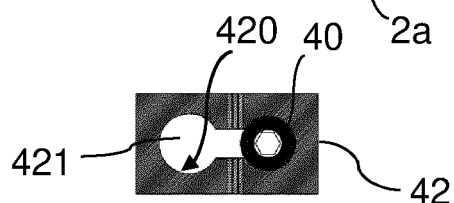


Fig. 5a

Fig. 5b

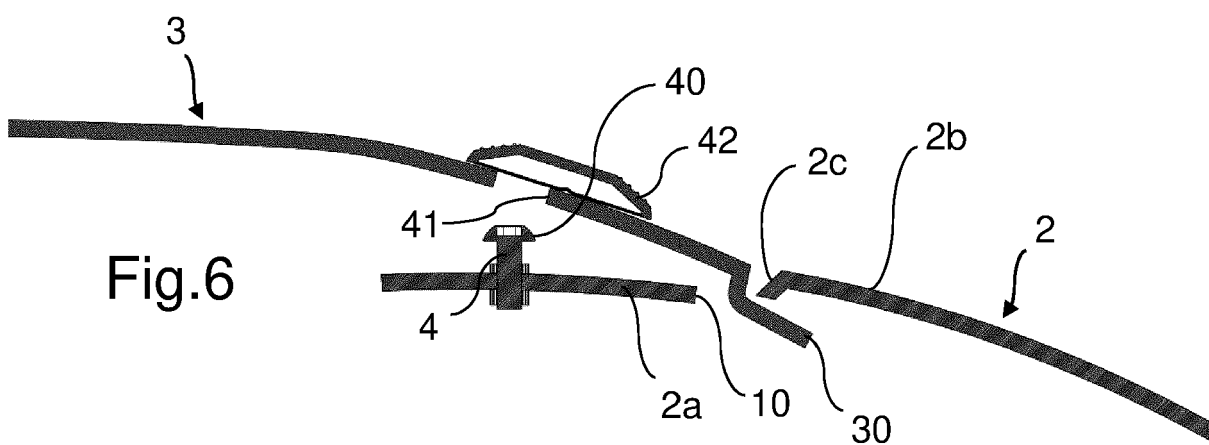
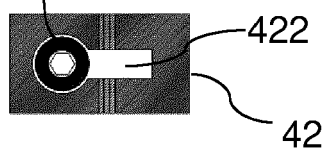
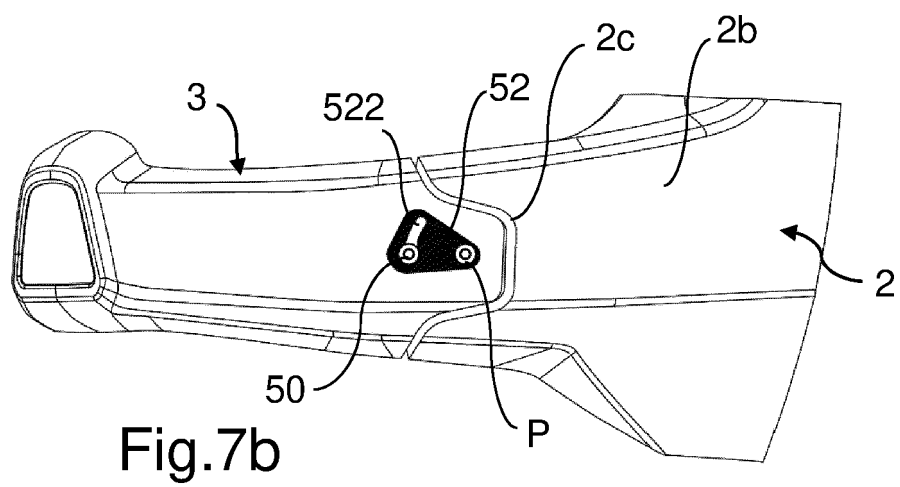
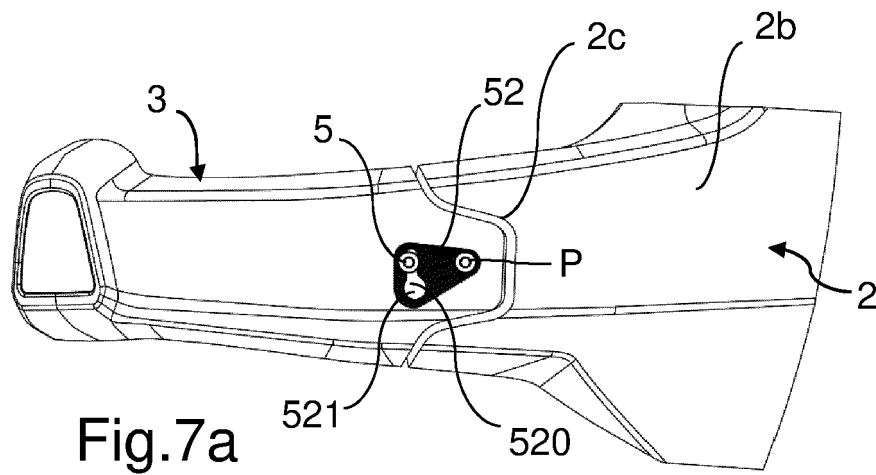


Fig. 6



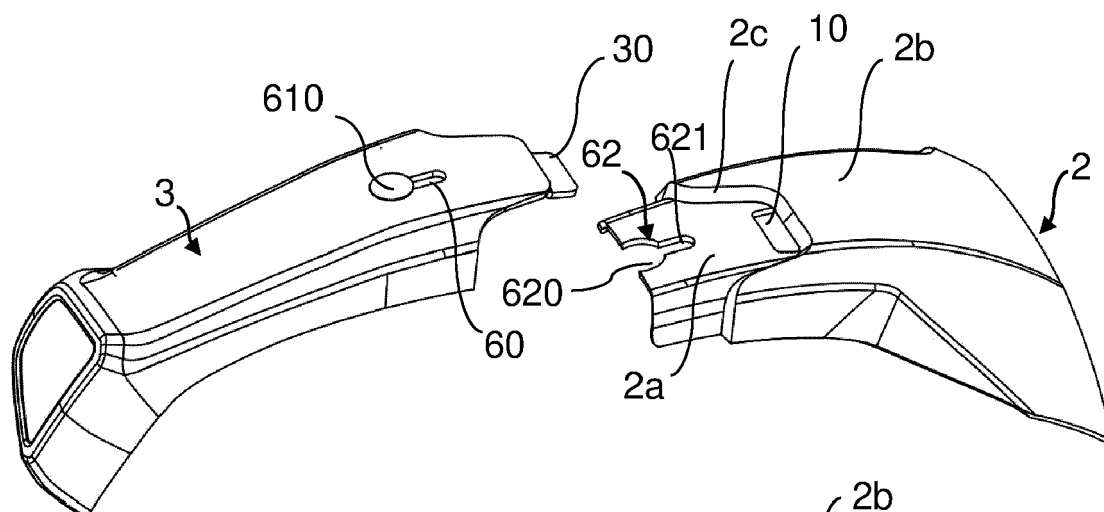


Fig.8a

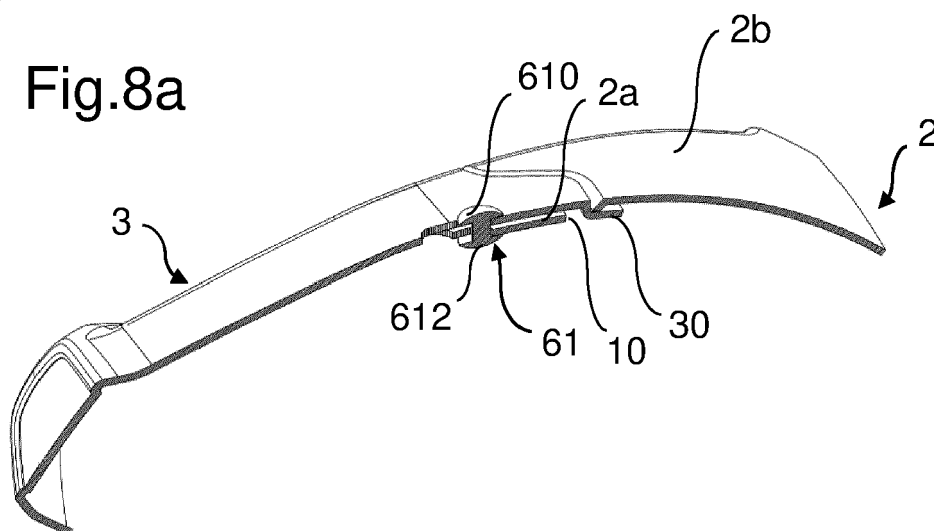


Fig.8b

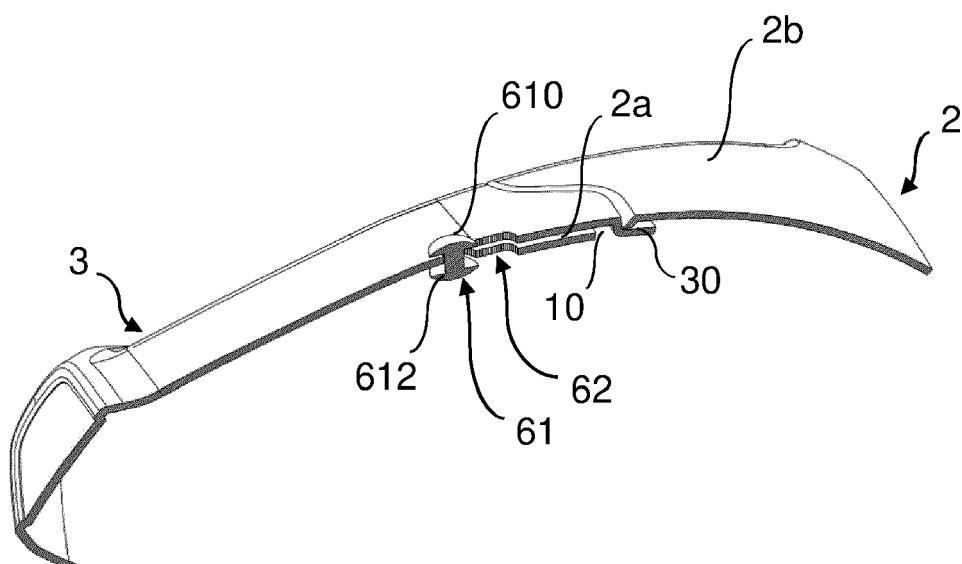


Fig.8c

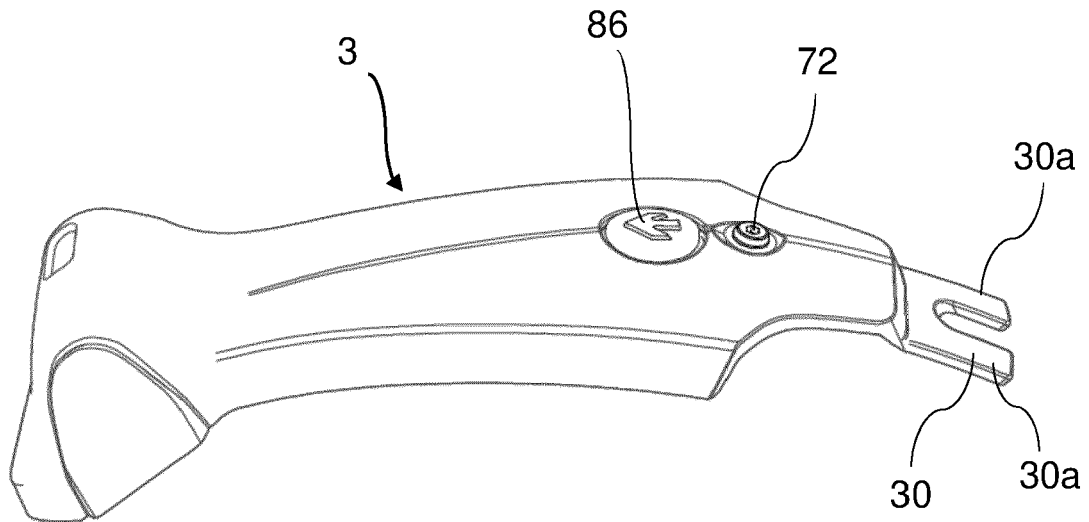


Fig.9

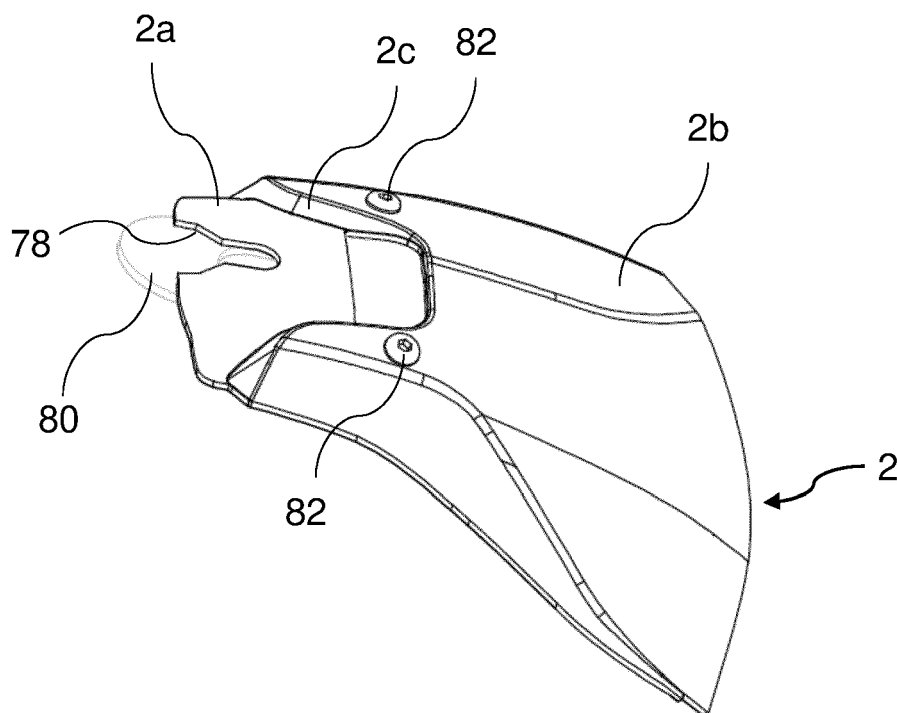


Fig.10

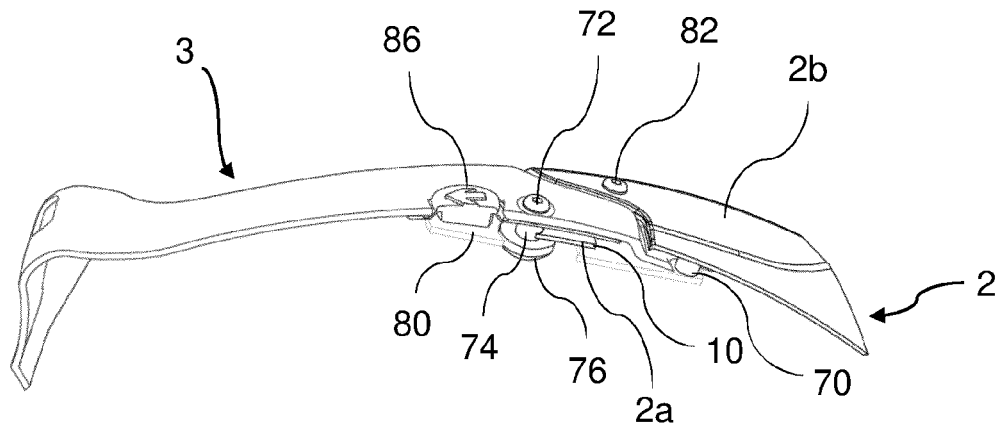


Fig.11

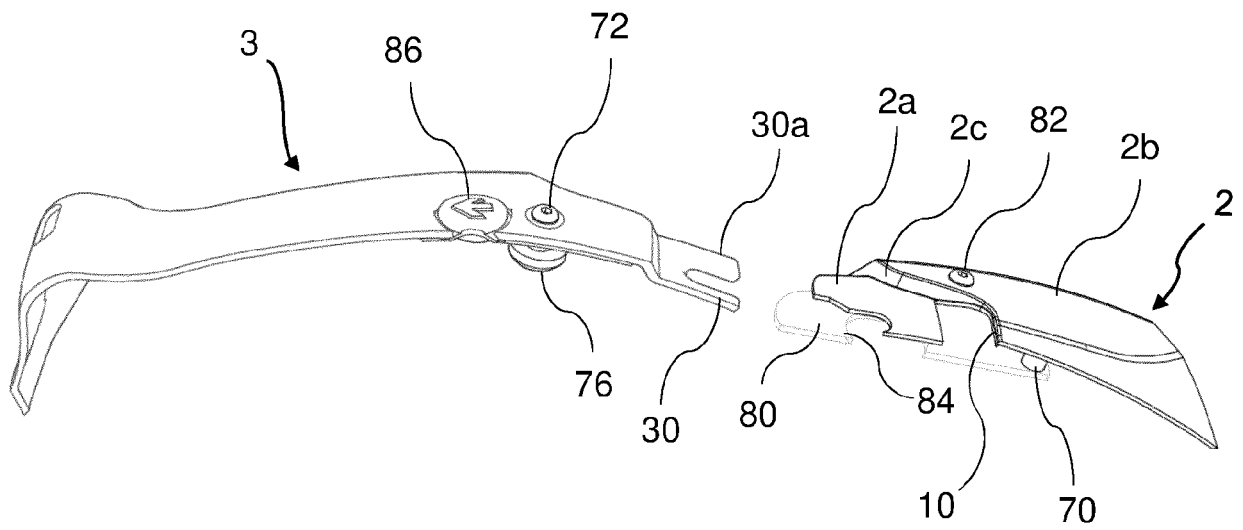


Fig.12

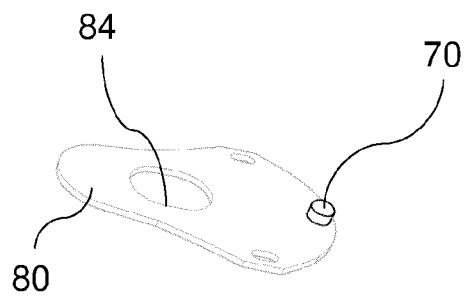


Fig.13

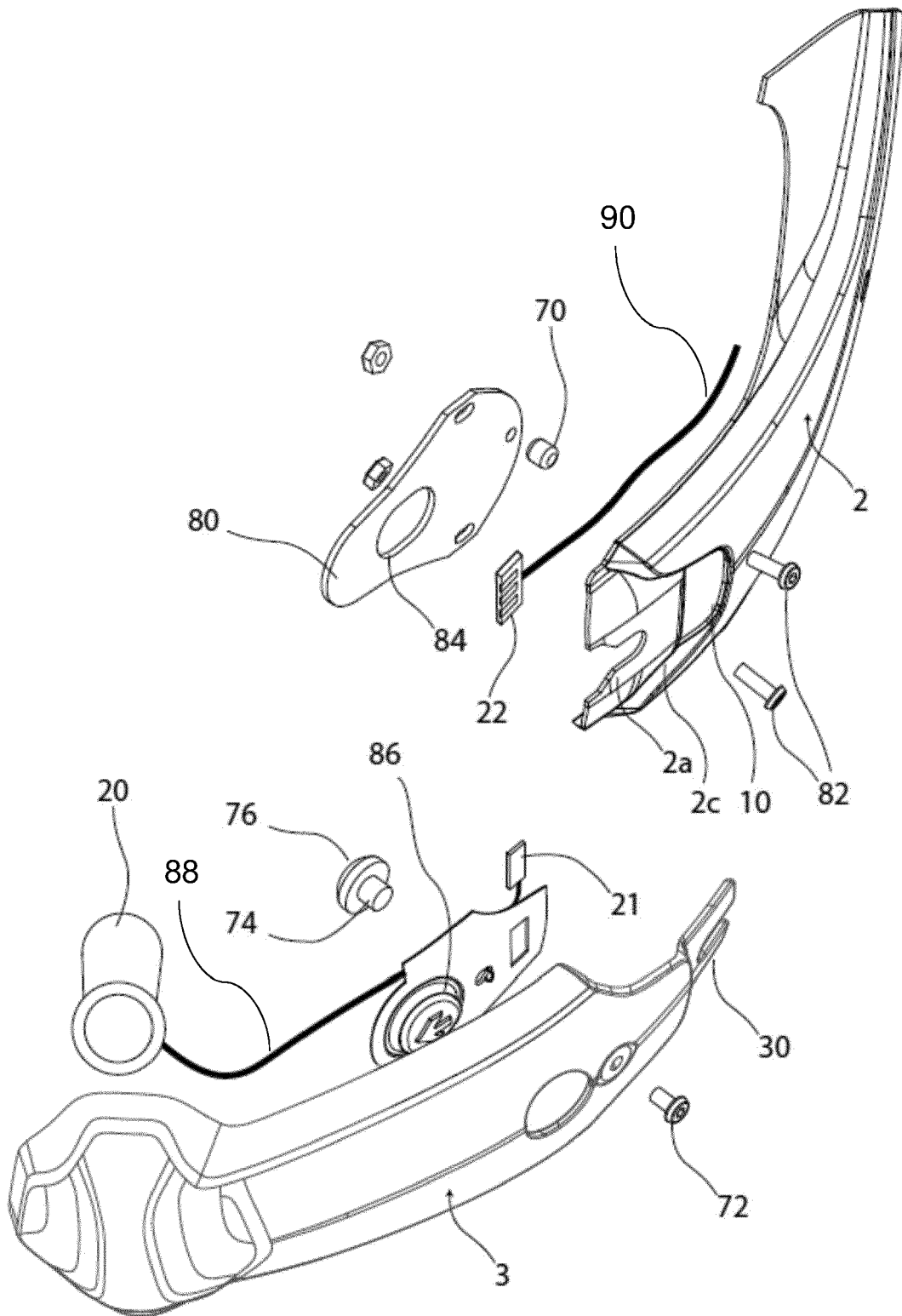


Fig.14

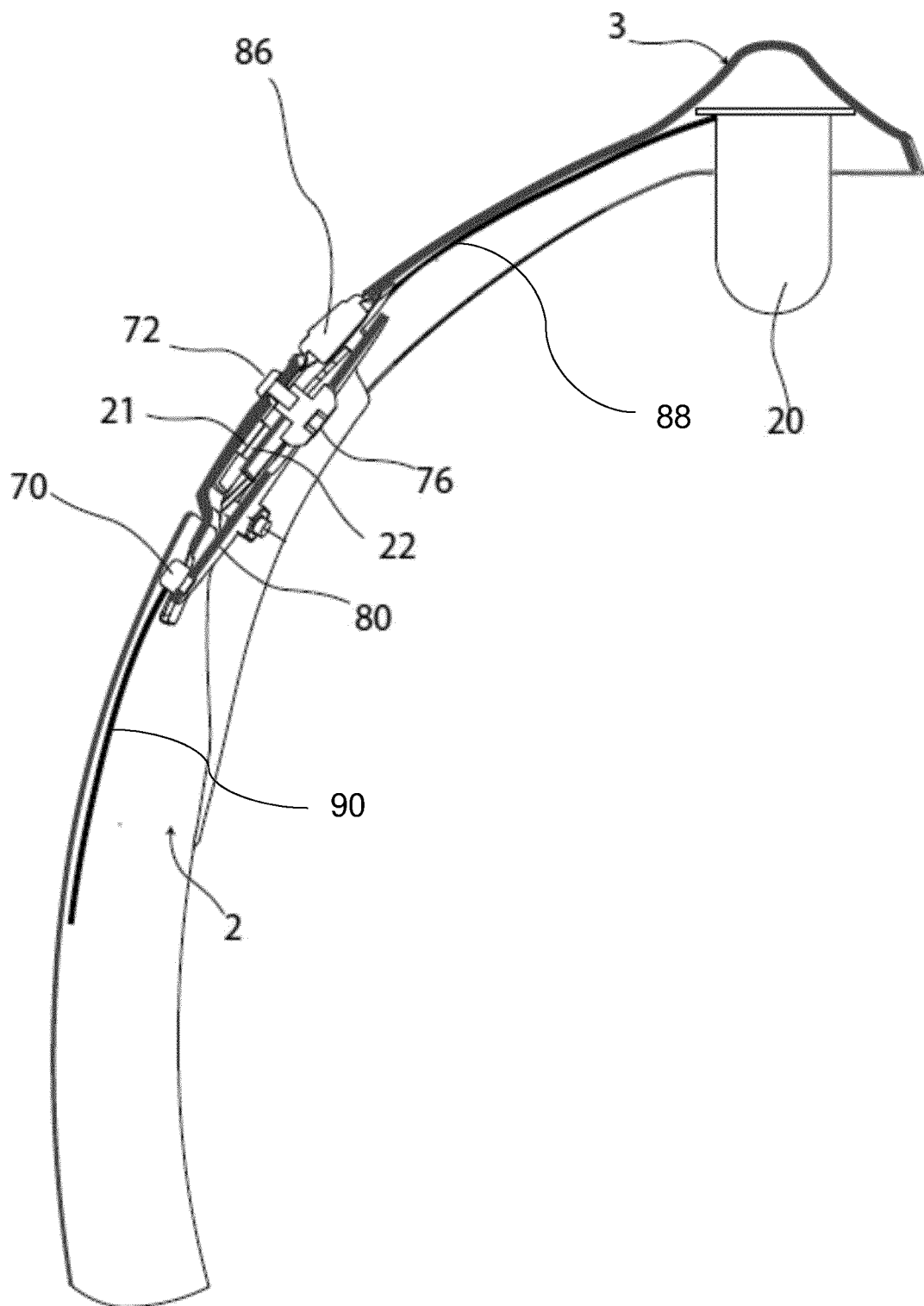


Fig.15



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