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(54) SHELL FOR PROTECTIVE HELMET AND ASSOCIATED PROTECTIVE HELMET

(57) A shell for a protective helmet is described, the shell comprising a shell body and a functional band around at least a front part and/or a rear part of the shell body, wherein the functional band comprises a central wall, an upper wall and a lower wall, wherein the functional band comprises a seat for attaching an accessory formed by an opening in the upper wall, in the lower wall, or in the upper wall and lower wall of the functional band.

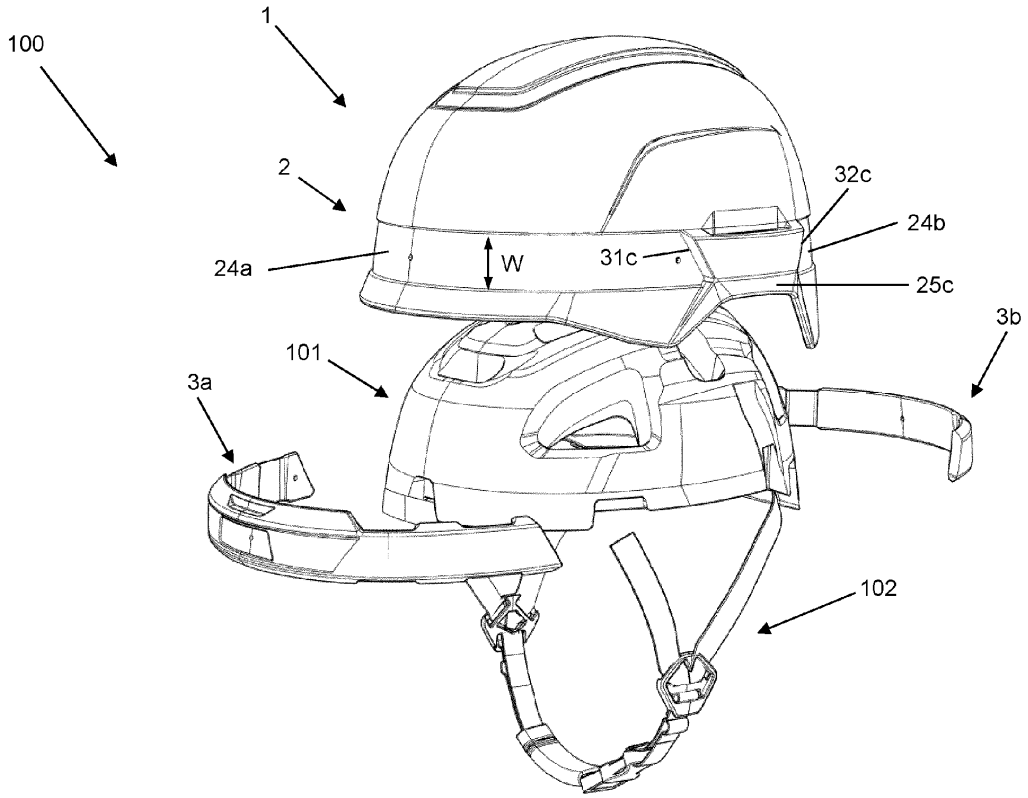

Fig. 5

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Description

Technical field

[0001] The present invention relates to the field of protective helmets for work or sport use. In particular, the present invention relates to a shell for a protective helmet and a protective helmet with comprises such a shell.

Background art

[0002] As is known, protective helmets are used in various working and sporting environments. Protective helmets are normally used by workers who perform activities in environments where there is a potential risk of the head of the worker being exposed to knocks or impacts (for example, building site workers, firefighters, etc.). Protective helmets are also used in a sporting environment for example by cyclists, skiers, hikers or rock climbers.

[0003] A protective helmet typically comprises a cap which forms the protective shell provided by the helmet in the event of knocks or impacts resulting from external objects.

[0004] The shell may be closed or open. In this latter case it typically comprises openings for allowing ventilation.

[0005] Furthermore, depending on the conditions of use, it is known to use the protective helmet with accessories, such as a sunshield, a protective visor for the face, anti-noise earmuffs, a torch or a head lamp, reflective elements, a rear protection, for example made of fireproof material, etc.

[0006] US 2022/047033 A1 and WO2021/089617 A1 disclose helmets.

Summary of the invention

[0007] The Applicant has carefully examined the known shells for protective helmets, with the aim of improving them from the point of view of their functionality and their robustness.

[0008] In particular, for example, the Applicant has realized that the known shells provided with a sunshield are typically made as one piece from a plastic material which incorporates both the structure of the shell and the sunshield in the front part of this structure. In the case of these helmets, it is therefore not possible to remove or replace the sunshield without replacing the entire helmet.

[0009] As regards the other types of accessories, such as a torch or a head lamp, in the case of some known helmets they are fixed indirectly to the said shell by means of straps, for example, which pass through openings in the shell or are attached thereto. However, this type of fixing system may not be entirely stable and also means that the shell is provided with openings, this therefore not being applicable for a closed shell.

[0010] In any case, the fixing system provided for an accessory often does not allow easy replacement of the accessory fixed to the shell, following for example damage or faulty operation.

[0011] Moreover, often, in the case of the known helmets, the removal and/or replacement of an accessory is not particularly easy when the helmet is worn by the user and is typically performed by handling the helmet when it is not worn. This situation is therefore such that, if the user of the helmet must necessarily replace an accessory or a component of said accessory (for example the battery of the head lamp), usually the helmet is taken off, a situation which may give rise to risks.

[0012] As regards the robustness, the Applicant has noted that the shells according to the prior art may be improved so as to provide a greater resistance to impacts occurring in the region of the user's head, in particular in the forehead and occipital regions.

[0013] In view of the above, the Applicant has tackled the problem of providing a shell for a protective helmet which is improved compared to the known shells in terms of both functionality and robustness. In particular, the Applicant has tackled the problem of providing a shell for a protective helmet which allows the protective helmet to be provided with one or more functional accessories in an easier and more flexible manner compared to the known shells, namely, in other words, which allows the protective helmet to be adapted in a simple manner to different conditions of use. Furthermore, the Applicant has tackled the problem of providing a shell for a protective helmet which improves the robustness of the helmet in particular to impacts which occur in the forehead and occipital regions of the user's head.

[0014] In the present description and the claims, the expression "functional band" (or also simply "band") will be understood as meaning an elongated component present on the outer surface of the shell and shaped so as to follow the curvature of the said shell. This component may consist of one piece, made as a single body with the shell body or as a separate piece, or may comprise one or more portions made as separate parts and configured to be associated with the shell. The functional band of the shell according to the present invention may have, fixed thereto, one or more accessories with given functions for example, as mentioned above, a sunshield, a protective visor for the face, anti-noise earmuffs, a torch, a head lamp, reflective elements, a rear protection, etc. These accessories therefore ensure that the shell is able to satisfy different requirements depending on the one or more accessories which are fixed to it.

[0015] According to a first aspect, the present invention provides a shell for a protective helmet, the shell comprising a shell body and a functional band around at least a front part and/or a rear part of the shell body, wherein the functional band comprises a central wall, an upper wall and a lower wall, wherein the functional band comprises a seat for attaching an accessory formed by an opening in the upper wall, in the lower wall, or in the upper wall and lower wall of the functional band.

[0016] According to embodiments, the functional band

comprises a plurality of attachment seats formed by openings in the upper wall, in the lower wall, or in the upper wall and lower wall of the functional band.

[0017] According to embodiments, at least one attachment seat formed by an opening in the upper wall corresponds to an attachment seat formed by an opening in the lower wall, the two attachment seats being in communication.

[0018] According to embodiments, the attachment seat formed by an opening in the upper wall and the attachment seat formed by a corresponding opening in the lower wall communicate via a channel in the thickness of the functional band.

[0019] According to embodiments, the functional band comprises a first portion along a front part of the shell and a second portion along a rear part of the shell.

[0020] According to embodiments, the functional band also comprises a first lateral band portion and a second lateral band portion along a left-hand side part of the shell and along a right-hand side part of the shell.

[0021] According to embodiments, the first portion and the second portion of the functional band are applied to the shell body by means of mechanical members and/or gluing and/or welding.

[0022] According to embodiments, the first portion comprises two first two first end hooks configured to engage with front housings of the first lateral band portion and the second lateral band portion.

[0023] According to embodiments, the shell further comprises first locking L-shaped pins configured to lock the first end hooks in the front housings of the first lateral band portion and the second lateral band portion.

[0024] According to embodiments, the second portion comprises two second end hooks configured to engage with rear housings of the first lateral band portion and the second lateral band portion.

[0025] According to embodiments, the shell further comprises second locking L-shaped pins configured to lock the second end hooks in the rear housings of the first lateral band portion and the second lateral bad portion.

[0026] According to embodiments, the first portion comprises: inclined intermediate hooks configured to engage with corresponding slots in the shell body and/or attachment keys configured to engage with corresponding holes in the shell body and/or ribs.

[0027] According to embodiments, the second portion comprises attachment keys configured to engage with corresponding holes in the shell body and/or ribs.

[0028] According to embodiments, the shell body comprises ribs at said first portion and said second portion.

[0029] According to embodiments, the first lateral band portion and the second lateral band portion are integral with the shell body.

[0030] According to a second aspect, the present invention provides a protective helmet comprising a shell as described above, an internal protective element shaped as to be housed in the shell so as to provide further protection for the user's head and a retaining system configured to fasten the helmet under the wearer's chin.

[0031] According to embodiments, the protective helmet also comprises an accessory attached to the functional band, the accessory being one of the following: a pair of anti-noise earmuffs, a torch, a light-refracting surface, a protective visor or a rear protection.

Brief description of the drawings

[0032] The present invention will become clearer from the following detailed description, provided purely by way of a non-limiting example, to be read with reference to the accompanying Figures in which:

- Figure 1 is a first axonometric view of a shell with functional band according to an embodiment of the present invention;
- Figure 2 is a second view of the shell with functional band of Figure 1;
- Figure 3 is a front view of the shell with functional band of Figure 1;
- Figure 4 is an axonometric view of two portions of the functional band of Figure 1 without shell;
- Figure 5 is an exploded view of the shell with functional band of Figure 1;
- Figure 6 is a side view of a shell with functional band according to another embodiment of the present invention;
- Figure 7 is a top plan view of the shell with functional band of Figure 6;
- Figure 8 is an axonometric side view of the shell with functional band of Figure 1 with a protective visor mounted;
- Figure 9 is an exploded view of the shell with functional band and visor of Figure 8;
- Figure 10 shows a clip for attaching the visor of Figure 8;
- Figure 11 shows an exploded view of the system for attaching the visor and the associated swivel joint;
- Figure 12 shows a cross-sectional view of the system for attaching the visor and the associated swivel joint;
- Figure 13 is an axonometric side view of the shell with functional band of Figure 1 with a torch mounted;
- Figure 14 shows an exploded view of the torch attachment system;
- Figure 15 is a first view of an embodiment of the functional band to be fixed to the shell;
- Figure 16 is a second view of the functional band of Figure 15;
- Figure 17 shows the functional band of Figures 15 and 16 immediately before its attachment to the shell; and
- Figure 18 shows the functional band of Figures 15 and 16 attached to the shell.

Detailed description of preferred embodiments of the invention

[0033] According to the present invention a shell for a protective helmet is provided, said shell comprising a functional band for fixing to the said shell one or more accessories depending on the situation for which the protective helmet is used. Said band is an elongated component present on the outer surface of the shell and shaped so as to follow the curvature of the said shell. In particular, the band is preferably positioned close to the bottom edge of the shell and is completed so as to form a perimetral ring close to said bottom edge of the shell.

[0034] According to embodiments of the present invention, the shell comprises a shell body having a substantially rigid protective outer surface. The shell body is suitable for being arranged, at least partially, on the head of a user.

[0035] The functional band according to the present invention may be made as one piece with the shell body; alternatively it may consist of a single piece made as a piece separate from the shell body and configured to the be associated with the said shell body, or it may comprise one or more portions made as pieces separate from the shell body and configured to be associated with the said shell body.

[0036] According to some embodiments, the band comprises a first portion fixed to the front part of the shell body and a second portion fixed to the rear part of the shell body. The two portions of the band which are situated in the front part and rear part of the shell both have an elongated arch shape. According to these embodiments, these two portions of the band are made as parts separate from the body of the shell and then fixed thereto. They may for example be fixed in a surface recess formed in the body of the shell. The band is preferably completed by two lateral portions which are situated on both sides of the shell body: in particular they are portions of the shell body projecting outwards so that the thickness of said lateral portions corresponds substantially to the thickness of the front and rear portions of the band.

[0037] Figures 1-5 schematically shows a shell 1 for a protective helmet according to a first embodiment of the present invention. The shell 1 shown in the Figures is a closed shell (namely the shell body 2 does not have openings) and comprises a shell body 2 and a functional band 3. The functional band 3 preferably comprises a first band portion 3a positioned in the front part of the shell, a second band portion 3b positioned in the rear part of the shell; the band 3 further comprises a first lateral band portion 3c and a second lateral band portion 3d along a left-hand side part of the shell 1 and along a right-hand side part of the shell 1, respectively, which are preferably integral with the shell body 2, namely formed as one piece therewith. The shell body 2 is shaped so as to receive at least partially the head of a user. Once the shell is worn by the user, the front part of the shell 1, and therefore the first band portion 3a, is situated in the front region of the user's head, while the rear part of the shell 1, and therefore the second band portion 3b, is situated in the occipital region of the user's head; the first lateral portion 3c of the functional band 3 and the second lateral portion 3d of the functional band 3 are instead situated, respectively, opposite the left-hand ear and the right-hand ear of the user.

[0038] According to this embodiment, the shell body 2 (which comprises the lateral portions 3c and 3d of the functional band 3), the first band portion 3a and the second band portion 3b are made as separate parts. The first band portion 3a and the second band portion 3b are preferably made of a substantially rigid thermoplastic material, for example polypropylene or ABS (acrylonitrile butadiene styrene). The first band portion 3a and the second band portion 3b have preferably a thickness of between 2 mm and 10 mm, more preferably between 2 mm and 5 mm, and a width W, at a central wall (see Figure 4), preferably of between 10 mm and 30 mm. The shell body 2 is also preferably made of a substantially rigid thermoplastic material, for example polypropylene or ABS (acrylonitrile butadiene styrene).

[0039] According to this embodiment, the first band portion 3a and the second band portion 3b are preferably fixed to the shell body 2. Fixing may be performed by means of suitable fixing means, such as screws or pins, and/or by means of gluing and/or welding. For example, the first band portion 3a and the second band portion 3b may comprise, on an inner surface thereof, a number of pins suitable for engaging inside corresponding holes formed in the shell body 2, for example in the region of the recess configured to house the corresponding band portion.

[0040] Figure 5 is an exploded view which shows some components of a protective helmet 100 which comprises the shell 1 shown in Figures 1-4. The protective helmet 100 shown in Figure 5 also comprises an internal protective element 101 shaped so as to be housed inside the shell 1 in order to provide the head of the user with further protection (said internal protective element is for example made of polystyrene, in particular EPS - sintered expanded polystyrene - so as to absorb effectively any knocks and impacts). The helmet 100 also comprises a retaining system 102 configured to allow fastening of the helmet underneath the wearer's chin. In particular, the retaining system 102 shown schematically in Figure 5 comprises a strap with a closing element, for example of the snap-engaging type. The internal protective element and the retaining system are known components of a protective helmet. They in particular will not be further described in the continuation of the present description since they are not relevant for the purposes of the present invention.

[0041] Considering again that shown in Figures 1-5, the shell body 2 has a convex outer surface 21 with a shaped bottom edge 22. The shaping of the bottom edge 22 is performed so to adapt the helmet to the user's head, in particular, for example, in the zones corresponding to

the position of the user's ears so as to accommodate anti-noise earmuffs which may be fixed to the shell 1. The outer surface 21 of the shell body 2 may also have a rear portion elongated downwards with respect to the front portion so as to protect part of the user's neck.

[0042] The shell body 2 may have, on its outer surface, a number of ribs which define zones of varying thickness of the said shell body. For example, as schematically shown in Figures 1 and 2, the outer surface of the shell body 2 shown in these Figures comprises ribs 23 which, in particular, define a projecting (thicker) portion on the top part of the shell body 2, so as to provide protection against impacts from above.

[0043] As already mentioned above, the shell body 2 preferably comprises, formed on its outer surface 21 in the front part of the shell 1, a first recess 24a designed to house the first band portion 3a. The shell body 2 also comprises, formed on its outer surface 21 in the rear part of the shell 1, a second recess 24b designed to house the second band portion 3b. Both the first recess and the second recess 24a, 24b are formed on the surface 21 of the shell body 2 close to the bottom edge 22 of the surface 21 and each of them extends lengthwise on a curved portion along the perimeter of the shell body 2. The length of the first recess 24a corresponds substantially to the length of the first band portion 3a, while the length of the second recess 24b corresponds substantially to the length of the second band portion 3b. The "perimeter" of the shell body 2 referred to corresponds to the substantially oval contour of the shell body 2 in a horizontal intersecting plane thereof at the height of the first recess 24a and the second recess 24b. The first recess 24a and the second recess 24b each have a width W corresponding to the width of the central wall of the first band portion 3a and the second band portion 3b, respectively, as will be illustrated below. The width W of each recess 23a, 23b is preferably substantially uniform over its entire length.

[0044] The first recess 24a extends lengthwise on the front part of the shell 1 and partially on each side part of the shell 1 and terminates at a first wall 31c, 31d of the respective lateral band portion 3c, 3d. This first wall 31c, 31d is for example inclined, as shown in Figures 1-5. Similarly, the second recess 24b extends lengthwise on the rear part of the shell 1 and partially on each side part of the shell 1 and terminates at a second wall 32c, 32d of the respective lateral band portion 3c, 3d. This second wall 32c, 32d is for example inclined, as shown in Figures 1-4, with an opposite inclination to that of the first wall 31c, 31d.

[0045] The first lateral band portion 3c has in fact, in the embodiment shown in Figures 1-4, a central wall 33c with a substantially trapezoidal shape. It also has an upper wall 34c comprising an opening 35c, with a substantially rectangular shape, which forms a corresponding attachment seat for means for fixing one or more accessories to the functional band, for example a first earmuff of a pair of anti-noise earmuffs. The attachment seat is formed as a cavity in the thickness of the first lateral band portion 3c which extends from the corresponding opening 35c formed in the upper wall 34c. Fixing may be performed by engaging a component of said fixing means associated with the accessory inside the attachment seat. In particular, in the embodiment shown in the Figures, the opening 35c preferably extends within the thickness of the first lateral band portion 3c over its entire width thus forming a through-slot 36c. The second lateral band portion 3d also has in fact, in the embodiment shown in Figures 1-5, a central wall 33d with a substantially trapezoidal shape. It also has an upper wall 34d comprising an opening 35d, with a substantially rectangular shape, which forms a corresponding attachment seat for means for fixing, for example a second earmuff of the pair of anti-noise earmuffs. This opening also preferably extends within the thickness of the second lateral band portion 3d over its whole width, thus forming a through-slot 36d.

[0046] Along the first lateral band portion 3c, in particular underneath it, the outer surface 21 of the shell body 2 shown in the Figures is preferably shaped so as to allow fixing of the first earmuff of a pair of anti-noise earmuffs to the shell 1. In particular, the outer surface 21 of the shell body 2 preferably has a projecting portion 25c which substantially forms an extension of the central wall 33c of the first lateral band portion 3c so as to house underneath it the top part of the earmuff. The through-slot 36c therefore opens out underneath the projecting portion 25c of the shell body 2 on the inside thereof. Similarly, along the second lateral band portion 3d, in particular underneath it, the outer surface 21 of the shell body 2 is preferably shaped so as to allow fixing of the second earmuff of a pair of anti-noise earmuffs to the shell 1. In particular, the outer surface 21 of the shell body 2 preferably has a projecting portion 25d which substantially forms an extension of the central wall 33d of the second lateral band portion 3d so as to house underneath it the top part of the earmuff. The through-slot 36d therefore opens out underneath the projecting portion 25d of the shell body 2 on the inside thereof.

[0047] As mentioned above, fixing of a pair of anti-noise earmuffs to the shell 1 is performed by means of known fixing means present on the earmuffs, which engage in the through-slots 36c and 36d present in the first lateral band portion 3c and in the second lateral band portion 3d. The anti-noise earmuffs are known components of a protective helmet and for this reason will not be described here in detail.

[0048] Figure 3 is a front view of the shell 1 according to the embodiment described hitherto of the present invention, which has, as shown in the said Figure, a symmetrical structure with respect to the plane AA'.

[0049] According to this embodiment, the first band portion 3a also has preferably a symmetrical structure with respect to the plane of symmetry AA'. Said plane divides the first band portion 3a into two identical segments. Each band segment has a central wall 32a, an

upper wall 33a and a lower wall 34a. The upper wall 33a and the lower wall 34a are, in the embodiment shown in Figures 1-5, preferably shaped so that, when the first band portion 3a is fixed to the shell body 2, the free edge of these walls rests against the outer surface 21 of the shell body 2. Furthermore, as shown in the Figures, in this embodiment, the upper wall 33a has a variable width along the first band portion 3a and in particular a width which is wider along the central part of the first band portion 3a where this upper wall 33a has a greater inclination.

[0050] Each band segment preferably comprises one or more openings formed in the upper wall and/or in the lower wall which form corresponding attachment seats for means for fixing one or more accessories to the functional band. Said fixing may be performed by engaging a corresponding component (for example an engaging tooth) of these fixing means inside the attachment seat, as will be described in greater detail below. Each attachment seat is formed as a cavity in the thickness of the segment, which extends from the corresponding opening formed in the upper wall or lower wall of the said segment. A pair of corresponding attachment seats (namely in corresponding positions in the upper wall and in the lower wall) may communicate with each other. For example, two corresponding seats may communicate via a channel formed in the thickness of the functional band. In this case, the two corresponding attachment seats, formed in the upper wall and in the lower wall of the band, may form a through-slot. Advantageously, the attachment seats communicate with each other so that it possible to avoid the accumulation of dust or debris. Furthermore, cleaning with water is facilitated because the water passes from the attachment seat formed in the upper wall and drains out from the attachment seat formed in the lower wall.

[0051] In particular, in the embodiment shown in the Figures, each band segment preferably comprises on its inner surface (namely on the surface which, once the associated band portion is fixed to the shell body 2, faces the shell body 2) one or more grooves 36a formed in the thickness of the band segment and extending from an opening 35a in the upper wall 33a and each terminating in a corresponding opening 37a in the lower wall 34a. When the first band portion 3a is fixed to the shell body 2, each groove 36a forms, between the first band portion 3a and the outer surface of the shell body 2, a respective through-slot 36a. In other words, each pair of corresponding openings of the upper wall and lower wall 33a, 34a of the band segment form two corresponding attachment seats which communicate via a channel which corresponds to the groove 36a formed in the thickness of the segment. In the embodiment shown in the Figures, each band segment of the first band portion 3a forms two through-slots 36a.

[0052] Furthermore, in its central part, the upper wall 33a of the first band portion 3a has a further attachment seat formed by an opening 38 which preferably extends within the thickness of the first band portion 3a so as to form a cavity in the front part of the first band portion 3a. This cavity may also extend as far as the lower wall 34a of the first band portion 3a so as to form a through-slot.

[0053] The plane of symmetry AA' also divides the second band portion 3b into two identical segments. Each band segment has a central wall 32b, an upper wall 33b and a lower wall 34b. The upper wall 33b and the lower wall 34b are, in the embodiment shown in Figures 1-5, preferably shaped so that, when the second band portion 3b is fixed to the shell body 2, the free edge of these walls rests against the outer surface 21 of the shell body 2.

[0054] Each segment of the second band portion 3b also preferably comprises, on its inner surface, one or more grooves 36b formed in the thickness of the band segment and extending from an opening 35b in the upper wall 33b and each terminating in a corresponding opening 37b in the lower wall 34b. When the second band portion 3b is fixed to the shell body 2, each groove 36b forms, between the second band portion 3b and the outer surface 21 of the shell body 2, a respective through-slot 36b. In other words, each pair of corresponding openings of the upper wall and lower wall 33b, 34b of the band segment form two attachment seats which communicate via a channel which corresponds to the groove 36b formed in the thickness of the segment. In the embodiment shown in the Figures, each band segment of the second band portion 3b forms a single through-slot 36b.

[0055] Figures 6 and 7 show a shell 1 according to a second embodiment of the present invention. According to this second embodiment of the shell, the shell 1' comprises a shell body 2' with a number of ventilation openings. In the embodiment shown in Figures 6 and 7, the shell body 2' comprises five ventilation openings, in particular, a front opening 26a located on the front part of the shell body 2' and four side openings 26b located on the sides of the shell body 2' symmetrically with respect to the plane of symmetry AA'. In other words, each side of the shell body 2' comprises a respective pair of side openings 26b. The openings in this second embodiment of the shell according to the present invention allow ventilation of the internal volume of the shell. In a helmet which comprises the shell 1' according to this second embodiment of the present invention, the openings 26a, 26b of the shell body 2' preferably correspond to a number of similarly shaped openings formed in the internal protective element of the helmet (see for example Figure 5 already described above which shows an example of an internal protective element with openings).

[0056] Advantageously, the attachment seats of the functional band on the shell 1, 1' shown in the Figures allow one or more accessories to be fixed to the said shell. As already discussed above, the attachment seats present in the first lateral band portion 3c and in the second lateral band portion 3d allow a pair of anti-noise earmuffs to be fixed to the shell. The attachment seats of the first band portion 3a and the second band portion 3b allow one or more further accessories to be fixed to the

shell 1, 1' in a convenient and reliable manner.

[0057] Furthermore, advantageously, compared to the shells of the prior art, according to the present invention the attachment seats for fixing the accessories to the shell are mostly formed in the functional band and therefore the provision of these attachment seats does not affect the integrity and the robustness of the shell body.

[0058] As described, the functional band may comprise one or more portions made as parts separate from the shell body. This advantageously allows the shell to be equipped with different functional bands depending on the application for which the helmet is used. For example, it is possible to associate with the shell body functional bands having a different number of attachment seats depending on the number and type of accessories required, and/or functional bands with different forms and/or dimensions.

[0059] Figure 8 shows, for example, a shell 1 to which an accessory, in particular a visor 4, is fixed. The visor shown comprises a support structure, or frame 41, connected to the shell and a mask 42 attached to the support structure 41 and configured to protect the user's face when the helmet is worn, in particular the user's eyes. The support structure 41 comprises two arms 43a, 43b which are rotatably connected to the shell 1 on the two sides of the shell 1.

[0060] The fixing of this particular accessory is performed preferably by means of fixing means which comprise a pair of engaging devices 5 or, more simply, clips, as shown in Figures 9, 10, 11 and 12. The clip 5 may be used also to fix other types of accessories to the shell 1, for example a torch, as will be described below. The clip 5 is preferably made of a thermoplastic material, for example nylon.

[0061] The clip 5 is preferably C-shaped. It comprises a body with a substantially flat central portion 51, a first curved portion 52a which forms a first curled part at a first end of the central portion 51 and a second curved portion 52b which forms a second curled part at a second end of the central portion 51.

[0062] The two curved portions 52a, 52b are preferably configured to engage with two corresponding attachment seats present in the functional band along the upper wall and lower wall. In particular, in the embodiments shown in the Figures, the two curved portions 52a, 52b are preferably configured to engage with the edges at the two ends of a through-slot 36a, 36b of the functional band 3 (for example, a through-slot 36c of the first band portion 3a). In particular, the first curved portion 52a has preferably a free end which forms a first engaging tooth 53a, inclined towards the inside of the "C" and configured to be inserted inside the respective opening 35a present on the upper wall of the functional band 3 opposite the through-slot 36a concerned. The first engaging tooth 53a has an inner wall 54 (namely a wall which faces the inside of the "C") and an inner corner edge 55 on its end which are configured, once the first engaging tooth 53a has been inserted inside the corresponding opening 35a of the upper wall 33a of the functional band 3, to lock against the inner wall of the functional band 3 at the edge of the opening 35a. The second curved portion 52b has preferably a free end which forms a second engaging tooth 53b configured to be inserted inside the respective opening 37a in the lower wall 34a of the functional band 3 opposite the through-slot concerned 36a. The second engaging tooth 53b, according to this embodiment, is not inclined and extends upwards parallel to the central portion 51 of the clip 5. The second engaging tooth 53b has an inner wall 56 (i.e., a wall which faces the inside of the "C") configured to, once the second engaging tooth 53b is inserted inside the corresponding opening 37a of the lower wall 34a of the functional band 3, be positioned facing the inner wall of the functional band 3 at the edge of the opening. The clip 5 furthermore preferably comprises a tongue 57 which projects from an outer surface of the second curved portion 52b (namely from the surface of the second curved portion 52b situated opposite with respect to the inside of the "C"). This tongue 57, once the clip 5 is engaged with the shell 1, is inclined towards the outside of the shell 1. The tongue 57 is configured to be used by the user of the helmet in particular to engage and disengage the clip 5 with/from the shell 1, as will be described hereinbelow.

[0063] In the embodiments shown in the Figures, the clip 5 is engaged with the shell 1 inside one of the through-slots 36a, 36b of the first and second portions 3a, 3b of the functional band 3 which are fixed to the shell body 2. Engagement is performed by inserting the first engaging tooth 53a inside the opening 35a, 34b of the upper wall 33a, 33b of the band so as to lock the inner corner edge 55 of the first tooth 53a against the inner wall of the through-slot 36a, 36b along the edge of the opening 35a, 35b. Then by gripping the tongue 57 with the fingers, the user rotates the clip 5 so as to bring it into contact with the band 3 until the second engaging tooth 53b of the clip 5 is inserted inside the opening 37a, 37b formed in the lower wall 34a, 34b of the band and the inner wall 56 of the second tooth 53b makes contact with the inner wall of the through-slot 36a, 36b at the edge of the opening. In order to disengage the clip 5, the user may apply pressure with a finger onto the tongue 57 in order to rotate the clip 5 outwards and cause the second engaging tongue 53b to come out of the opening 37a, 37b in which it is inserted. In this way, it is possible to remove the clip 5 by causing the first engaging tooth 53b to come out of the corresponding opening 35a, 35b.

[0064] The clip 5, finally, comprises, along its central portion 51, on its outer surface, a coupling element 6 for attaching the accessory in question.

[0065] According to embodiments of the present invention shown in particular in Figures 11 and 12, the coupling element 6 is preferably configured to be coupled with a swivel joint 7 of the visor 4 present on each arm 43a, 43b of the frame of the visor 4. This swivel joint, in particular, allows rotation of the visor 4 with respect to the shell 1. Advantageously, the swivel joint 7 allows rotation of the

visor 4 from a working position, where the visor protects the user's face (as shown in Figure 8), into a raised position.

[0066] According to the embodiments shown in the Figures (see in particular Figure 10), the coupling element 6 is formed on a wedge-shaped body 61 projecting from the outer surface of the clip 5 on its central portion 51. The wedge-shaped body 61 forms a planar surface and compensates for the curvature of the functional band 30 with which the clip 5 is engaged. The coupling element 6 comprises a cylinder 62 which projects towards the outside of the wedge-shaped body 61. The cylinder 62 has a hole 63 in the centre and two recesses 64 in diametrically opposite positions with respect to the centre of the cylinder 62.

[0067] In particular, the hole 63 is a through-hole which extends over the entire thickness of the cylinder 62 and the wedge-shaped body 61 and continues over the entire thickness of the central portion 51 of the clip, as shown in Figure 12. The through-hole 63 is configured to receive a screw 8. The through-hole 63 has preferably a greater diameter at one of its ends for receiving the head of the screw 8.

[0068] The screw 8 allows the coupling element 6 of the clip 5 and the swivel joint 7 of the visor 4 to be locked together, as will be described below.

[0069] Each swivel joint 7 of the visor 4 comprises, at a terminal portion 44a, 44b of the respective arm 43a, 43b of the support structure 41, a through-hole 71, a first slot 72 and a second slot 73. The first and second slots 72, 73 extend along a circle arc concentric with respect to the centre of the through-hole 73, in two diametrically opposite positions. The first slot 72 has preferably a first smooth inner wall and a second undulating inner wall which has a series of notches or depressions. The second slot 73 has preferably smooth inner walls. Both the first slot and the second slot 72, 73 are curved at their ends.

[0070] Each swivel joint 7 of the visor 4 further comprises a respective covering cap 74, for example circular shaped, with a substantially flat surface, suitable for being attached to the respective arm 43a, 43b of the visor 4 and to the coupling element 6 of the clip 5.

[0071] The covering cap 74 comprises, on its substantially flat surface, two pins 75, with a substantially circular cross-section, which project from said surface. Each pin 75 is configured to engage inside a respective slot 72, 73; in particular, the pin 75 which engages inside the first slot 72 is configured to be inserted in each of the notches formed in the first slot 72, so as to lock the visor in a respective position with respect to the shell 1. The locking of the visor 4 in one of the possible positions I performed by rotating the visor 4 so that the pin 75 inserted in the first slot 72 slides inside the said slot and engages with one of the notches. The pin 75 which engages inside the second slot 73 slides inside it between the two ends of the slot 73 which acts as end-of-travel stop.

[0072] The covering cap 74 further comprises, in the centre of its substantially flat surface, a cylinder 76 with a hole in the centre, configured to receive the end of the cylinder of the screw 8. During assembly, in order to attach each cap to a respective arm 43a, 44b of the visor 4 and to the coupling element 6, the substantially flat surface of the cap 74 is placed against the outer surface of the terminal portion 44a, 44b of the arm 43a, 43b so that the pins 75 engage inside the slots 72, 73 and the cylinder 76 is housed inside the through-hole 71. The cylinder 76 has, projecting from it, two projections which are configured to engage inside the recesses 64 present in the cylinder 62 of the clip 5.

[0073] As is clear, advantageously, assembly of the visor on the shell may be easily performed by the user also when the helmet is worn. The user must simply position the two clips 5 inside the opposite through-slots 36a, 36b on the two sides of the shell 1 and push the clips 5 by applying pressure on the tongues 57 so that they engage inside both the upper and the lower openings. In order to detach the visor 4, again if necessary when the helmet is worn, the user merely presses the tongues 57 in the opposite direction, namely outwards, and raises the visor.

[0074] Figures 13 and 14 show the shell 1 and a further accessory, i.e., a torch 9. As shown in the figures, the torch 9 may be engaged with the shell 1 by means of a single clip 5. In this case, the coupling element 6 of the clip 5 is joined together with a cylindrical sleeve 91 provided with a longitudinal slit. Said joint may be realized, for example, using a screw inserted inside the clip 5, as already described above, and screwed inside a hole formed in the sleeve 91.

[0075] The torch 9 is then mounted on the shell 1, by inserting it inside the sleeve 91. Once the torch 9 is inserted inside the sleeve 91 joined together with the clip 5, it may be mounted by engaging the clip 5 in a pair of corresponding attachment seats (a through-slot in the embodiment shown in the Figure) which are formed in the functional band, as already described above with reference to assembly of the visor 4.

[0076] Advantageously, the torch may be mounted on the shell in a stable and secure manner.

[0077] Furthermore, in this case also, the accessory considered, namely the torch, may be engaged with and disengaged from the shell simply and quickly, also when the helmet is worn. This, as already mentioned above, also allows the risk to be minimized for the user in the case where the said accessory must be removed or replaced.

[0078] Figures 15, 16, 71 and 18 show in detail an embodiment of a functional band 3, and how it may be firmly attached to the shell body. For better clarity, Figures 17 and 18 show only the lower part of the shell body 2. In practice, the shell body 2 is sectioned with an horizonal plane in the proximity of the upper wall 33a, 33b of the functional band 3.

[0079] The functional band 3 comprises a first portion 3a configured to be positioned in the front part of the shell

body 2 and a second portion 3b configured to be positioned in the rear part of the shell body 2.

[0080] The first band portion 3a comprises, at each end thereof, an end hook 3a1. Each end hook 3a1 of the first band portion 3a is configured to penetrate front housings 3c1 and 3d1 of the first and second lateral band portions 3c, 3d. Each end hook 3a1 may for example comprise a flat stem, for example with a rectangular cross section, and a head, for example with a substantially triangular cross section. In addition to the two end hooks 3a1, at least one inclined intermediate hook 3a2 (facing inwards) may be provided. Advantageously, two inclined intermediate hooks 3a2 may be provided. Each intermediate hook 3a2 may for example comprise a flat stem, for example with a rectangular cross section, and a head, for example with a substantially triangular cross section. Each intermediate hook 3a2 is configured to penetrate a corresponding slot 2a2 in the shell body 2.

[0081] Similarly, the second band portion 3b comprises, at each end thereof, an end hook 3b1. Each end hook 3b1 of the second band portion 3b is configured to penetrate rear housings 3c2 and 3d2 of the first and second lateral band portions 3c, 3d. Each end hook 3b1 may for example comprise a flat stem, for example with a rectangular cross section, and a head, for example with a substantially triangular cross section. In addition to the two end hooks 3b1, at least one inclined intermediate hook may be provided.

[0082] According to embodiments, the first band portion 3a also comprises attachment and centering keys 3a3 in a central position. The attachment keys 3a3 are configured to engage with corresponding holes 2a3 in the shell body 2.

[0083] Similarly, according to embodiments, the second band portion 3b also comprises attachment and centering keys 3b3 in a central position. The attachment keys 3b3 are configured to engage corresponding holes 2b3 in the shell body 2.

[0084] According to embodiments, the first band portion 3a comprises one or more ribs 3a4 projecting towards the inside. The ribs 3a4 of the first band portion stiffen the first band portion 3a and determine a precise distance with respect to the shell body 2. In addition, the vertical ribs 3a4 define internal walls of the openings 35a. The intermediate hooks 3a2 may also form a wall and therefore, together with the ribs 3a4, they delimit a channel which is open above (at 35a) and below (at 37a). However, ribs 2a4 can be provided protruding outwards from the surface of the shell body 2.

[0085] The front housings 3c1 and 3d1 may comprise a triangular profile, substantially complementary to the end of the end hooks 3a1 of the first band portion 3a.

[0086] Similarly, the rear housings 3c2 and 3d2 may comprise a triangular profile, substantially complementary to the end of the end hooks 3b1 of the second band portion 3b.

[0087] According to embodiments, front locking pins 3a5 having an "L" shape (also indicated as front locking L-shaped pins) may be provided to lock the end hooks 3a1 of the first band portion 3a in the front housings 3c1, 3d1.

[0088] Similarly, according to embodiments, rear locking pins 3b5 having an "L" shape (also indicated as rear locking L-shaped pins) may be provided to lock the end hooks 3b1 of the second band portion 3b in the rear housings 3c2 and 3d2.

[0089] The phase of assembling the first band portion 3a and the second band portion 3b with the shell body 2 will be described below. The ease and speed of the operation will be evident. Furthermore, advantageously, the phase of assembling does not require screws. This makes such assembly quick. Furthermore, the absence of screws (typically metal) avoids the creation of cracks in the event of an impact, significantly increasing safety.

[0090] To firmly attach the first band portion 3a to the shell body, the end hooks are positioned at the entrance of the front housings. By pressing the first band portion towards the shell, the end hooks of the first band portion engage with the triangular profiles of the front housings. At the same time, the inclined intermediate hooks 3a2 of the first band portion engage with the corresponding slots 2a2 in the shell body 2 and the attachment and centering keys 3a3 engage with the corresponding holes 2a3 in the shell body. As a further security measure against disassembling, two locking L-shaped pins 3a5 are inserted, one for each front housing 3c1 and 3d1. The first band portion 3a is thus firmly and precisely locked to the shell body 2 of the helmet 1. As mentioned above, channels are formed, which are open at the top (35a) and at the bottom (37a). The walls of these channels can be formed by the ribs 3a4 inside the first band portion 3a and/or by the intermediate hooks 3a2 and/or by the ribs 2a4 protruding from the surface of the shell body 2 towards the outside.

[0091] In a completely similar way, the second band portion 3b may be firmly attached to the shell body 2. The end hooks 3b1 are positioned at the entrance of the rear housings 3c2 and 3d2. By pressing the second band portion 3b towards the shell body 2, the end hooks 3b1 of the second band portion 3b engage with the triangular profiles of the rear housings 3c2 and 3d2. At the same time, the attachment and centering keys 3b3 engage with the corresponding holes 2b3 in the shell body 2. As a further security measure against disassembling, two locking L-shaped pins 3b5 are inserted, one for each rear housing. The second band portion 3b is thus firmly and precisely locked to the shell body 2 of the helmet. As mentioned above, channels are formed, which are open above (35b) and below (37b). The walls of these channels can be formed by the ribs inside the first band portion and/or by the ribs 2b4 protruding from the surface of the shell body 2 towards the outside.

[0092] Advantageously, while maintaining the shell body 2, the functional band 3 may be changed. For example, a functional band with a different shape and/or different technical features may be mounted on the shell

body. For example, a functional band with light (e.g., LED) or with a sensor or with a light-reflecting surface may be mounted.

[0093] The assembly phase could take place by simultaneously attaching the first band portion and the second band portion, or by attaching the second band portion before the first band portion.

Claims

1. A shell (1; 1') for a protective helmet comprising a shell body (2; 2') and a functional band (3) around at least a front part and/or a rear part of the shell body (2; 2'), wherein the functional band (3) comprises a central wall (32a, 32b, 33c, 33d), an upper wall (33a, 33b, 34c, 34d) and a lower wall (34a, 34b), wherein the functional band (3) comprises an attachment seat for an accessory, said attachment seat being formed by an opening (35a, 35b, 35c, 35d, 37a, 37b, 38) in the upper wall (33a, 33b, 34c, 34d), in the lower wall (34a, 34b), or in the upper wall (33a, 33b) and lower wall (34a, 34b) of the functional band (3).

2. The shell (1; 1') according to claim 1, wherein the functional band (3) comprises a plurality of attachment seats formed by openings (35a, 35b, 35c, 35d, 37a, 37b, 38) in the upper wall (33a, 33b, 34c, 34d), in the lower wall (34a, 34b), or in the upper wall (33a, 33b) and lower wall (34a, 34b) of the functional band (3).

3. The shell (1; 1') according to claim 1 or 2, wherein at least one attachment seat formed by an opening (35a, 35b) in the upper wall (33a, 33b) corresponds to an attachment seat formed by an opening (37a, 37b) in the lower wall (34a, 34b), the two attachment seats being in communication.

4. The shell (1; 1') according to claim 3, wherein the attachment seat formed by an opening (35a, 35b) in the upper wall (33a, 33b) and the attachment seat formed by a corresponding opening (37a, 37b) in the lower wall (34a, 34b) communicate via a channel (36a, 36b) in the thickness of the functional band (3).

5. The shell (1; 1') according to any one of the preceding claims, wherein the functional band (3) comprises a first portion (3a) along a front part of the shell (1; 1") and a second portion (3b) along a rear part of the shell (1; 1')

6. The shell (1; 1') according to claim 5, wherein the functional band (3) also comprises a first lateral band portion (3c) and a second lateral band portion (3d) along a left-hand side part of the shell (1; 1') and along a right-hand side part of the shell (1; 1').

7. The shell (1; 1') according to claim 6, wherein the first portion (3a) and the second portion (3b) of the functional band (3) are applied to the shell body (2; 2') by means of mechanical members and/or gluing and/or welding.

8. The shell (1; 1') according to claim 6 or 7, wherein the first portion (3a) includes two first end hooks (3a1) configured to engage with front housings (3c1, 3d1) of the first lateral band portion (3c) and of the second lateral band portion (3d).

9. The shell (1; 1') according to claim 8, further comprising first locking L-shaped pins (3a5) configured to lock the first end hooks (3a1) in the front housings (3c1, 3d1) of the first lateral band portion (3c) and of the second lateral band portion (3d).

10. The shell (1; 1') according to any one of claims 6 to 9, wherein the second portion (3b) includes two second end hooks (3b1) configured to engage with rear housings (3c2, 3d2) of the first lateral band portion (3c) and of the second lateral band portion (3d).

11. The shell (1; 1') according to claim 10, further comprising second locking L-shaped pins (3b5) configured to lock the second end hooks (3b1) in the rear housings (3c2, 3d2) of the first lateral band portion (3c) and of the second lateral band portion (3d).

12. The cap (1, 1') according to any one of claims 8 to 11,

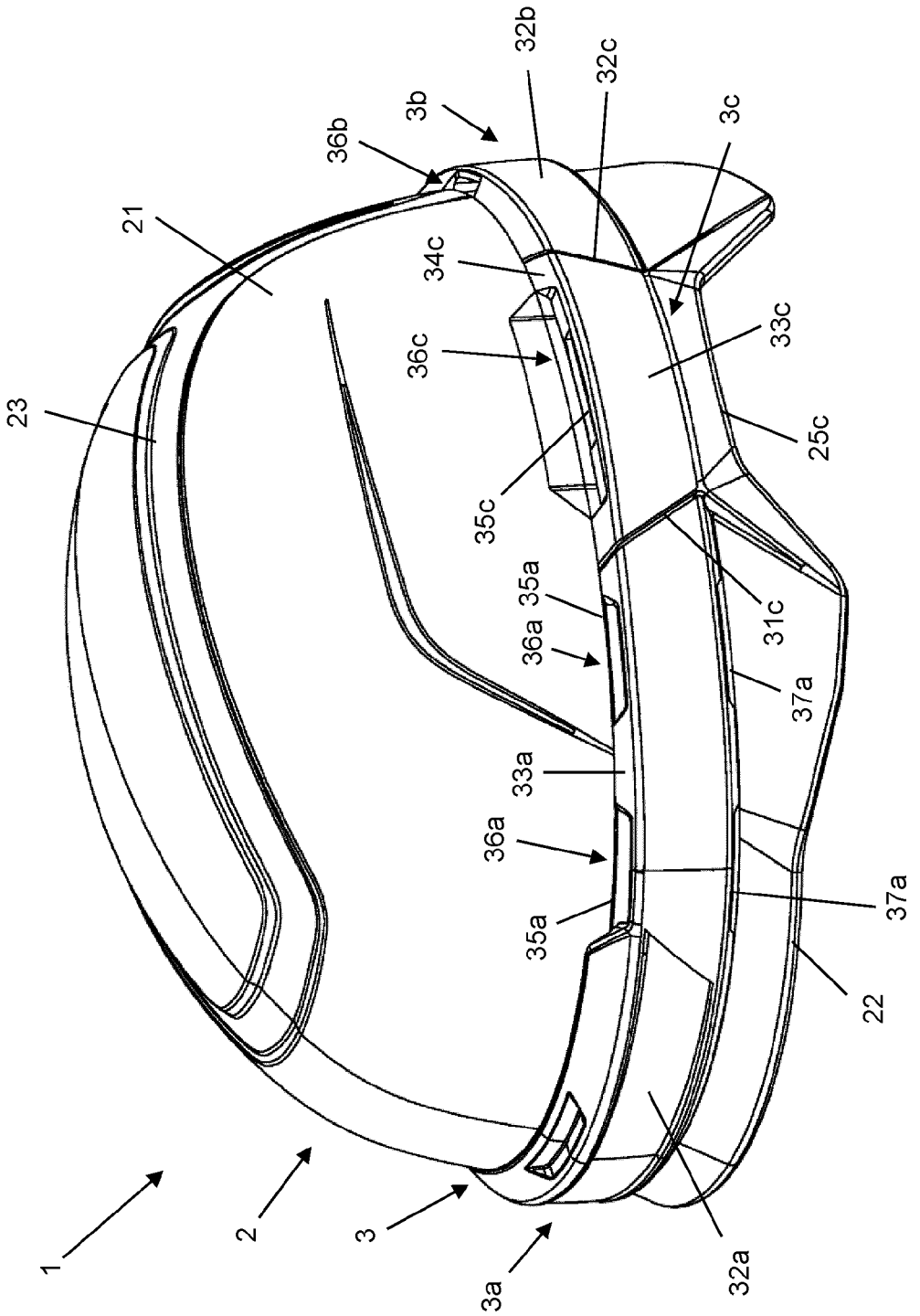
    wherein the first portion (3a) comprises: inclined intermediate hooks (3a2) configured to engage with corresponding slots (2a2) in the shell body (2) and/or attachment keys (3a3) configured to engage with corresponding holes (2a3) in the shell body and/or ribs (3a4); and/or
    wherein the second portion (3b) comprises attachment keys (3b3) configured to engage with corresponding holes (2b3) in the shell body (2) and/or ribs;
    and/or
    wherein the shell body (2) comprises ribs (2a4, 2b4) at said first portion (3a) and said second portion (3b).

13. The shell (1; 1') according to claim 6, wherein the first lateral band portion (3c) and the second lateral band portion (3d) are integral with the shell body (2; 2').

14. A protective helmet (100) comprising a shell (1; 1') according to any one of the preceding claims, an internal protective element (101) shaped to be housed in the shell (1; 1') so as to provide further protection for the wearer's head and a retaining system (102) configured to fasten the helmet (100) un-

der the wearer's chin.

15. The protective helmet (100) according to claim 14, also comprising an accessory attached to the functional band (3), for example a pair of anti-noise earmuffs, a torch, a light-refracting surface, a protective visor or a rear protection.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3b
3c
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36b
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Fig. 1

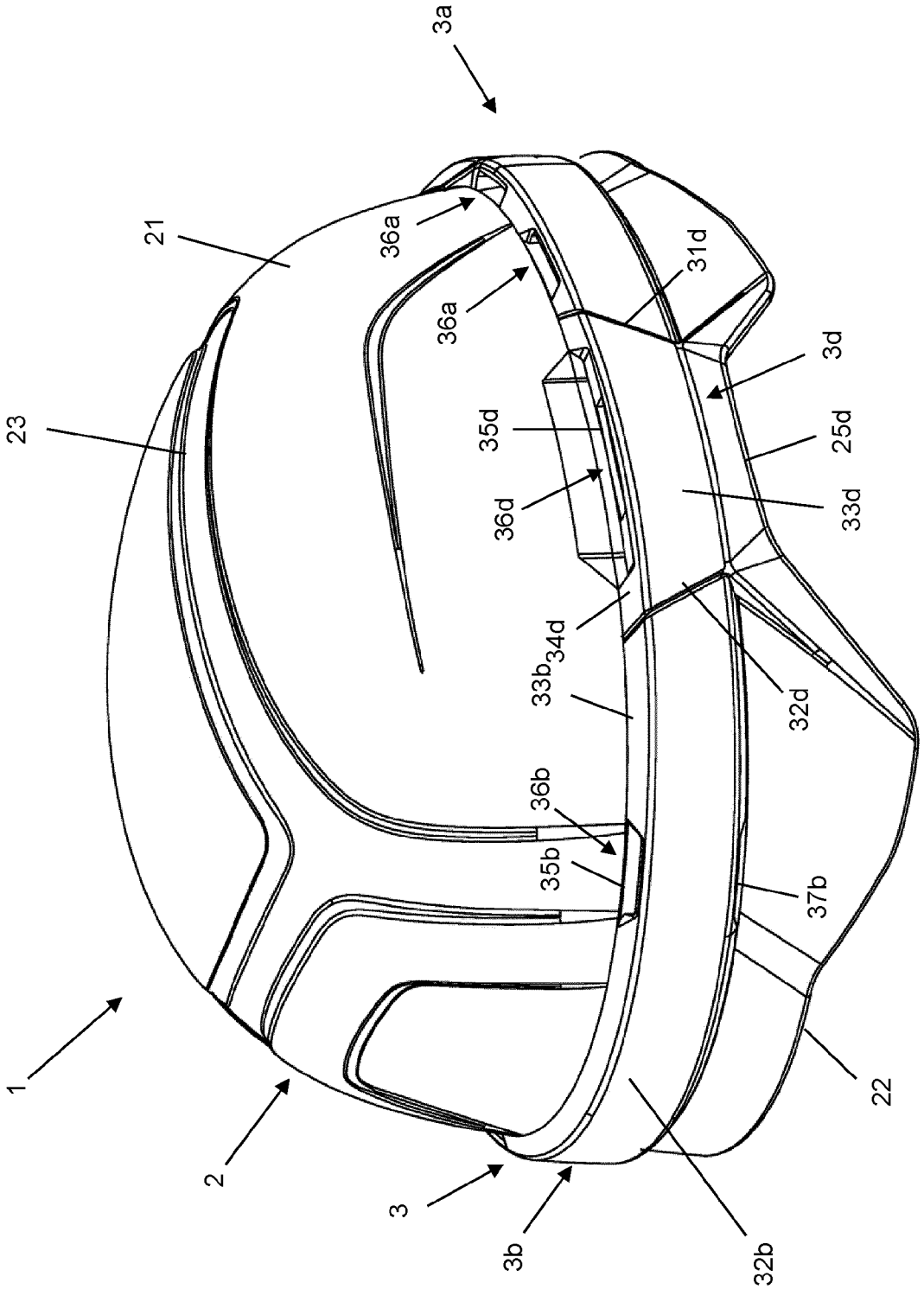
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Fig. 2

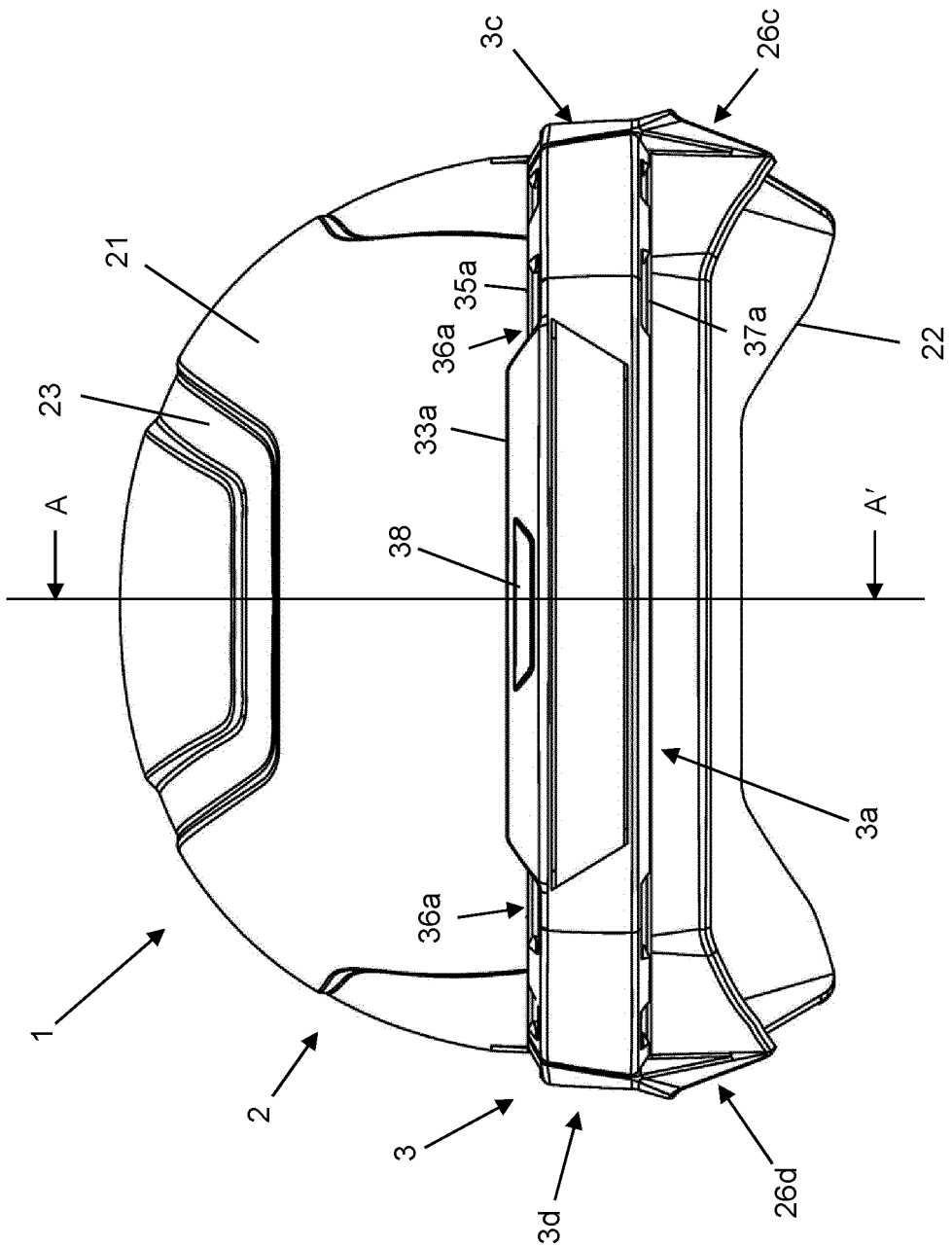


Fig. 3

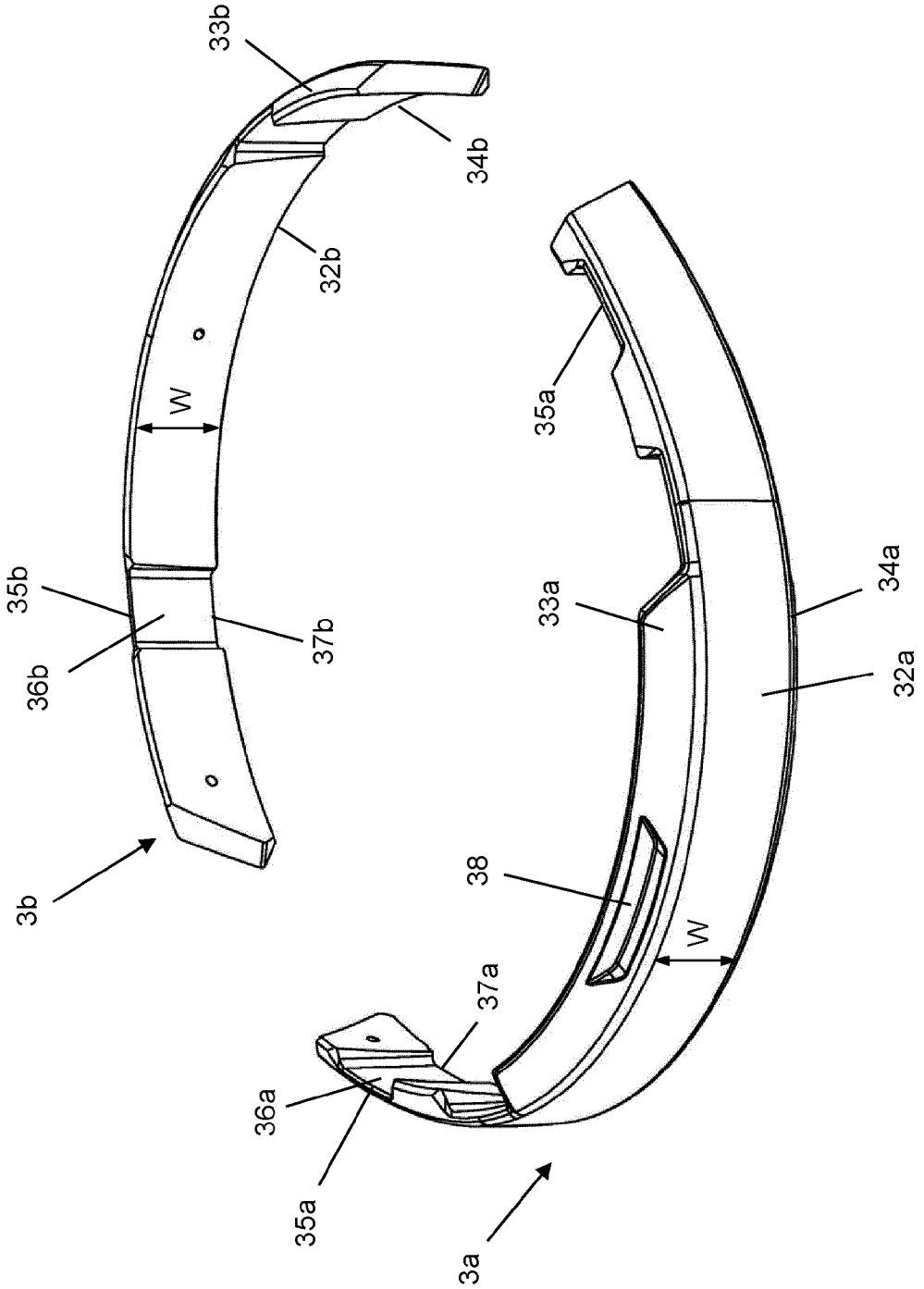


Fig. 4

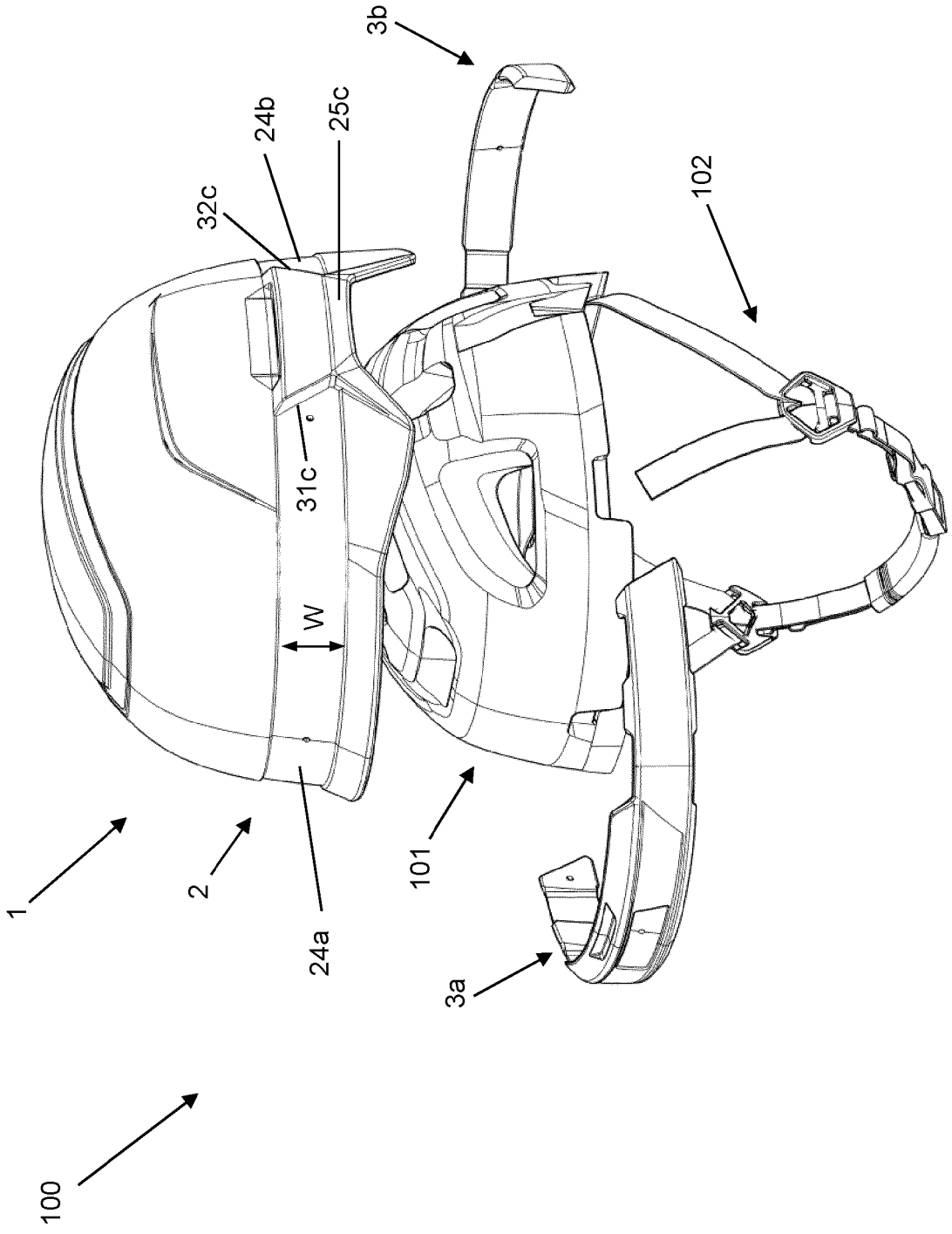


Fig. 5

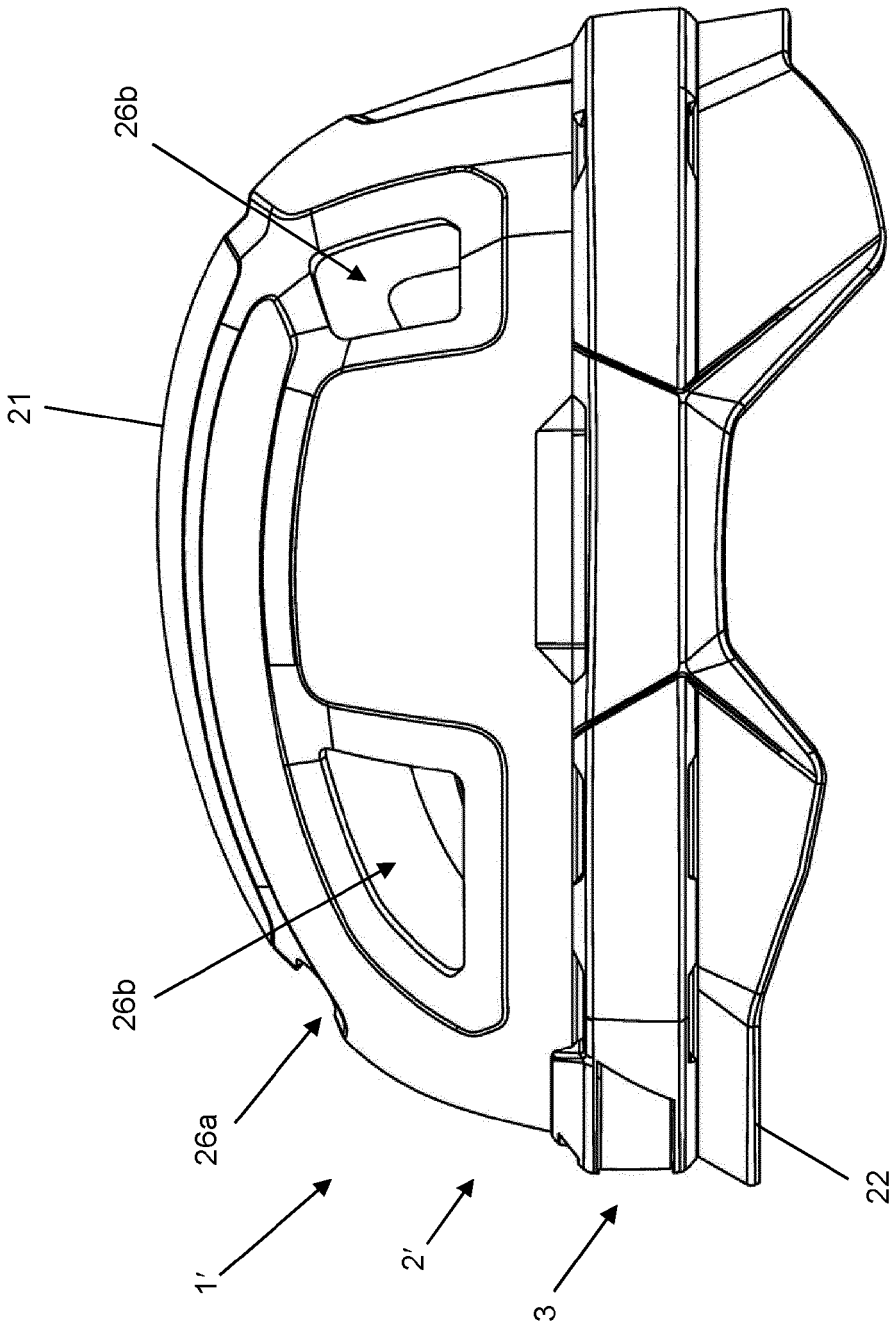
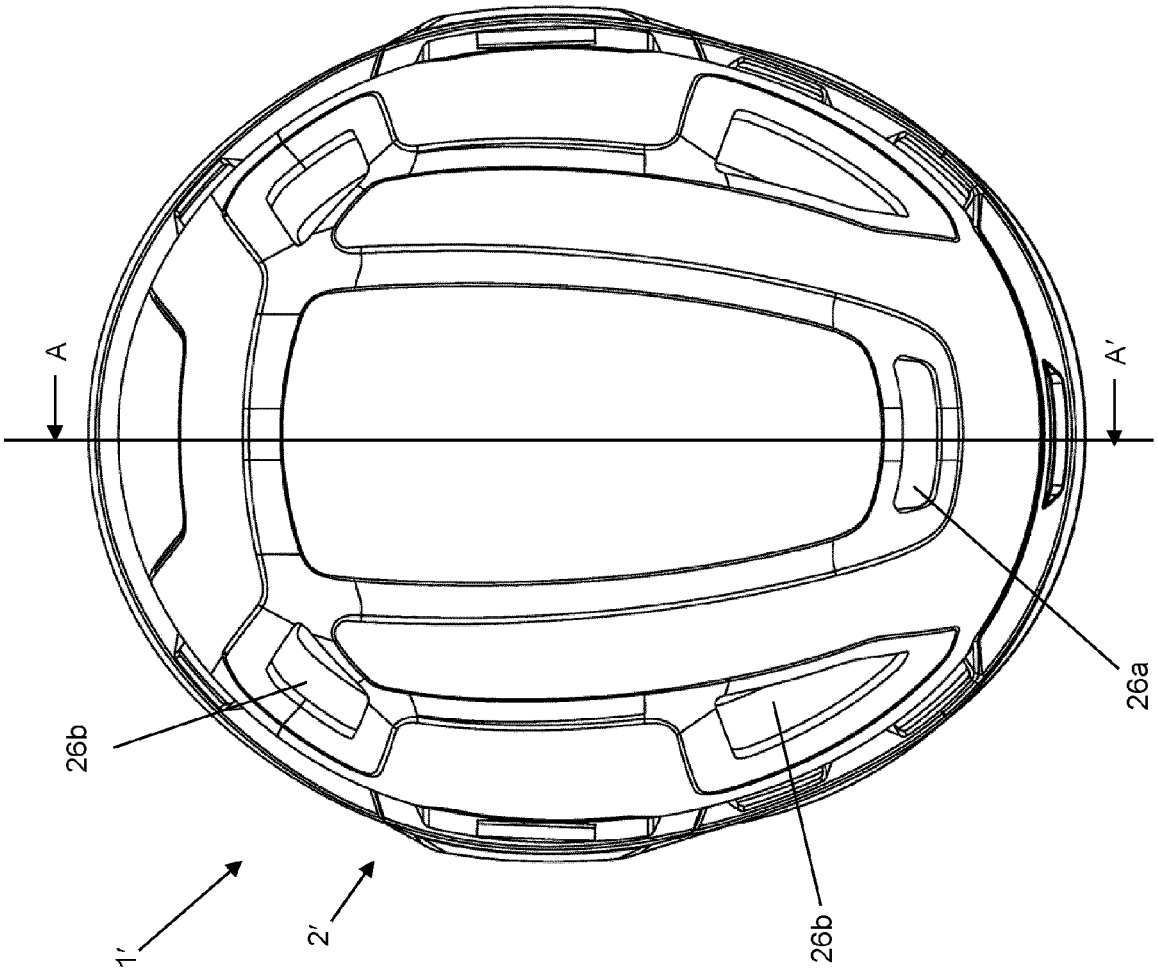


Fig. 6

Fig. 7



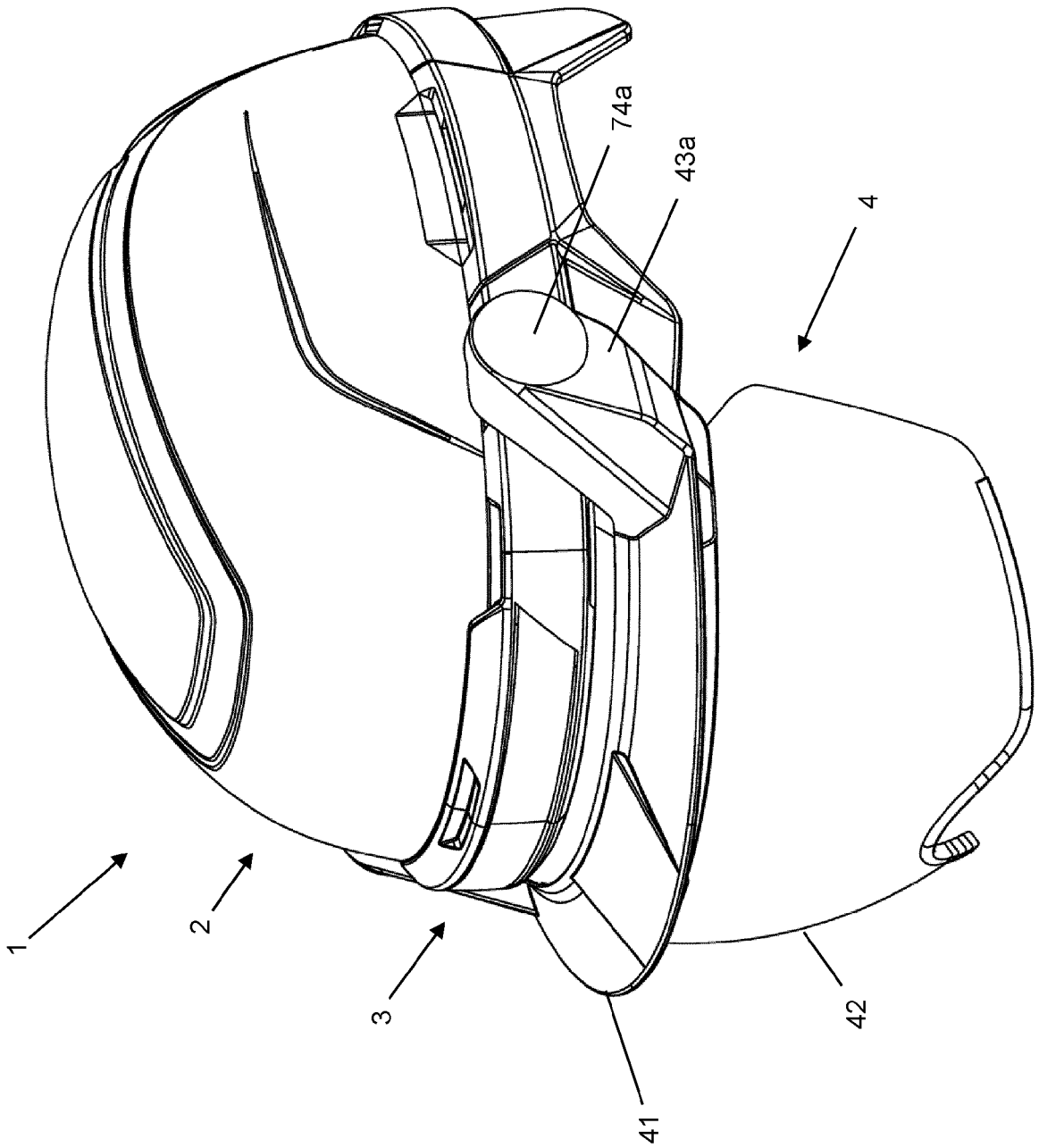


Fig. 8

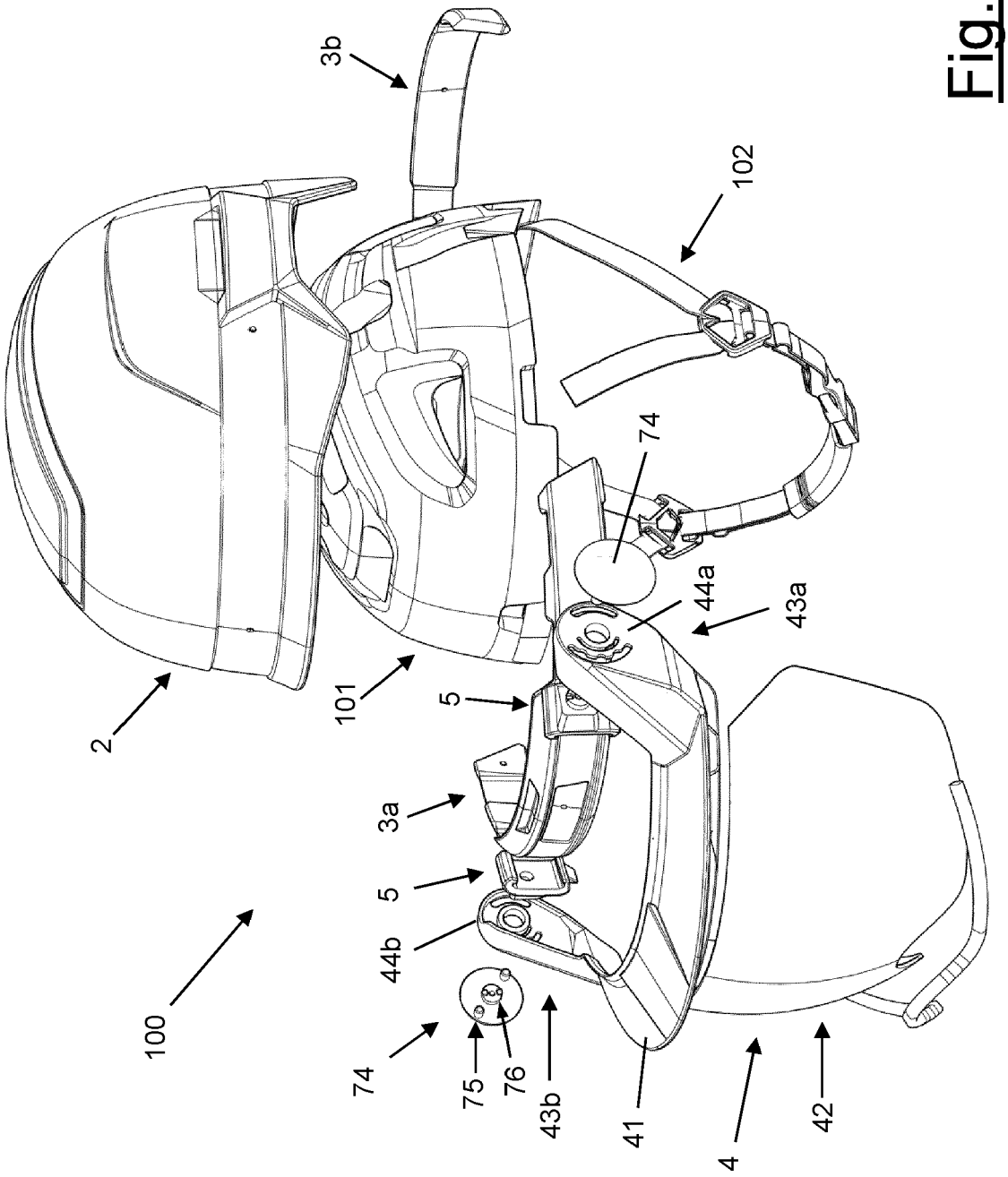
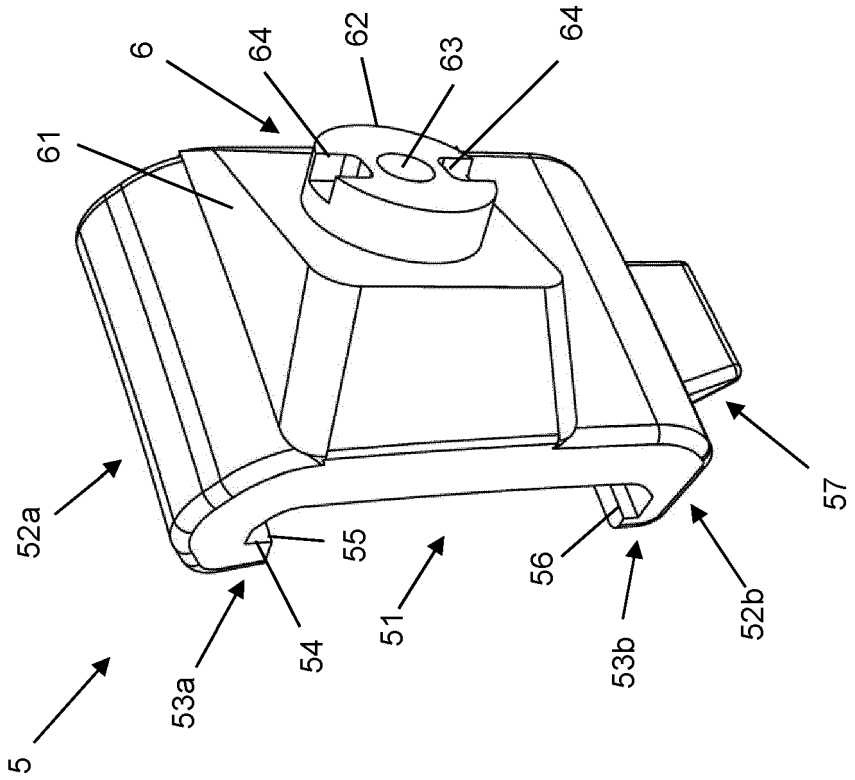


Fig. 9

Fig. 10



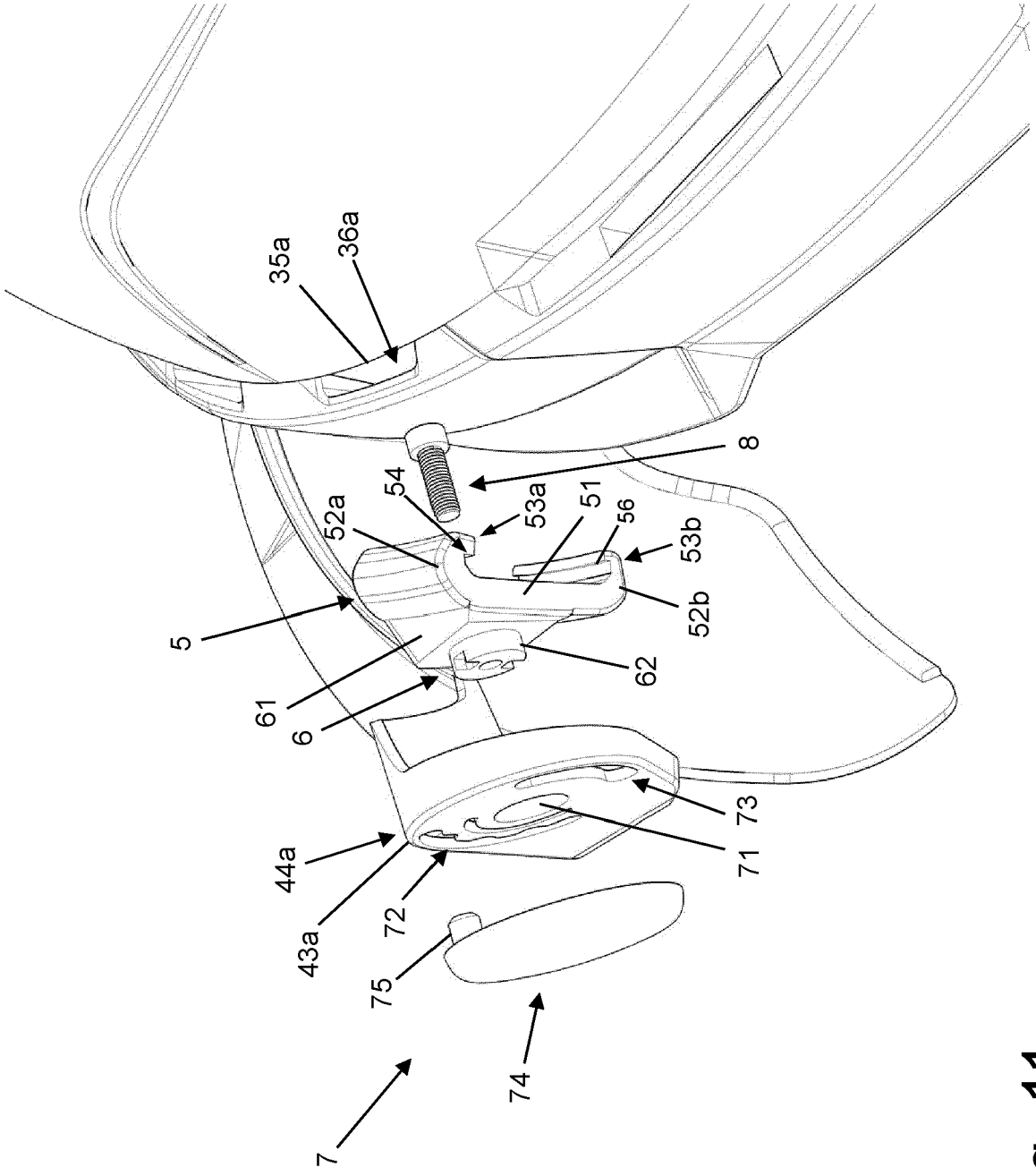


Fig. 11

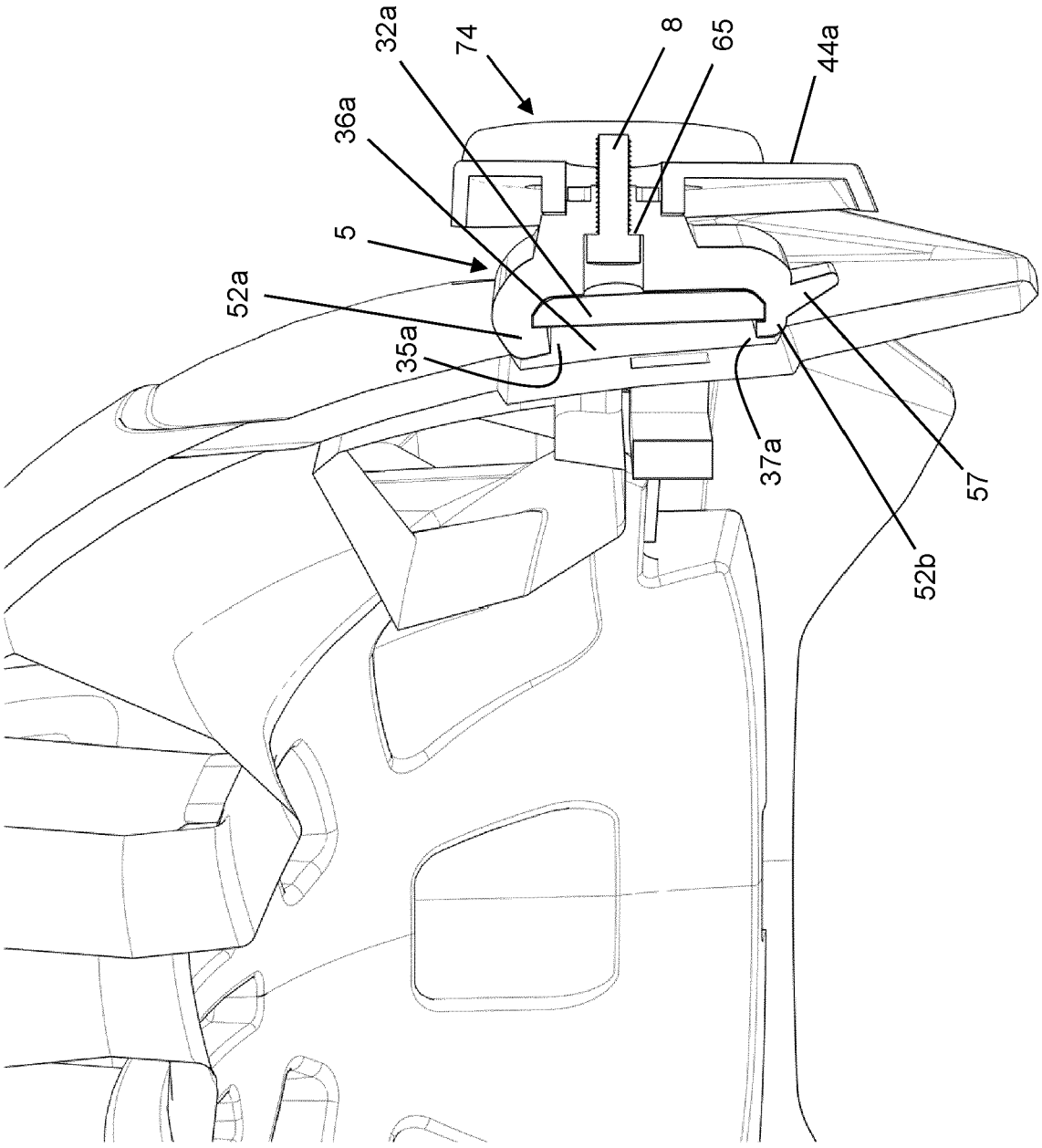


Fig. 12

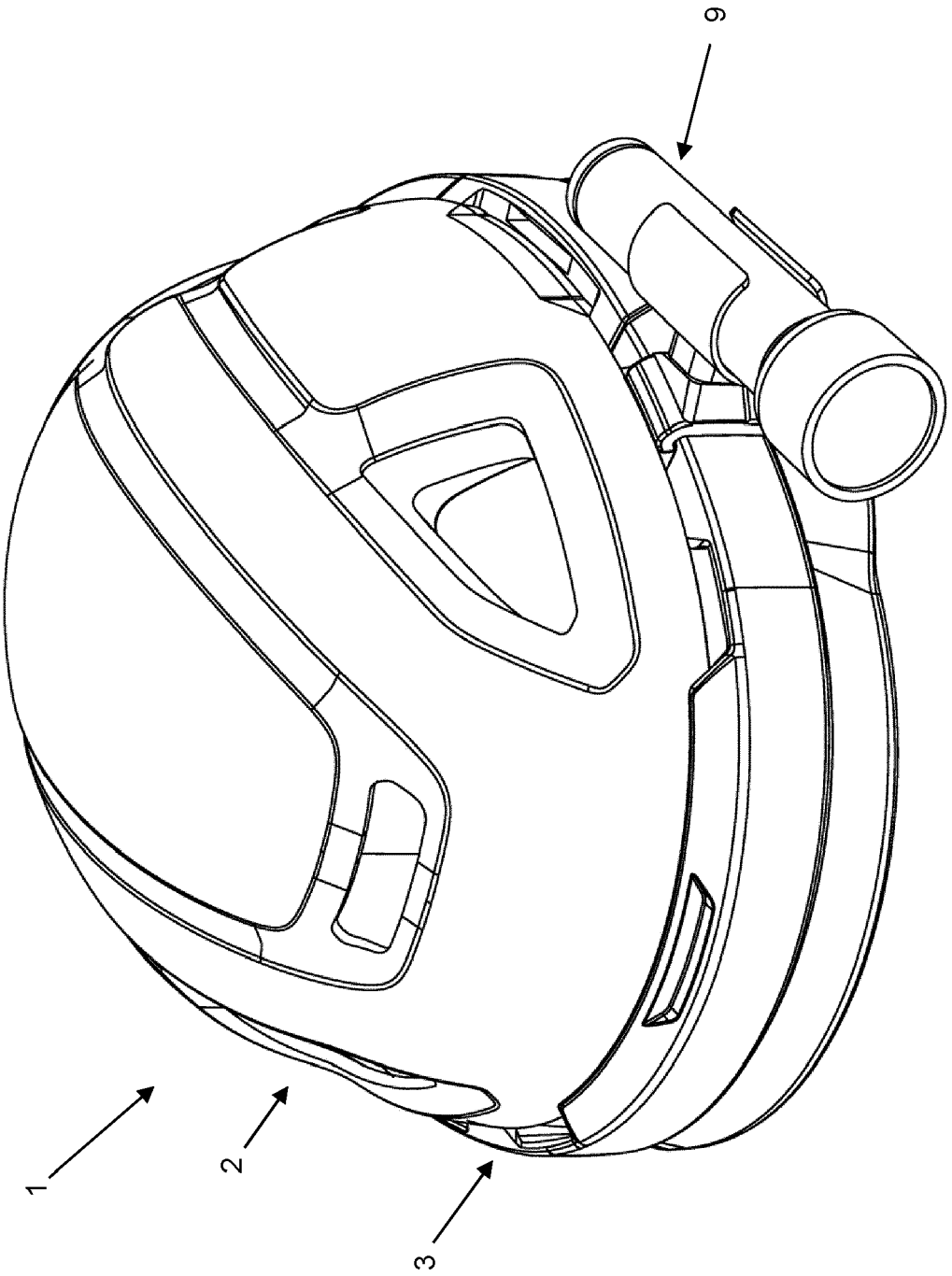


Fig. 13

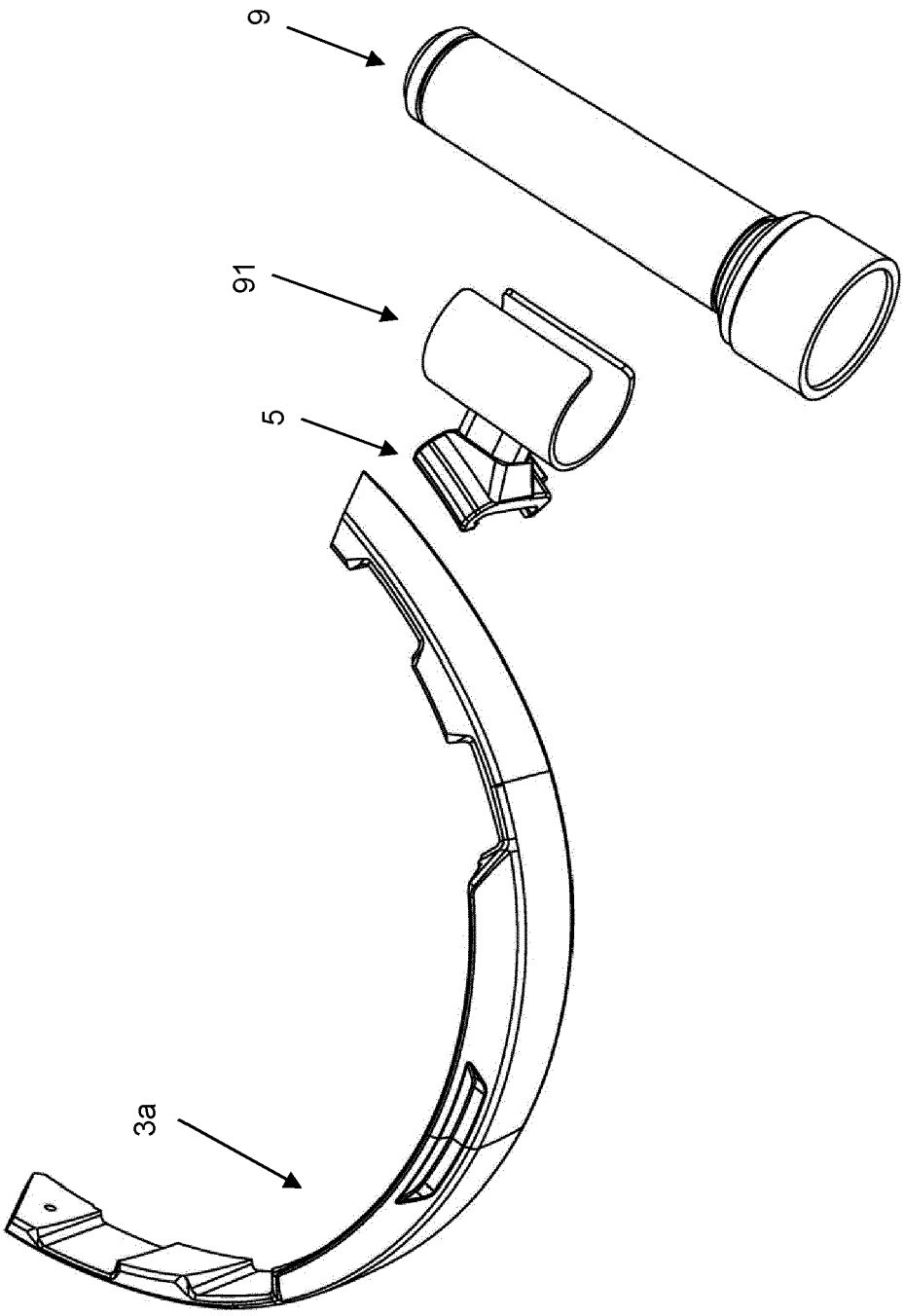


Fig. 14

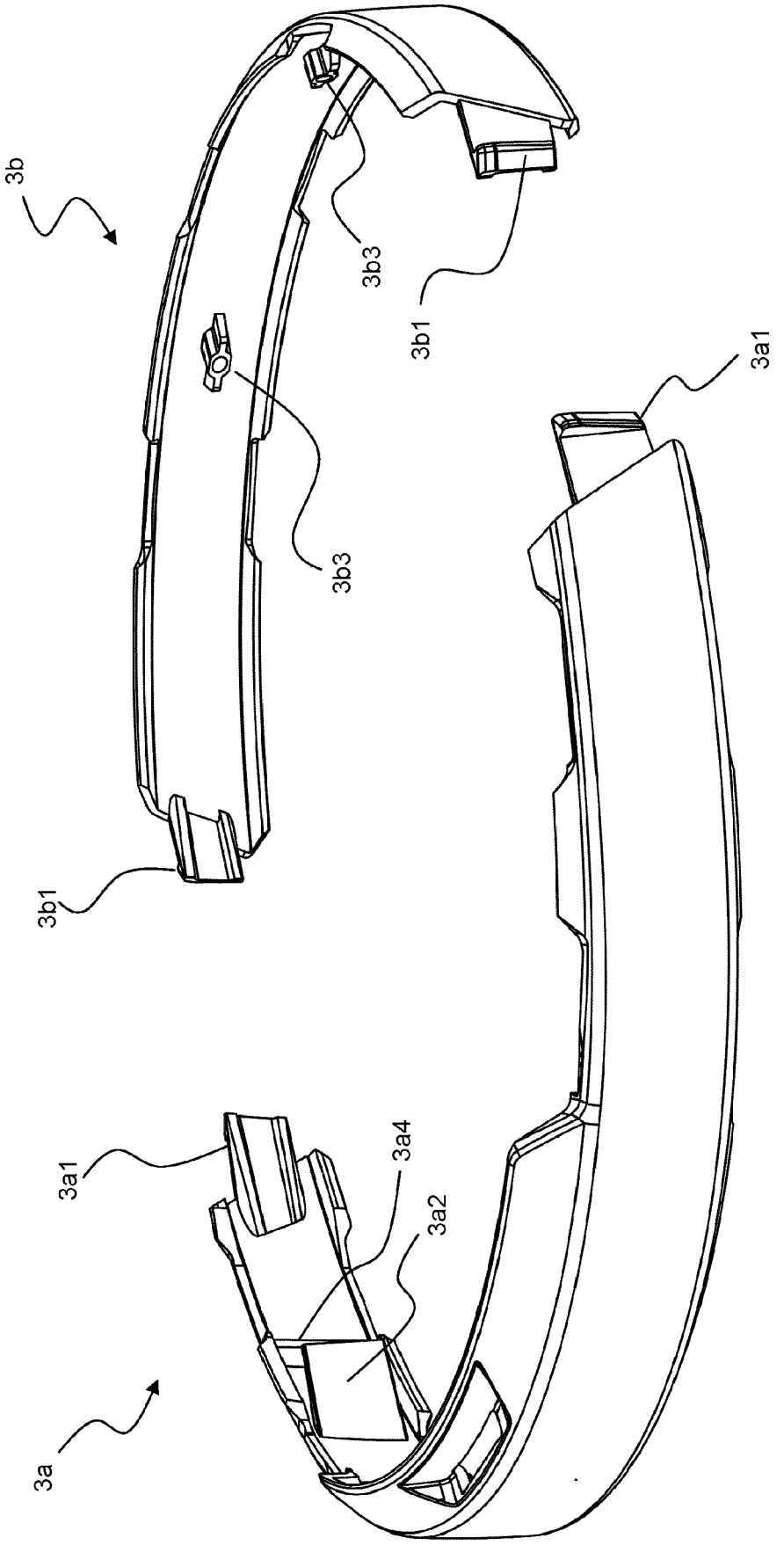
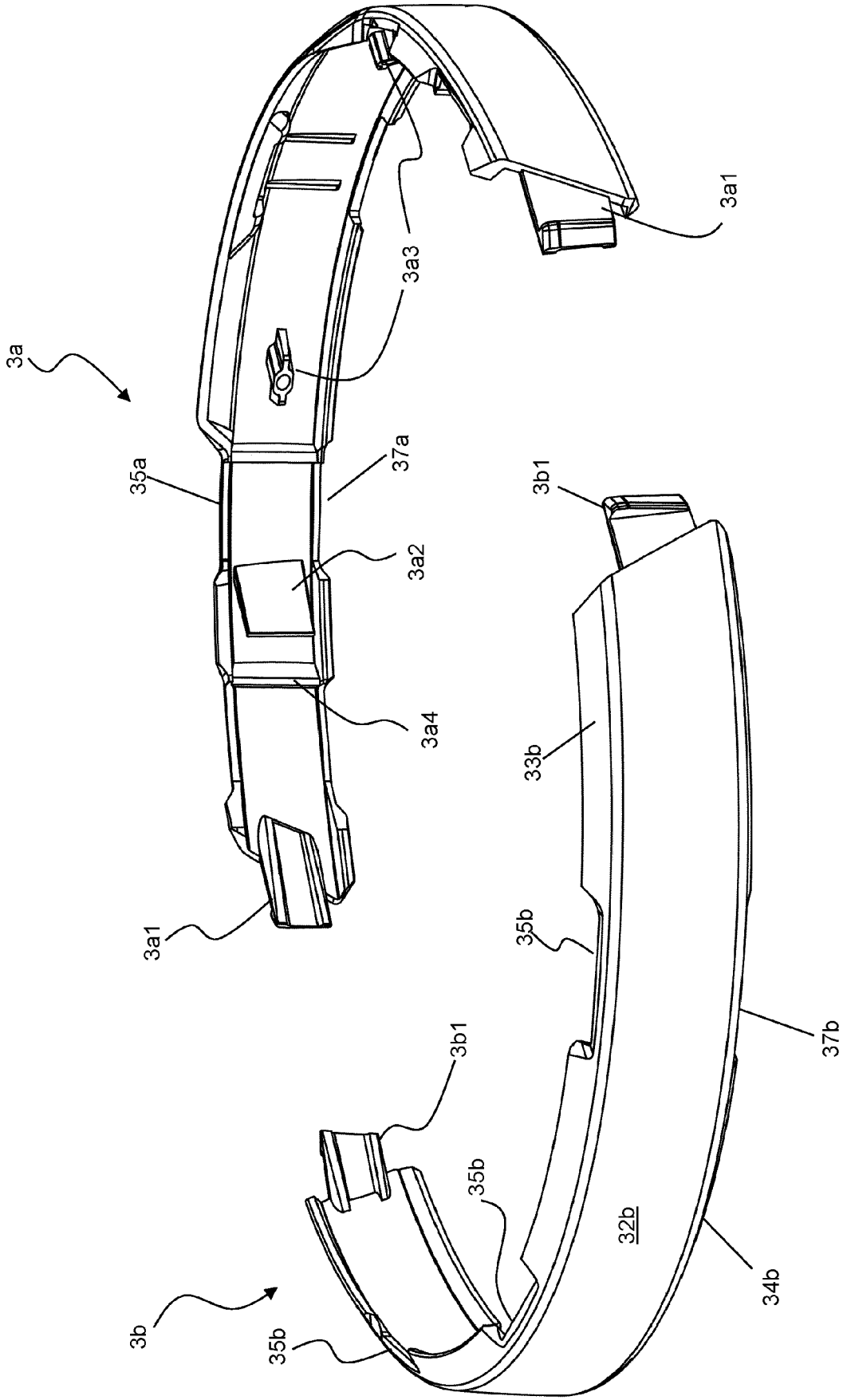


Fig. 15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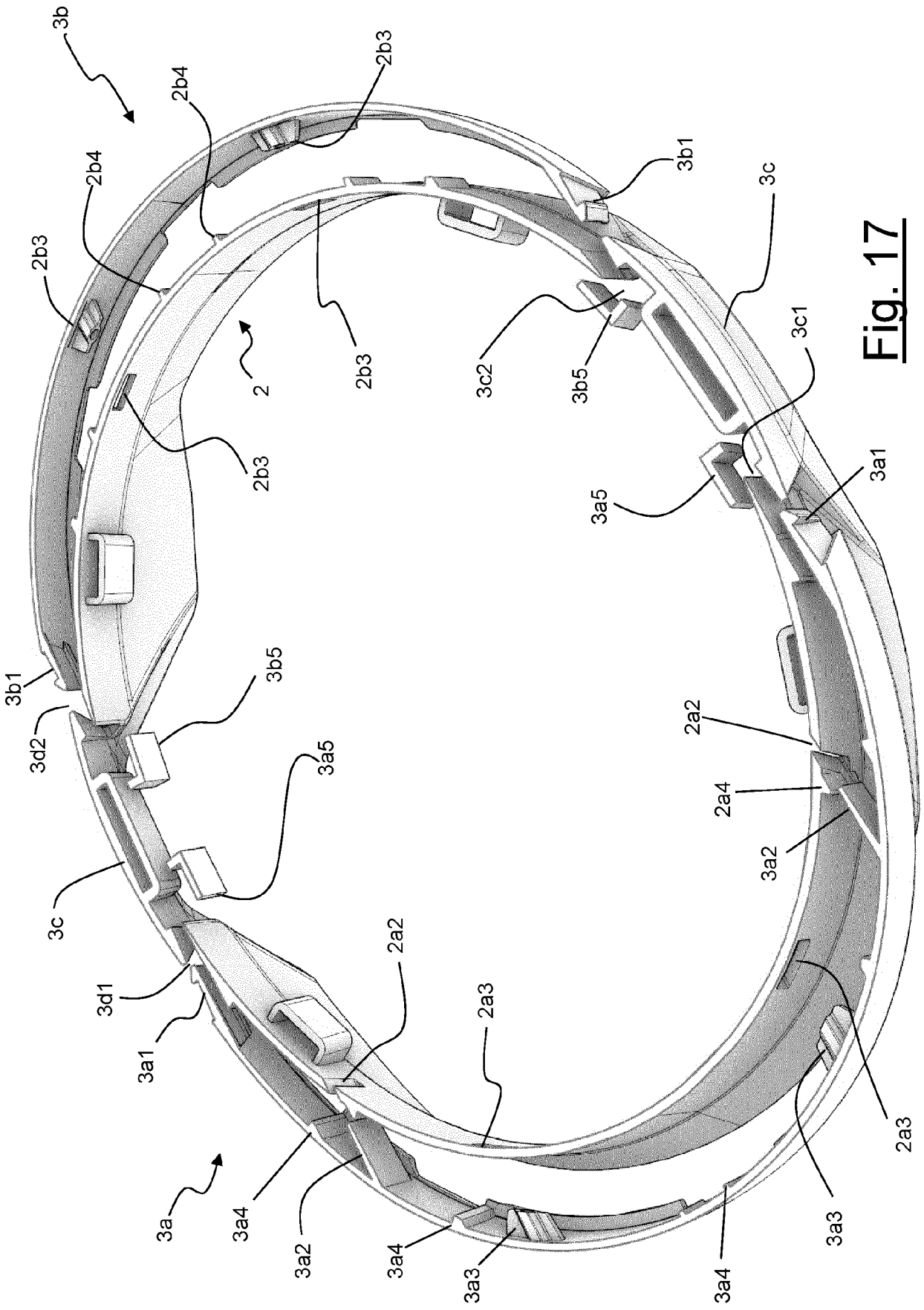
34b
3b
35b

Fig. 16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3d1
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3a
3a4
3a2
3a4
3a3
3a4
3a3

Fig. 17

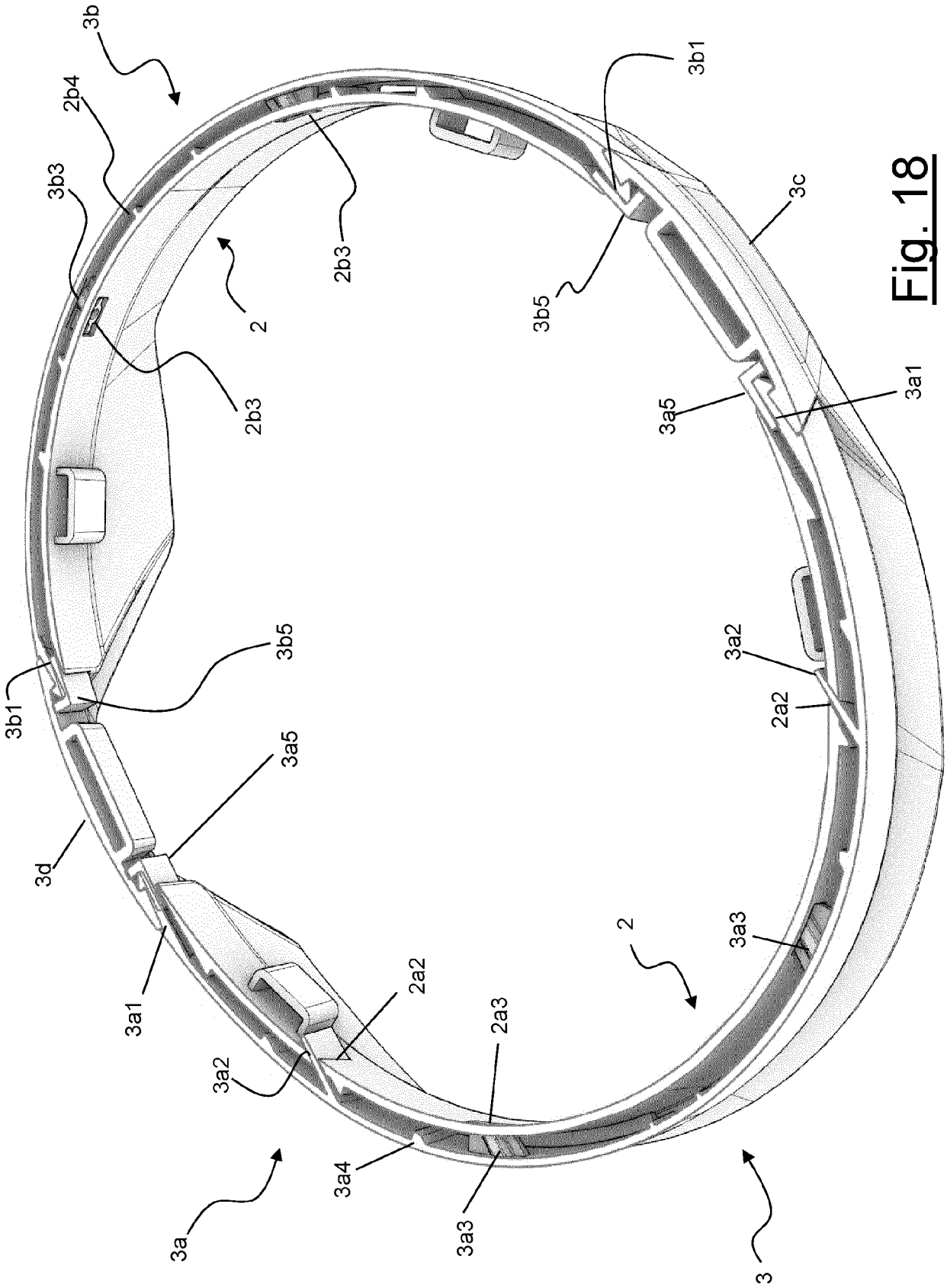
3b
2b4
3b3
2b3
2
2b3
3b1
3b5
3c
3a5
3a1
3b5
3b1
3a2
2a2
3a5
3d
3a1
2a2
2
3a3
3a2
2a3
3a4
3a
3a3
3

Fig. 18

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EUROPEAN SEARCH REPORT

Application Number
EP 23 20 9232

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14 March 2024	D'Souza, Jennifer

CATEGORY OF CITED DOCUMENTS

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