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(54) PROTECTIVE HELMET ASSEMBLY WITH HIGHT ADJUSTABLE SYSTEM

(57) The application is directed a protective helmet assembly comprising at least one outer shell configured for surrounding at least partly a head of a user; at least one helmet suspension adapted to be coupled to the outer shell, wherein the assembly further comprises at least one link element configured to be at least indirectly connected to the outer shell and at least indirectly connected to the helmet suspension, wherein the length of

the link element is adjustable and the link element comprises at least one bendable elongate connection member, wherein further a first section of the connection member is extending from at least one first attachment element to at least one second attachment element, the first attachment element comprises at least one opening through which the connection member is extending, and wherein the length of the first section is adjustable.

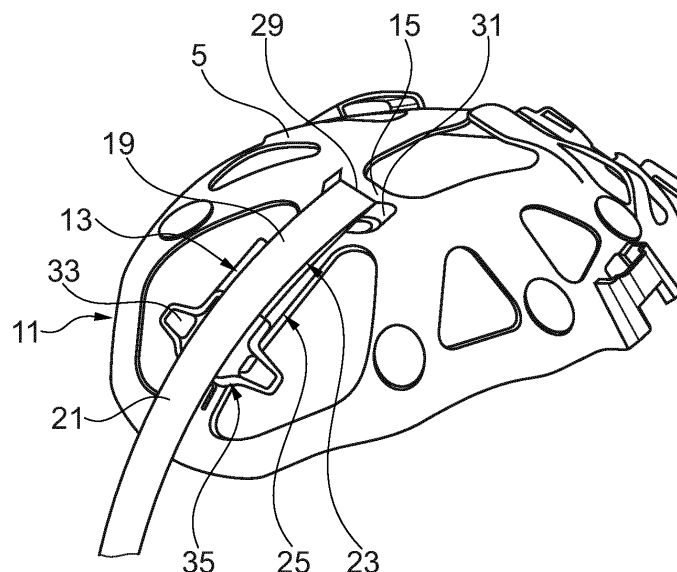


Fig. 2

Description

[0001] The present disclosure relates to a protective helmet assembly comprising at least one outer shell configured for surrounding at least partly a head of a user; at least one helmet suspension adapted to be coupled to the outer shell, wherein the assembly further comprises at least one link element configured to be at least indirectly connected to the outer shell and at least indirectly connected to the helmet suspension wherein the length of the link element is adjustable.

[0002] As is known in the art, a variety of activities, workplace functions, and emergency situations require certain safety measures and equipment. Such activities, functions, and situations may include, for example, industrial or manufacturing activities, construction activities, rescue situations, and other instances where protection of the user's head via a protective helmet is of the utmost importance. Thus, protective helmets are widely used in a variety of environments.

[0003] To ensure a best possible comfort for a user it is known in the prior art to allow an adjustment of the position of the outer shell relative to the helmet suspension being supported by and being in direct contact with the head of the user. This adjustment is made by height adjusters. These adjusters allow to adapt the distance between the head of the user and the outer shell. By adapting this distance it is ensured that the outer shell covers the maximum area of the head of the user, i.e. the coverage area of the head by the helmet is optimized. Furthermore the balance of the helmet is optimized according to the head size of the user.

[0004] For example US 2,964,753 A of the applicant discloses a height adjuster in form of an adjustable height sweatband. Although the height adjuster has proven itself in principle it shows some drawbacks. It does not provide the ability to adjust the height in predefined steps to provide the ability to adjust the height in a reproducible manner. This is however crucial as emergency personal often has to adapt its equipment under high time pressure.

[0005] Furthermore the document US 11,432,609 B2 discloses a safety helmet with adjustable comfort liner. The comfort liner is constrained to the front part and to the rear part of a shell, and the helmet has a webbing arranged between the shell and the comfort liner along the upper median portion of the comfort liner. By changing the length of the webbing the height is adjusted. This height adjustment device has however the drawback that the liner is deformed depending on the set height decreasing the wearing comfort for a user and that the end of the webbing is extending over the liner and out of the outer shell increasing the risk that the webbing can get caught on an object bearing a high risk for a user, for example a fire fighter. Furthermore the deformation of the liner reduces the fastening strength of the helmet to the head of the user such that the helmet can easier get loosened from the head of the user.

[0006] Accordingly, there is a need in the art for an improved protective helmet assembly with a shell and a suspension system having a height adjustment device. It is thus the object of the claimed subject matter to further develop the known protective helmet assembly with height adjustment device to overcome the drawbacks known from the prior art, for example the before described disadvantages, in particular to provide an improved protective helmet assembly with a height adjustment system providing the ability to reproducibly adjust the height of the shell relative to the helmet suspension system without negatively influencing the wearing comfort for a user or the holding strength of the helmet of the head of a user.

[0007] According to a first aspect this problem is solved by a protective helmet assembly comprising at least one outer shell configured for surrounding at least partly a head of a user; at least one helmet suspension adapted to be coupled to the outer shell, wherein the assembly further comprises at least one link element configured to be at least indirectly connected to the outer shell and at least indirectly connected to the helmet suspension, wherein the length of the link element is adjustable and the link element comprises at least one bendable elongate connection member, wherein further a first section of the connection member is extending from at least one first attachment element to at least one second attachment element, the first attachment element comprises at least one first opening through which the connection member is extending, wherein the length of the first section is adjustable.

[0008] It is proposed that the first attachment element is at least indirectly connected to the helmet suspension and the second attachment element is at least indirectly connected to the outer shell.

[0009] Furthermore a protective helmet assembly can be characterized in that the first attachment element is at least indirectly connected to the outer shell and the second attachment element is at least indirectly connected to the helmet suspension.

[0010] Optionally in the protective helmet assembly a second section of the connection member is extending from the first attachment element, in particular the first opening and/or in a direction opposite to the first section, to a first end of the connection member.

[0011] It is also proposed that a second end of the connection member, in particular located opposite the first end of the connection member, is connected to the second attachment element.

[0012] Advantageous embodiments can be characterized in that the second attachment element comprises at least one second opening and the connection member is extending through the second opening, wherein a third section of the connection member extends from the second attachment element, in particular the second opening and/or a direction opposite to the first section, to a second end of the elongate member.

[0013] In the before described embodiments it is op-

tionally planned that the first end is connected to at least one first adjustment element and/or the second end is connected to at least a second adjustment element, wherein the first adjustment element and/or the second adjustment element is/are fixable in at least two different positions, preferably at least three different positions, more preferably at least four different positions, and/or in an infinite number of positions, wherein in the different positions the lengths of the first section and the second section along the connection member and/or the lengths of the first section and the third section along the connection member are different.

[0014] For the before described embodiment it is proposed that by moving the first adjustment element from one position to another position the length of the first section is increased and the length of the second section is reduced or the length of the first section is reduced and the length of the second section is increased.

[0015] For the before described embodiments it is proposed that by moving the second adjustment element from one position to another position the length of the first section is increased and the length of the third section is reduced or the length of the first section is reduced and the length of the third section is increased.

[0016] Optionally it is preferred that the connection member undergoes a change of direction, in particular a reversal of direction, from the first section to the second section and/or from the first section to the third section.

[0017] Furthermore the protective helmet assembly can be characterized in that the second section is extending from the first attachment element, in particular the first opening, to the first end into a direction having a direction component opposite to the direction of the connection member from the second end to the first attachment element.

[0018] Optionally it is proposed that the third section is extending from the second attachment element, in particular the second opening, to the second end into a direction having a direction component opposite to the direction of the connection member from the first end to the second attachment element.

[0019] Alternatively or additionally in the protective helmet assembly the first adjustment element is fixable relative to the outer shell, the first section of the connection member and/or the helmet suspension, in particular a bridge and/or a cap of the helmet suspension, via at least one first fixation means and/or the second adjustment element is fixable relative to the outer shell, the first section of the connection member and/or the helmet suspension, in particular a bridge and/or a cap of the helmet suspension, via at least one second fixation means.

[0020] For the before described embodiments it is proposed that the first fixation means and/or the second fixation means comprises at least one latching device, at least one locking device, at least one snap-in-device, at least one, clipping device, at least one Velcro device, at least one plug-in device, at least one sliding device, at

least one interlocking device, and/or at least one click-on device.

[0021] Finally it is proposed that the connection member comprises at least one strap, at least one webbing, at least one belt, and/or at least one line.

[0022] The claimed subject matter is thus based on the astonishing perception that by providing a height adjustment device being separate from a helmet suspension but in work relation to the helmet suspension it is ensured that the comfort for a user is optimized as the form and configuration of the helmet suspension being the element in direct contact with the head of the user and defining the holding strength for the helmet remains unchanged irrespective of the adjustment of the height. In particular the helmet suspension can be configured and adapted in the size and form to best fit the form of the head of the user proving optimized wearing comfort that is not negatively influenced by adjusting the height of the outer shell relative to the head of the user. Furthermore a movement of the outer shell relative to the head and/or the helmet suspension does not negatively influence the fit of the helmet to the head of the user and the fastening strength of the helmet suspension and thus the complete helmet to the head of the user. The wearing comfort is furthermore increased by configuring the height adjustment device to include a link element comprising an elongate connection member extending through an opening of an attachment element. This allows to arrange the connection member in such a way that it undergoes a change of direction, in particular a reversal of direction, such that the link element remains compact, in particular that it is prevented that parts of the connection member extend out of the outer shell. Furthermore the use of the attachment elements and the guidance of the connection member through the opening allows to connect the link element to the best suited areas of the outer shell and the helmet suspension with regard to the balancing of the outer shell, in particular in the different height positions, and to ensure that the height adjustment is intuitive, quick and easy to use.

[0023] Further features and advantages of the claimed subject-matter will become apparent from the following description of preferred embodiments. These embodiments are explained with the help of the attached figures in which

Fig. 1 is a side view onto a user wearing a protective helmet assembly according to the claimed subject matter;

Fig. 2 is a view onto the protective helmet assembly of Fig. 1 omitting the outer shell, i.e. a view onto the helmet suspension and height adjustment device;

Fig. 3 is a view onto the protective helmet assembly of Fig. 1 and Fig. 2 omitting the outer shell from the inside of the protec-

tive helmet assembly; and

Fig. 4a to 4c views onto the protective helmet assembly as shown in Fig. 2 and 3 in different setting positions of the height adjustment device.

[0024] Figure 1 shows an embodiment of a protective helmet assembly 1 according to the claimed subject matter. The protective helmet assembly 1 comprises an outer shell 3 and a helmet suspension in form of a cap 5. The protective helmet assembly 1 is worn by a user 7. The helmet suspension 5 is in direct contact with a head 9 of the user 7. In particular the cap 5 is adjustable in different dimension and directions to best possibly adapt the form of the cap 5 to the form of the area of the head 9 on which the cap 5 rests. In this way a form-fit between the head 9 and the cap 5 is provided to allow a best holding of the protective helmet assembly 1 on the head of the 9 of the user 7 and to increase the comfort for the user 7.

[0025] To further increase the comfort for the user 7 a height h is adjustable. The height h describes the distance between the upper side of the cap 5 and the head 9, respectively, on the one hand and the inner side of the outer shell 3 on the other hand. By adapting the height h the position of the outer shell 3 with respect to the head 9 can be aligned to best fulfill the requirement that the outer shell 3 covers as much as possible of the head 9 to provide the best protection on the one hand and to avoid that the outer shell 3 negatively influence the field of view of the user 7 on the other hand. Furthermore the height h influences the balance of the protective helmet assembly 1 according to the size of the head 9 thus allowing to optimize the balance by adjusting the height h .

[0026] To adjust the height h the protective helmet assembly 1 a height adjustment device 11. The height adjustment device 11 comprises a link element 13 connecting the outer shell 3 and the cap 5. The link element 13 is connected to a first attachment element 15 comprised by the cap 5 and connected to a second attachment element 17 which in turn is connected to the outer shell 3. The link element 13 comprises a bendable elongate connection member in form of a strap 19. A first section 21 of the strap 19 extends from the first attachment element 15 to the second attachment element 17.

[0027] As explained in the following the length of the first section 21 is adjustable. By adjusting the length of the first section 21 the height h can be changed.

[0028] A second section 23 of the strap 19 extends from the first attachment element 15 to a first end 25, whereas a second end 27 of the strap 19 is connected to the second attachment element 17 and thus indirectly to the outer shell 3.

[0029] The height adjustment device 11 is shown in more detail in Figure 2. The first attachment element 15 comprises a first opening 29 formed in a bridge 31 of the cap 5. The strap extends from the second end 27 along its first section to the opening 29 formed in the first attach-

ment element 15, and through the opening 29 along the second section 23 to the first end 25. The first end 25 is connected to a first adjustment element in form of a slider 33. The slider 33 can be moved along a rail 35. The rail 35 is optionally formed in and/or by the cap 5, optionally a bridge of the cap 5.

[0030] By a movement of the slider 33 the strap 19 is driven. The result of this action is that the length of the second section 23 of the strap 19, i.e. the distance between the first end 25 and the first opening 29, is changed. This in turn changes the length of the first section 21 of the strap 19 and thus the height h . In case the length of the second section 23 is increased, the length of the first section 21 is decreased such that the height h is increased. Alternatively, in case the length of the second section 23 is reduced, the length of the first section 21 is increased such that the height h is decreased. Thus the height adjustment device 11 enables the height h to be adapted to the corresponding size of the head 9 within a defined range.

[0031] In a preferred embodiment the first adjustment element provides at least three stable positions in which the slider 33 is fixed during normal use of the helmet, in particular by a form and/or force fit with the rail 35. For example the positions might be characterized by clothing sizes S, M, L. These positions ensure a wide range of coverage with regard to different sizes of the head 9. The slider 33 can be fixed in the different position by a first fixation means in form of a latching device.

[0032] In Fig. 3 a view onto the protective helmet assembly 1 from inside the helmet or the underside of the helmet suspension in form of the cap 5 is shown. It can be seen that the rail 35 has an opening 37 that is formed as the letter S. As the opening 37 allows a view onto the backside of the slider 33 by the contrast provided by the slider (bright color) and the rail 35 (dark color) the user can easily identify the position of the slider 33 correlated with a specific height h .

[0033] The Figures 4a to 4c show the slider 33 in different positions. In the left part of the respective figure a top view similar to the Figure 2 is shown for the respective position of the slider 33 whereas in the right part of the respective figure a view similar to the Figure 3 is shown for the respective position of the slider 33.

[0034] In Figure 4a the slider 33 is shown in the position shown in the figures 2 and 3. The position corresponds to the position S as indicated by the opening 37 in the form of an S acting as a window onto the backside of the slider 33. In this position the height h is at a maximum as the first section 21 has a minimal length.

[0035] In Fig. 4b the slider 33 is shown in a intermediate position. The position corresponds to the position M as indicated by the opening 37' in the form of an M. In this position the length of the second section 23 has been decreased compared to the position S shown in Figure 4a. Thus the length of the first section 21 has been increased compared to the position S shown in Figure 4a and thus the outer shell 3 has been lowered such that

the height h has been reduced compared to the position shown in Fig 4a.

[0036] In Fig. 4c the slider 33 is shown in an extreme opposite position compared to the position shown in Fig. 4a. The position corresponds to the position L as indicated by the opening 37" in form of the letter L. Compared to the position shown in Fig. 4b the length of the second section 23 has been decreased further such that also the length of the first section 21 has been increased further compared to the position shown in Fig. 4b. Thus the outer shell 3 has been lowered further to a minimal height h.

[0037] Although the claimed subject matter has been described in the example with a first section 21 and second section 23 of the strap 19 on the side of the first end 25, in particular that the strap 19 extend through a first opening 29 of the first attachment element 15, also the second attachment element 17 might provide a second opening through which the strap 19 is extending. In this way a third section of the strap is formed between the second opening and the second end 27. By changing the length of the third section also the length of the first section 21 could be changed and thus in turn the height h could be adjusted by a second adjustment element being connected to the second end. Such a second opening and second adjustment element could be provided in addition or alternatively to the first adjustment element as described before.

[0038] Furthermore, although the protective helmet assembly has been described as having three stable positions of the slider 33 it is also possible that only two or a plurality of more than three stable positions can be realized. Also the slider 33 might be stable not only in incremental positions but also infinite numbers of stable positions can be provided, for example by replacing the latching device by a non-toothed linear friction device.

[0039] The features disclosed in the claims, the specification and the drawings may be essential for the different embodiments of the claimed subject-matter, either separately or in any combination with each other.

REFERENCE SIGN LIST

[0040]

1	protective helmet assembly
3	outer shell
5	cap
7	user
9	head
11	height adjustment device
13	link element
15	first attachment element
17	second attachment element
19	strap
21	first section
23	second section
25	first end

27	second end
29	first opening
31	bridge
33	slider
5 35	rail
37, 37', 37"	opening

h height

10 Claims

1. A protective helmet assembly (1) comprising

at least one outer shell (3) configured for surrounding at least partly a head (9) of a user (7); at least one helmet suspension (5) adapted to be coupled to the outer shell (3), wherein the assembly (1) further comprises at least one link element (13) configured to be at least indirectly connected to the outer shell (3) and at least indirectly connected to the helmet suspension (5), **characterized in that** the length of the link element (13) is adjustable and the link element (13) comprises at least one bendable elongate connection member (19), wherein further a first section (21) of the connection member (19) is extending from at least one first attachment element (15) to at least one second attachment element (17), the first attachment element (15) comprises at least one first opening (29) through which the connection member (19) is extending, wherein the length of the first section (21) is adjustable.

2. The protective helmet assembly according to claim 1, wherein the first attachment element (15) is at least indirectly connected to the helmet suspension (5) and the second attachment element (17) is at least indirectly connected to the outer shell (3).

3. The protective helmet assembly according to claim 1, wherein the first attachment element is at least indirectly connected to the outer shell and the second attachment element is at least indirectly connected to the helmet suspension.

4. The protective helmet assembly according to one of the preceding claims, wherein a second section (23) of the connection member (19) is extending from the first attachment element (15), in particular the first opening (29) and/or in a direction opposite to the first section (21), to a first end (25) of the connection member (19).

5. The protective helmet assembly according to one of the preceding claims, wherein a second end (27) of

the connection member (19), in particular located opposite the first end (25) of the connection member (19), is connected to the second attachment element (17).

6. The protective helmet assembly according to one of the preceding claims, wherein the second attachment element comprises at least one second opening and the connection member is extending through the second opening, wherein a third section of the connection member extends from the second attachment element, in particular the second opening and/or a direction opposite to the first section, to a second end of the elongate member.
7. The protective helmet assembly according to claim 4 or 6, wherein the first end (25) is connected to at least one first adjustment element (33) and/or the second end is connected to at least a second adjustment element, wherein the first adjustment element (33) and/or the second adjustment element is/are fixable in at least two different positions, preferably at least three different positions, more preferably at least four different positions, and/or in an infinite number of positions, wherein in the different positions the lengths of the first section (21) and the second section (23) along the connection member (19) and/or the lengths of the first section and the third section along the connection member are different.
8. The protective helmet assembly according to claim 7, wherein by moving the first adjustment element (33) from one position to another position the length of the first section (21) is increased and the length of the second section (23) is reduced or the length of the first section (21) is reduced and the length of the second section (23) is increased.
9. The protective helmet assembly according to claim 7 or 8, wherein by moving the second adjustment element from one position to another position the length of the first section is increased and the length of the third section is reduced or the length of the first section is reduced and the length of the third section is increased.
10. The protective helmet assembly according to one of the claims 4 to 9, wherein the connection member (19) undergoes a change of direction, in particular a reversal of direction, from the first section (21) to the second section (23) and/or from the first section to the third section.
11. The protective helmet assembly according to claim 10, wherein the second section (23) is extending from the first attachment element (15), in particular the first opening (29), to the first end (25) into a direction having a direction component opposite to the direction of the connection member (19) from the second end (27) to the first attachment element (15).
12. The protective helmet assembly according to claim 10 or 11, wherein the third section is extending from the second attachment element, in particular the second opening, to the second end into a direction having a direction component opposite to the direction of the connection member from the first end to the second attachment element.
13. The protective helmet assembly according to one of the claims 7 to 12 wherein the first adjustment element (33) is fixable relative to the outer shell (3), the first section of the connection member (21) and/or the helmet suspension (5), in particular a bridge (31) and/or a cap (5) of the helmet suspension, via at least one first fixation means and/or the second adjustment element is fixable relative to the outer shell, the first section of the connection member and/or the helmet suspension, in particular a bridge and/or a cap of the helmet suspension, via at least one second fixation means.
14. The protective helmet assembly according to claim 13, wherein the first fixation means and/or the second fixation means comprises at least one latching device, at least one locking device, at least one snap-in-device, at least one, clipping device, at least one Velcro device, at least one plug-in device, at least one sliding device, at least one interlocking device, and/or at least one click-on device.
15. The protective helmet assembly according to one of the preceding claims, wherein the connection member comprises at least one strap (19), at least one webbing, at least one belt, and/or at least one line.

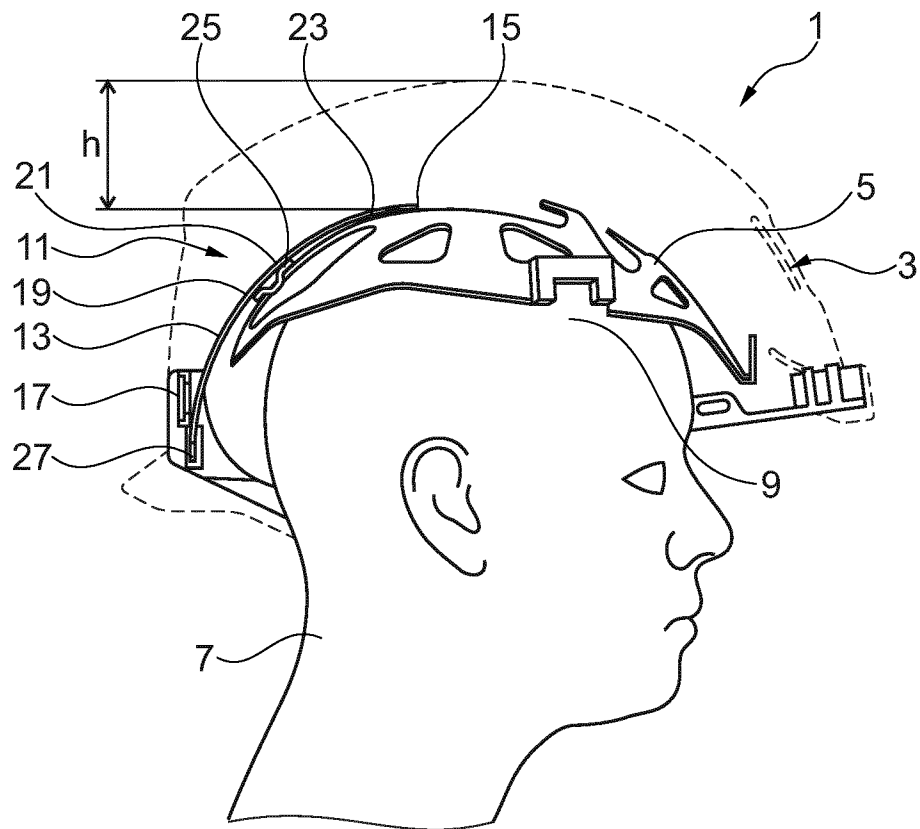


Fig. 1

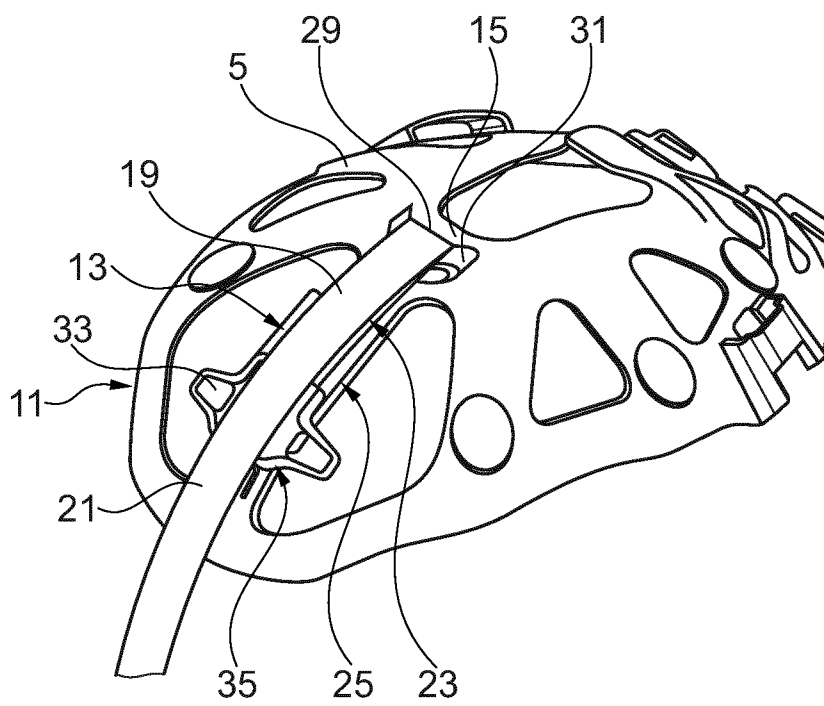


Fig. 2

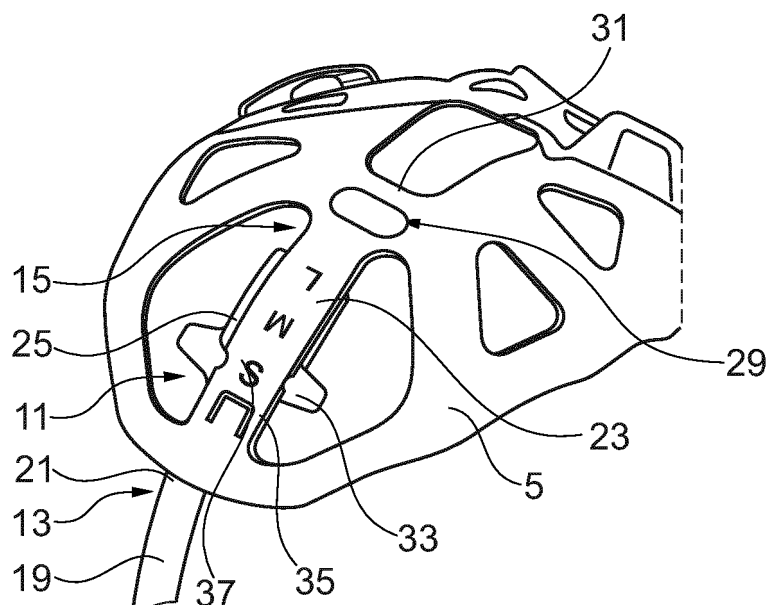


Fig. 3

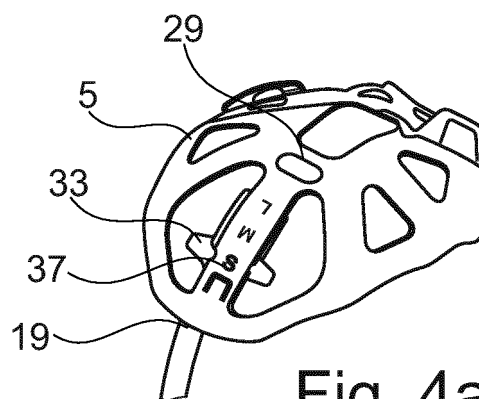
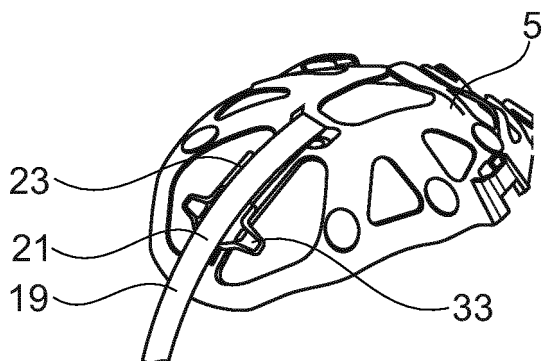


Fig. 4a

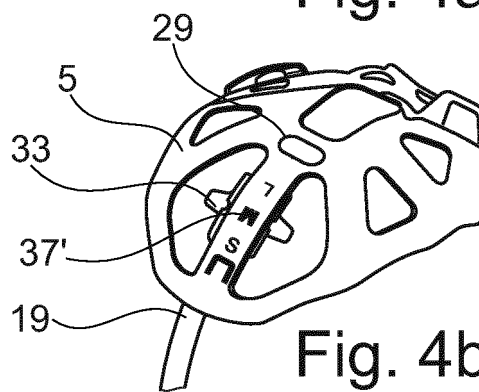
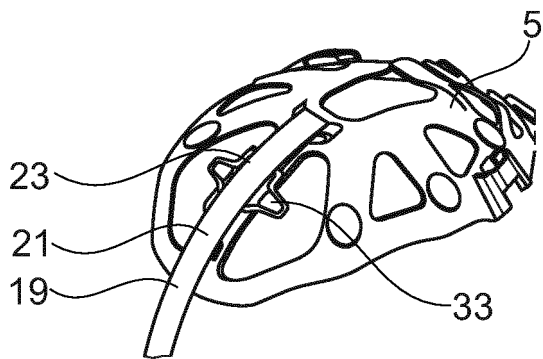


Fig. 4b

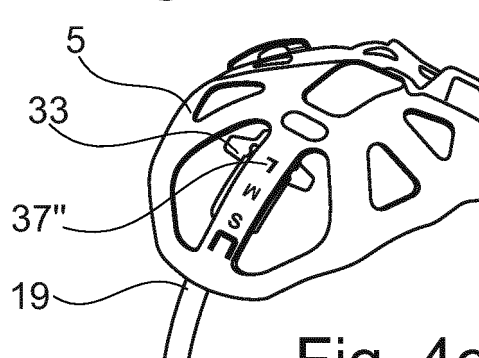


Fig. 4c



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Application Number

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Place of search		Date of completion of the search	Examiner
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