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(54) INTERNAL LINING STRUCTURE FOR A PROTECTIVE HELMET AND RESPECTIVE PROTECTIVE HELMET

(57) The present disclosure relates to an internal lining structure (100) for a protective helmet (1000), where the helmet has at least one energy absorption layer (1080) and the internal lining structure (100) is intended to be arranged on an inner side of the energy absorption layer (1080) and facing a user's head. The internal lining structure (100) comprises a padding (20) which has a plurality of padding portions (21), each in a spaced relationship with respect to at least one adjacent padding portion (21) so as to define a plurality of intermediate spaces (22), each between at least one padding portion (21) and at least one adjacent padding portion (21). The internal padding structure (100) comprises a support frame (30) which has a plurality of support frame portions (31), each arranged in a respective intermediate space (22) and fixed between the at least one padding portion (21) and the at least one adjacent padding portion (21) so as to act as a connection between the at least one padding portion (21) and the at least one adjacent padding portion (21).

The present disclosure also relates to a protective helmet (1000) comprising an outer shell (1070) for protection against penetration, an energy absorption layer (1080) positioned along an inner side of the outer shell (1070) facing the user's head, and the internal lining structure (100) arranged along an internal surface of said energy absorption layer (1080) and facing the user's head.

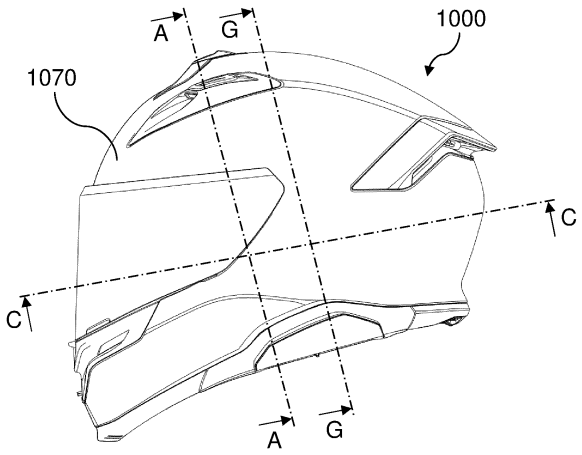

FIG. 1

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Description

DESCRIPTION

[0001] The present disclosure relates in general to an internal lining structure for a protective helmet. In particular, the present disclosure relates to the internal lining structure and relates also to a protective helmet which comprises it.

[0002] In protective helmets it is known to use a padding layer in contact with the user's head in order to improve the comfort. In particular, the padding layer is usually arranged in between the user's head and an impact absorption layer, made for example of sintered expanded polystyrene (EPS).

[0003] Generally, the impact absorption layer has through-channels for favouring ventilation between the inside and the outside of the helmet. More specifically, usually the through-channels are made both in the front or forward part of the helmet, so as to favour the entry of air during use of the helmet, and in the rear part, so as to favour exit of the air and therefore ensure a ventilation through-flow for the inside of the helmet which improves the comfort for the user. In particular, the ventilation flow is ensured by the difference in pressure generated between the front channels and the rears channel during use.

[0004] The present disclosure is based on the recognition by the inventor of the present disclosure that the padding layers such as those made available hitherto by the prior art, while being advantageous from many points of view, have a number of drawbacks.

[0005] More specifically, in order to ensure adequate comfort and prevent the user's head from coming into direct contact with the impact absorption layer, the known padding layers cover most of the inner surface of the impact absorption layers, leaving free only the portions necessary for ensuring the through-flow of the air from the ventilation channels.

[0006] However, in the helmets according to the prior art, the padding layer may be deformed at the moment when the user puts on the helmet and the layer comes into contact with the user's head. This deformation may cause an obstruction of the ventilation channels during use of the helmet and consequently a worsening or a blockage of the ventilation inside the helmet.

[0007] This results in significant drawbacks in term of performance and comfort, such as an increase in the temperature and the humidity inside the helmet.

[0008] The starting point of the present disclosure is therefore the technical problem of providing an internal lining layer for a protective helmet which is able to satisfy all the aforementioned requirements with reference to the prior art and/or achieve further advantages.

[0009] This is obtained by means of an internal lining structure for a protective helmet and a protective helmet according to the respective independent claims. Secondary characteristics of the subject of the present disclosure are defined in the corresponding dependent claims.

[0010] In particular, in accordance with the present disclosure, it is proposed to provide an internal lining structure for a protective helmet, where the helmet comprises at least one energy absorption layer and the internal lining structure is intended to be arranged on an inner side of the energy absorption layer and facing a user's head.

[0011] Furthermore, the internal lining structure comprises a padding which has a plurality of padding portions, each in a spaced relationship with respect to at least one adjacent padding portion so as to define a plurality of intermediate spaces, where each intermediate space is situated between at least one padding portion and at least one adjacent padding portion.

[0012] Furthermore, the internal padding structure comprises a support frame which has a plurality of support frame portions, each arranged in a respective intermediate space and fixed between the at least one padding portion and the at least one adjacent padding portion so as to act as a connection between the at least one padding portion and the at least one adjacent padding portion

[0013] Namely, between at least one padding portion and at least one adjacent padding portion there is an intermediate space in which a support frame portion of a plurality of support frame portions is positioned.

[0014] Each support frame portion enables the respective padding portions to which it is fixed to be kept in position. Each support frame portion has breathability and lightening holes.

[0015] The present disclosure also relates to a protective helmet comprising an outer shell for protection against penetration, an energy absorption layer positioned along an inner side of the outer shell facing the user's head, and an internal lining structure according to an embodiment, which are described below.

[0016] In particular, preferably the internal lining structure is arranged in a manner adhering to an inner surface of the energy absorption layer facing the user's head.

[0017] Preferably, the energy absorption layer comprises at least one or more ventilation channels passing through the energy absorption layer and/or having the form of a groove or recess formed along an inner surface of the energy absorption layer for ventilation of the helmet. Moreover, preferably, at least one support frame portion is superimposed on a respective ventilation channel.

[0018] The outer shell of the helmet may also have an air vent configured to able to pass from a closed condition to an open condition, or vice versa, so as to prevent or allow, respectively, the passage of air from the outside towards the inside of the helmet, for example through the one or more ventilation channels.

[0019] Further advantages, characteristic features and modes of use forming the subject of the present disclosure will become clear from the following detailed description of embodiments thereof, provided by way of a

non-limiting example.

[0020] It is in any case clear that each embodiment forming the subject of the present disclosure may have one or more of the advantages listed above; in any case it is not required that each embodiment should have simultaneously all the advantages listed.

[0021] Reference will be made to the figures of the attached drawings in which:

- Figure 1 shows a side view of a protective helmet according to an embodiment of the present invention;
- Figure 2 shows a front view of the protective helmet according to Figure 1;
- Figure 3 shows a side view, from below, of the helmet along the cross-section C-C of Figures 1 and 2;
- Figures 4 and 5 shows a side view of the helmet along the cross-section B-B of Figures 1 and 2, in which the air vent of the helmet is in the open condition and closed condition, respectively;
- Figure 6 shows the side view of the helmet along the cross-section B-B of Figure 4 in a condition worn by a user, in which the ventilation air flow is also shown;
- Figure 7 shows a front view of the helmet along the cross-section A-A of Figures 1 and 2;
- Figure 8 shows a front view of the helmet along the cross-section G-G of Figures 1 and 2;
- Figure 9 shows a perspective view of an internal lining structure according to the present invention;
- Figure 10 shows a perspective view, from below, of the internal lining structure shown in Figure 9.

[0022] With reference to the attached figures, an embodiment of an internal lining structure for a protective helmet 1000 is denoted overall by the reference number 100.

[0023] The internal lining structure 100 is configured to be arranged on an inner side of an energy absorption layer 1080 of the protective helmet 1000, where the inner side and consequently the internal lining structure face the head of a user.

[0024] Furthermore, the internal lining structure 100 comprises a padding 20 which has a plurality of padding portions 21, where each padding portion is in a spaced relationship with respect to at least one adjacent padding portion 21 so as to define a plurality of intermediate spaces 22, where each intermediate space 22 is situated between at least one padding portion 21 and at least one adjacent padding portion 21.

[0025] Furthermore, the internal padding structure 100 comprises a support frame 30 which has a plurality of support frame portions 31, where each portion 31 of the support frame 30 is arranged in a respective intermediate space 22 and is fixed between the at least one padding portion 21 and the at least one adjacent padding portion 21 which define the respective intermediate space 22 so as to act as a connection between the at least one padding portion 21 and the at least one adjacent padding portion 21.

[0026] According to the present invention, therefore, the intermediate spaces 22 and/or the support frame 30 prevent the padding 20 from obstructing a ventilation flow passing through the internal lining structure 100, for example keeping free the padding 20 of the ventilation channels formed on the energy absorption layer 1080 also following a possible deformation of the padding 20 during use of the protective helmet 1000 by the user.

[0027] Preferably, the padding 20 has a first softness or yieldingness, and the support frame 30 has a second softness or second yieldingness, where the first softness is greater than the second softness, and similarly the first yieldingness is greater than the second yieldingness. Namely, preferably the padding 20 is softer than support frame 30. For example, the support frame 30 may be more rigid than the padding 20, or less prone to deformation by the user's head and/or by the energy absorption layer 1080.

[0028] Preferably, the support frame 30 forms a single piece with the padding 20, where the single piece is configured in the form of a cap. Namely, preferably the internal lining structure 100 is formed as a cap so as to favour, for example, positioning on the head of the user of the helmet and along the inner side of the energy absorption layer 1080.

[0029] Preferably, the support layer 30 has a plurality of through-holes 32 configured to allow an air flow or passage through the internal lining structure 100. For example, the through-holes 32 may have a circular and/or a polygonal form and may have forms and/or sizes which are different from each other.

[0030] Preferably, the padding 20 has a first thickness and the support frame 30 has a second thickness, where the first thickness is greater than the second thickness. In other words, preferably the padding 20 has a greater thickness than support frame 30.

[0031] According to the present invention, therefore, the support frame 30 does not occupy completely the intermediate space between adjacent padding portions 21, but allows a ventilation flow preferably by means of the smaller thickness compared to the padding 20 and/or by means of the through-holes 32 and/or by means of the softness which is less than that of the padding 20. Namely, according to the present invention, the support frame 30 allows a ventilation flow passing through the internal lining structure 100 to be maintained, for example by means of the zones without the support frame 30 which are created by the thickness smaller than that of the padding 20, and/or by the through-holes 20, and/or by

means of the softness which is less than that of the padding 20.

[0032] Therefore, according to the present invention, it is possible to prevent the padding 20 from obstructing the ventilation flow inside the helmet and at the same time allow the padding 20 to be kept in the correct position for ensuring comfortable use of the helmet owing to the presence of the support frame 30. Namely, the support frame 30 allows the intermediate space 22 between adjacent portions 21 of padding to be kept constant, allowing an air flow to be maintained through or along the intermediate space 22.

[0033] Preferably, the support frame 30 has a lamina-like or laminar configuration. Namely, the support frame 30 preferably has a sheet-like form which follows for example the cap-like form of the internal lining structure. In other words, the support frame 30 has a thickness which is much smaller than the other dimensions, such as the width and length, and preferably has a thickness which is at the most 5 to 25% of the other dimensions of the support frame 30.

[0034] Preferably, each portion 31 of the support frame 30 is fixed to the at least one padding portion 21 and to the at least one adjacent padding portion 21 along respective perimetral edges by means of one or more stitches, for example along respective perimetral edges.

[0035] Preferably, the padding 20 comprises a front portion 25 and a rear portion 26 which form a circular crown configured to surround at least partially the head of a user. Furthermore, preferably the padding 20 further comprises one or more sagittal portions 27 which extend from the circular crown in a direction substantially parallel to a sagittal plane. In the context of the present disclosure "sagittal plane" is understood as meaning the anatomical plane which divides the body, in particular the head, into a right-hand section and a left-hand section, namely into two mirror-image sections of the head.

[0036] Namely, preferably, one or more sagittal portions 27 may extend preferably from the font portion 25 and/or from the rear portion 26 with a branch-like or comb-like or finger-like form, preferably along one or more directions substantially parallel to a sagittal plane. In other words, the internal lining structure 100 preferably has one or more sagittal portions 27 which branch off or extend in a comb-like manner from the front portion 25 and/or from the rear portion 26, in a manner parallel to the sagittal plane.

[0037] In other words, therefore, the padding has preferably a circular crown formed by the front portion 25, preferably positioned at least along a front region of the user's head, and by the rear portion 26, preferably positioned at least along an occipital region of the user's head. In particular, the circular crown is configured preferably to surround the user's head during use and one or more sagittal portions 27 may extend from the circular crown along respective one or more directions substantially parallel to the sagittal plane. For example, the one or more sagittal portions 27 may extend from the front portion 25 or from the rear portion 26 or may extend between the front portion 25 and the rear portion 26 along the entire length of the internal lining structure 100.

[0038] Preferably, each portion 31 of the support frame extends along each respective intermediate space 22 in a direction substantially parallel to a sagittal plane.

[0039] Furthermore, for example, the through-holes 32 may have a rectangular or circular shape or other polygonal form and may have at least one variable dimension depending on the position of each through-hole 32 along a direction parallel to the sagittal plane. For example, the through-holes 32 intended to be located in a top zone of the user's head may have an aperture greater along the direction parallel to the sagittal plane than the through-holes 32 intended to be located in a front zone of the user's head.

[0040] It is pointed out that the one or more directions parallel to the sagittal plane are preferably the main flow directions of the ventilation air flow passing through the protective helmet 1000 during use. Therefore, this configuration allows the intermediate spaces 22 between adjacent portions 21 of the padding 20, in particular preferably between adjacent sagittal portions 27, to be arranged along a main direction of the air flow. In this way, in particular, the support frame 30 may be positioned along a main direction of the air flow, thereby favouring the ventilation inside the helmet 1000 through the internal lining structure 1000.

[0041] Preferably, the internal lining structure 100 comprises connection means 40 associated with the front portion 25 and/or the rear portion 26 of the padding 20. In particular, the connection means 40 are configured to allow a removable connection of the internal lining structure 100 to a protective helmet 1000, for example to an energy absorption layer 1080 of the helmet 1000.

[0042] Preferably, the support frame 30 is made of a polymeric material, even more preferably polypropylene.

[0043] The present disclosure also relates to a protective helmet 1000 comprising an outer shell 1070 for protection against penetration, an energy absorption layer 1080 positioned along an inner side of the outer shell 1070 facing the user's head, and an internal lining structure 100 according to one of the embodiments described above.

[0044] Preferably, the internal lining structure 100 is arranged an inner surface of the energy absorption layer 1080 facing the user's head, even more preferably in an adhering manner.

[0045] Preferably, the internal lining structure 100 is removably connected to the energy absorption layer 1080 by means of the connection means 40. For example, the internal lining structure 100 may be removably connected to the energy absorption layer 1080 by means of one or more buttons or by means of one or more form-fitting connections or by means of Velcro.

[0046] Preferably, the energy absorption layer 1080 comprises at least one or more ventilation channels 81 passing through the energy absorption layer 1080 and/or

having the form of a groove or recess formed along an inner surface of the energy absorption layer 1080 for ventilation of the helmet 1000. Moreover, preferably, at least one portion 31 of the support frame 30 is superimposed on a respective ventilation channel 81.

[0047] This characteristic feature ensures that the ventilation channel is not obstructed since the lamina which is less soft, when subjected to the pressure of the user's head wearing the helmet, does not yield towards the channel causing it to be obstructed. In other words, if the entire structure were to have a high softness, it would be compressed and obstruct the ventilation channel 81.

[0048] Namely, the one or more ventilation channels 81 may be through-channels passing through the energy absorption layer 1080, or may be grooves or recesses formed along an inner surface of the energy absorption layer 1080, or may also be a combination of through-channels and grooves or recesses preferably communicating in such a way as to allow the passage of air through the one or more ventilation channels 81. In this way, the ventilation flow is favoured between the outside and the inside of the helmet passing through the one or more ventilation channels 81 and the at least one portion 31 of the support frame 30, thus avoiding possible obstruction by the padding 20 for example following deformation by the user's head. For example, the ventilation flow is favoured by means of the zones without the support frame 30 which are created by the thickness which is smaller than that of the padding 20 and/or by the through-holes 32 and/or by means of the lesser softness of the support frame 30 compared to that of the padding 20.

[0049] Namely, the ventilation air flow may enter inside the helmet by means of the one or more ventilation channels 81, for example following opening of an air vent of the outer shell 1070 from a closed condition into an open condition, and may flow out of the helmet, for example, by means of a ventilation outlet positioned in the rear part of the outer shell 1070. Moreover, the ventilation air flow may flow inside the helmet along the intermediate space 22 between adjacent portions 21 of the padding 20 owing to the presence of the support frame 30, which prevents the obstruction of the one or more ventilation channels 81 by the padding 20.

[0050] Preferably, at least some of the plurality of through-holes 32 of each portion 31 of the support frame 30 are aligned at least partially with the one or more ventilation channels of the energy absorption layer 1080. This thus favours the ventilation flow which passes through the one or more ventilation channels 81 and through the plurality of through-holes 32.

[0051] The subject-matter of the present disclosure has been described hitherto with reference to its embodiments. It is to be understood that other embodiments relating to the same inventive idea may exist, all of these falling within the scope of protection of the claims which are attached below.

Claims

1. Internal lining structure (100) for a protective helmet (1000), said helmet having at least one energy absorption layer (1080) and said internal lining structure (100) being intended to be arranged on an inner side of said energy absorption layer (1080) and facing a user's head, wherein said internal lining structure (100) comprises a padding (20) having a plurality of padding portions (21) wherein each padding portion is in a spaced relationship with respect to at least one adjacent padding portion (21) so as to define a plurality of intermediate spaces (22), each intermediate space (22) being between at least one padding portion (21) and at least one adjacent padding portion (21), and wherein said internal lining structure (100) comprises a support frame (30), said support frame (30) having a plurality of support frame portions (31), each portion (31) of the support frame (30) being arranged in a respective intermediate space (22) and fixed between the at least one padding portion (21) and the at least one adjacent padding portion (21) so as to act as a connection between the at least one padding portion (21) and the at least one adjacent padding portion (21).

2. Internal lining structure (100) according to the preceding claim, wherein said padding (20) has a first softness or first yieldingness, and said support frame (30) has a second softness or second yieldingness, and wherein said first softness is greater than said second softness, or said first yieldingness is greater than said second yieldingness.

3. Internal lining structure (100) according to any one of the preceding claims, wherein said support frame (30) forms a single piece with said padding (20), said single piece being configured in the form of a cap.

4. Internal lining structure (100) according to any one of the preceding claims, wherein said support frame (30) has a plurality of through-holes (32) configured to allow the passage of air through said internal lining structure (100).

5. Internal lining structure (100) according to any one of the preceding claims, wherein said padding (20) has a first thickness and said support frame (30) has a second thickness, and wherein said first thickness is greater than said second thickness.

6. Internal lining structure (100) according to any one of the preceding claims, wherein said support frame (30) has a lamina-like or laminar configuration.

7. Internal lining structure (100) according to any one of the preceding claims, wherein said padding (20) comprises a front portion (25) and a rear portion

(26) forming a circular crown configured to surround a user's head at least partially, and wherein said padding (20) further comprises one or more sagittal portions (27) extending from said circular crown in a direction substantially parallel to a sagittal plane.

8. Internal lining structure (100) according to the preceding claim, wherein said each portion (31) of the support frame (30) extends along each said respective intermediate space (22) in a direction substantially parallel to a sagittal plane.

9. Internal lining structure (100) according to any one of the preceding claims in combination with claim 7, comprising connection means (40) associated with said front portion (25) and/or said rear portion (26) and configured to allow a removable connection of said internal lining structure (100) to a protective helmet (1000).

10. Internal lining structure (100) according to any one of the preceding claims, wherein said support frame (30) is made of polymeric material, preferably polypropylene.

11. Protective helmet (1000) comprising an outer shell (1070) for protection against penetration, said energy absorption layer (1080) positioned along an inner side of said outer shell (1070) facing the user's head, and an internal lining structure (100) according to any one of claims 1 to 10 arranged along an inner surface of said energy absorption layer (1080) facing the user's head.

12. Protective helmet (1000) according to the preceding claim comprising an internal lining structure (100) according to any one of claims 1 to 10 in combination with claim 9, wherein said internal lining structure (100) is removably connected to said energy absorption layer (1080) by said connecting means (40).

13. Protective helmet (1000) according to either one of claims 11 or 12, wherein said energy absorption layer (1080) comprises at least one or more ventilation channels (81) passing through said energy absorption layer (1080) and/or having the form of a groove or recess and formed along an inner surface of said energy absorption layer (1080) for ventilation of said helmet (1000), wherein at least one portion (31) of the support frame (30) is superimposed on a respective ventilation channel (81).

14. Protective helmet (1000) according to the preceding claim, comprising an internal lining structure (100) according to any one of claims 1 to 10 in combination with claim 4, wherein at least some of said plurality of through-holes (32) of each portion (31) of the support frame (30) are aligned at least partially with said one or more ventilation channels (81) of said energy absorption layer (1080).

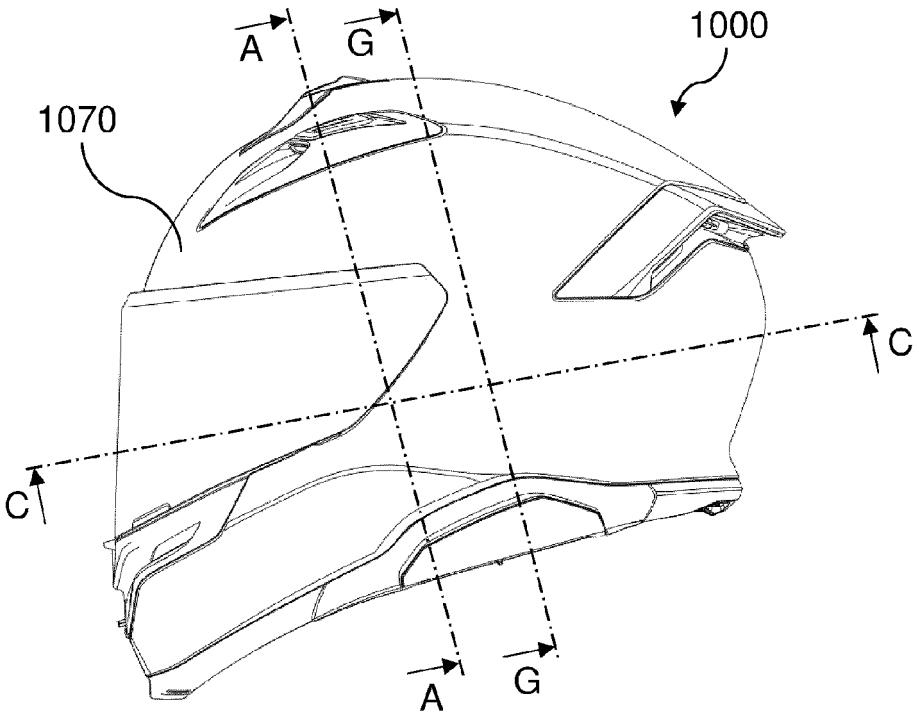

FIG. 1

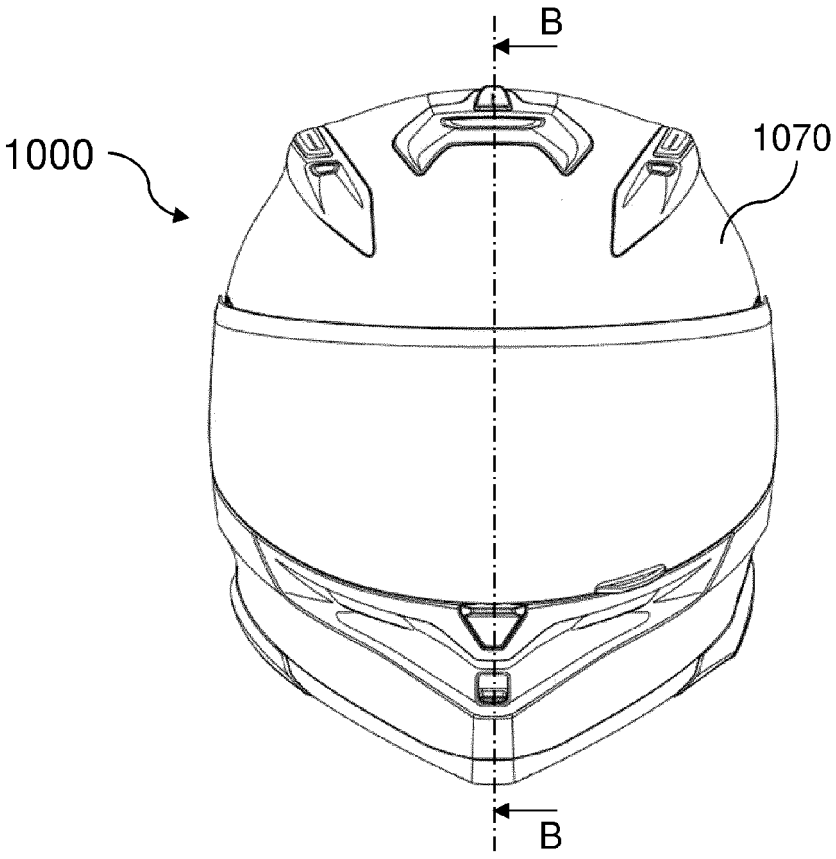

FIG. 2

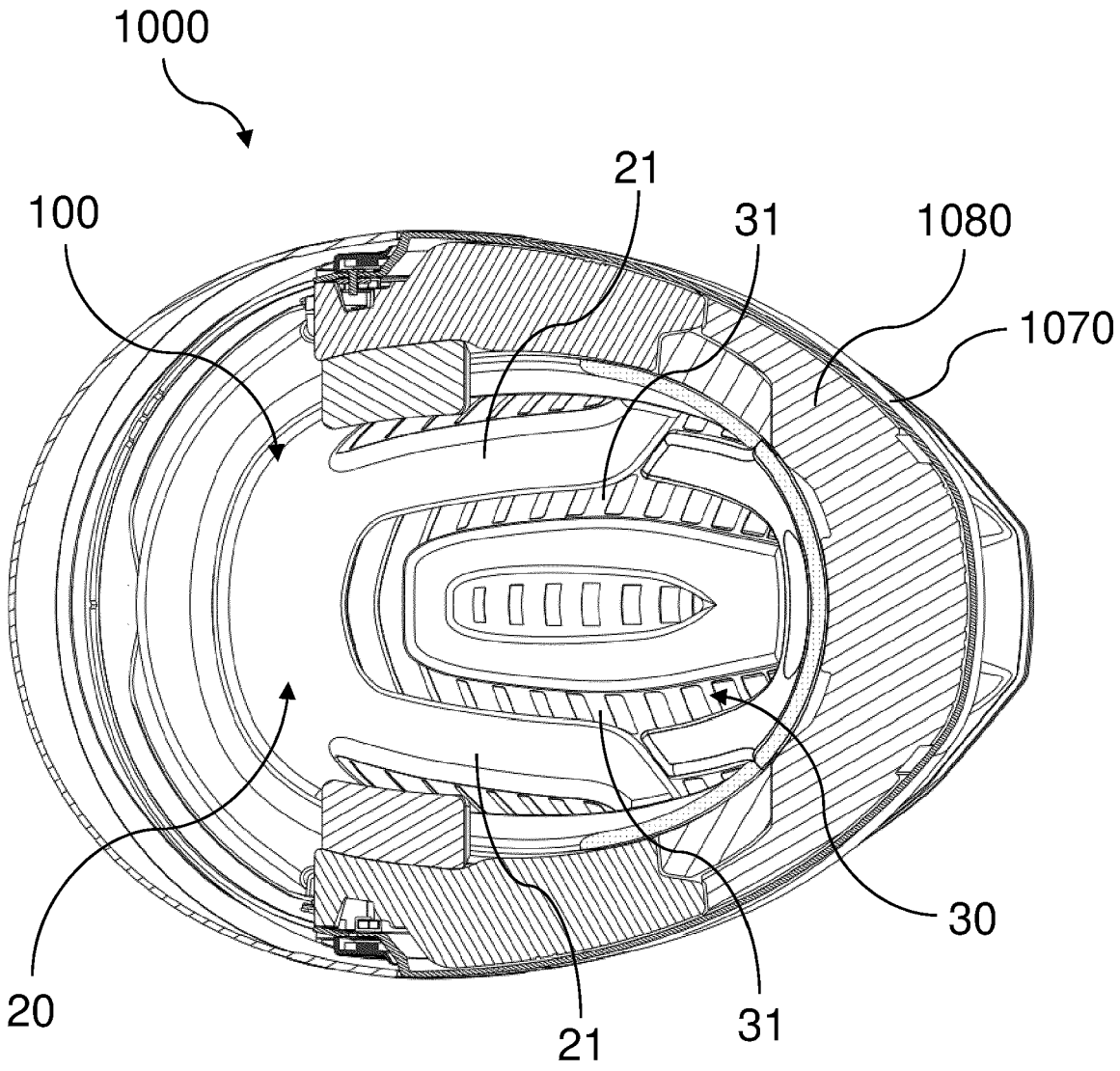

FIG. 3

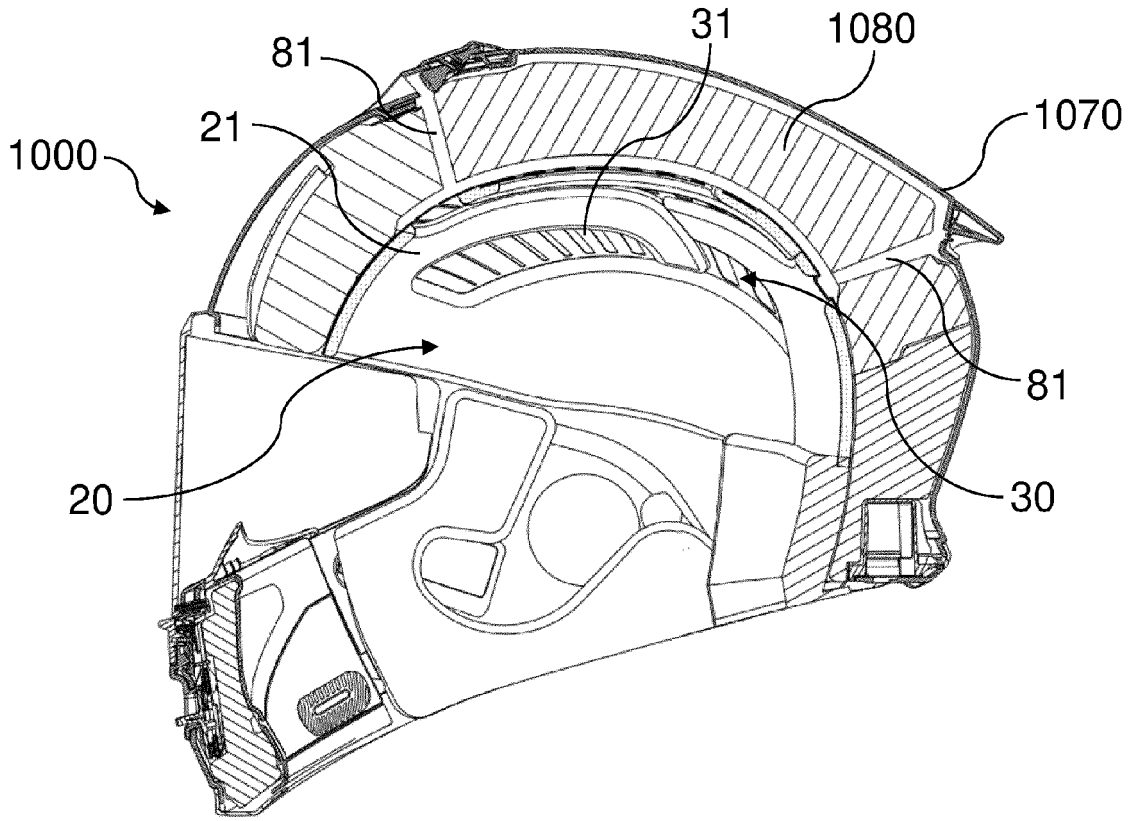

FIG. 4

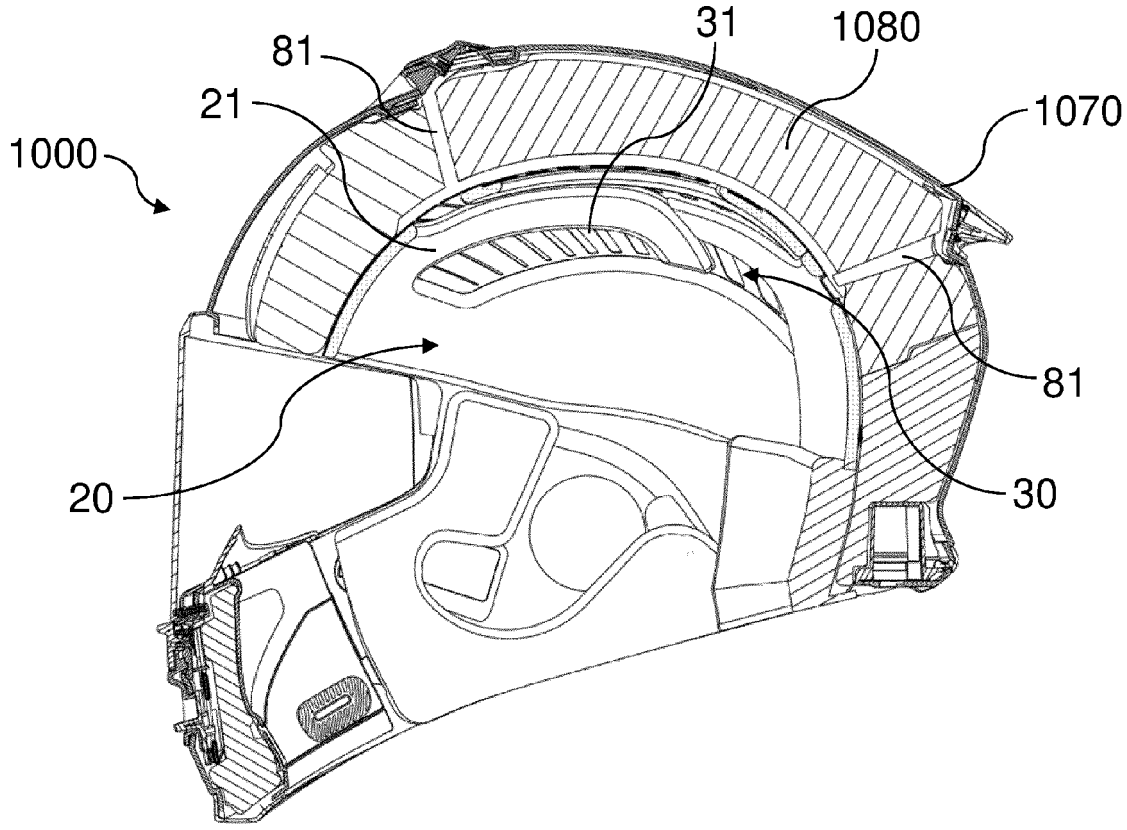

FIG. 5

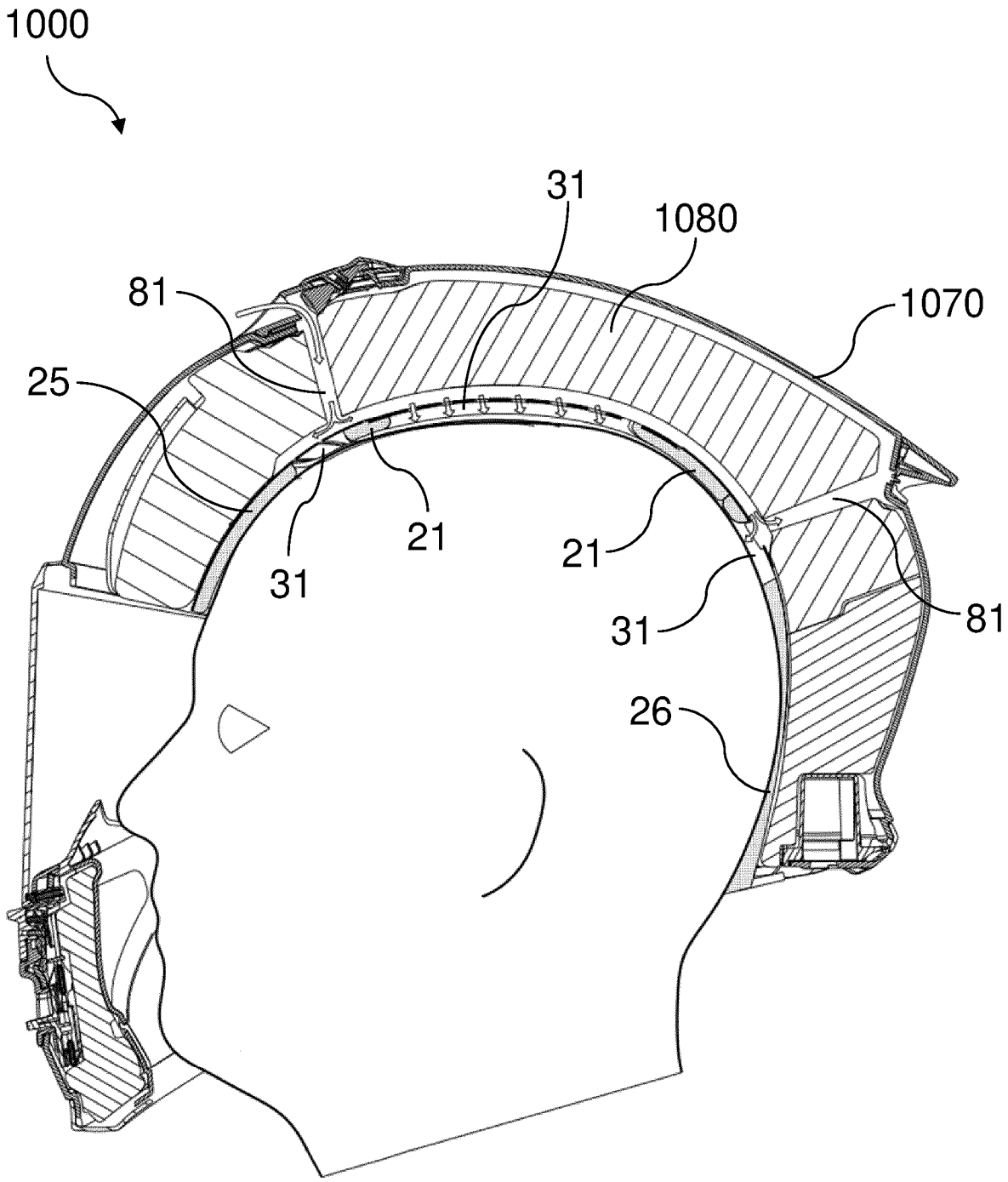

FIG. 6

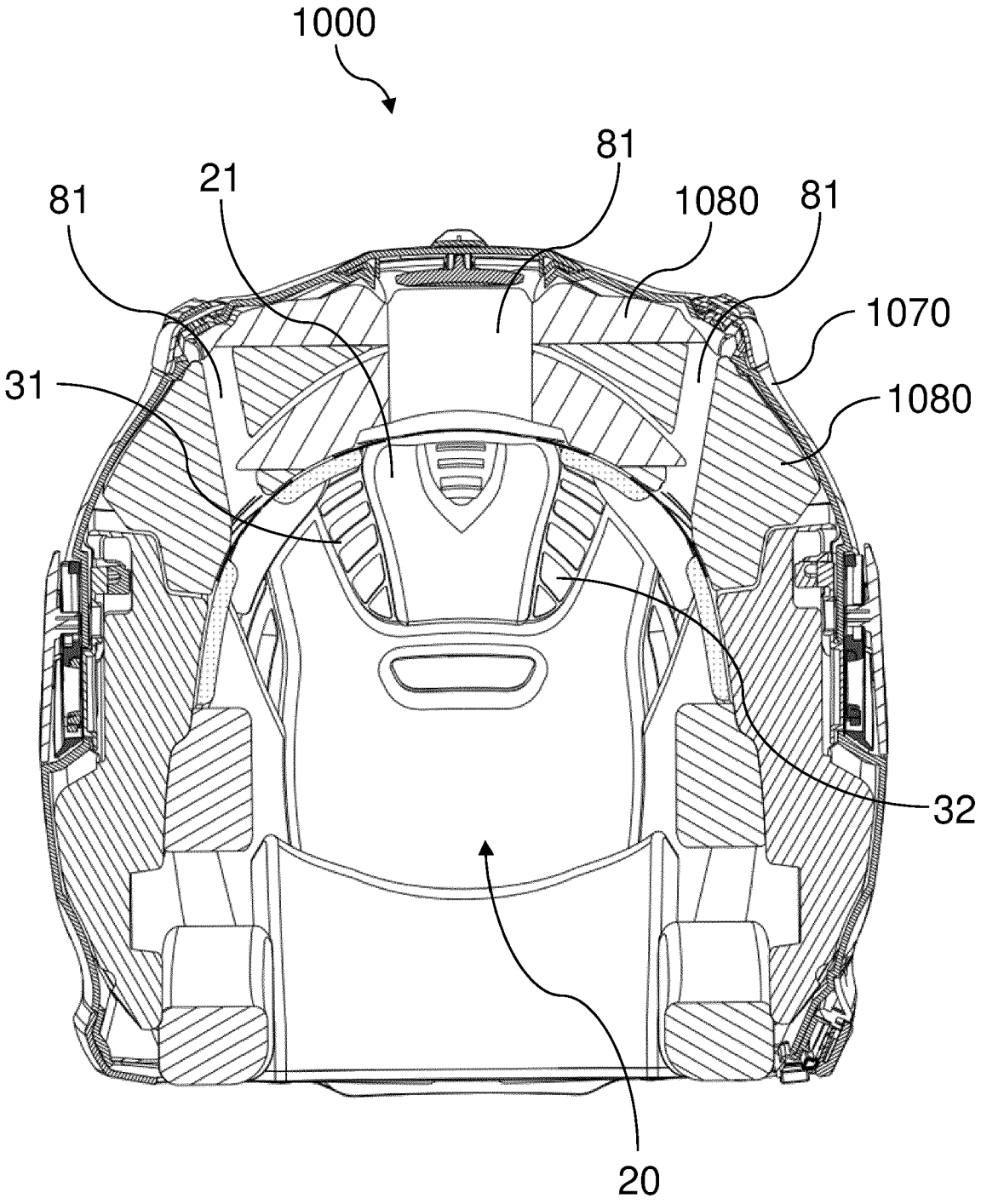

FIG. 7

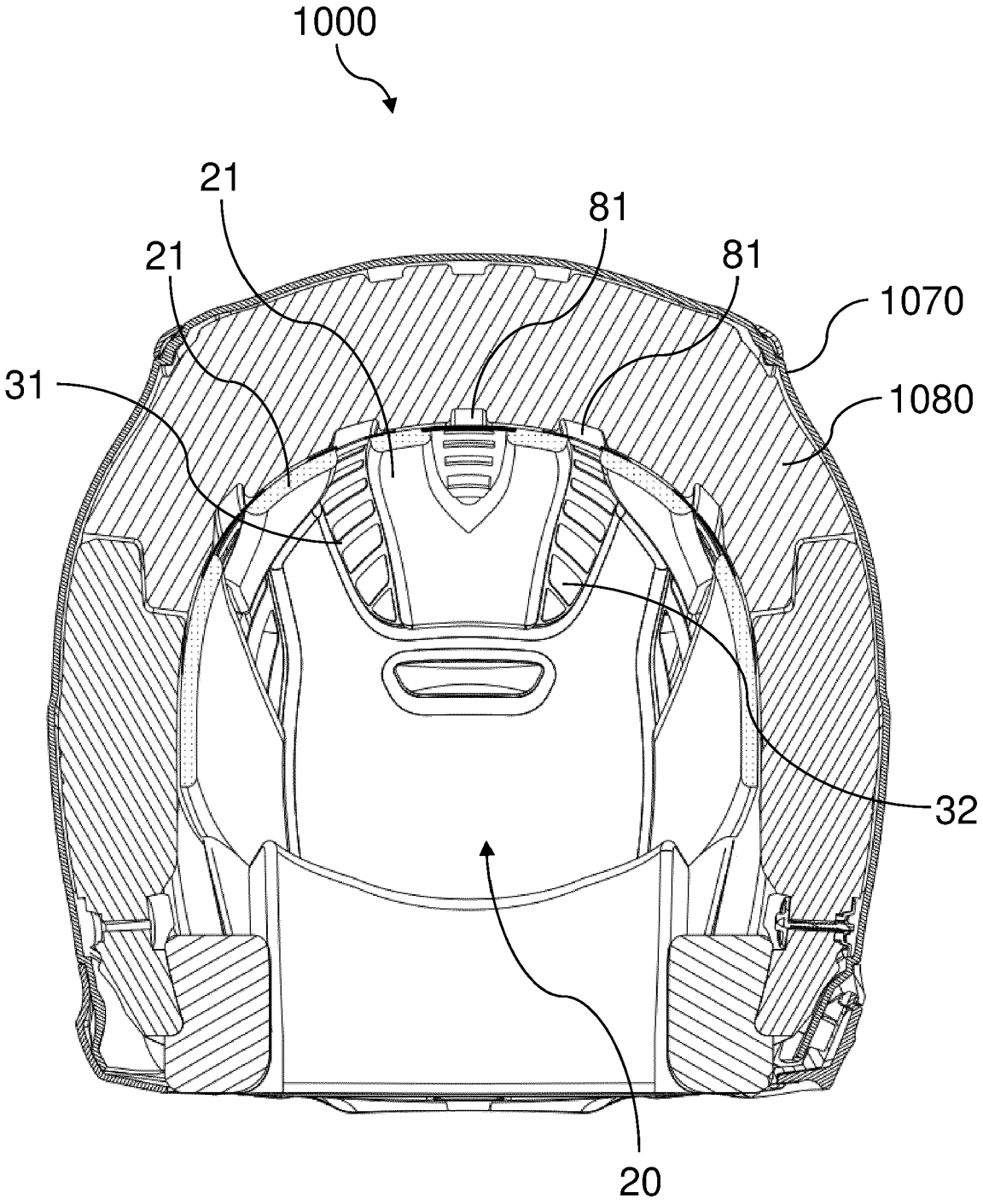

FIG. 8

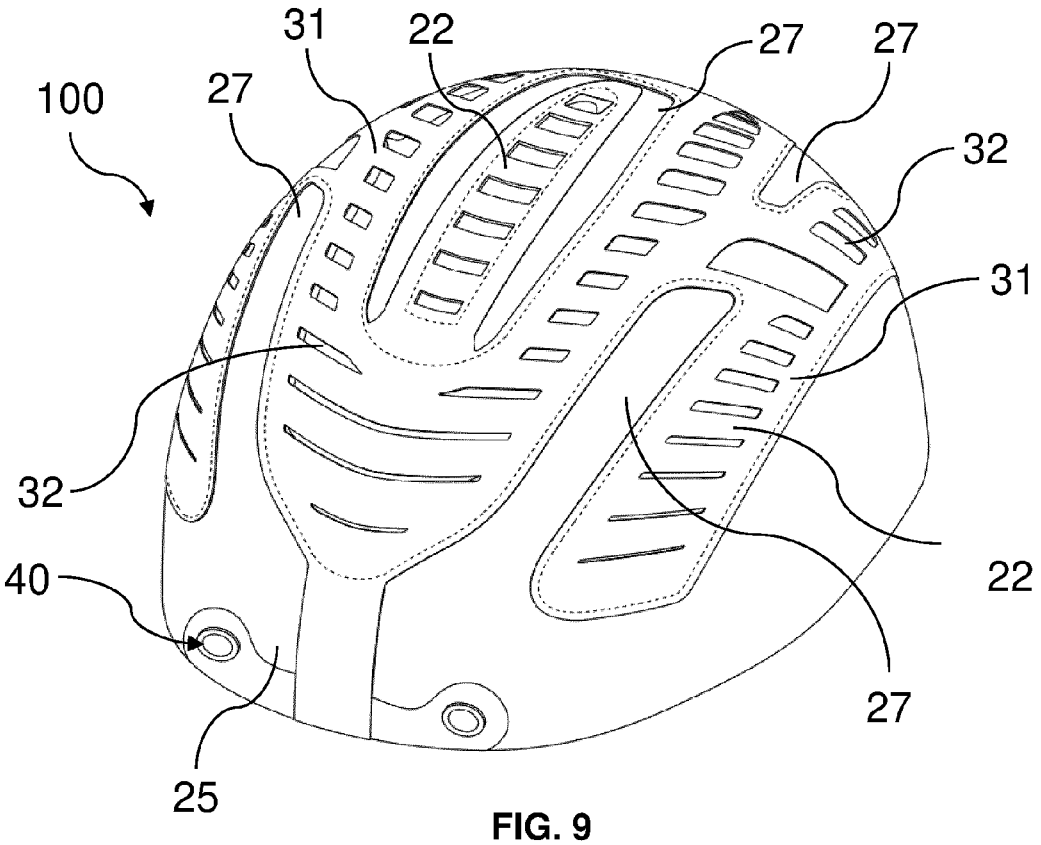
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FIG. 9

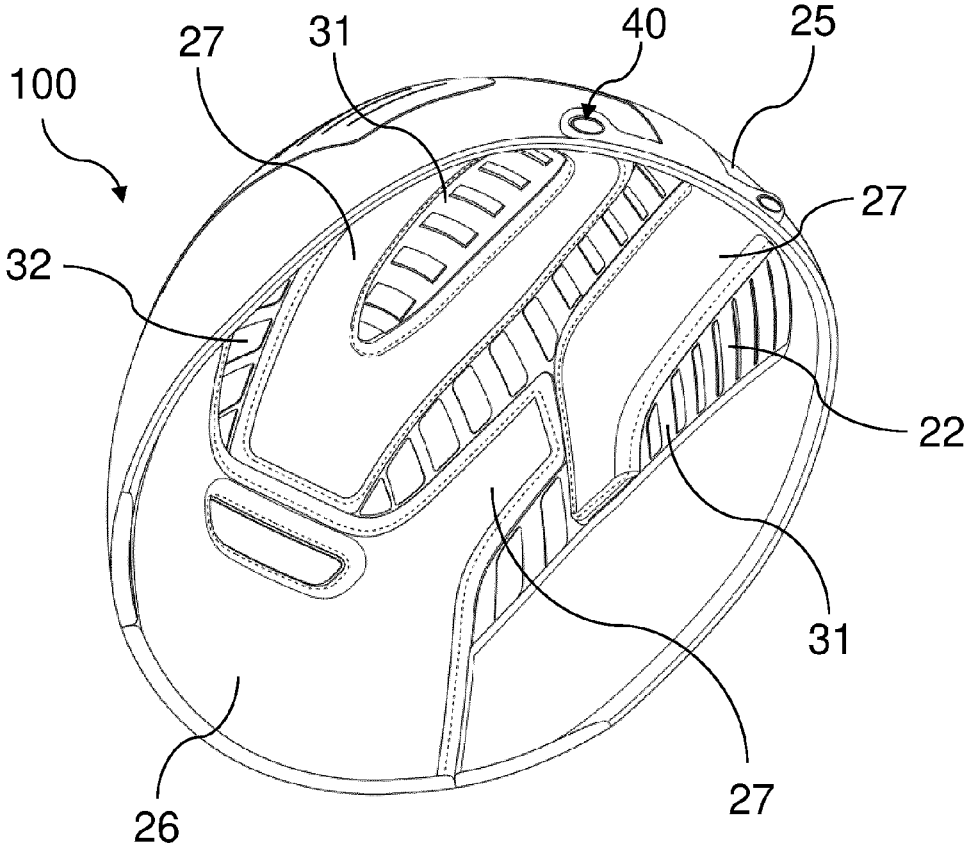
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FIG. 10

Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 24 21 8461

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 3 243 398 A1 (DAINESE SPA [IT]) 15 November 2017 (2017-11-15) * paragraphs [0031] - [0033]; figure 1 *	1-14	INV. A42B3/10 A42B3/12
A	US 2009/158506 A1 (THOMPSON MATTHEW T [US] ET AL) 25 June 2009 (2009-06-25) * paragraphs [0018], [0019]; figures 2,3 *	1-14	
A	US 2023/255297 A1 (LOWE MICHAEL W [US]) 17 August 2023 (2023-08-17) * paragraphs [0031] - [0033]; figures 6,7 *	1-14	
A	US 2015/089725 A1 (LOWE MICHAEL W [US] ET AL) 2 April 2015 (2015-04-02) * paragraph [0027]; figure 2a *	1-14	
A	DE 66 02 591 U (FIBRE METAL PRODUCTS GMBH [DE]) 12 June 1969 (1969-06-12) * page 2; figure 2 *	10	TECHNICAL FIELDS SEARCHED (IPC) A42B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	1 April 2025	D'Souza, Jennifer

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 24 21 8461

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