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(54) **Inner liner of a helmet, process to customize such an inner liner and helmet including such an inner liner**

(57) The present disclosure relates to an inner liner (10) of a helmet (12) interposed between a user's head (T) and a cap (14) of the helmet (12). The inner liner (10) includes a pad (24, 124) and at least one support insert (25) associated to the pad (24, 124) and located in a zone of the inner liner (10) acting as support for the cap (14).

The present disclosure also relates to a method for customizing the inner liner by use of one or more support inserts (25) located on the basis of the zones of the cap (14) resting on a user's head.

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Description

[0001] The present disclosure relates generally to the technical field of protective helmets. More particularly, the present disclosure relates to a inner liner, conventionally also referred to as "interior", for a protection helmet, which is located inside an external cap of a helmet, and intended to be interposed between the cap and a user's head. In particular, within the scope of the present description and in the claims hereinafter, by the term "inner liner" of a helmet it is meant a generally soft assembly which is for covering, at least partially, an internal or concave side of the cap (wherein said rigid cap includes a shell and a polystyrene layer) and acting as soft layer or comfort layer between the cap and the head. Such inner liner can also comprise cheekbone guards.

[0002] More particularly, in the field of protective helmets, it is known that the external cap, conventionally made up of a shell and a polystyrene layer, has a substantially spherical shape, with a variable internal circumference depending on the head size or dimension. The liner has a predefined height depending on the internal circumference of the cap, and is such as to fill a gap between the internal circumference of the cap and the circumference of a user's head. Ultimately, the inner liner has a height depending on the difference of the average dimensions of head circumference and internal diameter of the cap, to fill the space between the rigid external cap and the head.

[0003] Such an inner liner, though advantageous under several standpoints, entails some drawbacks.

[0004] A drawback is, e.g., that with a known inner liner it is not always possible to provide an optimal comfort and at the same time stability to the helmet.

[0005] In fact, considering the variability in the anatomy of a user's head, it is not always possible to have a helmet in which the interior of the helmet can perfectly fill the gap between the cap and the head.

[0006] In an attempt to overcome such a drawback, sometimes one has to choose a helmet of a smaller size in order to guarantee helmet stability to the detriment of comfort.

[0007] Sometimes instead, to have greater comfort and a less tight helmet, one has to choose a helmet of a larger size. In this case, however, in spite of the use of any strap or chin-strap the inner liner does not perfectly adhere to the head and therefore the helmet is not perfectly stationary when worn on. Ultimately, there is the risk of a scarce stability of the helmet when it is worn on.

[0008] The technical problem at the basis of the present disclosure lies in providing an inner liner of a helmet and a helmet including such liner allowing to overcome at least one of the drawbacks mentioned hereto and/or providing some advantages. Such a technical problem is solved by an inner liner for helmets as defined in the independent claim 1 and by a helmet according to claim 11.

[0009] The present invention also relates to a method

for customizing an inner liner for helmets, as defined in claim 15.

[0010] Secondary features of the subject of the present disclosure are defined in the corresponding dependent claims thereof.

[0011] Thanks to the use of one or more support inserts, which are located in a zone of the cap (or, more precisely, of the internal layer of the cap, e.g. the polystyrene one) resting on a user's head, during use of a helmet, a supporting of the cap by the inner liner may be obtained, actually freeing the cap dimension and the head dimension from a strict correlation.

[0012] In practice, it is the liner which has support points for the cap, so that a user "feels" in a relatively reduced way the cap resting on the head. In fact, thanks to the inserts, the feeling of resting is damped by the inner liner. In still other words, the inserts act as spacers between the cap and a user's head.

[0013] The inner liner according to the present disclosure can therefore give a high stability to the helmet, as the cap is mainly supported by the inner liner, without risk of the cap moving during use, as well as a satisfactory comfort. Comfort is guaranteed by the fact that the one or more inserts can be distributed, according to the head anatomy, and occupy defined zones of the inner liner. Moreover, in one embodiment, to foster comfort the inserts are made of a soft and compressible material, so as to be an integral part of the pad. For instance, it is a material having a flexible cell structure, such as a sponge.

[0014] Moreover, the soft and compressible material allows easy inserting of the inserts by a user thanks to the fact that, at the time of inserting, the insert may be slightly flattened. In order to foster compression, in some embodiments, the insert has an internal pass-through hole.

[0015] Moreover, it is noted that the compressible and flexible structure of the support inserts is compatible with a textile-type production of the interior of the helmet, e.g. by under-the-press thermoforming. In other words, it is observed that the fact of using a soft material allows to insert the inserts into the holes already at the time of manufacturing the interior of a helmet, and optionally to subject them to compression during the manufacturing of the interior of a helmet.

[0016] Moreover, the inner liner according to the present disclosure can allow to use, for a given range of sizes, a single cap of standard dimension and vary the inner liner, customizing the inner liner on the basis of the size, or of a specific configuration of a user's head. In this regard, it could suffice to vary the position or the height of the support inserts.

[0017] In this regard, it has to be noted that the inserts are structurally independent and individually manipulable members, and they can be inserted into the respective holes according to the needs.

[0018] It is therefore possible to customize an inner liner of a helmet starting from a customized mapping of a user's head in order to locate specific zones of the cap

resting on the head. Then, one or more support or resting inserts are associated to the pad in the regions of the located resting zones.

[0019] Other features and the modes of use of the subject of the present disclosure will become clear from the following detailed description of some preferred embodiments thereof, provided by way of a non-limiting example. It is clear, however, that each embodiment 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.

[0020] It is also to be understood that all possible combinations of the above-indicated embodiments, and of those described with reference to the following detailed description, fall within the scope of the present disclosure.

[0021] Reference will be made to the figures of the annexed drawings, wherein:

- Figure 1 shows an at least partially sectional side view of a helmet including an inner liner according to the present disclosure;
- Figure 2 shows a side view of an inner liner for a helmet according to the present disclosure in a worn condition;
- Figure 3 shows a rear view of an inner liner for a helmet according to the present disclosure in a worn condition;
- Figure 4 shows a sectional view along line IV-IV of Figure 2;
- Figure 5 shows a sectional view along line V-V of Figure 2;
- Figure 6 shows a sectional view of a portion of inner liner according to a variant embodiment;
- Figure 7 shows a view with detached parts of a portion of inner liner for a helmet;
- Figure 8 shows a view with detached parts of a portion of inner liner for a helmet during a processing step.

[0022] Referring to the attached figures, by reference number 10 it is denoted an inner liner, also referred to as "interior", for a helmet 12 according to the present disclosure. The helmet 12 includes a rigid external cap 14, which includes a polystyrene layer 15 and a shell 17 of reduced thickness with respect to the polystyrene layer 15.

[0023] The inner liner 10 is adapted to be interposed between a user's head T and the cap 14. Therefore, such inner liner 10 is a generally soft structure, hence intended to be bent to adhere to the shape of a user's head T. The inner liner 10 is fixed to the cap 14, e.g., by Velcro®, snap fasteners or alike removable fixing means. More particularly, in the example illustrated the inner liner 10 includes a pad 24 made of a soft and spongy material that partially lines the cap 14 and has open zones or cavities 26, allowing to keep the overall weight of the helmet 12 as reduced as possible, as well as facilitating aeration inside

the helmet 12, or allowing ear accommodation.

[0024] In the example illustrated, the pad 24 includes appendages 27 which extend to the region of each cheekbone and mandible of a user, to form so-called cheekbone guards.

[0025] According to an aspect of the present disclosure, the inner liner 10 comprises one or more support inserts 25 inserted into corresponding holes 33, in the example pass-through holes, obtained in the pad 24.

[0026] The support inserts 25 have a supporting or resting function, i.e. are able to support the cap 14 in the region of defined zones of the cap 14, or more precisely of the polystyrene layer 15, resting on the head T.

[0027] In other words, the inner liner 10 includes a pad 24 made of spongy material and support inserts 25, said inserts also made of spongy and hand-compressible material, preferably having a compressive strength greater than the material of which the pad 24 is made, so as to act as support for the cap 14 of the helmet 12. The support inserts 25 may have a thickness alike to or different from the pad 24, depending on the zone of the helmet 12.

[0028] The presence of the support inserts 25, which, as mentioned, support the cap 14, gives an improved stability to the helmet 12. In fact, the position of the support inserts 25 can be selected on the basis of a shape of the user's head T (for example on the basis of the dimensions or peculiar anatomical features), actually freeing from a direct or strict correlation the dimensioning of the cap 14 and a user's dimension or head.

[0029] From another standpoint, the support inserts 25 act as spacers so that the cap 14 keeps at a certain distance from the head T.

[0030] In the solution illustrated in the drawings, the support inserts 25 are made of a flexible cell structure, such as, e.g., foam.

[0031] In other embodiments, the support inserts 25 are made of gel, polyurethane or polystyrene.

[0032] In the embodiment described, four support inserts 25 are provided, located in the region of as many (four) points on the top of a user's head T, in particular two aligned in a top front zone (Figure 2) and two aligned in the top rear zone (Figure 3).

[0033] In other words, the position of such support inserts 25 is not random but accurately selected after having performed a mapping of a user's cranium, and having singled out on which points a cap 14 rests when it is worn on by user. Such points mainly vary depending on the dimension and size of the head T.

[0034] Referring to Figure 5, in one embodiment, the support insert 25 has a cylindrical shape and is provided with internal pass-through holes 28 parallel to the cylinder axis. Even more particularly, the support insert 25 has a first surface 25a adapted to be facing the cap 14 and a second surface 25b adapted to be facing the user's head T, and the pass-through hole 28 extends between said first surface 25a and said second surface 25b.

[0035] In the embodiment described, the inner liner 10 is moreover a textile sandwich structure including a first

lining 20, or external leather, a second lining 22, or internal leather, and the pad 24 of spongy material, included between the first lining 20 and the second lining 22. The pad 24 forms an inner core or kernel for the sandwich structure.

[0036] The first lining 20 and the second lining 22 are perimetrically connected in the region of respective edges projecting with respect to the core or pad 24, optionally by an edge ribbon, to keep the pad 24 stationary.

[0037] The first lining 20 and the second lining 22 are made of a so-called comfort fabric, e.g. of microfiber or of Lycra.

[0038] The pad 24 comprises at least two different layers of soft material.

[0039] Such a difference can consist, e.g., in a difference of thickness or height, and/or of material.

[0040] I.e., the pad 24 has two overlapped layers which are different from each other in thickness or height, and/or in material.

[0041] In the embodiment example the pad comprises a first layer 124 facing the user's head T and a second layer 224 facing the cap 14. The support inserts 25 are inserted passing through both the at least two layers 124, 224.

[0042] The first layer 124 is made of a material having a compressive strength smaller than the material of which the second layer 224 is made. Thus, there is a more rigid layer facing the cap 14 which is better able to bear the weight of the cap 14, and a softer layer facing the user which is more suitable for contact with the head T.

[0043] E.g., the two layers may be made of foam, gel, polyurethane or polystyrene.

[0044] Referring to Figure 8, the inner liner 10 is manufactured according to the following process.

[0045] The first lining 20 and the second lining 22 are provided, cut in a pattern according to the profile of inner liner 10 to be obtained.

[0046] Between the first lining 20 and 22, the layers 124, 224 of the various materials forming the pad 24 are inserted. The layers 124, 224 and the first lining 20 are provided with respective holes 33 for the housing of the support inserts 25. Moreover, the first lining 20 and the second lining 22 are provided on the inner side with a film of glue, schematically drawn and denoted by reference number 120 in figure 8, and are placed under a press 60 to facilitate adhesion and mutual gluing. Thus, the pad 24 formed by the various layers and materials described is immobilized between the first lining 20 and the second lining 22.

[0047] The first lining 20 and the second lining 22 have a surface extension greater than the pad 24. In practice, such perimetrical portions of the first lining 20 and of the second lining 22 are stably connected with each other, e.g. by glue or adhesive, along the entire perimetrical edge so as to contain the pad 24.

[0048] The first lining 20 and the layers 124 and 224 are moreover provided with holes 33 for the housing of the support inserts 25.

[0049] Optionally, the edge is subsequently trimmed and an edge ribbon is added.

[0050] This process for manufacturing the inner liner 10 allows to modify the materials and the layers of the pad 24 according to the needs, like e.g. according to the type of a protective helmet, e.g. motorcycle helmet, bicycle helmet, ski helmet, climbing helmet or other helmets, as well as to vary at will the design of the inner liner. According to an aspect of the present disclosure, it is moreover noted that, thanks to the use of the support inserts 25, 125, permanently inserted in the holes during use of the helmet and acting, as mentioned, as spacers between the cap 14 and a user's head T, an inner liner 10 can be manufactured which, besides giving stability to the cap 14, allows to use a cap 14 not strictly correlated to the head size or shape.

[0051] Thus, it is possible to use a cap of a common standard dimension for plural near sizes of a helmet 12, and vary only the inner liner 10, in a customized manner.

[0052] In practice, the position of the support inserts 25, 125 can be selected in a customized manner, and moreover, depending on the shape and size of a user's head, the inner liner 10 can be adapted by modifying the number of layers making up the pad 24, or the material of which the pad 24 is made.

[0053] In other words, by suitably selecting the position of the support inserts 25, 125, 125, which constitute resting points for the cap 14, and preferably varying the stratification and a distribution of the materials of the pad 24 according to head zones, it is possible to obtain an assortment of liners 10 different and customized with a single cap 14.

[0054] Therefore, it is possible to obtain an adjustment of the size of a helmet and a greater comfort, thanks to the fact that the position of the inserts and of the pad layers are selected depending on the shape and dimensions of a user's head.

[0055] The subject of the present disclosure has hereto been described with reference to preferred embodiments thereof. It is understood that there may be other embodiments referable to the same inventive concept, all falling within the protective scope of the claims set forth hereinafter.

Claims

1. An inner liner (10) of a helmet (12), said inner liner (10) being adapted to be interposed between a user's head (T) and a cap (14) of the helmet (12), said cap (14) including at least one internal layer (15) and an external shell (17), said inner liner (10) including a pad (24) and at least one support insert (25) associated to said pad (24) and suitable for acting as support for the internal layer (15) of the cap (14), wherein said support insert (25) is located into a corresponding hole (33, 133) obtained in said pad (24, 124).

2. The inner liner (10) according to claim 1, wherein said support insert (25) has at least one pass-through hole (28).
3. The inner liner (10) according to claim 2, wherein said support insert (25) has a first surface adapted to be facing the cap (14) and a second surface adapted to be facing the user's head (T), and wherein said at least one pass-through hole (28) extends between said first surface (25a) and said second surface (25b).
4. The inner liner (10) according to any one of the preceding claims, wherein the support insert (25) is made of a material having a flexible cell structure.
5. The inner liner (10) according to any one of the preceding claims, wherein the support insert (25) is a body individually manipulable and structurally independent from the pad (24) and is made of a hand-compressible material having a compressive strength greater than a compressive strength of said pad (24).
6. The inner liner (10) according to any one of the preceding claims, having a textile structure with a sandwich configuration and including a first lining (20) and a second lining (22), wherein said pad (24) is included between the first lining (20) and the second lining (22).
7. The inner liner (10) according to claim 6, wherein said support insert (25) is inserted in a pass-through hole (33) in said first lining (20) and in the pad (24).
8. The inner liner (10) according to any one of the preceding claims, wherein said pad (24) includes at least two overlapped layers (124, 224) and said support insert (25) is inserted in both said at least two layers (124, 224).
9. The inner liner (10) according to any one of the preceding claims, wherein said pad (24) has weight-lightening cavities or openings (26).
10. The inner liner (10) according to any one of the preceding claims, comprising a plurality of support inserts (25) distributed in said pad (24).
11. A helmet (12) including a cap (14) and an inner liner (10) according to any one of the preceding claims.
12. The helmet (12) according to claim 11, including an assortment of inner liners (10) according to any one of the preceding claims, said inner liners (10) being different from one another at least on the basis of a number, distribution, height and/or material of the support inserts (25).
13. The helmet (12) according to claim 11 or 12, wherein said internal layer (15) of the cap (14) is a layer of polystyrene.
14. The helmet (12) according to any one of the preceding claims 11 to 13, wherein the pad (24) is associated to the cap by removable fixing means.
15. A method for customizing an inner liner (10) for a protection helmet (12), wherein said inner liner (10) is adapted to be associated to a rigid cap (14) of the protection helmet (12), said cap (14) including a shell (17) and an internal layer (15), said method comprising the steps of
 - performing a mapping of a user's head (T) to locate zones of the internal layer (15) of the cap (14) resting on the head (T);
 - providing a pad (24) adapted to line at least partially the internal layer (15),
 - inserting one or more support inserts (25) into corresponding holes (33) obtained in said pad (24) and in the region of said zones of the layer (15) resting on the head (T), said support inserts (25) being adapted to act as support for the layer (15) of the cap (14).
16. The method according to claim 15, wherein during a step of inserting into the respective pass-through holes (33) said one or more support inserts (25) are partially compressed in a longitudinal direction.
17. The method according to claim 15 or 16, wherein, without changing the cap (14), a first inner layer (10) is replaced with a second inner liner (10), said second inner liner (10) being different from the first inner liner (10) at least on the basis of a number, distribution, height and/or material of the support inserts (25).

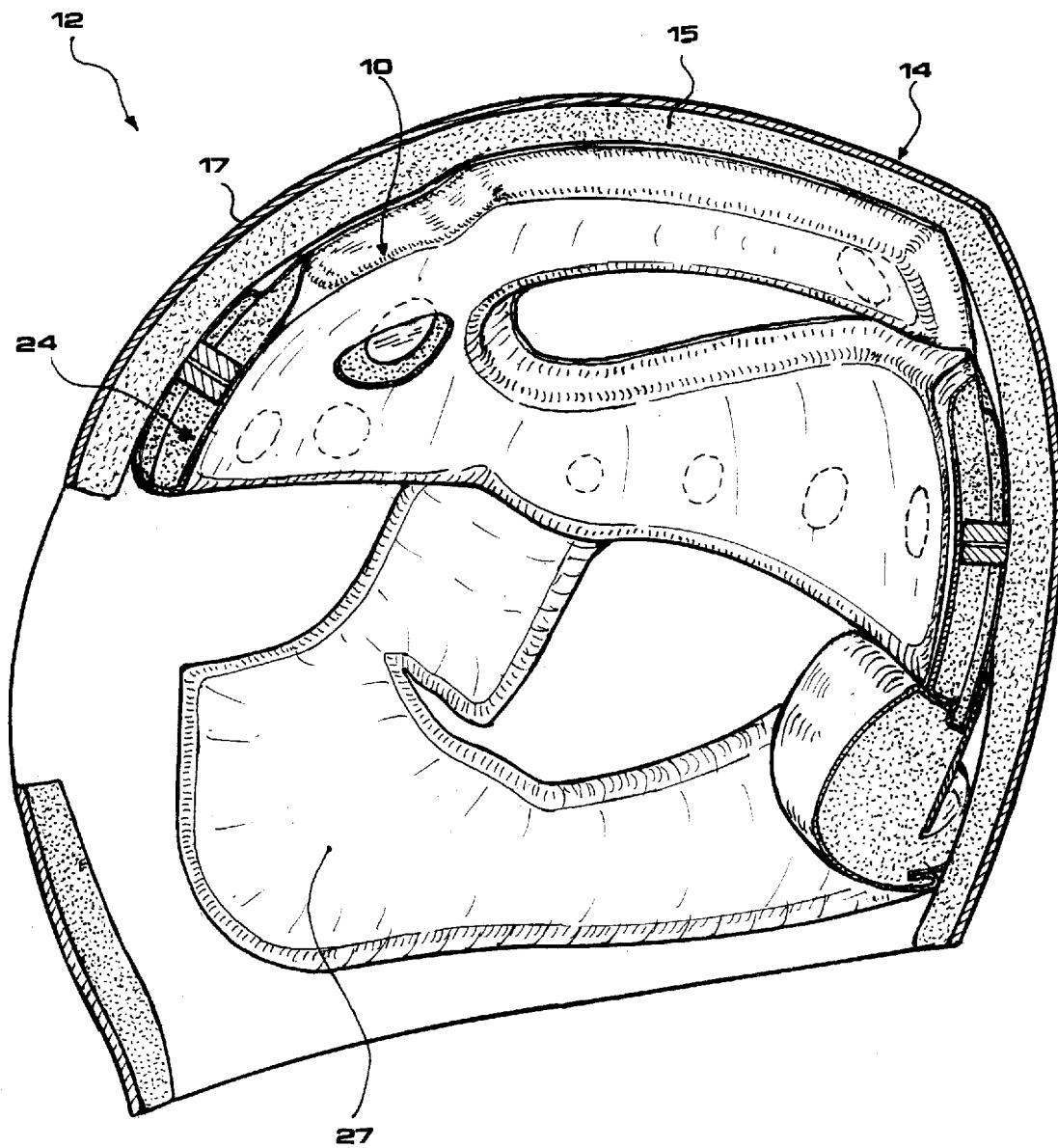


FIG.1

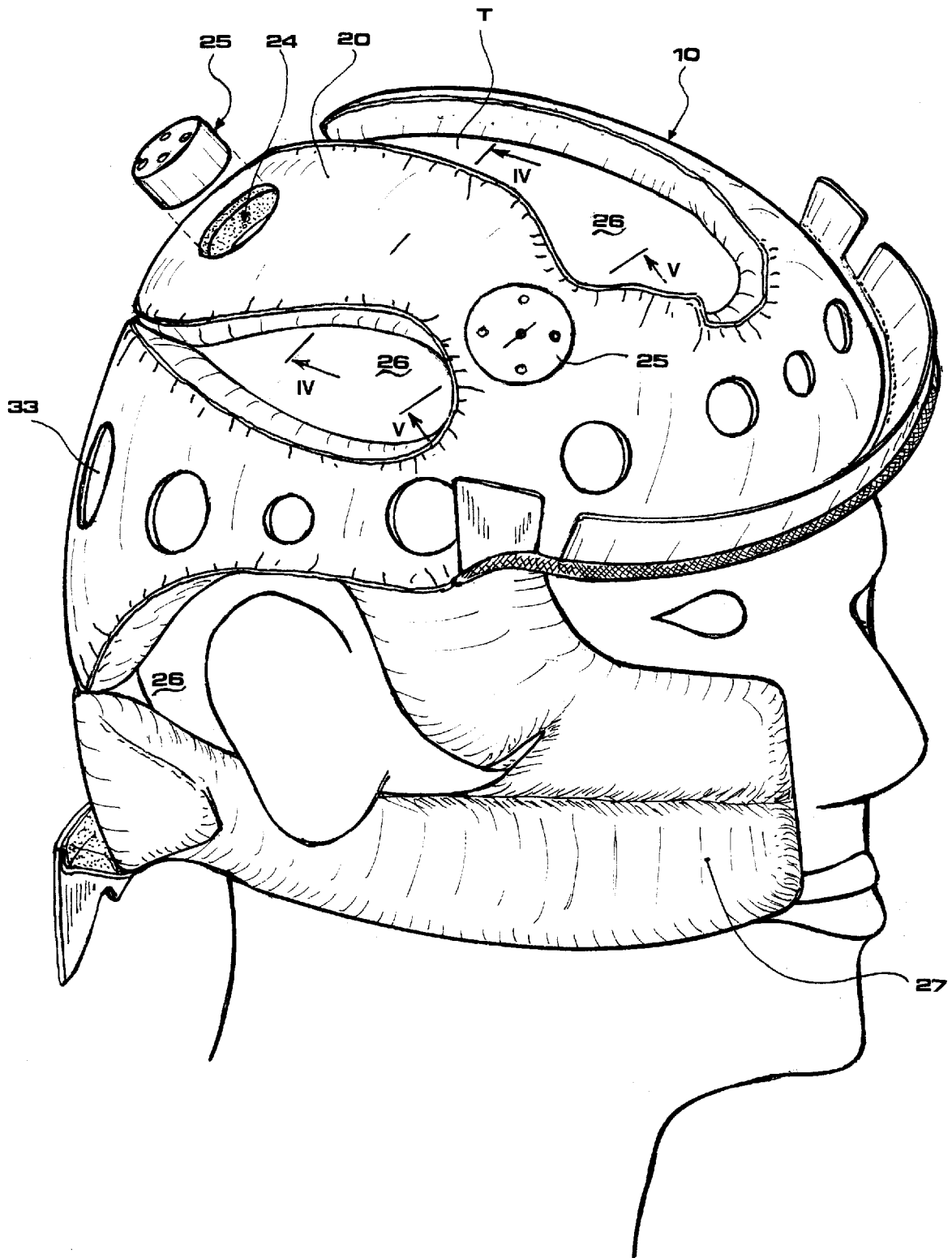


FIG.2

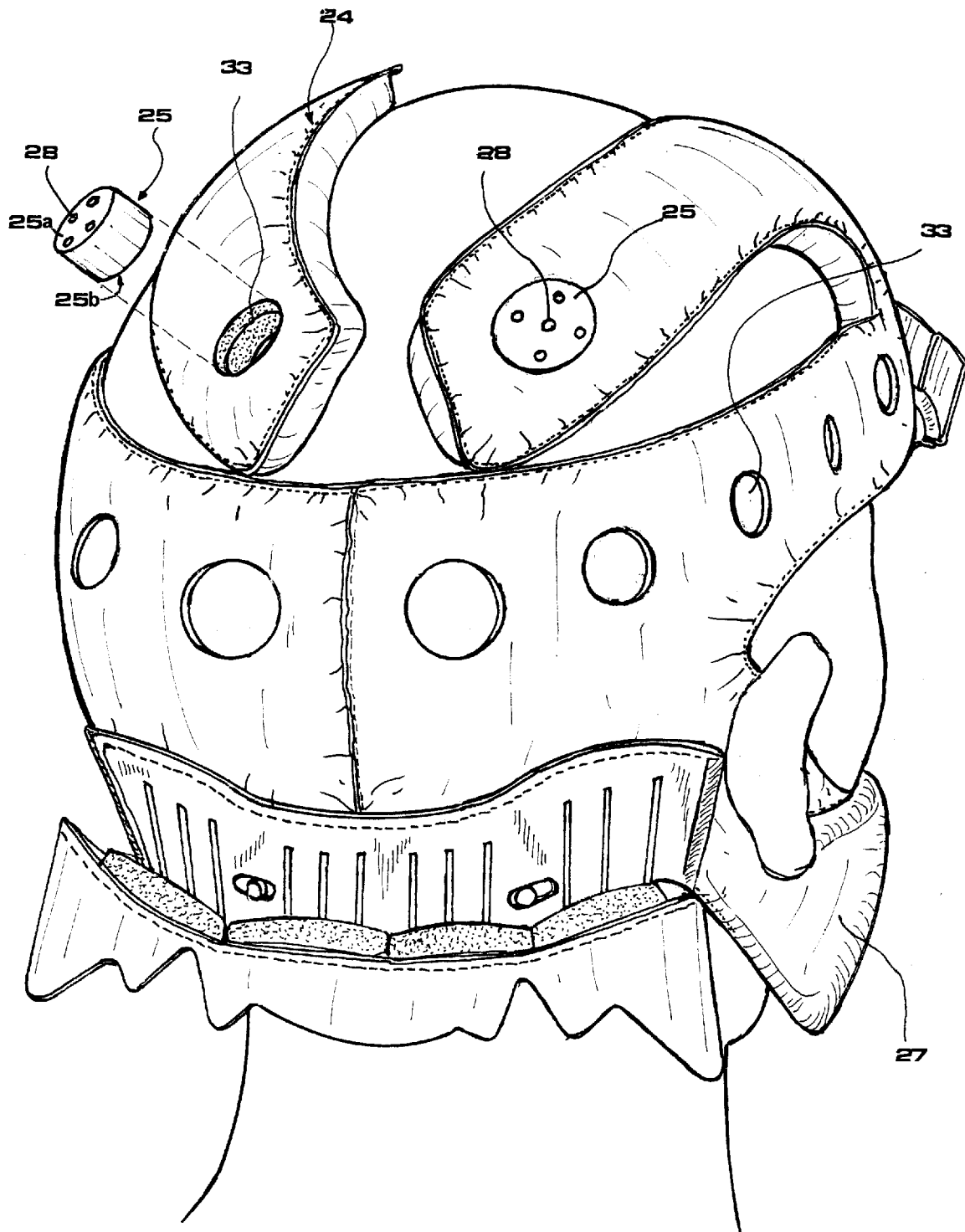


FIG.3

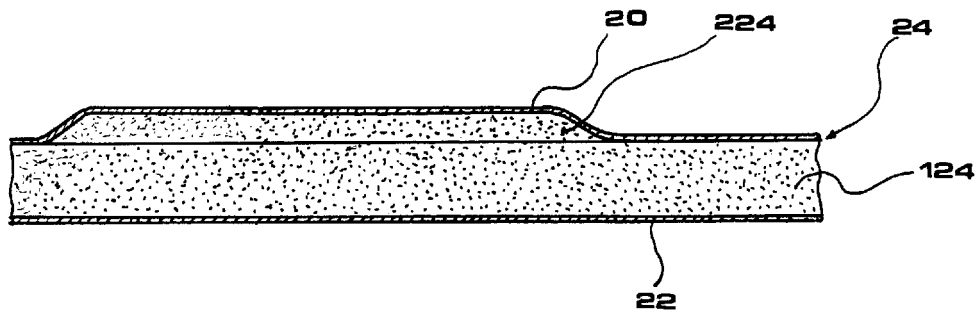


FIG. 4

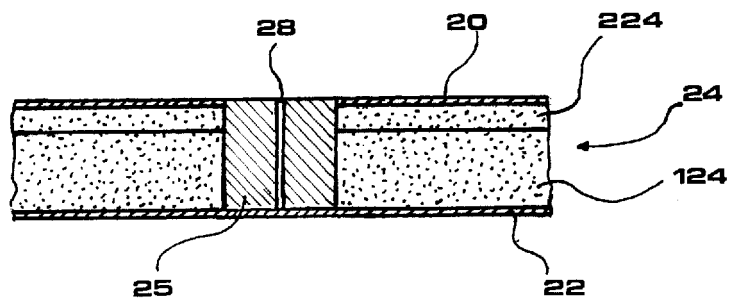


FIG. 5

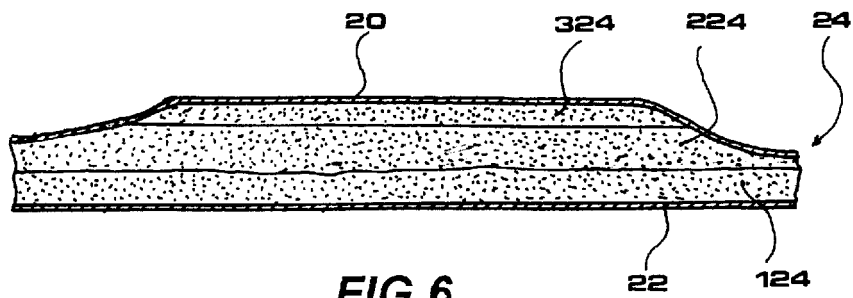
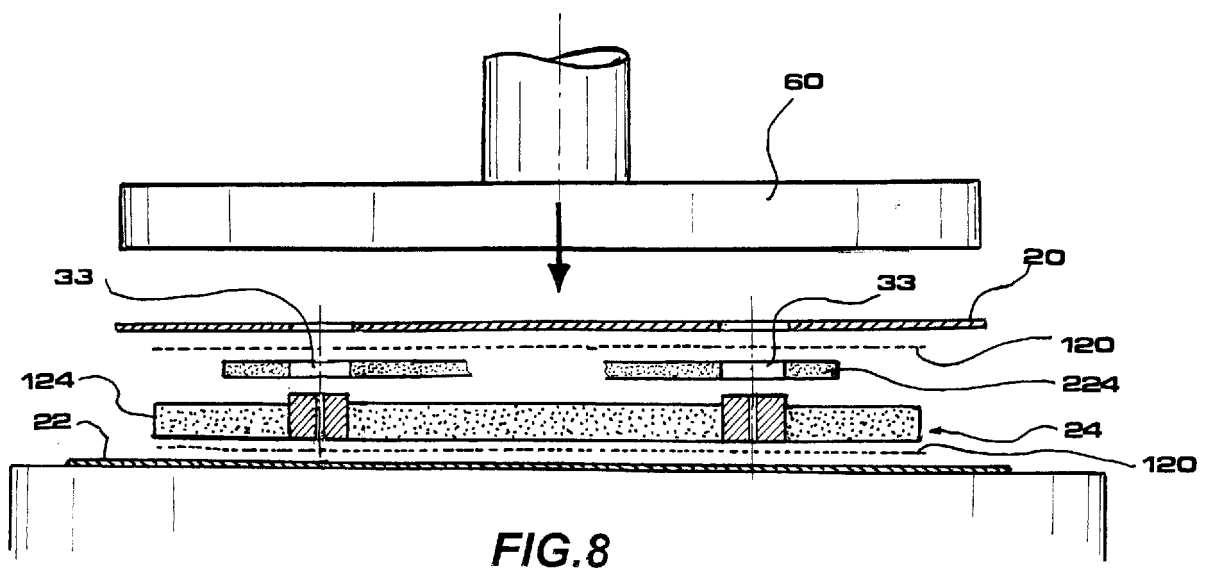
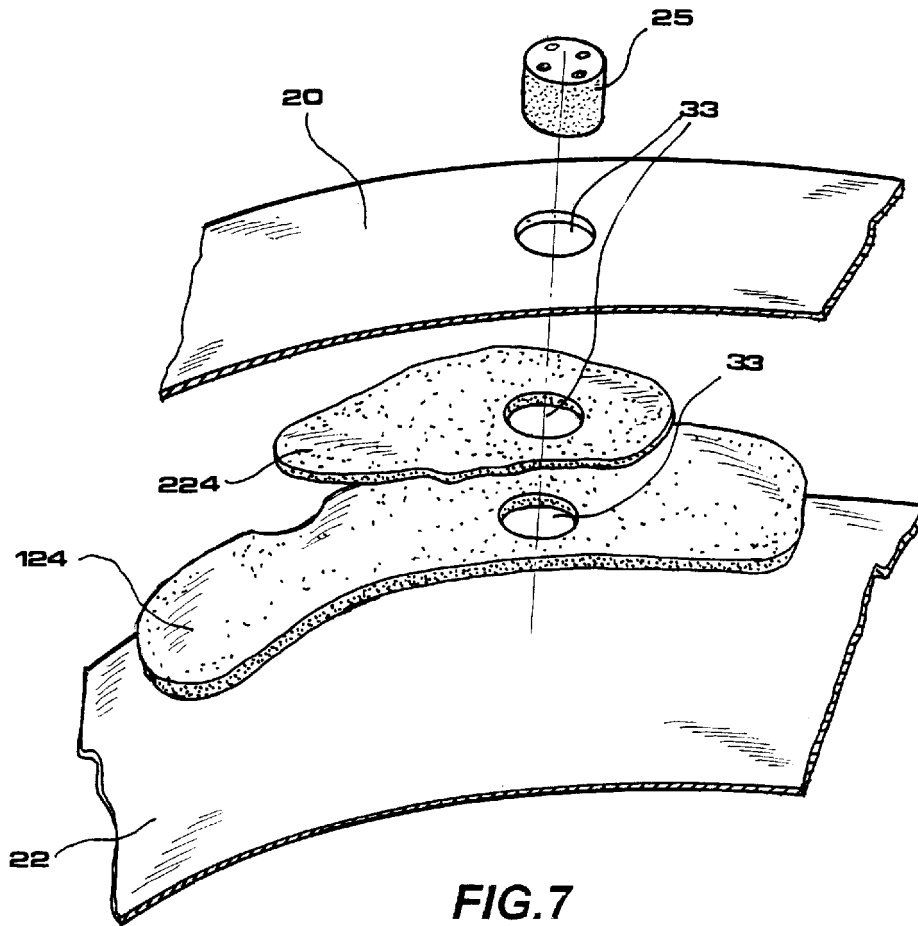


FIG. 6





EUROPEAN SEARCH REPORT

Application Number
EP 12 15 4040

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* abstract; figures 1,2,3 *	15-17	
Y	US 4 345 338 A (FRIEDER JR LEONARD P ET AL) 24 August 1982 (1982-08-24) * column 1, line 40 - line 42 * * column 2, line 66 - column 3, line 42 *	15-17	
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X	US 3 465 363 A (RANEY DENNIS F) 9 September 1969 (1969-09-09) * figure 1 *	1-8,11, 13	
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 April 2012	Examiner Guisan, Thierry
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 12 15 4040

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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