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(54) **INNER LINER FOR A HELMET AND HELMET INCLUDING SUCH AN INNER LINER**

(57) An inner liner (10) for a helmet (12) arranged between the head of a user and a cap (14) of the helmet (12) is described. The inner liner (10) includes a padding (13) and one or more fixing elements (20) having a cou-

pling portion for removably fixing the padding (13) to the cap (14) of the helmet (12). The fixing elements (20) are elements structurally independent of or elements separable from the padding (13).

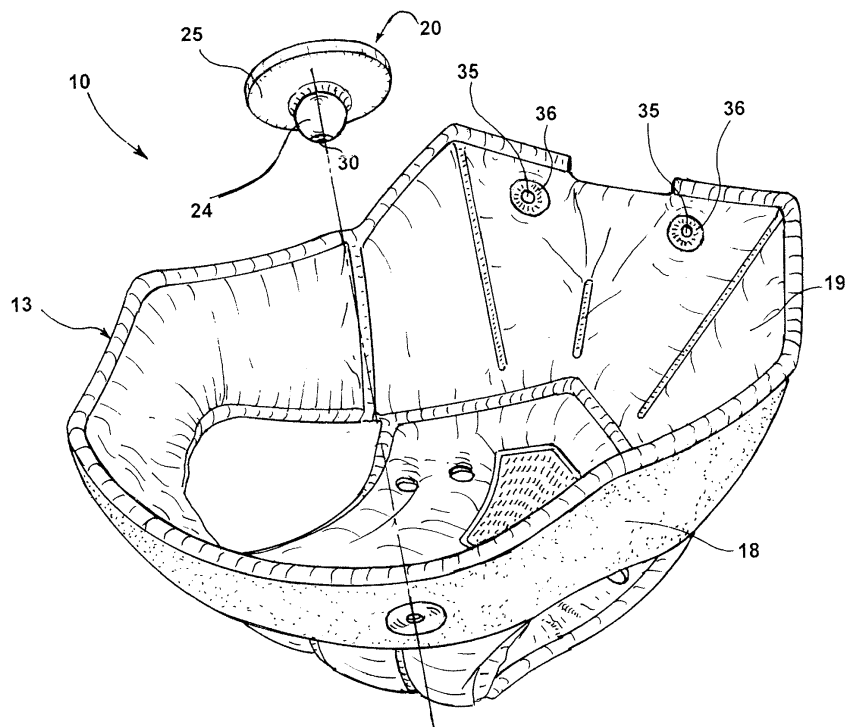


FIG.1

Description

[0001] The present disclosure relates in general to the technical sector of protective helmets. More particularly, the present disclosure relates to an inner liner, also called conventionally an "inner", for protective helmets, which is arranged inside an outer cap of a helmet and is intended to be arranged between the cap and the head of a user.

[0002] In particular, in the context of the present description and in the following claims, the term "inner liner" of a helmet is understood as meaning an assembly including a generally soft padding which serves to cover, at least partially, an inner or concave side, or intrados side, of the cap (wherein the cap includes, usually and conventionally, a shell and a layer made of polystyrene, or some other foam material having an energy-absorbing function).

[0003] The padding acts as a soft layer for ensuring the comfort of the user's head. In fact, the padding is in direct contact with the head and for this purpose should ensure the best possible comfort. The material from which the padding is made is therefore chosen so as to be as soft and comfortable as possible. This inner liner may also include so-called cheek protectors.

[0004] The inner liner is moreover fixed to the intrados side of the cap, for example, by means of Velcro, press-studs or similar fixing or joining systems.

[0005] The present disclosure is based on the realization by the author that an inner liner for helmets of the known type has a limited functionality.

[0006] For example, a liner for helmets of the known type does not ensure optimum comfort in every season.

[0007] In fact, in the summer, the inner liner should be made of a material able to provide a sufficiently cool sensation, such as a lining made of lycra or polyester, while in the winter a warmer material, such as a velvet, may be more convenient.

[0008] In an attempt to overcome this drawback it has been proposed providing a plurality of paddings which are made of different materials and which are suitable for different seasons. However, this choice results in the need to use at least two paddings and therefore constitutes an inconvenience for the user who must always have available two different accessories for the same helmet.

[0009] A technical problem forming the basis of the present disclosure consists in providing an inner liner for a helmet and a helmet including such an inner liner, which is able to overcome at least one of the aforementioned drawbacks and/or which provides a number of advantages.

[0010] This technical problem is solved by an inner liner for helmets as defined in the independent claim 1 and by a helmet according to claim 13.

[0011] Basically, the present disclosure is based on the idea of separating or making the elements for fixing the padding structurally independent of the structure of the padding itself. In this way, once the inner liner has

been detached from the respective cap, the fixing elements may in turn be detached from the padding. The padding may then be handled separately from the fixing elements and for example turned inside out so as to change the side of the padding facing the intrados side of the cap.

[0012] Basically these fixing elements are elements which allow, on the one hand, temporary and removable fixing, and, on the other hand, constitute fixing elements which are per se removable, namely are elements which are structurally independent and may be individually handled.

[0013] The cap may be of the conventional type including a polystyrene layer and an outer cap, or may be cap having layers different from those of the conventional cap. The cap is to be regarded as an element having mainly a protective function for a user's head, for example an energy-absorbing function and/or a function of preventing the penetration of a foreign body.

[0014] The term "padding" is understood in the context of the present disclosure as referring to a generally soft structure, with a cap-like or concave shape, which can be handled manually and which may be entirely or partly devoid of fixing elements intended for temporary or reversible fixing of the padding to the cap. The padding may also be a structure with cavities or incisions, namely with empty weight-reducing zones or spaces. Alternatively, it may consist of a solid, soft, cap-shaped structure.

[0015] The padding may be understood as being a layered structure, i.e. including an inner pad, and one or more layers which externally line the inner pad. The pad may also be a multilayered structure. Alternatively, the pad may be without a liner and also made as a single layer or two layers joined together. Preferably, the padding includes the liner and even more preferably the liner is different for the sides of the padding. What is important for the present disclosure is that the padding has two sides, i.e. an intrados side facing the user's head, and an extrados side facing the cap.

[0016] The fixing elements may be associated with the padding so as to have a coupling portion facing an extrados side, for allowing (removable) fixing with a coupling counter-element or fixing counter-portion associated with the cap.

[0017] Owing to the fact that the fixing elements are structurally independent and are detachable with respect to the padding, they may be removed, and the padding may be inverted or reversed so that the intrados side becomes the extrados side and vice versa. The fixing elements may then again be associated with the padding, for example so that the coupling portion faces again the new extrados side, and allow fixing to the cap. It should be noted that, if they were not removable, the fixing elements would remain on the intrados side or facing the intrados side of the padding, causing discomfort for the user.

[0018] An increased functionality of the padding may

therefore be obtained.

[0019] For example the padding may be of the reversible type, and therefore be made so as to have one side made of a material which is cooler and one side made of a material which is warmer; in general the padding may be made of two different materials, so that the extrados side is different from the intrados side.

[0020] Alternatively, the padding may be simply reversible, without differentiation of the material, and may be turned over or inverted so as to change the side in contact with the head.

[0021] Other advantages of the separate structure of the padding and fixing elements is that the padding may be washed separately from the fixing elements which may be retained and thus are subject to less wear due to cleaning.

[0022] The padding may also be replaced separately from the fixing elements. The fixing elements may therefore be used for different paddings. The padding may also have a lower cost and the fixing elements may be made with a more solid structure which ensures a greater resistance and mechanical strength over time.

[0023] In one embodiment of the present disclosure, the fixing elements are configured to allow a male/female type connection with the cap. Preferably, the fixing elements have a structure which has a substantially T-shaped or mushroom-like cross-section, namely they consist of elements which have a hat portion or, head portion, and a stem or shank portion. The hat portion is a preferably flat or substantially plate-like portion, suitable for being positioned on an intrados side of the padding and limiting as far as possible any discomfort for the user. The stem portion is configured at one end for fastening with a coupling counter-portion associated with the cap.

[0024] The fastening may be a press-stud or Velcro fastening or similar reversible fastening known to the person skilled in the art.

[0025] Preferably, the padding is provided with holes intended to receive at least partially the fixing element, and preferably the aforementioned stem portion. For example, when the fixing element is configured with a T-shaped cross-section, the fixing element is inserted inside the hole so that the hat portion is on the intrados side and comes into contact with an inner side of the portion of the padding surrounding the hole. The stem portion has an end facing the extrados side and ready for coupling with the counter-portion associated with the cap.

[0026] When it is required to reverse the padding, the fixing element is extracted towards the intrados side and inserted again on the opposite side of the padding.

[0027] In one embodiment of the present disclosure, in order to damage as little as possible the padding following the continuous insertion and extraction of the stem portion of the fixing element, or in general repeated removal of the fixing element, the padding has a more rigid or reinforced zone around the hole, such as that defined above, intended for example to receive the stem portion.

This greater rigidity may be obtained by means of gluing together of the layers which form the padding around the hole and preferably thermoforming of the layers with compression and pressing together of the same.

[0028] Other characteristic features and modes of use of the subject of the present disclosure will emerge more clearly from the following detailed description of a number of preferred embodiments thereof, provided by way of a non-limiting example. It is nevertheless evident how each embodiment may have one or more of the advantages listed above; in any case it is nevertheless not necessary that each embodiment should have simultaneously all the advantages listed.

[0029] It is also understood that the scope of the present disclosure includes all the possible combinations of the embodiments indicated above and of those described with reference to the following detailed description.

[0030] Reference will now be made to the figures in the attached drawings in which:

- Figure 1 shows an axonometric view, with parts disassembled, of an inner liner for a helmet according to an embodiment of the present disclosure;
- Figure 2 shows a view of a partially cross-sectioned detail of the inner liner for a helmet according to Figure 1;
- Figure 3 shows a cross-sectional view along the line III-III of Figure 2;
- Figure 4 shows a view of a helmet including the inner liner for a helmet according to Figure 1.

[0031] With reference to the attached figures, the reference number 10 indicates an inner liner, also called "inner", for a helmet 12 according to the present disclosure. The helmet 12 includes an outer rigid cap 14 which includes, in turn, for example, a layer 15 made of polystyrene or other foam or non-foam material with an energy-absorbing function, and a shell 17, for example with a smaller thickness than the polystyrene layer 15 (Figure 4) and having an anti-penetration function. The cap 14, the polystyrene layer and the shell 17 are elements known to the person skilled in the art and will not be further described in the continuation of the present description. The cap 14 may be made using any manufacturing method and is to be regarded as being a device including at least one layer having an energy-absorbing function and/or one layer having an anti-penetration function, namely a function ensuring protection against the penetration of a foreign body. The inner liner for a helmet according to the present disclosure is designed to be connected and fixed, for example, to the layer having an energy-absorbing function and/or to the layer with an anti-penetration function.

[0032] The inner liner 10 is able to be arranged between the head of user and the cap 14. This inner liner 10 includes a padding 13 which is a generally soft structure intended therefore to be curved in the form of cap so

as to adhere to the form of a user's head.

[0033] More particularly, in the example shown, the padding 13 includes a pad 16 made of soft and yielding material, for example foam material, even more particularly, for example, polyurethane (PU) with a density of 21 grammes/m³.

[0034] The pad 16 is in turn lined with a first layer 18, or outer layer, made of a first material, and a second layer 19, or inner layer made of a second material.

[0035] The first layer 18 and the second layer 19 define two opposite sides of the padding 13.

[0036] Even more preferably, the pad 16 may include in turn two layers, i.e. a first layer, for example a sponge combined with the first material, for example a winter material, such as velvet-like material, and a second layer, for example a second sponge, combined with a second lining material, such as a cooler fabric. The two lining materials may then be stitched together to create the padding 13.

[0037] In other words, the first layer 18, the second layer 19 and the inner pad 16 (which may in turn be formed by several layers) form a multilayer structure which is suitably stitched and shaped so as to define an intrados side and an extrados side of the padding. The intrados side is intended to face the inside or the user's head, while the extrados side is intended to face the cap 14.

[0038] It is to be understood that further layers and/or reinforcing elements or plate-like elements - not mentioned in the present description and/or not shown in the disclosure drawings - may be provided and arranged between the first layer 18, the second layer 19 and the inner pad 16.

[0039] Preferably, the padding 13 is reversible, namely it may be turned inside out so that an intrados side becomes an extrados side of the padding and vice versa and both the sides or layers of the padding may be attached to an intrados side of the cap 14.

[0040] In order to fix the padding 13 to the cap 14, the inner liner 10 includes one or more fixing or coupling elements 20 which are structurally independent of the padding 13. In other words, these elements are elements which may be individually handled separately from the padding 13. The fixing elements 20 include coupling portions 30 which are able to be connected and/or coupled reversibly or removably together with coupling or fixing counter-portions 32 fixed to the cap 14 (the coupling counter-portions 32 are indicated generally in Figure 4). For example, the fixing elements 20 include a coupling portion of a press-stud suitable for connection with a connecting counter-portion of the press-stud. Alternatively, the fixing elements include a connecting portion of a Velcro connection or similar connection of the reversible type.

[0041] Owing to the fact that the fixing elements 20 are elements which are structurally independent of the padding 13, these fixing elements may be temporarily associated with the padding 13, for example so that the cou-

pling portion 30 faces the extrados side of the padding 13 and therefore emerges from the extrados side and a connection with the coupling portion 32 associated with the cap 14 is possible.

[0042] A portion of the fixing element 20 may remain on an intrados side and preferably be shaped so as to create minimum inconvenience for a user.

[0043] For example, preferably, each fixing element 20 has a form with a T-shaped cross-section and includes a first portion 24 able to be associated with an extrados side, and a second portion 25 able to be associated with an intrados side. An intermediate portion 26 is arranged between the first portion 24 and the second portion 25. The first portion 24 and the intermediate portion 26 form the shank or stem of the "T". Preferably, the intermediate portion 26 has a diameter or generally a size smaller than that of the second portion 25 and preferably smaller also than the first portion 24.

[0044] The second portion 25 may have a substantially plate-like or generally flat form so as to create the minimum volume or projection on the head side. Preferably the second portion 25 is provided with a comfort fabric or similar layer suitable for contact with the head. The first portion 24 has at one end the connecting or coupling portion 30 for allowing connection with the connecting counter-portion 32 associated with the cap 14.

[0045] The fixing element 20 may be inserted in corresponding holes or recesses 35 formed in the padding 13. The fixing element 20 is inserted via the side of the first portion 24 so that the second portion 25 is retained on the intrados side (coming into contact therewith), and the connecting or coupling portion 30 projects from the extrados side for fixing together with the cap 14. It should be noted that the first portion has dimensions such as to have a diameter larger than the hole 35 and allow the fixing element to remain stably engaged with the padding 13.

[0046] The first portion 24 therefore forces slightly the hole 35 at the moment of insertion.

[0047] Preferably, in an embodiment such as that shown in the drawings, in order to reduce as far as possible the risk of damaging the padding 13, the latter includes a zone 36 around each hole 35 which is more rigid or reinforced with respect to the remaining part of the padding 10. For example the more rigid zone 36 or localized reinforcement may be obtained by means of gluing of the layers which form the padding, for example by means of thermoforming.

[0048] The reinforcement may be obtained by means of other techniques known in the sector, such as stitching, or using plastic elements which form a collar or annular band around the hole.

[0049] The advantage of gluing, in particular by means of thermoforming, is that the reinforcement may be obtained very rapidly and without using additional elements, which may weigh down the structure.

[0050] It is also pointed out that, when gluing, thermoforming or also stitching of the layers of the padding 13

is performed compression of the layers which form the padding 13 is also obtained. Such a compression around the hole 35 allows the thickness of the padding to be reduced and in fact a recess 37 to be created in the padding 13 around the hole 35. This recess allows seating of the second portion 25 of the fixing element 20, incorporating it substantially within the general volume of the padding 13 and therefore reducing the risk that the second portion 25 of the fixing element 20 may be "sensed" by a user.

[0051] It is also pointed out that the recess 37 is present on both sides of the padding 13, and therefore both on the intrados side and on the extrados side, and its function may therefore be used in both the configurations of the padding 13.

[0052] Preferably, in order to reinforce further the hole 35 and prevent tearing when the fixing element 20 is inserted/extracted, the inner liner 10 may include plate-like elements made of plastic more rigid than the padding 13. The plate-like elements may be inserted between the two layers which form the pad 16 and stitched to the edge of the inner liner 10. The plate-like elements may provide the inner liner 10 with a further reinforcement for any further machining which must be carried out on the inner liner 10.

[0053] Preferably, in an embodiment such as that shown in the drawings, the first material of the first layer 18 is preferably different from the second material. The first material is for example a warmer material, namely a material suitable for providing the user with a warm sensation around their head. For example, said material may consist of a velvet-like material. The second material of the second layer 19 may be a material, so-called cool material, namely able to provide the user with a cool sensation around their head, such as a nylon, cotton, linen or other fabric lining, i.e. so-called cool fabrics, or it may be a breathable and/or perforated fabric.

[0054] Thus, since the padding 13 may be freed of the fixing elements 20 and turned inside out in a reversible manner, the padding may be reversed depending on the season and sensation which the user wishes to have. Alternatively, it is also possible for the first layer 18 and the second layer 19 to be made of the same material and for the padding 13 to be reversed only in order to change the side on which the head makes contact with the padding 13.

[0055] In order to perform reversal of the helmet inner 10, the following manoeuvres may be performed:

Initially, the fixing elements 20 are housed inside the holes of the padding 13 and fixed to the cap so that each second portion 25 faces the intrados side of the helmet inner.

[0056] Then the fixing elements 20 are detached from the cap 14, by simply releasing the removable fastening with the cap 14. Then the padding 13 is reversed so that the extrados side becomes the new intrados side and

vice versa, and the fixing elements 20 are extracted from the associated holes and inserted via the new intrados side until the second portion 25 comes into abutment against the side of the padding in the more rigid zone 36.

[0057] The fixing elements 20 are then ready again for being fixed to the cap 14.

[0058] The subject-matter of the present disclosure has been described hitherto with reference to preferred embodiments thereof. 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.

15 Claims

1. Inner liner (10) for a helmet (12), said inner liner (10) being able to be arranged between the head of a user and a cap (14) of the helmet (12), said inner liner (10) including a padding (13) and one or more fixing elements (20) having a respective coupling portion (30) able to be fixed in a removable manner to the cap for removably fixing the padding (13) to the cap (14) of the helmet (12), wherein said one or more fixing elements (20) are elements structurally independent of, or elements separable from, or removable with respect to, the padding (13).
2. Inner liner (10) according to claim 1, wherein the padding (13) has one or more holes (35), each able to receive at least a portion of a respective fixing element (20).
3. Inner liner (10) according to claim 2, wherein said padding (13) has an intrados face or side and an extrados face or side and wherein said one or more fixing elements (20) include a first portion (24) able to be associated with, or emerge from, or facing, the extrados side of the padding and a second portion (25) able to be associated with, or placed on, the intrados side of the padding (13) and an intermediate portion (26) able to be inserted and received in the hole of the padding (13).
4. Inner liner (10) according to claim 3, wherein said one or more fixing elements (20) are mushroom-shaped, or have a "T" cross-section, and include a hat portion or plate portion (25) corresponding to said second portion.
5. Inner liner (10) according to claim 3 or 4, wherein the first portion (24) supports at one end the coupling portion (30).
6. Inner liner (10) according to any one of the preceding claims 2 to 5, including a zone (36) around each hole (35), said zone (36) being more rigid than the remaining part of the padding (13).

7. Inner liner (10) according to claim 6, wherein the more rigid zone (36) is an area in which layers forming the padding are glued to each other or are layers more rigid than a remaining portion of the padding (13). 5
8. Inner liner (10) according to any one of the preceding claims 2 to 7, wherein said padding (13) has a housing recess (37) around said hole (35). 10
9. Inner liner (10) according to claim 7 and claim 8, wherein the more rigid zone (36) is an area in which layers forming the padding are pressed together to form a smaller thickness area around the hole and define said recess (37). 15
10. Inner liner (10) according to any one of the preceding claims, wherein the padding (13) has two opposite faces, or an intrados side and an extrados side of the padding (13), and wherein the padding (13) is reversible and is able to be inverted so that an intrados side becomes an extrados side of the padding (13) and vice versa, and both the two faces or layers of the padding are able to be joined to the cap (14) by means of said one or more fixing elements (20). 20 25
11. Inner liner (10) according to claim 10, wherein said two faces are made of two different materials.
12. Inner liner (10) according to claim 10 or 11, wherein the padding includes a pad (16), at least a first layer (18), or outer layer, made of a first material, and at least a second layer (19), or inner layer made of a second material, wherein the first layer (18) and the second layer (19) define said two faces. 30 35
13. A helmet (12) including a cap (14) and an inner liner (10) according to any one of the preceding claims, said cap being provided with connecting or coupling counter-portions able to be coupled with said coupling portion (30) of said fixing elements (20). 40
14. The helmet (12) according to claim 12, wherein said cap (14) includes a layer having an energy-absorbing function, for example a foam material, and/or a layer having an anti-penetration function, for example an outer shell. 45

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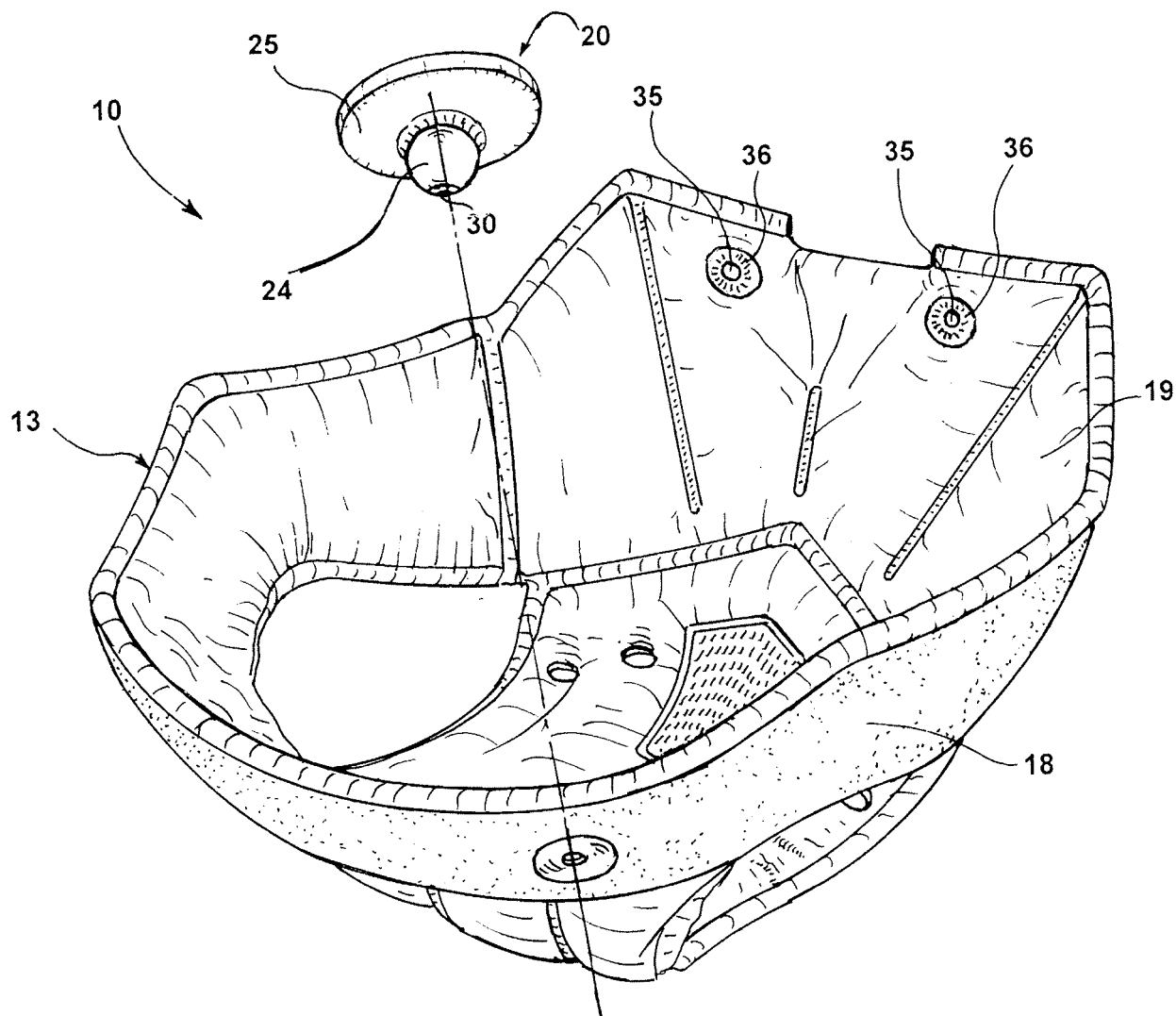


FIG. 1

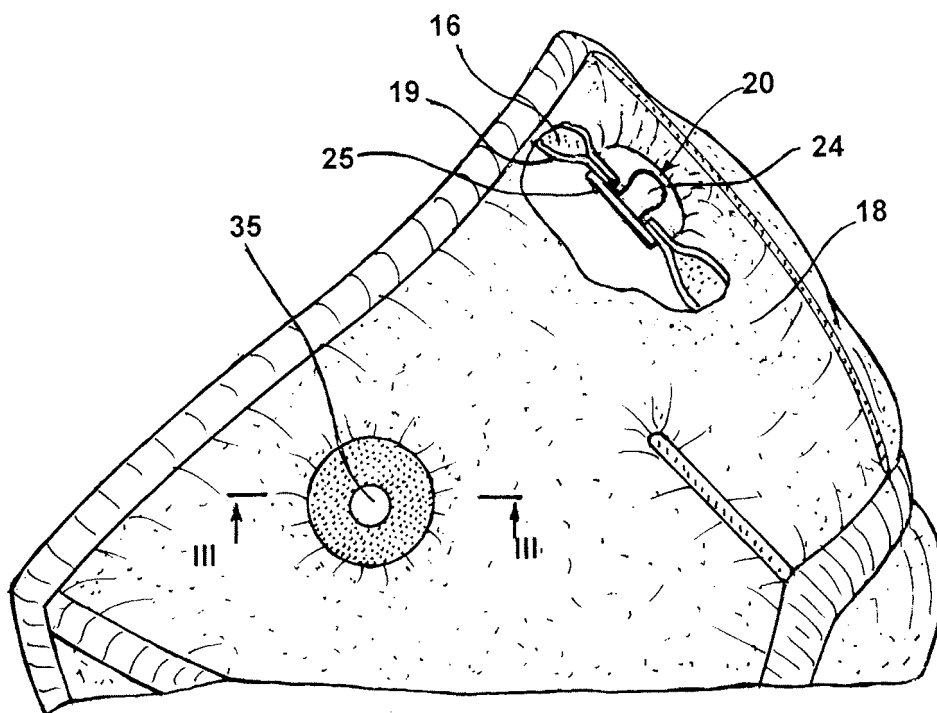


FIG.2

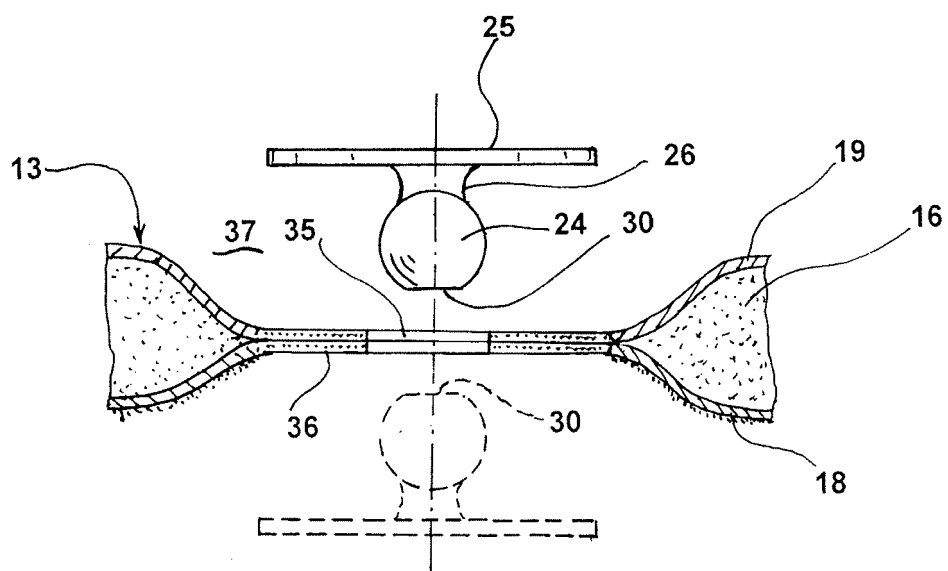


FIG.3

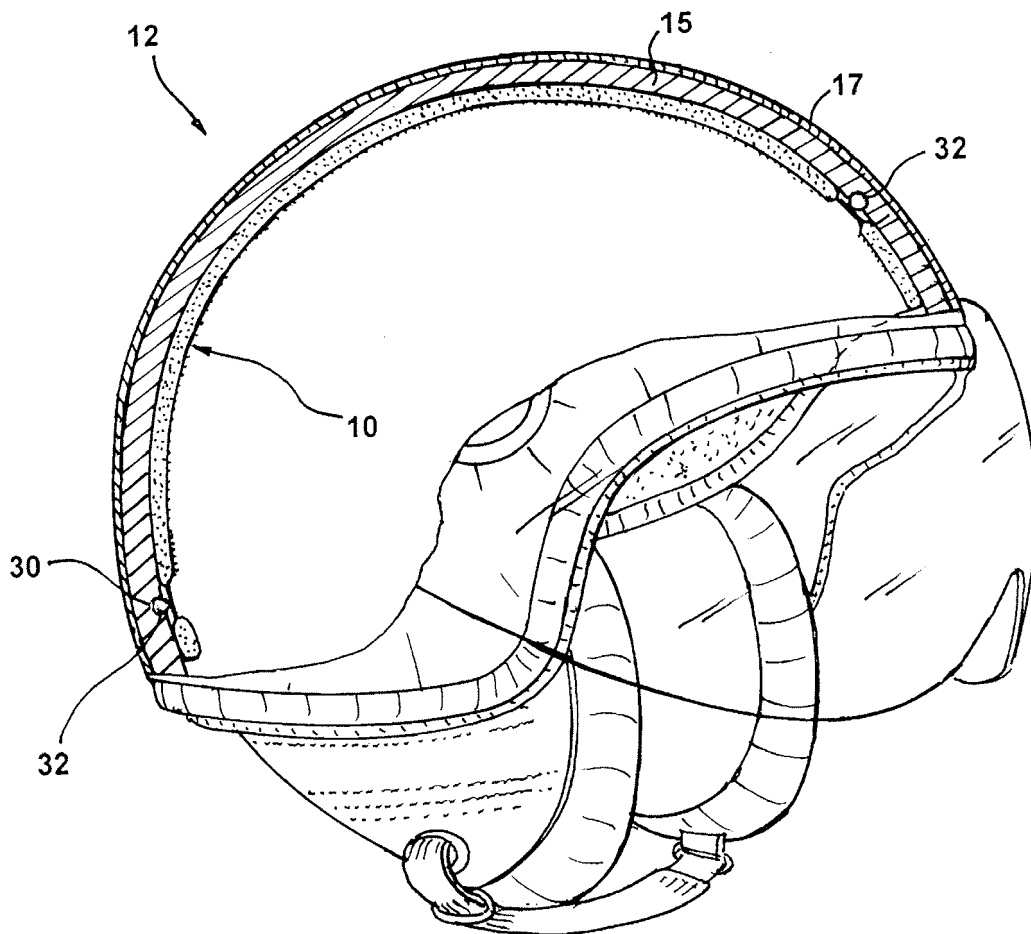


FIG.4



EUROPEAN SEARCH REPORT

Application Number
EP 17 16 9673

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
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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 21 August 2017	Examiner D'Souza, Jennifer
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			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 17 16 9673

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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