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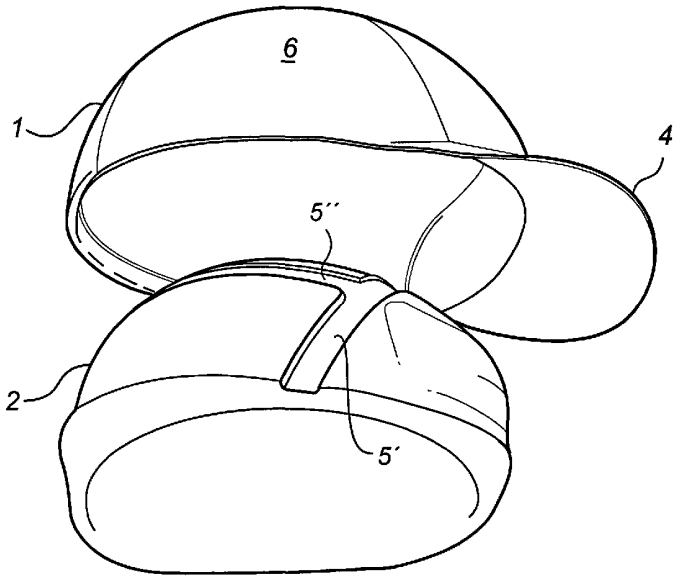
(54) Title: HELMET WITH COMPRESSABLE COVERING



(57) **Abstract:** The invention relates to a helmet, comprising an inner shell of dimensionally stable, shock absorbing cellular plastic intended to be located nearest to the user's head and an outer covering which is arranged on the outside and covers the inner shell. According to the invention, the outer covering comprises a compressable covering of a thermo-compressed plastic material which has a higher density than the inner shell. Since both the inner shell and the outer covering have force-absorbing properties, the inner shell may be made thinner when the outer covering is made thicker. This means that the outer covering may be made thicker without the total thickness of the helmet necessarily being increased. A thicker outer covering is advantageous in order to prevent the outer covering from being torn off when it gets in contact with the ground.

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HELMET WITH COMPRESSABLE COVERING

Field of the Invention

The present invention relates to a helmet for cyclists, skiers, yachtsmen or others who devote themselves to activities where their head may be exposed to blows or other external violence.

In particular, the invention relates to a helmet of the type which exists as a bicycle helmet having an inner shell of cellular plastic which is adapted to be located nearest to the user's head and an outer covering which is arranged on the outside and which covers the inner shell.

Background Art

When a helmet is used in the above-mentioned activities and other similar sport-related recreational activities, increasing demands are made on a sporty and "cool" appearance. Consequently, use is made of brightly coloured materials in clothes and equipment (sails, ropes, bicycles, skis, etc.). The same demands are made on helmets which, in order to appeal to the user, must not be too unwieldly or unattractive.

Traditional bicycle helmets are a good example of helmets that by their shape discourage a lot of people from using a helmet, resulting in serious injuries and large costs.

A bicycle helmet often consists of an inner shell of cellular plastic, usually EPS (expanded polystyrene) or EPP (expanded polypropylene), which is intended to absorb a shock by the cellular plastic being compressed. The inner shell is surrounded by a thin outer covering made of rigid plastic adapted to give the helmet an attractive appearance and improve its protecting properties regarding certain types of external violence. The rigid shell distributes the pressure when it gets into contact with a sharp edge, which improves the shock absorption of the

cellular plastic. In order to fulfil the technical demands made by the authorities on bicycle helmets, a relatively thick shell of cellular plastic is required, typically in the range of up to 35 mm. This thickness results in the helmet protruding from the user's head (some people consider that it looks like a mushroom).

In order to prevent the outer shell from being torn off too easily when it gets into contact with the ground, or from cracking when being knocked against, for example, an edge, it should have a thickness of some millimetres. Since this further adds to the thickness of the helmet, it is common that the outer shell only is about one millimetre thick, or even thinner than one millimetre. Thus, there is a great risk that the outer shell cracks or is damaged when it gets into contact with the ground.

In addition, the rigid plastic covering is, from a manufacturing point of view, expensive to adapt as regards size, which has led to the situation that most helmets available on the market are sold in one size and are fitted with various adjustment facilities in the form of straps, buckles or the like.

Besides, the rigid plastic covering is not very well suited for the graphical design of the helmet that is desired by the users since its appearance is too "artificial". It would be especially desirable for the helmet to have an outside of textile material so that it could be decorated and shaped almost as a cap. Attempts have been made to provide the plastic covering with a cover of fabric, but these have not been very successful.

Some years ago a new type of head protector was developed by the applicant, consisting of a thermo-compressible material, for example polyethylene, which is thermo-compressed to the desired density and shape. A textile layer may be laminated on the thermo-compressed cellular plastic. By means of the thermo-compression, a headgear which is very attractive as regards designing can be provided; for example, the head protector may be

shaped as a peaked cap. On the other hand, it is very difficult to manufacture such a head protector that fulfils the above-mentioned technical demands made on a bicycle helmet.

Summary of the Invention

The object of the present invention is to provide a helmet which fulfils the demands as made and at the same time offers the possibility of an attractive design.

This object is achieved by a helmet of the above-mentioned type, the outer covering consisting of a compressable layer of thermo-compressed plastic material which has a higher density than the inner shell.

Surprisingly good test values have been obtained by means of this construction. In testing, a weight coated with two layers according to the invention has been dropped, on the one hand, against a flat anvil and, on the other, an edge anvil, and the retardation of the weight has been measured. In the testing, an inner shell of EPS with a thickness of about 15 mm and an outer covering of thermo-compressed polyethylene with a thickness of about 6 mm have been used. The result was better than for only one cellular plastic layer having a corresponding thickness (about 21 mm).

These good properties regarding strength of material and shock resistance are achieved by means of a thickness of the helmet that falls below that of normal conventional helmets having an inner shell of cellular plastic and a thin outer covering of rigid plastic. This saving of the necessary thickness of helmet is due to the properties of the outer covering and the combination of inner shell and outer covering.

On the one hand, the thermo-compressed outer covering is hard enough to distribute the force of impact over a larger area and, on the other, the thermo-compressed outer covering is slightly resilient and thus contributes to the actual force absorption. Since both the inner

shell and the outer covering have force-absorbing properties, the inner shell may be made thinner when the outer covering is made thicker. This means that the outer covering may be made thicker without necessarily increasing the total thickness of the helmet. A thicker outer covering is advantageous in order to prevent the outer covering from being damaged when it gets in contact with the ground.

In the above-mentioned testing, it was further found that the total thickness of the helmet could be decreased when the outer covering was made with a large enough thickness. The construction according to the invention, having two layers that are each separately compressable, where the outer covering is harder, thus seems to give an improved shock absorption when the thickness is unchanged, or alternatively, an unchanged shock absorption when the thickness is smaller.

By the outer covering being formed by means of thermo-compression, it is easy, in connection with the forming, to provide sections having a varying thickness, which improves the possibilities of a good design.

The outer covering of a thermo-compressed material is further soft enough to allow embroidered edging, which is impossible if an outer covering of rigid plastic is used. The embroidered edging contributes to an attractive design.

At a relatively low cost, the thermo-compressed outer covering may be manufactured in many sizes, which makes it economically possible to produce helmets which are adapted for different sizes.

The density of the thermo-compressed layer is, for example, between 2 and 3 times higher than that of the inner shell. This proportion is achieved when conventional cellular plastic materials are used in the inner shell and a thermo-compressed cellular plastic in the outer covering.

Suitably, the outer covering constitutes between 20 % and 50 % of the total thickness of the helmet and, optionally, this percentage varies over the helmet. Thus, it is ensured that the outer covering is thick enough not to be torn off too easily when it gets in contact with the ground. At the same time the thickness of the inner shell should dominate the helmet in order to achieve optimal shock absorption.

The plastic material may consist of a cellular plastic material such as polyethylene, which is well-suited for forming by thermo-compression. An outer layer of fibrous material may further be applied on the plastic material of the outer covering. By means of this construction, an outer covering is provided which makes it possible to give the helmet an attractive finish without decreasing the shock resistance. Preferably, the fibrous layer may be composed by woven fabric, for example textile.

Thermo-compression is useful if it is desirable to have a layer of fabrics.

Brief Description of the Drawings

The present invention will in the following be described in more detail with reference to the accompanying drawings which by way of example show a preferred embodiment of the invention.

Fig. 1 is a perspective view from below of a helmet according to one embodiment of the invention.

Fig. 2 is a perspective exploded view from below of the helmet in Fig. 1, but without the strap.

Description of a Preferred Embodiment

The helmet shown in Figs 1 and 2 comprises an outer covering 1 and an inner shell 2. The inner shell 2 is made of a shock-absorbing cellular plastic material, preferably die-cast EPS (expanded polystyrene) or EPP (expanded polypropylene) and its construction is rather

like a corresponding shell in a conventional bicycle helmet. One difference is that conventional bicycle helmets usually are not size-adapted, but the same cellular plastic shell is used for many different sizes.

A strap 3 may be arranged at the helmet, suitably between the inner shell and the outer covering as shown in Fig. 1. The strap 3 may be formed in a conventional manner and aims at keeping the helmet in position on the user's head. In order to facilitate mounting of the strap, while at the same time it is ensured that the strap is kept in position also in case of a considerable shock, the inner shell 2 is provided with recesses 5', 5'' which run in a first path 5' from side to side over the bending of the shell, and furthermore from this first path in two further paths 5'' towards the neck portion of the helmet.

The outer covering 1 essentially consists of a plastic material, preferably a polyethylene, and a layer of fibrous material 6, preferably woven fabric, which has been laminated on the plastic in a flat condition. Subsequently, this laminate is thermo-compressed to the desired shape. In the shown example the outer covering has been formed to a cap-like shape and thus exhibits a peak portion 4. The woven fabric makes it possible to give the helmet an attractive design; for instance decals may be attached to the fabric.

In connection with thermo-compression, the outer covering may be given a varying thickness in order to correspond to such variations in the inner shell. Such variations may be required depending on varying demands being made on different helmet sections or due to the desired appearance.

Embroidered edging may be performed through the plastic material and, if necessary, parts of the outer covering may be thermo-compressed to a smaller thickness in order to facilitate the performance of embroidered edging. If embroidered edging is to be carried out on ar-

eas where a larger thickness of the outer covering is required, these areas may be provided with a supplementary insert of thermo-compressed plastic material (not shown).

The plastic material of the outer covering has a higher density than the cellular plastic of the inner shell, suitably about 2-3 times higher. The density of the inner shell may be in the range of 60-200 kg/m^3 if conventional cellular plastic is used, and the outer covering then conveniently has a density in the range of 200-300 kg/m^3. Although the plastic material thus is considerably more rigid than the cellular plastic, it is, however, slightly resilient, which ensures the good shock resistance mentioned above.

According to a preferred embodiment, the inner shell has a thickness of about 16 mm and the outer covering a thickness of about 6 mm. Thus, the total thickness of the helmet becomes about 22 mm, which is considerably less than that of conventional helmets having a similar strength of material.

In a known manner, the helmet also exhibits holes extending through both the inner shell and the outer covering. These holes are not shown in Figs 1 and 2, but can be suitably designed by those skilled in the art.

It will be understood that the present invention is not limited to the described embodiment. A plurality of variations are possible within the scope of the inventive idea defined by the claims. For example, the respective thicknesses of the two layers may vary over the surface of the helmet and in combination give different strength of material in different sections.

In addition, the helmet may, if necessary, be provided with a further layer, for instance, an outer layer of rigid plastic of a type known per se. Although this is not in the first place the inventive idea which, on the contrary, relates to eliminating the need for such a rigid plastic shell, this variant should not be considered excluded.

CLAIMS

1. A helmet, comprising an inner shell of dimensionally stable, shock absorbing cellular plastic intended to be located nearest to the user's head and an outer covering which is arranged on the outside and covers the inner shell, c h a r a c t e r i s e d in that the outer covering comprises a compressable layer of a thermo-compressed plastic material which has a higher density than the inner shell.

2. A helmet as claimed in claim 1, wherein the density of said plastic material, for example, is between 2 and 3 times higher than the density of the inner shell.

3. A helmet as claimed in claim 1 or 2, wherein the outer covering constitutes between 20 % and 50 % of the thickness of the helmet, counted along a perpendicular through inner shell and outer covering.

4. A helmet as claimed in any one of the preceding claims, wherein the thermo-compressed plastic material consists of a cellular plastic material such as polyethylene.

5. A helmet as claimed in any one of the preceding claims, wherein an outer layer of fibrous material is applied on the plastic material of the outer covering.

6. A helmet as claimed in claim 5, wherein the fibrous material is woven fabric, preferably textile.

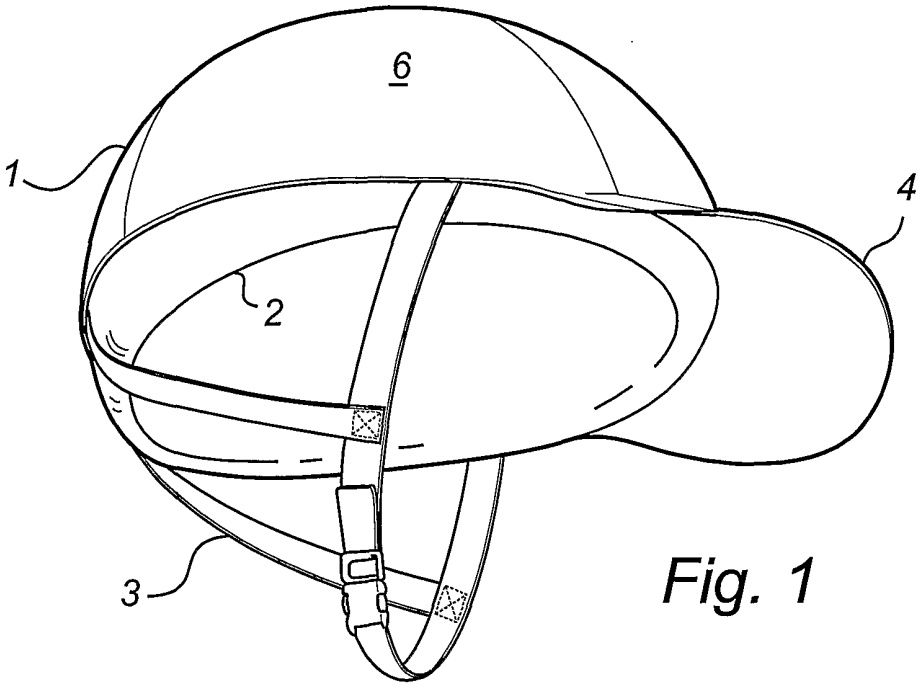

Fig. 1

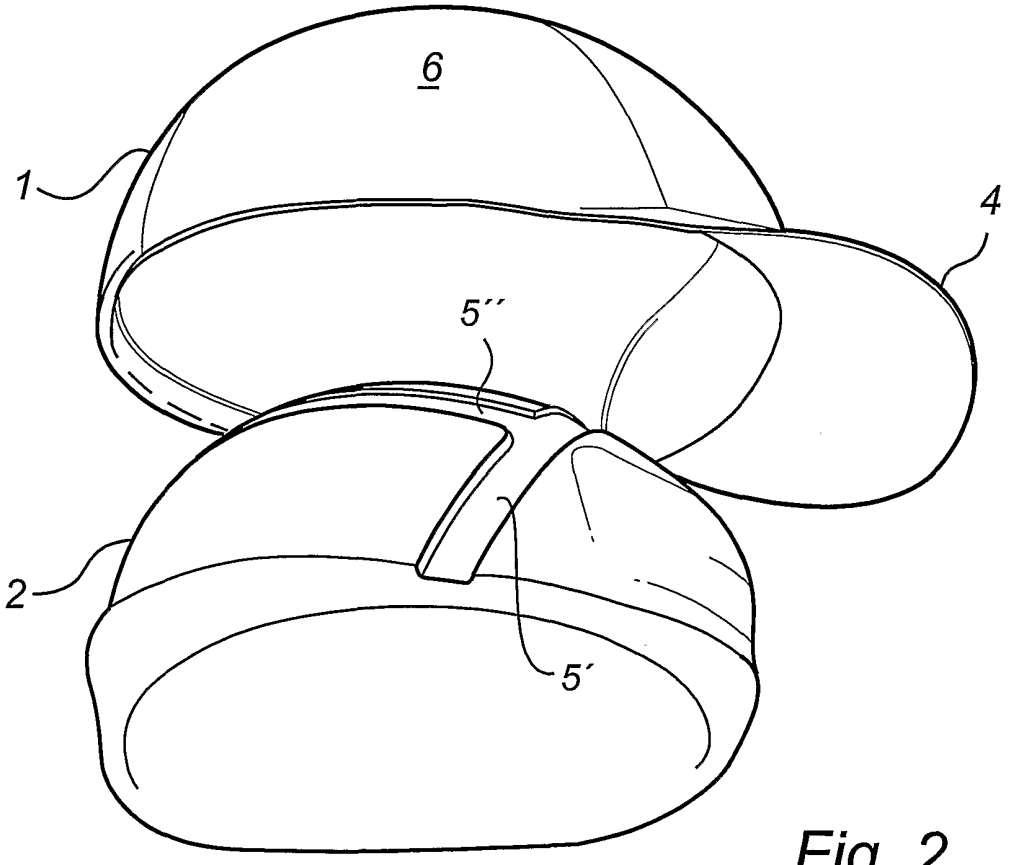

Fig. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 01/01852

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A42B 3/06
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A42B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI DATA, EPO INTERNAL, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	WO 9614768 A1 (PHILLIPS, KENNETH, DAVID), 23 May 1996 (23.05.96) --	1-6

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means
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"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 November 2001	04 -12- 2001
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Jan Carlerud/ELY Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 01/01852

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

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