This invention relates to a protective recreational helmet including a hard outer shell (1), an impact-absorbing liner (2) and a retention system (3). The shell (1), the liner (2) and the retention system (3) are provided as separate units which are adapted to be user affixable to each other. Preferably the shell (1) and the liner (2) are held together by means of the retention system (3).
This invention relates to protective recreational helmets, e.g. devices used to diminish the acceleration caused by recreational accidents that otherwise would lead to head injuries, and include a hard outer shell, an impact-absorbing liner and a retention system.

Protective recreational helmets used today are formed to be used in a special type of recreational activity. In some extent helmets formed for one special recreational activity can also be used in other activities and give some protection. The best protection, however, is given by a helmet formed just for the special activity. Children who often take part in a great number of different activities would thus, for the best protection, need varied types of helmets for the various recreational activities. As children also grow they will need new sizes regularly. This leads to that parents often would have to buy several helmets each year.

The major object of the present invention is to create a helmet system that can be used for several different recreational activities. Another object is to extend the life of the helmet, or at least of some parts of the helmet.

These objects have been obtained in that the invention has been given the characterising features defined in the appended claims.

This invention stands in the same relationship to conventional helmets as an adjustable wrench to a fixed wrench. The fixed wrench is a superior tool in the correct context, but in a differing context it cannot be used at all. The helmet system according to the invention is thus a flexible helmet which can be user adapted to any number of applications by means of user selected variation of the helmet subsystems.

The helmet subsystems which together provide a finished application are the following:

1. A hard outer shell. The system helmet can use several outer shells formed in accordance with the intended recreational activity.

2. An impact-absorbing liner. The system helmet can use one of several different liners, as well as several sizes. One liner can also be used in different shells.

3. A retention system. The system helmet can use one of several retention systems, in accordance with the different retention requirements in different recreational activities.

The invention will now be described further, by way of example, with reference to the accompanying drawings, in which fig. 1a-1f show elevations of helmets according to the invention intended for different recreational activities, fig. 2a-2b show side elevations of two different liners for use in the helmet according to the invention, fig. 3a-3c show -schematic side elevations of a helmet according to the invention provided with different retention webbings, fig. 4a-4b show a retention webbing for use as a chin-strap and how this chin-strap is mounted in the helmet, fig. 5a-5b show a retention webbing for use in a three-point retention system and how this is mounted at the rear of the helmet, fig. 6 show for two different helmet shells how the different shells include identically formed parts, and fig. 7 show in a perspective view how the shell and the liner are joined by means of the retention webbing.

The shell 1 is the historically recognized antecedent to modern helmets. The ancient helmet was merely a hard casque of leather, which would protect the bearer from blows. In this invention the shell 1, seen in fig. 1a-1f, is defined as a hard outer covering, preferably of a plastic material, the purpose of which and therefore the form of which can vary from application to application. For example, in ice-hockey the shell (shown in fig. 1a) must be stiff, to resist the point loading from an impacting puck, and relatively closed, because of that the recreational environment is cold and chilly. In skiing the shell (shown in fig. 1b) is similar to the ice-hockey shell, with the added need to provide additional thermal protection. This skiing shell (1b) is fully closed, but can be thin, as stiffness is not a central demand. In bicycle touring (shown in fig. 1c) the stress is on ventilation, but also on avoiding penetration by blunt objects, such as curbs and automobile door handles. A specially formed shell for baseball players is shown in fig. 1d. An almost fully closed shell for moped drivers is shown in fig. 1e. A similar shell can be used for hang gliding - (shown in fig. 1f), but this shell is provided with through-cuts at the location of the users ears, as the user must have unimpaired hearing.

The liner 2 is, according to this invention, a component which can be varied according to the needs of the user. The liner shown in fig. 2a can for example be used for bike riders together with the shell shown in fig. 1c, but this liner can also be used for baseball players together with the shell shown in fig. 1d. A different liner, which also provides ear protection, is shown in fig. 2b. This liner can be used by moped drivers in the shell shown in fig. 1e, and for hang gliding together with the shell shown in fig. 1f.

The liners 2 would, in most cases, be fabricated from impact-absorbing, expanded cellular materials, such as expanded polystyrene. However, the design of each liner 2 requires that it fit the
several outer shells 1 to which it is intended to be paired. Thus all liners 2 have essentially the same top outside shape, as can be seen from the top shape of the two liners shown in figs. 2a and 2b.

Not only that it is possible to use the same liner 2 in different shells 1, but it would also be possible to make liners with different inner sizes in one outer size so that, when a child grows, it would be possible to maintain the outer shell and only replace the liner.

Also the retention system 3, according to the invention, is a component which can be varied in accordance with the different needs in different applications. A two-point system is shown in fig. 3a and can be used in those recreational contexts where helmets traditionally feature such retention systems, e.g. in ice-hockey. For contexts where the primary concern is to protect the user from falling objects, and not user falls, such as in baseball playing or in model airplane competition, an elastic no-buckle retention system, as shown in fig. 3b, can be substituted. In contexts where the user can be exposed to violent falls, such as in bicycling and downhill skiing, a three-point retention system, as shown in fig. 3c, can be used.

In this invention, in contrast to conventional helmets, the shell 1 is not permanently affixed to the liner 2 or to the retention system 3. Instead the shell 1 is affixed to the liner 2 and/or the retention system 3, for example by use of Velcro type fasteners or by the loop-through principle for the retention webbings as described below.

To make it possible to use different liners 2 in different shells 1 the inner shape of all the shells and the outer shape of all the liners have to be essentially the same. A number of fixed parts 6,7 of the shells 1 and of the liners 2 have been given almost identical form (cf. fig. 6) to make it possible to combine them in the various fashions and to affix them to each other by means of the retention webbings 3. The shells 1 and the liners 2 have also at the same locations been provided with slots 8 through which the retention webbings 3 can be pulled through. While conventional helmets have rivets of steel or plastic which hold the webbing in place during use, the webbings according to this invention are held in place with a snare loop as indicated in fig. 1c. The ends of the left and right rear webbings can be attached to the chin-straps 4 as indicated in fig. 1c.

Of course, the shell, the liner and the retention system can be given other shapes than those shown in the drawings and described above for use in other activities.

Claims

1. Protective recreational helmet including a hard outer shell (1), an impact-absorbing liner (2) and a retention system (3), characterised in that the shell (1), the liner (2) and the retention system (3) are provided as separate units which are adapted to be user affixable to each other.

2. Helmet according to claim 1, characterised in that several different shells (1) are formed to be used with the same liner (2) for different recreational activities.

3. Helmet according to claim 2, characterised in that the inner shape is the same in the different shells (1).

4. Helmet according to claim 2 or 3, characterised in that a number of fixed parts of the shells (1) are formed identical in the different shells.

5. Helmet according to claim 4, characterised in that the fixed parts include slots (8) through the shell (1).

6. Helmet according to any of the preceding claims, characterised in that different liners (2) are provided, essentially including the same outer shape, and formed so that each liner (2) can be used with different shells (1).

7. Helmet according to claim 6, characterised in that the different liners (2) include a number of identical fixed parts (6,7), e.g. slots, in the different liners.

8. Helmet according to any of the preceding claims, characterised in that different retention systems (3) are provided for the different recreational activities.

9. Helmet according to claim 8, characterised in that the retention system (3) include retention webbings formed as loop-through snares (4,5) which are to be pulled through slots (8) in the shells (1) and in the liners (2).

10. Helmet according to any of the preceding claims, characterised in that the shell (1) and the liner (2) are held together by means of the retention system (3).
**DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
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<tr>
<th>Category</th>
<th>Citation of document with indication, where appropriate, of relevant passages</th>
<th>Relevant to claim</th>
<th>CLASSIFICATION OF THE APPLICATION (Int. Cl.)</th>
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<tr>
<td>X</td>
<td>EP-A-0 096 148 (BARNSÄKERHET) * Page 1, lines 8-13; page 2, lines 11-14; page 4, lines 12-17,23-33; figures 1,5,10,11</td>
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<td>A</td>
<td>US-A-3 568 210 (MARIETTA) * Column 1, lines 56-72; column 2, lines 1-13,37-72; column 3, lines 1-45; figures 1-3,5</td>
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<td>A</td>
<td>FR-A-2 239 215 (BRIOULT) * Page 1, lines 26-34; page 2, lines 5-15,26-38; page 3, lines 1-16; page 4, lines 4-11; claims 2-6</td>
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<td>DE-U-8 137 990 (CONTE OF FLORENCE) * Claim 1; figures *</td>
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<td>A</td>
<td>US-A-4 044 400 (LEWICKI et al.) * Claims 1,11,12; figures 1,5,6,8</td>
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The present search report has been drawn up for all claims.

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<td>THE HAGUE</td>
<td>12-06-1986</td>
<td>BOURSEAU A.M.</td>
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**CATEGORY OF CITED DOCUMENTS**

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