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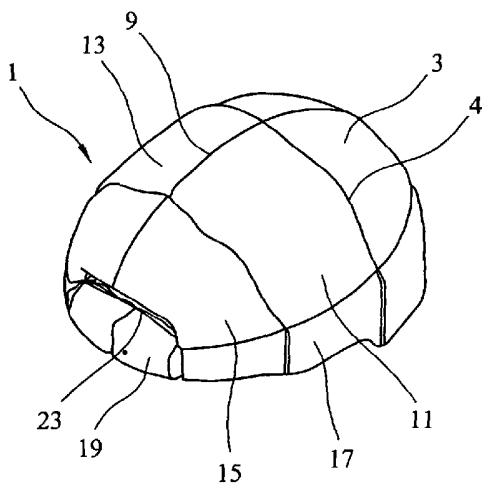
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(54) Title: COLLAPSIBLE HELMET



**FIG. 1**

(57) Abstract: A collapsible helmet comprises a shell 1 having two or more components which are hingedly connected together about fold lines extending across the shell. Each component comprises a plurality of panels 3 with each panel being hingedly connected to at least one adjacent panel. The shell may be adjustable between a first configuration in which the helmet may be placed over the head of the user and a second configuration in which said components are flattened and are arranged in a substantially overlying relationship.

WO 2012/049463 A1

## Collapsible helmet

### Field of the invention

This invention relates to collapsible helmets which may be used by, for instance,  
5 cyclists, motorcyclists, participants in various sporting activities and those people  
operating in workplaces where protective headgear is worn.

### Background to the invention

Protective helmets for outdoor activities such as cycling are generally hemispherical  
10 in shape, conforming approximately to the shape of the top of the head, and are made  
of rigid, thick, impact absorbing materials designed to protect the head from being  
damaged if the user falls against a hard surface, including a protrusion such as a kerb  
stone, or if hit by a falling object such as may be encountered on a building site,  
quarry or mine. There are a specific rigorous safety standards required for different  
15 sporting activities. Helmets which meet these standards are typically bulky and  
awkward to store or put in a bag etc when not being worn.

### Statements of the invention

According to the present invention, there is provided a helmet comprising a shell  
20 having two or more components which are hingedly connected together about fold  
lines extending across the shell, each component comprising a plurality of panels,  
each panel being hingedly connected to at least one adjacent panel, whereby the shell  
may be adjustable between a first configuration in which the shell may be placed over  
the head of a user and a second configuration in which said first and second  
25 components are each flattened and are arranged in a substantially overlying  
relationship.

Preferably, the shell has two of said components, and the fold line preferably extends  
longitudinally of the helmet.

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Preferably, each panel has at least one edge which is non-linear and which abuts a  
corresponding non-linear edge on an adjacent panel.

Preferably, the inside of the shell is provided with integral inwardly projecting ribs, the ribs of the components being positioned so that, when the helmet is in its relatively collapsed condition, at least some of the ribs of the one component are interleaved with ribs of a second component. This arrangement will ensure that  
5 maximum thickness of protection can be combined with minimal thickness when in the second configuration.

Preferably, the helmet is provided with means for securing the first and second components together so that the shell is locked into its first configuration, and has a  
10 rigid structure.

Preferably, the components are connected together by means of a living hinge, that is to say, a thin flexible hinge made from a suitable flexible material such as a plastic material which is able to bend along the line of the hinge.  
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Preferably, each panel is hingedly connected to an adjacent panel by means of a living hinge.

Preferably the living hinges between the panels and/or between the components are  
20 formed from a single sheet of material, more preferably a single sheet of plastics material.

More preferably, the single sheet of material is imbedded within the panels.

25 Preferably, each panel is internally shaped to conform approximately to that curved area of the user's head which, when the helmet is in use, lies adjacent to said panel.

Preferably, the helmet is provided with front and rear pieces, each piece comprising two hingedly connected together elements which are movable between an open and a  
30 closed position.

Preferably, means are provided to urge said elements into the open position, more preferably, said urging means are magnetic.

Preferably means are provided to urge the shell components towards each other. More preferably, said urging means are magnetic.

The present invention further provides a shell for a helmet of the invention.

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The present invention also provides a method of providing protection to a person's head, the method comprising providing a helmet of the invention in its collapsed condition, opening up the helmet into its open condition and securing the helmet on the person's head.

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In addition, the present invention provides a method for storing or carrying a helmet of the invention after use, the method comprising removing the helmet from the user's head and causing the helmet to assume its collapsed condition.

15 The present invention may enable a helmet to be collapsed down to about one third of its volume for carrying or storage purposes.

Hemispherical shapes, such as those of a protective helmet, are strong and do not naturally collapse or fold. However, the invention makes use of the foldability of  
20 other three dimensional shapes, such as some open based polyhedrons, having hinge axes along the edges and having ridged faces. In this way complex un-foldable polyhedrons can fold by splitting between faces along selected edges.

The invention in effect adds protective cladding into the inside and outside faces of  
25 foldable polyhedron to form a generally hemispherical helmet shape. Simple polyhedrons with curved cladding do not fold very flat. More complex polyhedrons can achieve the balance between the minimum number of folds and the flatness of the fold, especially if the inner surfaces have offset ribs.

30 According to the present invention, with suitable locking clips around the rim to make the helmet into an unfoldable polyhedron, thereby forming a rigid hemisphere when in use, the shell then behaves in a similar way to that of a conventional helmet. However, with the clips released it can be collapsed or folded.

**Brief description of the drawings**

The accompanying drawings are as follows:-

5 Figure 1 is a perspective front view showing the shell of a helmet in accordance to the present invention;

Figure 2 is a rear perspective view of the helmet shell of Figure 1;

10 Figure 3 is a bottom plan view of the helmet shell of Figure 1;

Figure 4 is a side perspective view of the helmet shell of Figure 1 in its collapsed condition;

15 Figure 5 is a bottom plan view of the helmet shell of Figure 1 in its collapsed condition;

Figure 6 is a front perspective view of the frame of the helmet shell of Figure 1; and

20 Figure 7 is a bottom plan view of the helmet shell of Figure 1 with side segments in their released positions.

**Detailed description of the invention**

25 The present invention will now be described, by way of example only, with reference to the accompanying drawings.

Referring to the accompanying drawings a helmet of the present invention includes a helmet shell 1 and connectors such as straps (not shown) for securing the helmet to the head of a user. Shell 1 comprises a plurality of rigid foam panels 3 mounted on a polypropylene sheet in the form of a frame 5 which is a single sheet extending over  
30 substantially the entirety of shell 1 and which is provided as a series of living hinges 7 allowing panels 3 to pivot relative to each other.

Each panel 3 has at least one non-linear edge 4 which matches and abuts a corresponding edge of an adjacent panel. As a result, protection is provided even

where the helmet encounters a sharp edge, such as that of a kerb stone, which would otherwise penetrate the shell through to the skull of the wearer.

5 Accordingly, a helmet incorporating a shell 1 is capable of assuming two configurations. In its open condition, as illustrated in Figures 1-3, it may be worn by a user in order to protect his head. In its closed or collapsed condition, as illustrated in Figure 4, the helmet is relatively flat, occupying about one third of the volume occupied in its open condition, making for convenient storage in a briefcase or other bag or providing a relatively non-bulky article for carrying around by hand.

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Shell 1 is collapsible about axis or fold line 9 which extends centrally from front to rear. In another embodiment, the corresponding fold line may extend transversely from side to side or there may be two or more such fold lines extending across the shell. Shell 1 comprises two portions 11 and 13 which are largely identical, subject to the offset rib feature described below, and each provides in effect a half portion of the shell.

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Each half shell comprises top panels 15, side panels 17, front panels 19 and rear panels 21. Provided between front panels 19 and adjacent top panels 15 is a front vent passage 23. A corresponding rear vent passage 25 is provided between rear panels 21 and top panels 15. As indicated above, the entire assembly of panels is mounted on the polypropylene frame 5 with the latter imbedded within upper and lower panel sections. Frame 7 may be provided with holes 27 through which the foam material of the panels extends.

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The panels 3 are in general internally shaped to fit the area of the wearer's head which, in use, will lie adjacent to the panel. Each panel 3 is very broadly of trapezoidal shape in plan. In other embodiments, the panels may be of other shapes, such as oval.

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Magnets are provided on the meeting edges of front panels 19 and rear panels 21 so that adjacent panels are attracted to each other and support the shell in its open position. Magnets are also provided on opposed panels 11 and 13 and these attract each other to maintain the integrity of the shell in its collapsed condition.

Referring in particular to Figure 7, the central panel of each of side panels 17 is connected to adjacent side panels by means of a locking mechanism. This locking mechanism includes bosses 29 on the central panels and catches 31 located on the adjacent panels. A slide release button 33 is located on the central panel 17 which is operable to disengage the catches and bosses. This locking mechanism is such that when the shell is opened the central panel 17 can be moved from the position shown in Figure 7 to that in Figure 1 with the locking mechanism snapping into place. Release of the locking mechanism by release buttons 33 allows the panels 17 to be moved outwardly and the shell to be folded to the position shown in Figure 5.

The interior of the shell 1 is profiled to provide ribs such as ribs 35. The ribs of 1 component of shell 1 are offset from the ribs of the corresponding component on the other side of shell 1. They are arranged such that when the helmet is collapsed these ribs interleave. Accordingly a strong construction can be provided to the helmet while allowing the helmet to collapse to a very flat structure.

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### Claims

1. A helmet comprising a shell having two or more components which are hingedly connected together about fold lines extending across the shell, each component comprising a plurality of panels, each panel being hingedly connected to at least one adjacent panel, whereby the shell may be adjustable between a first configuration in which the shell may be placed over the head of the user and a second configuration in which said first and second components are each flattened and are arranged in a substantially overlying relationship.
2. A helmet according to claim 1, wherein the shell has two of said components, and the fold line preferably extends longitudinally of the helmet.
3. A helmet according to claim 1 or claim 2, wherein each panel has at least one edge which is non-linear and which abuts a corresponding non-linear edge of an adjacent panel.
4. A helmet according to any of the preceding claims, wherein the component of the shell are provided with integral, inwardly projecting ribs, the ribs of the components being positioned so that, when the helmet is in its relatively collapsed condition, at least some of the ribs of one component are interleaved with ribs of a second component.
5. A helmet according to any of the preceding claims, wherein means are provided for securing the first and second components together so that the shell is locked into its first configuration.
6. A helmet according to any of the preceding claims, wherein the components are connected together by means of a living hinge.
7. A helmet according to any of the preceding claims wherein each panel is hingedly connected to an adjacent panel by means of a living hinge.



8. A helmet according to claim 2 or claim 7, wherein the living hinges between the panels and/or between the components are formed from a single sheet of material, more preferably a single sheet of plastics material.
- 5 9. A helmet according to claim 8, wherein the single sheet of material is embedded within the panels.
- 10 10. A helmet according to any of the preceding claims, wherein each panel is internally shaped to conform approximately to that curved area of the user's head which, when the helmet is in use, lies adjacent to said panel.
11. A helmet according to any of the preceding claims, wherein the helmet is provided with front and rear pieces, each piece comprising two hingedly connected together elements which are movable between an open and a closed position.
- 15 12. A helmet according to claim 11, wherein means are provided to urge said elements into the open position.
13. A helmet according to claim 12, wherein said urging means are magnetic.
- 20 14. A helmet according to any of the preceding claims, wherein means are provide to urge the shell components towards each other.
15. A helmet according to claim 14, wherein said urging means are magnetic.
- 25 16. A shell for a helmet as claimed in any of the preceding claims.
17. A method for providing protection to a persons head, the method comprising providing a helmet according to any of claims 1 to 16 in its collapsed configuration, opening up the helmet into its open condition and securing the helmet on a persons head.
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18. A method for storing or carrying a helmet according to any of claims 1 to 16 after use, the method comprising removing the helmet from the user's head and causing the helmet to assume its collapsed condition.

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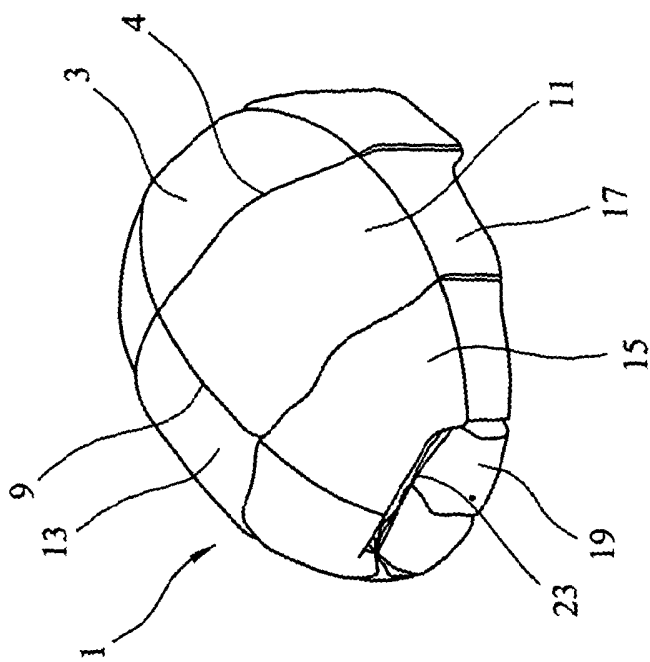


FIG. 1

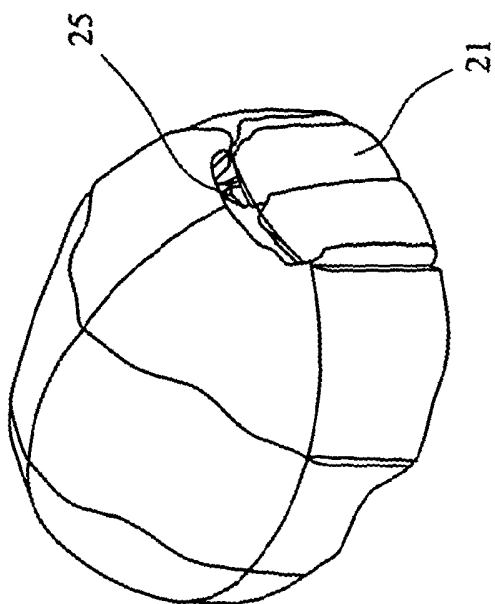


FIG. 2

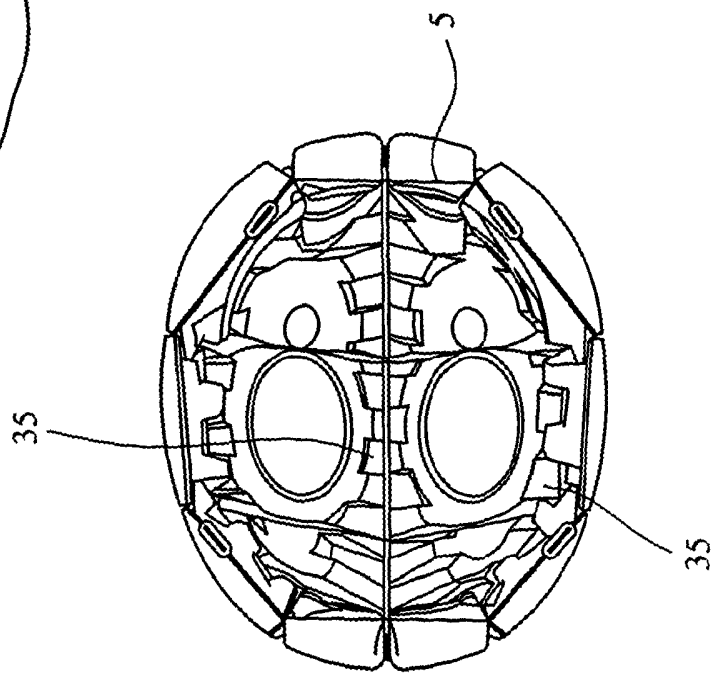


FIG. 3

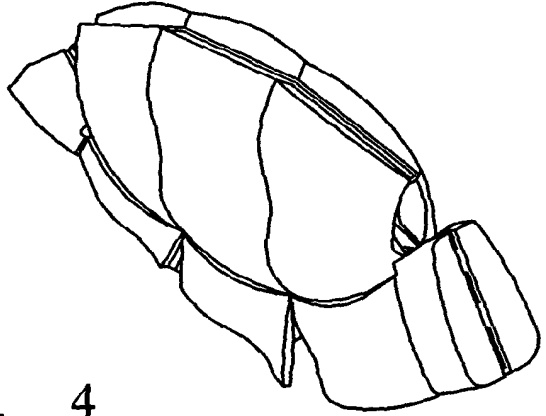


FIG. 4

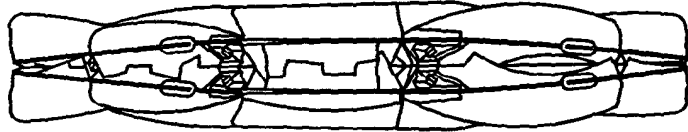


FIG. 5

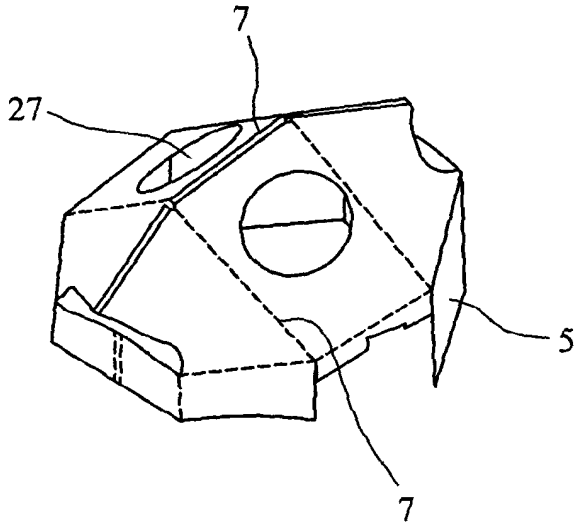


FIG. 6

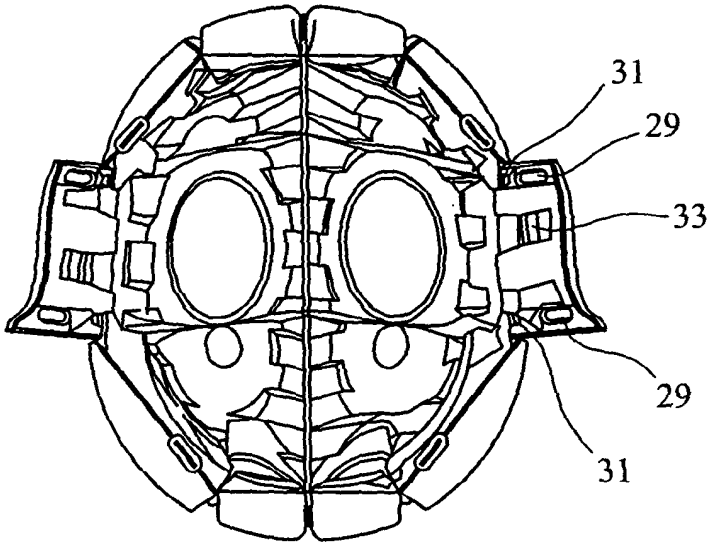


FIG. 7

**INTERNATIONAL SEARCH REPORT**

International application No  
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**A. CLASSIFICATION OF SUBJECT MATTER**  
INV. A42B3/32  
ADD.

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)  
A42B

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

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

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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A	US 3 440 660 A (KRINKE ALVERN J) 29 April 1969 (1969-04-29) column 2, lines 34-47; figures 2-4 -----	1,16-18
A	DE 10 2007 039287 A1 (ROESLER PETER [DE]) 26 February 2009 (2009-02-26) claim 1 -----	1,6-8

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

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Information on patent family members

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