

Jan. 7, 1964

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3,116,490

SAFETY HELMET HAVING A SEMI-FLEXIBLE LINER

Filed Feb. 6, 1963

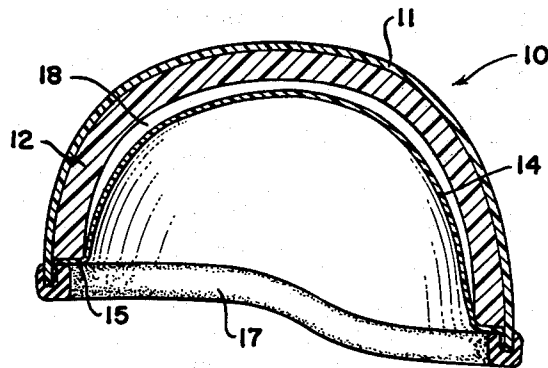


FIG. 1

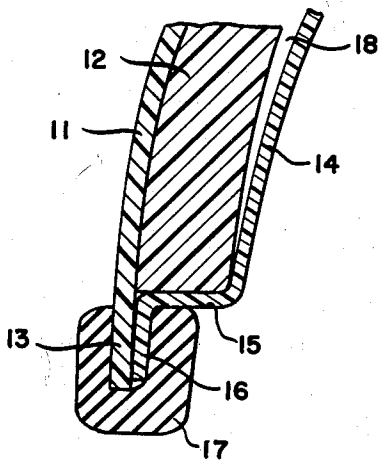


FIG. 2

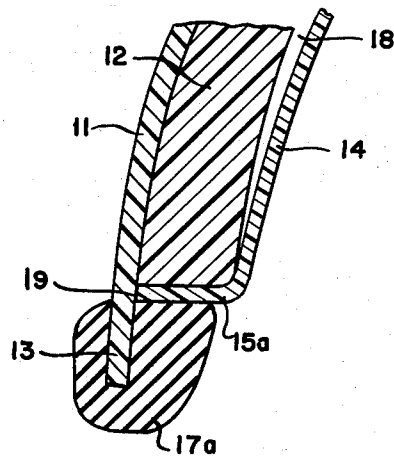


FIG. 3

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SAFETY HELMET HAVING A SEMI-FLEXIBLE LINER

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Filed Feb. 6, 1963, Ser. No. 256,734

4 Claims. (Cl. 2—3)

This invention relates to a safety helmet and more particularly to a safety helmet shell having an interior "free floating" shock absorbing liner.

Safety helmets are commonly made of a rigid, outer, protective shell whose interior is covered with a padding of resilient material which functions as a load absorbing cushion.

The object of this invention is to improve such a helmet construction by providing an additional load absorbing element, namely a semi-flexible liner located within the shell and cushioning layer. The liner is formed of semi-flexible material, that is, of a material which will flex or bend only under substantial load. The liner is arranged to freely float and flex a distance before contacting and applying pressure to the cushioning layer to thus substantially slow down and reduce impact forces against the wearer's head.

This and other objects and advantages of this invention will become apparent upon reading the following description, of which the attached drawings form a part.

In these drawings:

FIG. 1 is a cross-sectional elevational view of the safety helmet herein.

FIG. 2 is an enlarged cross-sectional view of an edge portion thereof.

FIG. 3 is an enlarged cross-sectional view, similar to FIG. 2 but showing a modification.

The safety helmet 10, includes an inverted, bowl-shaped, outer shell 11, formed of a hard, substantially rigid, plastic material, such as fibrous glass reinforced resin.

The inner wall surface of the shell is covered with a cushioning layer 12, except for a lower, exposed, edge strip portion 13. The cushioning layer is preferably formed of a foamed plastic material, such as foamed polystyrene, which is characterized by being resilient and compressible under pressure but having a relatively slow recovery rate upon release of pressure to return to its original shape. One suitable cushioning material is that described in U.S. Patent No. 3,058,162, used in a thickness of about $\frac{3}{4}$ of an inch.

The cushioning layer 12 is secured to the shell by any suitable adhesive so that it is firmly and non-shiftably positioned in place.

An inner, bowl-shaped liner 14 is placed within the shell and cushioning layer. This layer is relatively thin, and is formed of a semi-flexible, relatively stiff, material which will flex or bend only under considerable pressure, and which will return to its initial shape upon release of the pressure. One material suitable for this purpose is that identified as "Royalite 20," manufactured by United States Rubber Company, a semi-flexible thermoplastic material, of about .030" wall thickness.

The lower edge of the liner is bent outwardly with a relatively sharp bend to form an outwardly extending continuous flange 15 located beneath the lower edge of the cushioning layer 12 and of a width which is slightly greater than the thickness of the cushioning layer. The free edge of the flange 15 is bent downwardly to form an edge band 16 arranged in face to face contact with the lower edge strip 13 of the outer shell.

A continuous, U-shaped edge beading 17 formed of rubber or a rubber-like material receives the outer shell

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edge strip 13 and the band portion 16 of the inner liner and frictionally clamps them together, the inner liner being otherwise free of securement to the shell and its bowl-shaped portion being free of any positive securement to the cushioning layer and the shell and being spaced a slight distance 18 from the inner surface of the cushioning layer.

The helmet may be provided with a headband if desirable or may be used as is with the addition of a chin strap secured to the shell in the conventional manner.

In operation, whether with or without a headband, upon impact: (a) the outer shell will distribute impact loads over a wide area and will prevent or minimize penetration to the head of the impact creating instrument, (b) the wearer's head will momentarily move relative to the shell, thus flexing or bending the inner liner locally over an area which is considerably larger than the area of impact, and also distorting the entire inner liner relative to the shell, until contact is made between the inner liner and the cushioning layer, (c) which layer will then resiliently compress. Thus, the resistance of the inner liner to flexing and bending and the free floating momentary movement of the inner liner will absorb a considerable portion of the impact and, most importantly, will slow down the otherwise more rapid movement of the head towards the hard shell to considerably minimize the possibility of a brain concussion.

FIG. 3 illustrates a modification wherein the inner liner outwardly bent flange 15a is formed without the depending band but instead abuts the shell along its free edge 19 in a continuous line around the interior of the shell wall. The liner is held in place between the beading 17a and the lower edge of the cushioning layer 12 and is maintained there partially by friction and partially by the rigidity of the inner liner.

This invention may be further developed within the scope of the following claims. Accordingly, it is desired that the foregoing description be read as being merely illustrative of an operative embodiment of this invention and not in a strictly limited sense.

I now claim:

1. A safety helmet comprising an inverted, thin wall, bowl-shaped outer shell formed of a substantially rigid material; the entire interior wall surface of the shell, except for a narrow, continuous strip at the lower, that is, open edge of the shell, being covered with a relatively thick layer of a resilient, cushioning material adhesively secured thereto; an inner liner, bowl-shaped similarly to the shell, fitted within the shell and the covering layer, with the lower edge of the liner being bent outwardly to form a continuous, outwardly extending peripheral edge flange, the flange being slightly wider than the thickness of said layer and having its outer edge frictionally engaged against the shell inner surface below the layer and adjacent the lower edge of the shell, and support means arranged on the lower edge of said shell and frictionally engaging said flange for holding the flange in its position relative to the shell, the bowl-shaped portion of the liner being free of positive securement to the layer and to the shell and its outer wall surface normally being spaced a short distance inwardly of the layer inner wall surface, and the liner being formed of a stiff, semi-flexible material, characterized by being bendable under substantial pressure but normally recovering its shape upon release of such pressure, whereby the liner, when under pressure may freely float and flex within the shell for a short distance before pressing against the cushioning layer.

2. A construction as defined in claim 1, and wherein the free edge of said liner flange is bent downwardly to form a narrow edge band arranged in face to face contact with the lower, narrow edge strip of the shell, and said support means being in the form of a U-shaped edge beading ex-

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tending around the shell lower edge and receiving the shell lower edge and said edge band and frictionally clamping the edge band to the shell lower edge.

3. A construction as defined in claim 1, and said cushioning layer being formed of a resilient, foamed plastic material characterized by resiliently compressing under pressure and having a relatively slow recovery rate, upon release of pressure, to its initial shape. 5

4. A construction as defined in claim 1, and said support means being in the form of a resilient, continuous edge bead secured to the lower edge of the shell and ex- 10

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tending inwardly of the shell, beneath said flange, and said flange being frictionally clamped between the edge bead and the lower edge of said layer.

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