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R. E. RICHTER
PROTECTOR HELMET

2,763,005

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Fig. 1.

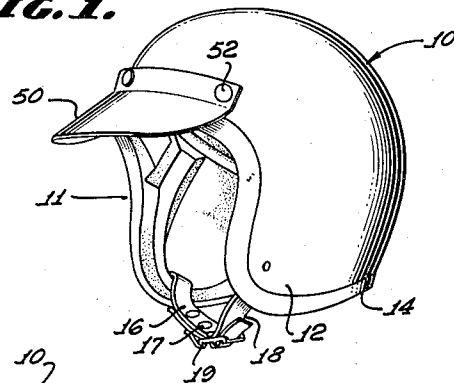


Fig. 2.

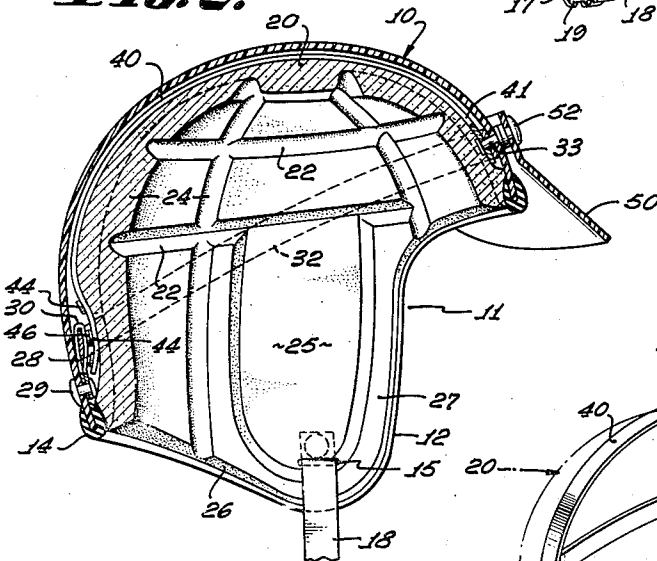


Fig. 3.

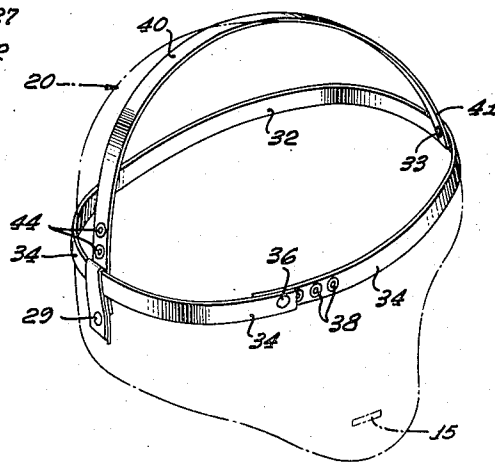
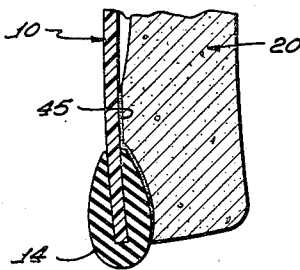


Fig. 4.



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PROTECTIVE HELMET

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13 Claims. (Cl. 2—6)

This invention relates to a protective helmet and more particularly to a lightweight helmet providing unusual strength and impact resistance that may be readily adjusted to snugly fit heads of varying sizes and shapes.

Protective helmets are today in common use in many fields. In the fields of sports, for example, crash helmets are being worn with increasing frequency by sports car and other racing enthusiasts. Many additional sports, such as football and polo, similarly require protective helmets. In military operations, crash helmets are customarily worn by great numbers of the personnel including pilots, members of tank crews and other such personnel. In addition, there are increasing demands for safety helmets in many industrial fields, too numerous to mention. The helmet of the present invention is adaptable to all these uses and, in fact, its use is contemplated wherever maximum, safe, comfortable protection is desired for the head.

Despite the widespread and increasing use of protective helmets, no helmet presently in commercial use permits full and adequate protection of the head to be properly based on an efficient adjustment of the helmet to the size and shape of the wearer's head; yet it is fundamental that for maximum protection the helmet must distribute the shock over as large an area of the head as possible. Thus prior attempts at such adjustment have usually resulted only in dangerously localizing transfer of the blow to top or side portions of the head. This is particularly true, for example, of helmets relying on internal webs or cradles, which themselves are the primary shock-absorbing structure. In addition, no adjustable helmet heretofore devised has insured full, adequate protection to such vulnerable areas of the head as the base of the skull, temples and cheek bones since the outer shell of the helmet is generally movable with respect to the inner shock-absorbing straps. Nor has there been a helmet with the desired characteristics that could also be simply and easily constructed as a substantially integral unit, and which additionally provided adequate ventilation of the head.

Accordingly, a principal object of the present invention is to provide a lightweight, unusually rugged, protective helmet which may be readily adjusted for a personalized fit to any wearer's head, thereby insuring maximum protection and safety.

Another object of the invention is to provide such a helmet that will provide unusually complete protection all over the head, and to its most vulnerable areas, namely, the base of the skull, temples and cheek bones.

Another object of the invention is to provide, in a protective headgear, an inner cushioning shock-absorbing liner capable not only of providing maximum protection to the head but also of supplying adequate ventilation to the head for the comfort of the wearer.

Another object of the present invention is to provide such an inner protective liner that is resistant to wear,

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stains, perspiration and to most chemicals such as oils, gasoline and alcohols.

Another object of the invention is to provide a helmet that will be safe, cool and which is readily adaptable to production line methods of assembly.

Other objects and advantages of the invention will be apparent from the following description of an exemplary device and from the drawings in which:

Fig. 1 is a view in perspective of a helmet embodying the invention;

Fig. 2 is a view in section through the helmet showing details of its construction;

Fig. 3 is a view in perspective showing from the rear an adjusting means useful in adapting the helmet to the head size and shape of the wearer, and showing its position with respect to a phantom outline of an inner protective liner for the helmet; and

Fig. 4 is an enlarged view in section of an edge portion of the helmet showing further details of its construction.

In a broad view a protective helmet according to the invention comprises a rigid smoothly contoured outer shell 10, a head-contacting liner 20 within the shell of a soft spongy shock-absorbing material (and corresponding in contour to the outer shell) and adjusting means uniquely interposed between the shell and the lining for compressibly adjusting the liner to heads of varying size and shape. In its preferred construction the helmet also includes a novel network of ventilating channels on the inside surface of the liner which greatly add to the comfort of a wearer of the helmet.

Turning to the drawings, an exemplary helmet includes an outer shell 10 of a substantially rigid, tough, resilient construction. Preferably the outer shell is constructed as a reinforced laminate in which the materials forming the layers are particularly selected for impact resistance and desirable strength to weight ratios. Thus a suitable base material may be selected from any one of the thermosetting class of resins which under the influence of heat, pressure and catalyst condense and polymerize to form rigid final shapes of substantial strength, toughness, and lightness in weight, as for example, phenolics, amino-aldehyde resins and alkyd resins. Suitable reinforcing materials might include any fibrous material, such as fabric, but preferably is fiberglass which has proved the strongest material for this purpose.

The shell 10 is substantially ovoidal in shape and is designed to cover as much of the head as practical, without interfering with the full movement of the neck, and leaving room for such additional gear as racing goggles and other paraphernalia. As shown, a suitable construction for the shell includes a face opening 11 adjacent front portions of the shell and a downwardly extending portion 12 providing adequate protection for the ears, temples and cheekbones. For comfort of wear the shell is also preferably provided with a resilient edge bead 14 of any yieldable material such as synthetic or natural rubber or other suitable organic material. Rigidly secured to the downwardly projecting portions 12 of the shell and passing inwardly through slots 15 in the inner liner are chin straps 16 and 18 which preferably are fastened by a quick-release type fastener, such as a snap fastener 17. One of the straps may also be provided with a buckle or slide fastener 19 for purposes of adjustment.

Adapted for a close fit within the shell is a head-contacting liner 20 of a soft spongy shock-absorbing material and having an outer surface corresponding in contour to the inner surface of the shell. In its preferred construction the liner 20 is molded in one piece of rubber-like foamed organic material, such as foamed plastic,

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synthetic rubber or other comparable material, that has been cured to a chemically resistant shape-retaining state. A particular material found useful for the purpose is polyurethane which also has the desirable property of expanding or "growing" within the mold during cure. The liner 20 preferably is of substantial thickness to provide maximum protection to the head of the wearer. Molded on the inside surface of the liner is a network of ventilating channels or grooves which may include circumferential channels 22 extending horizontally of the helmet and vertical channels 24 radiating downwardly and outwardly from an upper circumferential channel 22. The vertical channels 24 extend the full length to the lower edge 26 of the liner where they admit an adequate supply of ventilating air to the head. As will be apparent to one skilled in the art, air will circulate upwardly through the channels 24 and will be carried circumferentially about the wearer's head by the channels 22. To additionally adapt the helmet to a wearer's head and to insure comfort of wear, ear recesses 25 are preferably provided in the downwardly projecting portions 27 of the liner.

Interposed between the shell 10 and the lining 20 is a unique headband or strap arrangement for compressably adjusting the liner to the shape of a wearer's head. The illustrated arrangement includes a positioning strap 28 rigidly secured within the shell adjacent its rear, as by a rivet 29, forming a loop 30. Likewise secured within the shell above face opening 11, as by a rivet 33, is a circumferential headband 32 having ends 34 extending rearwardly of the helmet and through the loop 30. A fastener such as a male snap 36 is preferably provided on one of the ends and a series of female snap fasteners 38 on the other end so that the two ends 34 may be selectively joined into an ovalar headband of varying circumference. As is evident from Figs. 2 and 3, the band 32 is adapted to pass about the helmet between the shell 10 and liner 20 to provide a positive adjustment of the helmet to head size.

To particularly provide for adjusting the height of the helmet, a second band 40 is also secured within the shell so as to pass upwardly between top portions of the shell and liner. In the illustrated apparatus, the strap 40 is secured at end 41 to the rivet 33 holding the head band 32 in place. The other end 42 of the band extends rearwardly of the shell to a point adjacent the loop 30. The end 42 may be provided with a series of female snap fasteners 44 adapted to engage a male fastener 46 on the innermost surface of loop 30. The fasteners 44, 46 permit the band 40 to be selectively joined into an upwardly directed top headband of arcuate shape and of varying length according to head height.

The inner liner 20 is preferably bonded to the outer shell 10 all about its edge except for a small portion towards the rear of the helmet. Any suitable bonding agent 45 may be used for this purpose such as a rubber or plastic base cement compatible with the materials used in construction of the liner and shell. The purpose of leaving the unbonded area adjacent the rear of the helmet is to permit this portion of the liner to be pulled inwardly so that the adjusting snaps in headbands 32 and 40 may be reached for purposes of compressibly adjusting the size and shape of the liner. As will be apparent to a worker in the art, as the circumference of band 32 is reduced by adjustment of the snaps 36 and 38, the soft material of the liner will be compressed into a smaller diameter, reducing its size for an exact fit about the head. Similarly, by proper adjustment of the fasteners 44, 46 the height of the inner liner within the helmet may be adjusted to closely fit the head of the wearer. The net effect is that the shock-absorbing inner liner can be accurately fitted to the wearer's head by a simple adjustment of the bands 32 and 40, thereby insuring an unusual degree of impact distribution over the head and consequently maximum safety and comfort to the wearer. While a single overhead band 40 will efficiently perform the desired adjustment, it is evident that a number of such straps might be utilized with

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their ends secured at various points about the forward portion of the helmet. Similarly, if desired, additional circumferential bands 32 may be provided extending about the helmet, although the illustrated embodiment is preferred.

The rigid laminated construction of the shell 10 readily permits the use and attachment of a sun visor 50 which also may be a reinforced laminate. Preferably the visor is attached to the front of the helmet by break-away type snap fasteners 52 so as to be detachable at a predetermined impact pressure, thereby insuring utmost safety and convenience. To facilitate construction, a rear portion of the central fastener may also constitute the riveted connection 33 for the headband 32 and the forward end of the band 40, as shown. Because the visor can be rigidly attached adjacent the forward rim of the shell, the visor may easily extend low enough to properly shade the wearer's eyes, as from late afternoon sun or low floodlights.

From the above detailed description of an exemplary device it will be evident that the present invention makes possible in a safety helmet a degree of shock or impact-distribution that provides a maximum of protection to all portions of the head and not merely its top. The rear of the helmet adequately protects the base of the skull, while the downwardly projecting portions 12 are of sufficient size to completely protect the vulnerable temple and cheekbone areas. The protection provided by the tough outside construction of the helmet is extended interiorly by the inner spongy liner 20 which is contoured to fit closely about the head and adjacent the inside of the outer shell. By an additional unique positioning of adjusting bands between the liner and the shell, the helmet may be quickly and easily adjusted for height, size and shape of the head, and, consequently, for its maximum safe protection. Moreover, because of a novel network of ventilating channels provided on the inner surface of the liner, adequate circulation of cooling air is at all times insured. The net effect is a helmet that is not only attractive in appearance but which also provides an unusual degree of safety, comfort and commercial adaptability.

To those skilled in the art to which this invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. For example, adjustment of the liner might be provided with equal facility by other types of fasteners, such as buckle or slide fasteners. Also, the appearance of shape of the helmet might be varied considerably depending on the particular application or use contemplated. Accordingly it should be understood that disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting. In this regard, it should also be noted that the term "thermo-setting" is used in the specification in its broadest sense and, therefore, includes resins and other such materials capable of being cured on exposure to light as well as by application of heat.

I claim:

1. In a protective helmet, the combination of: an outer, smoothly contoured substantially rigid shell of tough resilient construction, said outer shell being substantially ovoidal in shape and having lower portions cut away to provide face and neck openings adjacent a lower rim; an edge bead of yieldable material secured to said lower rim; chin straps rigidly secured to downwardly projecting side portions of said shell; a positioning strap secured within the shell adjacent its rear to form a loop; a first band secured within the shell above said face opening, the ends of said band passing through said loop; fastening means on the ends of the band permitting said ends to be selectively joined into an ovalar head band of varying circumference; a second band having one end secured within the shell above said face opening and its other end extending rearwardly of the shell to a point adjacent said

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loop; fastening means on the rearwardly extending end of said second band and on said positioning strap, permitting said strap and band to be selectively joined into an upwardly directed head band of arcuate shape and of varying length; and an integral soft shock-absorbing liner bonded within said shell adjacent front portions thereof, said liner having a contour adapted to fit snugly within said outer shell, rear portions of said liner being movable inwardly from said shell to permit selective adjustment of said head bands, whereby said inner liner may be adjusted by said head bands to the head size and shape of a wearer of said helmet.

2. The device of claim 1 in which a web-like net work of grooves is provided on the inside surface of said liner, some of said grooves extending to points adjacent edge portions of the helmet to supply ventilation to the head.

3. The device of claim 1 in which said shock-absorbing liner is a rubber-like, foamed material which has been cured into a shape-retaining state.

4. The device of claim 3 in which said material or a similar synthetic foamed plastic material is polyurethane.

5. The device of claim 1 in which said rigid outer shell is a reinforced laminate.

6. The device of claim 5 in which said laminate is a cured thermosetting type plastic reinforced with fiberglass.

7. The device of claim 1 in which said helmet is provided with a substantially rigid detachable sun visor, said visor being provided with a break-away attachment to a forward part of said outer shell for safety and convenience.

8. In a protective helmet the combination of: a smoothly contoured outer shell; a loop secured within the shell adjacent its rear; a first band secured within the shell adjacent its front, the ends of said band passing through said loop; fastening means on said band permitting its ends to be selectively joined into an ovular head band of varying circumference; a second band having one end secured within the shell adjacent its front and adjacent said first band, the other end of the band ex-

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tending rearwardly of the shell to a point adjacent said loop; fastening means on the second band and on said loop permitting them to be selectively joined to form an arcuate head band of varying length; a soft spongy shock-absorbing liner secured within said shell adjacent front portions thereof, rear portions of said liner being movable inwardly from said shell to permit selective adjustment of said head bands; and whereby said inner liner may be adjusted by said head bands to the head size and shape of a wearer of said helmet.

9. The device of claim 8 in which the outer surface of said liner is smoothly contoured to correspond to and to fit closely adjacent the inside of said shell.

10. The device of claim 9 in which the inner surface of said liner is provided with ventilating channels opening adjacent lower edge portions of said helmet.

11. A protective helmet adapted to protect the head comprising: a rigid smoothly contoured outer shell; a head contacting liner within the shell of soft spongy shock-absorbing material, said liner corresponding in contour to said outer shell; and means interposed between said shell and liner for compressably adjusting the liner to the head size and shape of a wearer of said helmet.

12. The device of claim 11 in which said adjusting means comprises adjustable head bands secured to the shell and operable to compress said liner about the top and sides of a wearer's head.

13. The device of claim 11 in which portions of said liner are secured inside portions of said shell, permitting unsecured portions to be pulled away from said shell for purposes of adjustment.

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