

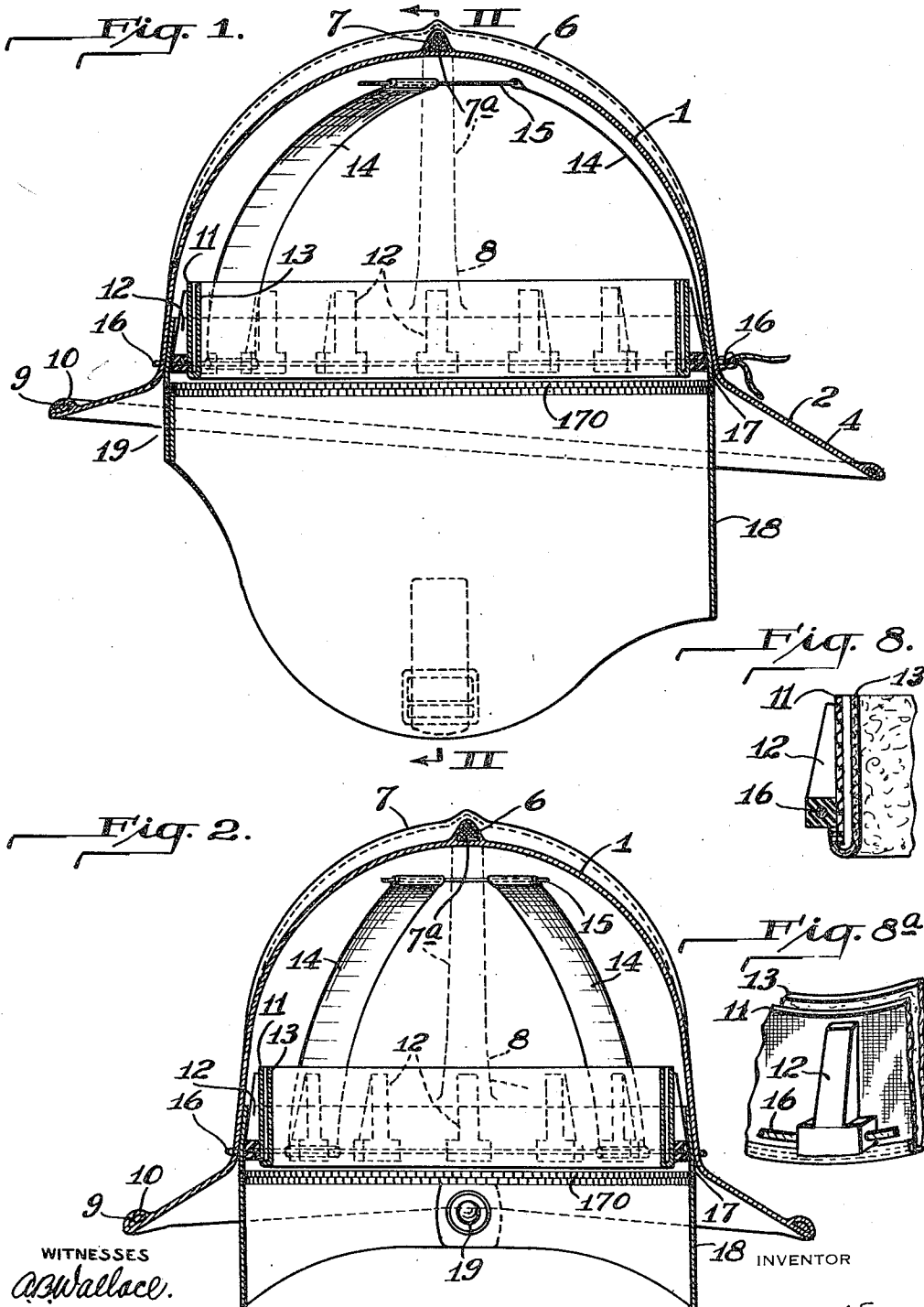
Dec. 31, 1935.

C. W. PUNTON
PROTECTIVE HEADGEAR

2,025,772

Filed May 19, 1934

2 Sheets-Sheet 1



WITNESSES
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2 Sheets-Sheet 2

Fig. 3.

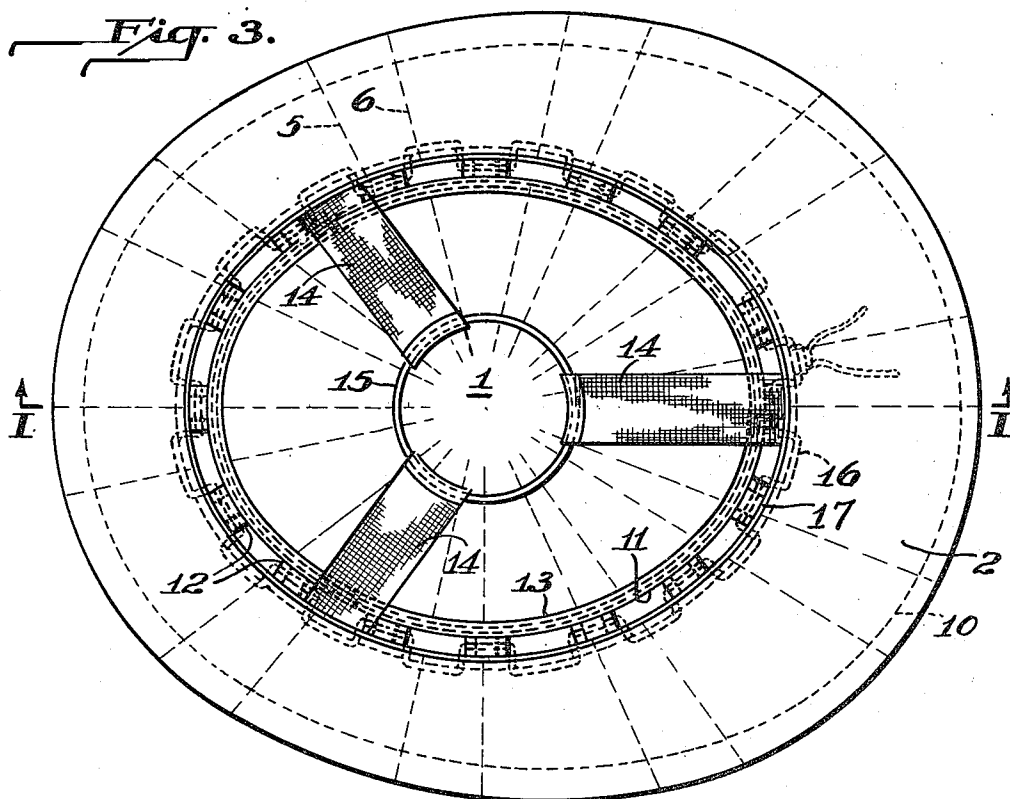


Fig. 4.

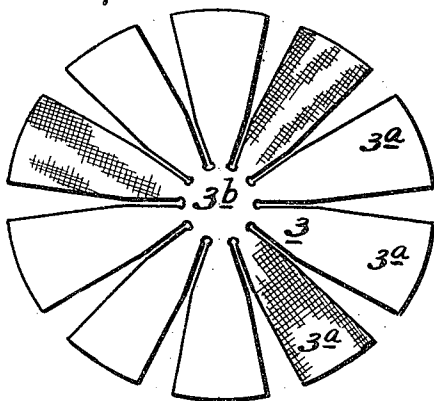


Fig. 5.

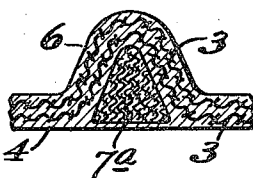


Fig. 7.

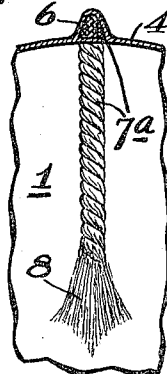
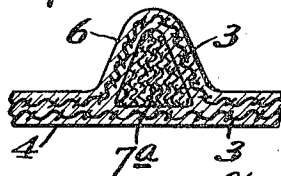


Fig. 6.



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UNITED STATES PATENT OFFICE

2,025,772

PROTECTIVE HEADGEAR

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15 Claims. (Cl. 2—5)

The invention relates to protective head-gear, particularly to safety helmets of the type used by firemen for protecting the head and neck from injury.

5 The major object of the invention is to provide a rigid, light-weight, electrically non-conducting safety head-gear which is strong enough to withstand severe shock, whose crown is reinforced by rib members to increase the shock resistance, which is resistant to the action of steam and liquids with which it may come into contact, which is easily made and embodies novel constructional features. It is among other objects to provide a cushioning sweat-band which is renewable and adjustable to vary the shape and size of its head-engaging opening, and a quickly removable shield for protecting the ears and neck of the wearer.

10 The invention may be described in connection with the accompanying drawings, in which Fig. 1 is a longitudinal section through the preferred embodiment of the invention, taken on line I—I, Fig. 3; Fig. 2 a cross-sectional view through the helmet, taken on line II—II, Fig. 1; Fig. 3 a bottom plan view of the helmet shown in Figs. 1 and 2; Fig. 4 a plan view, on a reduced scale, of an element preferably used in the manufacture of the helmet; Figs. 5 and 6 enlarged cross-sectional views through two forms of crown reinforcing ribs contemplated by the invention; Fig. 7 a fragmentary schematic view showing the disposition of the reinforcing rib in the crown of the helmet; and Fig. 8 an enlarged fragmentary view showing the preferred mode of constructing the sweat-band lining; and Fig. 8a a fragmentary perspective view of a portion of the sweat-band.

15 The head-gear provided by this invention comprises integrally molded crown and brim portions formed of molded plastic material reinforced interiorly by formable material in layer form, i. e., embedded in the plastic.

20 A major feature of this invention resides in the provision of reinforcing ribs in the crown, which ribs serve to augment the reinforcing effect of the formable layer material referred to hereinabove, and which further provide the appearance which is required in firemen's helmets of the conventional type.

25 In the practice of the invention, therefore, the head-gear is provided with longitudinal and transverse upstanding reinforcing ribs in which the formable material is pressed upwardly from the general contour of the crown, the interior surface of the crown remaining continuously smooth and uninterrupted. While this may be

accomplished in various ways, I now prefer to use, in the manufacture of the head-gear, preformed reinforcing elements, i. e., rib-producing members which are given a preliminary forming and plastic-impregnating treatment prior to being embodied in the structure used in making the head-gear.

30 In the practice of the invention such preformed elements are arranged in the female part of a suitable mold in such disposition that the male mold member cooperates to force the formable layer material outwardly from the crown and produce the ribs.

35 Most advantageously the preformed rib-producing members comprise lengths of rope, or the like braided material, which have been impregnated with a suitable plastic. The plastic may be, and preferably is, that used in the construction of the head-gear. After impregnation the rope is given a preliminary forming operation to shape it and to partially set the plastic.

40 In the preferred embodiment of the invention the periphery of the brim is likewise reinforced, preferably in the same manner, whereby cracking of the brim is prevented.

45 Various plastics are known which are suitable for use in the practice of this invention. These include, among others, asphalts and plastics compounded from rubber, casein, or cellulose compounds, numerous examples of which are known and available for commercial use. More suitably, however, the head-gear of this invention is made from plastics of the type comprising organic condensation products, which are commonly termed synthetic resins, or resinoids, and which are initially plastic and moldable, and which after being subjected to heat and pressure become very hard, infusible, non-conducting, insoluble in organic solvents, dilute acids and alkalis, and inert to steam. Of these materials the best known, and the one which is particularly advantageous, is that resulting from condensation of phenol and formaldehyde, although other types may be used, of which the phenol-furfural and urea-formaldehyde resinoids are examples.

50 The term "formable material" as used herein includes not only fabric materials, such as leather, textiles and the like, which are readily adaptable to a desired shape, but also those materials which may be shaped by special operations, such as spinning or molding, examples of such materials being sheet metal and vegetable fiber products. As used in the preferred embodiment, the formable materials are of a foraminous na- 55

ture, since they are light in weight, may be easily cut and shaped, and may be thoroughly interlocked with the plastic material. Various foraminous materials of this type are available, such as punched sheet metal, but it is preferred to use woven materials, such as wire screen, or, more advantageously, strong textile fabric, e. g., duck cloth, which may be not only embedded in the plastic, but may also be impregnated by it.

Having reference now to the drawings, the head-gear shown takes the form of a molded fireman's helmet comprising a dome-shaped crown 1 integral with a surrounding brim 2 sloping downwardly and outwardly therefrom and of the contour commonly used in such helmets. The structure, considered generally, comprises layers 3 of formable material embedded in and impregnated by plastic 4 which has been set by heat and pressure as described above.

In the preferred embodiment of the invention two layers of formable material are used, as illustrated in Figs. 5 and 6, which show the general structure, which is not susceptible of detailed illustration in Figs. 1 and 2 because of their small scale. When made from textile fabric these reinforcing layers of formable material most suitably are of the form shown in Fig. 4. They are formed by cutting or slitting generally elliptical pieces of duck inwardly from the edge at a plurality of peripherally spaced intervals to form sector-shaped pieces 3a jointed at their inner ends to a generally circular central body portion 3b, which lies at the apex, or center, of crown 1. Elements 3 are of such size as to extend substantially to the edge of brim 2, and most suitably the central body portion is of relatively small size. For example, it may be about 3½ inches in diameter for a helmet of average size. This construction makes it possible to arrange the layers in the mold smoothly and substantially free from the bulges which would be formed by overlaps if a solid piece of fabric were used. In the use of two or more layers of formable material the joints between the sectors preferably are overlapped, as indicated at 5 and 6 in Fig. 3. Of course, the layers may be shaped otherwise if desired for any particular purpose.

The helmet shown embodies a longitudinally extending reinforcing rib 6 and a transverse reinforcing rib 7, Figs. 1 and 2. In accordance with the invention these are produced by preformed rib-producing elements. To this end a material which may be molded to shape, most advantageously rope 7a, Figs. 5 to 7, or the like, is impregnated with plastic and is given a preliminary forming treatment to bring it into the general shape of the rib. In order that the ends of the ribs may merge smoothly into the contour of the crown, the outer ends of the rope may be frayed out as indicated at 8 in Fig. 7, so as to lie flat against and merge smoothly into the slope of the crown. Thereby there is no discontinuity or similar result which affects the appearance of the helmet.

In the manufacture of the head-gear the layers of formable material are arranged in the female part of a mold shaped to form the crown and brim and provided with suitable longitudinal and transverse grooves disposed and sized to receive and form the ribs from the rib-producing elements. The rib-forming members, having been preformed, are then arranged within the mold in positions to produce the ribs as shown in Figs. 1 and 2, and the layers of formable material having been impregnated with plastic, the

helmet is pressed in the mold by the male die member, to form and shape it under heat and pressure in the manner known in the art of plastic molding. Thus there is produced a molded helmet reinforced interiorly by layers of formable material, and having longitudinally and transversely extending crown-reinforcing ribs projecting upwardly from the crown, all of these members being moldably embedded in and impregnated by the plastic.

As indicated hereinabove, in the practice of the invention the formable material is pressed outwardly from the crown in forming the ribs by the preformed rib-producing element, which, therefore, underlies the formable material. This may be accomplished as shown in Figs. 5 and 6, for example. As shown in Fig. 5, the two layers 3 are first placed in the female part of the mold, after which the preformed elements are appropriately disposed in the mold, whereby when the male member enters the mold both layers are pressed outwardly through the action of the rib-producing elements. Another embodiment, shown in Fig. 6, resides in placing one of the layers 3 in the mold, then arranging the rib-producing elements, and then covering the latter with the second layer 3, so that the upper layer 3 is pressed outwardly in forming the rib, and the rib member lies between the two layers. Although Figs. 5 to 7 represent rib 6, it will be understood that they apply equally to rib 7, which is identical in all respects to the rib 6, except as to length.

Such rib formation through the use of preformed elements embodies various advantages. For instance, simple male mold parts suffice, which are less expensive and less subject to wear and breakage than those having projecting ribs for forcing the materials into grooved female mold parts. Also, where ribs are formed merely by being out-struck in the structure, or where of heavy but unreinforced section, they may possess insufficient strength to withstand severe shock. The preformed ribs provided by this invention cooperate to effect the shaping, and the rope, or the like, from which they are made forms a substantial reinforcement, conferring resiliency while minimizing the danger of failure of the hard plastic when struck a heavy blow. It will be noted also from the drawings that the interior surface of the crown is smooth and uninterrupted as a result of this construction.

The helmet may be, and preferably is, provided also with a reinforcing member around the periphery of the brim. This prevents splitting of the brim beginning at its edge when the helmet is dropped or struck by falling objects. This may suitably take the form of a rope reinforcing member 9 similar to that described in connection with the production of the ribs. This forms a resilient reinforcing bead 10 surrounding the brim.

The invention thus provides a fireman's helmet which is light, of exceptional strength for its weight, and durable. It is electrically non-conducting, resistant to all of the agencies which are met with in combating fires, and is adapted to protect the head of the wearer from falling objects and from injury when the head is raised suddenly into contact with, for example, floor beams or other members. Likewise, it is easy and relatively inexpensive to make, while combining the appearance required in a fireman's helmet with maximum safety, comfort and durability.

The head-gear provided by the invention likewise embodies a suitable band and lining struc-

ture. Having reference particularly to Figs. 1 to 3, the sweat-band preferably used is formed of a ring 11 of material to which there are permanently fastened resilient cushioning members 12, e. g., of sponge rubber, at spaced intervals, this portion of the band advantageously being of the type disclosed and claimed in U. S. Patent No. 1,935,204, issued November 14, 1933 to Mine Safety Appliances Company. Members 12 most suitably are of inverted T-shape whose outer faces are tapered vertically to compensate for the flaring of the crown surface. Through this tapering, and as described in the aforesaid patent, the inside surfaces, when the hat is worn, conform most comfortably to the head of the wearer.

To the lower end of the ring 11 there is attached a sweat-band for contact with the head of the wearer. Preferably this is effected by stitching, or otherwise connecting, one end of a strip 13 of leather, artificial leather, or the like material adapted as a sweat-band, to the lower end of the fabric strip 11, and turning the leather band 13 upwardly therearound, as shown in Fig. 8. In this manner there is provided a rolled lower edge which is comfortable to the wearer, and there is no stitching to contact with the head, which further increases the comfort of the helmet when worn for substantial periods of time.

The lining comprises a cradle structure embodying a plurality of strips 14 of flexible fabric connected at their upper ends by a draw member 15, and extending at spaced intervals downwardly in the crown, as shown in Figs. 1 and 2. The cradle bands and the sweat-band structure are connected to the helmet by means of a lacer 16 passed through openings in the cushioning blocks, through loops formed in the lower ends of the cradle strips 14 and through holes formed at the lower end of the crown as seen in Figs. 1-3 and 8a.

In this manner the sweat-band or the cradle, or both, are readily removable, either to replace one or the other of them, or to substitute others of different size, so that it becomes possible to supply all sizes and shapes of head using a minimum number of head-gear sizes. Also, by adjustment of the gathering of draw member 15, or by removing cushions 12 according to need, adjustment may be effected as desired. If desired, to increase protection against electrical hazards, the lacer 16 and the holes through which it is threaded may be covered by a strip of friction or the like tape applied thereover to the exterior of the crown.

Provision is made also for embodying a removable ear and neck shield. To this end the helmet is provided interiorly of the crown with an annular band 17 for detachably carrying a suitably shaped shield member 18 having side wings and a neck covering portion, such as that shown in Figs. 1 and 2, or other shapes conventional in the art. The band 17 and the shield member 18 are connected by quick detachable means, such as a slide fastener 170 of the type in which one stringer is carried by the edge of the shield, and the other stringer by band 17, the slider being removable from one of the stringers. The ends of the shield member may be connected at the back by means of a snap fastener 19. Band 17 may be connected to the crown by the lacer which holds the lining and cradle structures. This provides, therefore, a shield which may be readily attached and detached at will.

Thus the helmet embodies no metallic parts which may come into contact with electric wires

and convey current to the head of the wearer. The cradle structure, as will be noted from Figs. 1 to 3, is not attached to the sweat-band, so that pressure upon the cradle through the head is conveyed directly to the attaching lacer, rather than to the head band, with concomitant advantage. Also, the head-gear is adequately ventilated through the spaces provided between the resilient members. For these and other reasons inherent in the structure there is provided a helmet of maximum utility and comfort.

According to the provisions of the patent statutes, I have explained the principle and construction of my invention, and have illustrated and described what I now consider to represent its best embodiments. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A molded safety head-gear comprising integrally molded rigid crown and brim portions composed of molded plastic material having moldably embedded therein at least one reinforcing layer of formable material, and the crown having integrally formed upwardly projecting longitudinal and transverse reinforcing rib members including upwardly projecting portions of said formable material, and the head-gear being hard, strong, rigid and electrically non-conducting.

2. A molded safety head-gear comprising integrally molded rigid crown and brim portions composed of molded plastic material having moldably embedded therein at least one reinforcing layer of formable material, and the crown having preformed longitudinal and transverse reinforcing rib members moldably embedded integrally in the plastic and projecting upwardly from the crown surface, and the head-gear being hard, strong, rigid and electrically non-conducting.

3. A molded safety head-gear comprising integrally molded rigid crown and brim portions composed of molded plastic material having moldably embedded therein a plurality of superposed layers of formable material extending from the center of the crown substantially to the edge of the brim, and the crown having longitudinal and transverse upwardly projecting reinforcing rib members moldably formed integrally in the plastic and formable material, and the head-gear being hard, strong, rigid and electrically non-conducting.

4. A molded safety head-gear comprising integrally molded rigid crown and brim portions composed of molded plastic material having moldably embedded therein a plurality of superposed layers of formable material, and the crown having integrally formed longitudinal and transverse upwardly projecting reinforcing ribs including preformed plastic-impregnated members moldably embedded in the plastic and projecting said formable material upwardly from the crown surface, and the head-gear being hard, strong, rigid and electrically non-conducting.

5. A molded safety head-gear comprising integrally molded rigid crown and brim portions composed of molded plastic material having moldably embedded therein a plurality of superposed layers of formable material, and the crown having integrally formed longitudinal and transverse upwardly projecting reinforcing ribs including preformed plastic-impregnated ropes moldably embedded in the plastic between the layers of formable material, and the head-gear

being hard, strong, rigid and electrically non-conducting.

6. A head-gear according to claim 1, the edge of the brim being reinforced by a plastic-impregnated reinforcing member embedded therein.

7. A head-gear according to claim 4, the edge of the brim having a plastic-impregnated reinforcing rope member embedded therein.

8. A head-gear according to claim 5, the edge of the brim having a plastic-impregnated reinforcing rope member embedded therein.

9. A molded safety head-gear comprising integrally molded rigid crown and brim portions composed of molded plastic material having moldably embedded therein a plurality of superposed layers of formable material, and the crown having longitudinal and transverse upwardly projecting reinforcing ribs including preformed plastic-impregnated ropes moldably embedded in the plastic beneath at least one of said layers, the lower ends of said ropes being frayed out to merge the ends of the ribs smoothly into the crown contour adjacent the brim, and the head-gear being hard, strong, rigid and electrically non-conducting.

10. A molded safety head-gear comprising integrally molded rigid crown and brim portions composed of molded plastic material having moldably embedded therein at least one reinforcing layer of formable material, and the crown having integrally formed longitudinal and transverse upwardly projecting reinforcing rib members moldably formed in the plastic, a sweat-band arranged annularly within the crown adjacent the brim, a lining comprising strips of fabric connected at their upper ends extending downwardly at spaced intervals within the crown toward the brim, said band and lining being not directly connected, the lacer means connecting the band and lining as separate elements to the crown, and the head-gear being hard, strong, rigid and electrically non-conducting.

11. In a method of making safety head-gear having rigid crown and brim portions of molded plastic material, the steps comprising placing at least one outer layer of formable material in a mold contoured to provide crown and brim portions and provided with a groove in the crown-forming portion, arranging a preformed rib-producing member on said material above said groove, disposing at least one inner layer of formable material in the mold on top of said rib-producing member, supplying moldable plastic material to the mold, and molding to press said rib-producing member and outer layer into said groove to form a rib integral with and projecting upwardly from the crown.

12. In a method of making safety head-gear having rigid crown and brim portions of molded plastic material, the steps comprising placing at least one outer layer of formable material in a mold contoured to provide crown and brim portions and provided with a groove in the crown-forming portion, arranging a preformed rib-producing member on said material above said groove, disposing at least one inner layer of

formable material in the mold on top of said rib-producing member, supplying moldable plastic material to the mold, and molding to press said rib-producing member and outer layer into said groove to form a rib integral with and projecting upwardly from the crown, while forming said inner layer and the inner surface of the crown of smooth and continuous contour.

13. In a method of making safety head-gear having rigid crown and brim portions of molded plastic material, the steps comprising placing at least one outer layer of formable material in a mold contoured to provide crown and brim portions and provided with longitudinal and transverse grooves in the crown-forming portion, arranging longitudinal and transverse preformed rib-producing members on said material over said grooves, disposing at least one inner layer of formable material in the mold on top of said rib-producing member, supplying moldable plastic material to the mold, and molding to press said rib-producing member and outer layer into said groove to form longitudinal and transverse ribs integral with and projecting upwardly from the crown while forming said inner layer and the inner surface of the crown of smooth and continuous contour.

14. In a method of making safety head-gear having rigid crown and brim portions of molded plastic material, the steps comprising placing at least one outer layer of formable material in a mold contoured to provide crown and brim portions and provided with at least one groove in the crown-forming portion, plastic impregnating and preforming a rib-producing member, arranging said preformed plastic-impregnated rib-producing member on said material over said groove, disposing at least one inner layer of formable material in said mold on top of said rib-producing member, supplying moldable plastic material to the mold, and molding to press said rib-producing member and outer layer into said groove to form a rib projecting integrally with and upwardly from the crown while forming said inner layer and the inner surface of the crown of smooth and continuous contour.

15. In a method of making safety head-gear having a rigid crown and brim portions of molded plastic material, the steps comprising placing at least one outer layer of formable material in a mold contoured to provide crown and brim portions and provided with at least one groove in the crown-forming portion, fraying out the ends of a rope member, plastic impregnating said rope member and preforming it to form a rib-producing member, arranging said preformed plastic-impregnated rope member on said material over said groove with its frayed ends merging smoothly into the general crown contour, disposing at least one inner layer of formable material in the mold on top of said rib-producing member, supplying moldable plastic material to the mold, and molding to press said rope member and outer layer into said groove to form a rib integral with and projecting upwardly from the crown.

CHARLES W. PUNTON.