Aug. 30, 1932. C. W. PUNTON 1,875,143

PROTECTIVE CAP

Filed Aug. 18, 1931 2 Sheets-Sheet 1

Fig. 1.

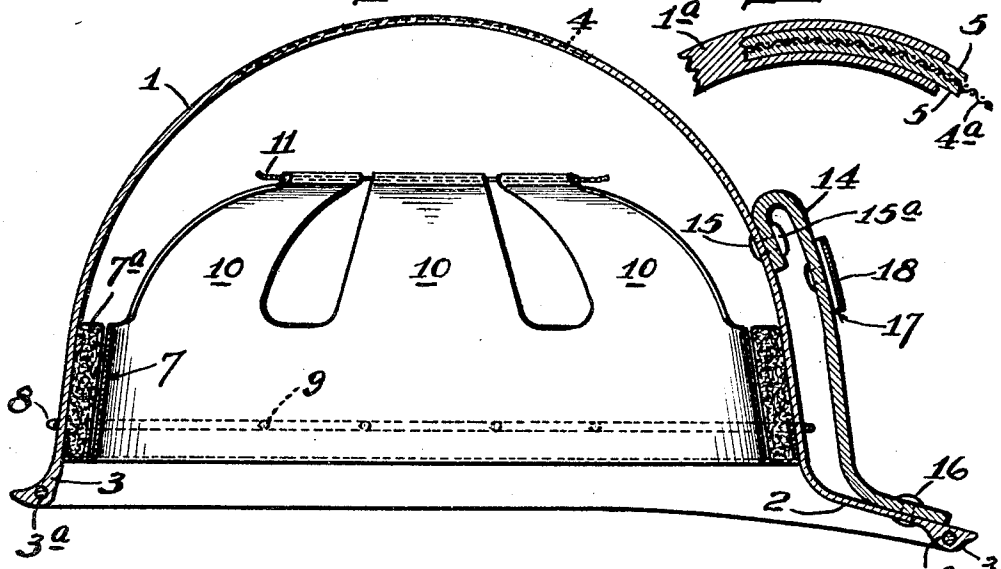


Fig. 4.

Fig. 2.

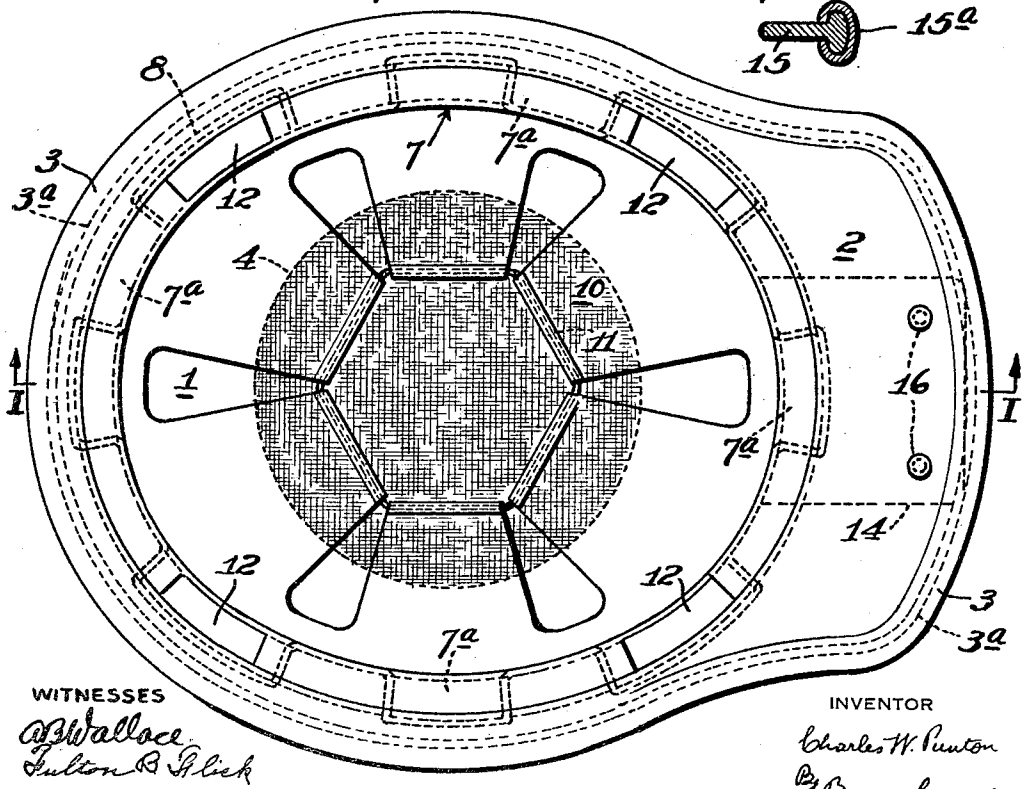


Fig. 5.

WITNESSES

A. B. Wallace

Fulton B. Slick

INVENTOR

Charles W. Punton

By Brown & Critchlow

Attys.

Aug. 30, 1932. C. W. PUNTON 1,875,143

PROTECTIVE CAP

Filed Aug. 18, 1931 2 Sheets-Sheet 2

Fig. 6.

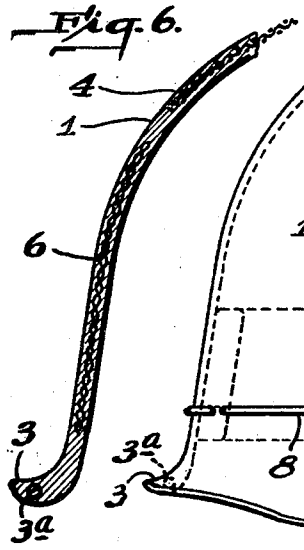


Fig. 3.

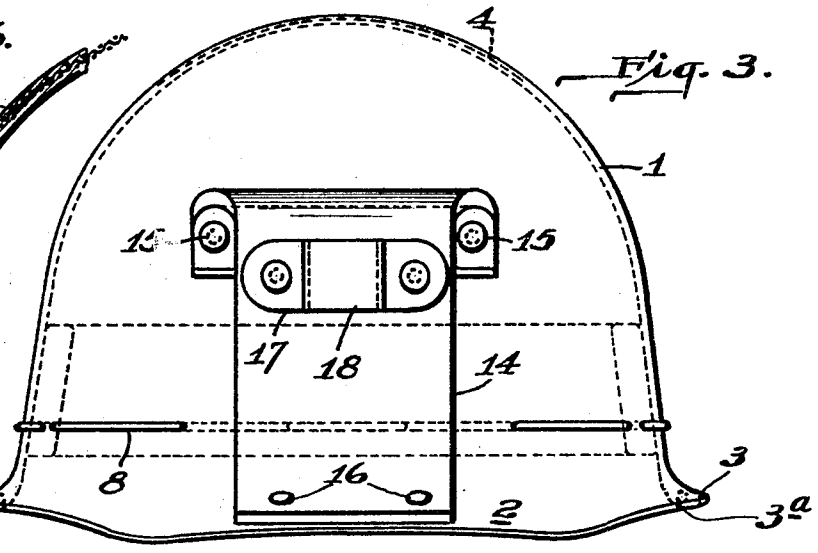


Fig. 8.

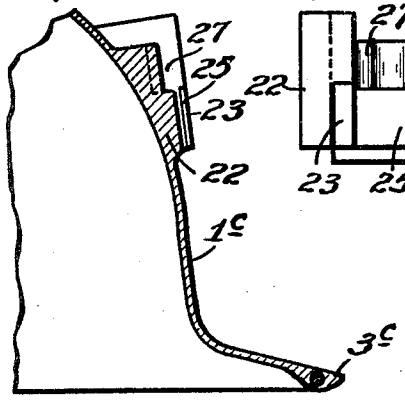


Fig. 9.

Fig. 10.

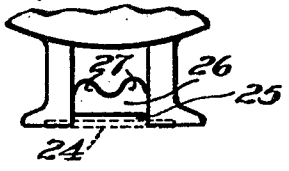


Fig. 13.

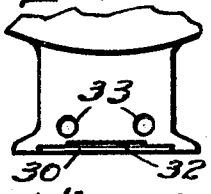


Fig. 7.

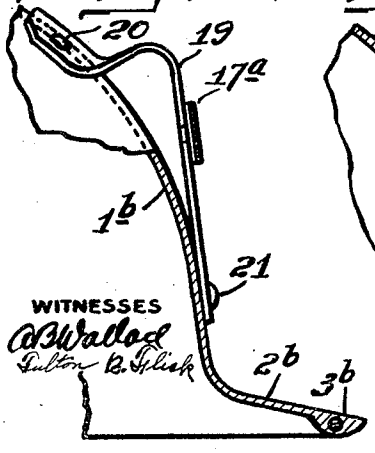


Fig. 11.

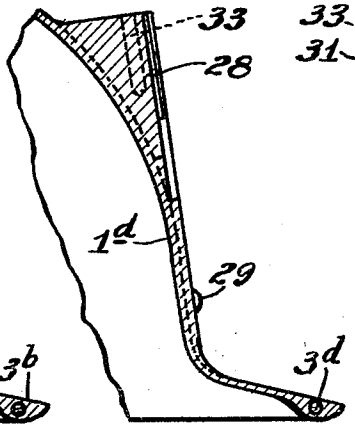
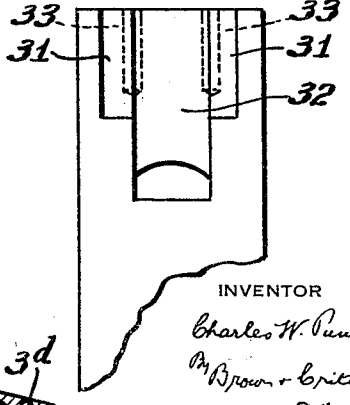


Fig. 12.



WITNESSES

C. Wallace

Fulton B. Flick

INVENTOR

Charles W. Punton

By Brown & Critchlow

Attys.

Patented Aug. 30, 1932 1,875,143

UNITED STATES PATENT OFFICE

CHARLES W. PUNTON, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO MINE SAFETY APPLIANCES COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

PROTECTIVE CAP

Application filed August 18, 1931. Serial No. 557,758.

This invention relates to protective caps for use by miners and others engaged in occupations where the head is endangered.

The headgear commonly worn by miners and those engaged in similar occupations generally consists of a cap embodying conventional crown and visor portions formed from leather, fibre, canvas, and the like to provide a relatively stiff structure. These caps are intended to offer more or less resistance to impact, so as to protect the wearer's head from damage by falling objects. However, the caps used up to the time of this invention have been subject to serious disadvantages inherent in their construction. For instance, the stiff edge or periphery of the crown portion of the cap has been more or less sharp and of substantially the same thickness as the balance of the crown, so that impact upon the cap, as by falling rock or coal, drives this sharp edge against the ears, injuring, or in some instances even severing them. Moreover, the materials used heretofore for this purpose become softened by moisture, or under heat, and are otherwise damaged in use, thus materially decreasing their efficiency.

It is among the objects of this invention to provide protective caps which are strong and rigid, are resistant to the action of moisture, mine acids, and heat, adapted to resist severe impact without injury to the wearer, of simple construction, are readily made, and embody advantages of prior caps while eliminating or minimizing injury to the ears.

A special object is to provide caps of the type referred to which are capable of preventing electric shock when the cap contacts with live electric conductors.

The invention may be described in connection with the accompanying drawings, in which Fig. 1 is a longitudinal section through one embodiment of the cap, taken on line I—I, Fig. 2; Figs. 2 and 3 bottom plan and front elevational views, respectively, of the cap shown in Fig. 1; Fig. 4 a fragmentary longitudinal section through the upper crown portion of a modified construction; Fig. 5 a cross section through an insulated rivet; Fig. 6 a fragmentary cross section on an enlarged scale through another embodiment, showing a reinforced construction; Fig. 7 a fragmentary longitudinal section through a cap showing another form of lamp holder; Fig. 8 a view similar to Fig. 7 showing a modified lamp holder molded integrally with the cap; Figs. 9 and 10 front elevation and plan views, respectively, of the holder shown in Fig. 8; and Figs. 11 to 13 views similar to Figs. 8 to 10 showing another form of integrally molded lamp holder.

In accordance with the invention caps embodying its stated objects are made by molding them integrally from a plastic adapted to provide a rigid, strong, hard and nonconducting structure, and by providing their lower edge with means for preventing injury to the ears. In accordance with the invention ear protection is afforded by providing the edge of the crown with a narrow outwardly extending flange, or bead. The caps thus provided are rigid, strong and durable, and they eliminate the danger of electric shock by contact of the head with exposed electrical conductors. In particular, they overcome the disadvantage of prior caps as regards ear injuries, for upon impact on the cap the bead does not cut, but tends to slide over, the ears. Other advantages presently to be pointed out, are also attained.

Although protection to the ears may be had by providing a narrow flange on the edges of the crown overlying the ears, it is preferred to extend it continuously around the periphery of the cap and to make its section greater than that of the crown portion. In this manner the cap is strengthened and reinforced against damage due to shock, and most suitably this result is enhanced by molding a reinforcing element in the bead. The crown may be, and preferably is, also reinforced against shock by molding into it a formable reinforcing element, such as duck or wire screen.

Various plastics may be used satisfactorily in the practice of the invention. For example, the caps may be made from beaten pulp, such as paper or wood pulp, which can be molded in a press to provide hard and

strong structures satisfying the requirements of such caps. The addition of sizing or bonding material, as is customary, materially assists in using such beaten pulp. Other moldable materials may be used, but it is preferred to use plastics of the type comprising organic condensation products, such as those commonly referred to as synthetic resins. Materials of this class are initially plastic and moldable, but after being subjected to appropriate heat and pressure they become very hard, infusible, non-conducting, and insoluble in most solvents, dilute acids and alkalis. The material preferably used is that resulting from condensation of phenol and formaldehyde, and for the best results the plastic comprises condensation products mixed with a more or less finely divided binder, such as chopped duck or the like. Or, if desired, the beaten pulp referred to may be impregnated with these materials. All such materials are termed "plastics" herein, for brevity of reference.

Having reference now to the drawings, the cap shown in Figs. 1 to 3 comprises a molded structure having a dome-shaped crown portion 1 extended at one end to form a visor 2. The periphery of the cap is provided with a continuous outwardly extending flange or bead 3 of substantially greater section than that of the crown. Preferably the outer, or upper, surface of the flange is continuous with the crown, the lower portion being thickened to provide the bulbous thickening shown. This provides a reinforcing bead which is especially suited for the purposes of the invention. In order further to reinforce this portion of the cap, there is preferably molded in the bead a reinforcing element 3*a*. Hemp rope has been found to be suitable for this purpose.

For most purposes the crown portion of the cap is also reinforced by a suitable material molded in the crown, as by a single layer of reinforcing screen 4, Fig. 1, totally embedded in the top of the crown. Experience has shown that there may be a tendency for the screen to become displaced toward the lower surface of the crown in the molding operation. This may be overcome by using a reinforcing element comprising a plurality of layers, such as a screen supported by paper. A single layer of paper arranged between the screen and the inner surface of the crown may be used, but as shown in Fig. 4 screen 4*a* is preferably sandwiched between layers 5 of paper, this element being molded in the top of crown 1*a*. With caps of ordinary size a circle of screen about 6 inches in diameter sufficiently reinforces the structure. While other materials may be used for this purpose, screen is desirable because it is readily shaped in molding, the wires slipping to assume the proper shape.

Although caps reinforced in this manner will be satisfactory for many purposes, greater strength, or resistance to breakage, is obtained by further reinforcing the crown. To this end a formable material, such as duck is molded in the crown. Substantial improvement in strength is obtained by molding a ring of duck in the crown adjacent the bead, but the most satisfactory results are had by the use of one or more layers 6, Fig. 6, of duck or the like extending from the edge substantially to screen 4.

The caps are made by placing a layer of suitable plastic, such as phenol-formaldehyde condensation product mixed with chopped duck, in an appropriate mold. The reinforcing element or elements, as the case may be, are then disposed appropriately in the mold and covered by the balance of the plastic. Upon heating and pressing in the manner customary with such materials the cap is formed and assumes the properties characteristic of these materials.

A feature of this invention resides in the provision of a head band which is removable and adjustable to the heads of different wearers. The form shown comprises a sweat band 7 of cloth, or other suitable material, disposed within and spaced from crown 1 by spaced cushioning pads 7*a* arranged at intervals between the band and the crown. The band is bent under the back of the pads, as shown in Fig. 1, and the structure is held removably in the crown by means of a non-metallic draw member 8 laced through holes 9 spaced around the crown and in the band and pads. The body of the sweat band is cut as shown in Figs. 1 and 2 to form a plurality of flaps 10 gathered at the top by a draw string 11 to form a lining, shown best in Fig. 1.

The sweat band thus provided is readily removable for replacement, and the size and shape of the head-receiving opening defined by it may be changed readily. Thus, by using thinner or thicker pads the area of the opening may be changed, or by appropriately positioning thick and thin pads its shape may be altered according to need. A particular advantage of this structure is that ventilation is assured by the spaces 12 between the ends of the pads, which provide for free circulation of air inside of the crown.

Where the caps are used by miners and for similar purposes they are provided with lamp holders associated with the crown above the visor. These holders may assume a variety of forms, and they may be either attached to the caps after they are formed, or molded integrally with them. The holder shown in Figs. 1 to 3 comprises a strip 14 of stiff leather or the like having outwardly projecting ears at its upper end connected to the crown by rivets 15, and folded upon itself and connected at its lower end to the

visor by means of rivets 16. A strip of metal 17 provided with an outwardly offset portion 18 for reception of a lamp is riveted to the upper part of the holder, as shown in Figs. 1 and 3.

The plastic used in these caps is a non-conductor so that should the cap contact with an exposed trolley wire or the like the current will not be carried to the wearer. In order to eliminate the possibility of conduction of electric current to the head by rivets extending through the crown, rivets 15 are of an insulated type. These may be formed readily by embedding the head of an ordinary rivet, Fig. 5, in plastic 15*a*, such as phenol-formaldehyde condensation product. The rivet is inserted from the outside through appropriate holes in the crown and strip 14, and, the embedded head being held in a suitable tool, the free end is upset within the crown. Rivets 16 used in the visor need not be of this non-conducting type because at this point of the cap there is substantially no possibility of contact of the inner end of the rivet with the wearer.

Another, and the preferred form of lamp holder, is shown in Fig. 7. It comprises a strip 19 of fiber, formed as shown in the drawings, connected to the cap in the manner just described by insulated rivets 20 and rivets 21 connected to the crown and visor, 1*b* and 2*b*, respectively. This form is also provided with a lamp retaining metal strip 17*a* like that shown in Fig. 3.

The holders may also be molded integrally with the cap, as shown in Figs. 8 to 10. The crown 1*c* of this embodiment is molded with a projection 22 overlying the visor portion and having a recess 23, Fig. 9, in its lower end for reception of a metallic plate 24, Fig. 10, for holding lamps of the flat hook carbide or a common form of electric miner's types, the bracket of the lamp being inserted between plate 24 and a recess 25 formed rearwardly thereof. In order to render the holder adapted to receive other standard types of lamp, its upper portion is provided, as shown in Figs. 9 and 10, with a deep recess 26 having spaced grooves 27 for receiving the hooks or clamps of various types of carbide and electric cap lamps.

Still another form of holder is shown in Figs. 11 to 13. This comprises a molded plastic block 28 attached to the crown 1*d* by means of insulated rivets 29. Like the holder shown in Figs. 8 to 10, this one is adapted to hold a variety of lamps. A metal strip 30 is riveted in a recess 31, and a narrower deeper recess 32 receives the brackets of lamps such as the flat hook carbide type. Holes 33 extending downwardly into the holder are provided for round hook lamps.

In addition to providing maximum protection to the ears when struck a downward blow, the caps are strong, durable, light and comfortable to wear. The visors are also strong and resistant to deformation or breakage, and to damage by mine water and other liquids. Being integral with the crown it is held in fixed position. Thus it affords protection to the face and eyes and helps to hold lamps and goggles in fixed position, and so to get the most satisfactory results from such accessory equipment. These are substantial advantages over the leather or canvas visors used heretofore, which become loosened, or broken down.

The cushioned adjustable head-band reduces pressure on the head and insures ventilation. It also makes it possible to manufacture but a few sizes, because the bands are readily adjustable to alter the size and shape of the opening. The caps withstand very severe impact without injury, are not affected by heat, moisture or mine acids, effectively protect the wearer from electrical shock, and are not flammable.

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 embodiment. 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 safety cap comprising integral rigid crown and visor portions formed of hard, non-conducting molded plastic and provided around their outer edge with an outwardly extending strengthening and ear-protective bead having a reinforcing element molded therein, and the crown containing a reinforcing element embedded in said plastic to strengthen the crown against breakage.

2. A safety cap comprising integrally molded rigid crown and visor portions formed of hard, non-conducting molded plastic, the edge of said crown portion adjacent the ears being provided with an integrally formed ear-protective bead, and the upper portion of said crown being reinforced by a wire screen embedded in said plastic.

3. A safety cap comprising integral rigid crown and visor portions formed of hard, non-conducting molded plastic, said portions being provided around the edge with an outwardly extending strengthening and ear-protective bead, and the upper portion of the crown having embedded therein a reinforcing element composed of layers of wire screen and paper.

4. A safety cap formed of a hard, non-conducting molded plastic of the organic condensation product type, the cap comprising integrally molded rigid crown and visor portions, a strengthening and ear-protective continuous bead of substantially heavier section than said portions integral with and extending out-

wardly from the periphery of the cap, a wire screen reinforcement embedded in said plastic in the upper portion of said crown, and a reinforcing element integrally molded in said bead.

5. A safety cap formed of a hard, non-conducting molded plastic, the cap comprising a rigid molded crown portion extended forward at one end to form a visor and provided peripherally with an integral narrow outwardly projecting flange of substantially heavier section than said crown, a rope reinforcing element molded in said flange, a wire screen embedded in said plastic in the upper part of said crown, and a lamp holder molded integrally in said crown above said visor.

6. A safety cap comprising molded rigid crown and visor portions provided peripherally with an integral narrow outwardly projecting flange of substantially heavier section than said portions, the cap being formed of a hard, non-conducting molded plastic of the condensation product type, the upper portion of the crown being reinforced by a strengthening element comprising layers of wire screen and paper embedded in said plastic, said flange having a reinforcing element molded therein, and a lamp holder associated with the crown above said visor.

7. A safety cap formed of hard, non-conducting molded plastic, the cap comprising integrally molded rigid crown and visor portions provided around their outer edge with an outwardly extending strengthening and ear-protective bead, the crown being reinforced in its upper portion and adjacent said bead portion by woven fabric reinforcing elements moldably embedded in said crown portions, and a sweat band replaceably disposed in said crown and adjustable to vary the size of its head-engaging opening.

In testimony whereof, I sign my name.

CHARLES W. PUNTON.