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(54) IMPROVEMENTS IN OR RELATING TO BULLET-PROOF  
HEAD PROTECTORS

(71) We, TIG BICORD AG, a Swiss Corporation of CH-6331 Hünenberg/Zug, Switzerland, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a bullet-proof protector for the purpose of protecting the head against bullets. Use is generally made of helmets which however only cover the upper part of the head and leave the lower part and the face unprotected, and the present invention is concerned with providing a protector which protects all areas of the head and which has a degree of flexibility.

According to this invention there is provided a bullet-proof head protector comprising a face plate, side plates and a top plate which plates are of bullet-proof metal and are stitched into or otherwise secured in respective fabric coverings which are interconnected, and a back wall of the protector comprising a plurality of layers of a high-strength plastics fibre fabric which are superposed to be bullet-proof and are secured to the top plate.

Surprisingly, it has been found that a large number of superposed layers of certain fabrics having very high strength provide good protection against bullets. Preferably, use is made of a Kevlar (Registered Trade Mark) fabric which possesses very high tensile strength and rigidity. This fabric consists of fibres made from an aromatic polyamide. A large number of webs of the fabric are superposed upon each other and provided effective protection against bullets. An inner hood thus formed may also extend behind the plates and increase the resistance to penetration by bullets. The fabric layers provide a soft support for the head of the wearer and the hood is sufficiently flexible for it to

adapt itself in an efficient manner to the shape of the head.

For the purpose of securing and locating the fabric layers and in accordance with a preferred further feature of the invention, a rearwardly projecting metal strip is secured to the top plate, which metal strip curves downwardly behind the fabric layers and locally holds them in position. The metal strip, which is preferably made from a bullet-proof material, thus extends round the rear of the top and provides additional protection and at the same time serves as a means for locally holding the fabric layers.

The metal strip and the fabric layers can be accommodated in the same fabric covering as the top plate so that the fabric layers and the metal strip are not visible from the exterior. Preferably the top plate, the metal strip and the fabric layers are formed as a unit and the fabric covering may have a sliding clasp fastener through which the unit can be inserted and removed when the fastener is open.

In a preferred embodiment of the invention a transparent sheet of bullet-proof plastics material is secured to the face plate in front of a viewing orifice, the sheet being secured to a visor holder which is attached to the face plate and which extends round at least the upper and side edges of the sheet. The sheet is preferably made from laminated polycarbonate material which resists bullets having an impact energy of 650 Nm. The sheet is secured at the top and two sides by the edges of the visor holder and is additionally supported from the rear so that it is not displaced rearwardly even when its front is struck by a bullet. The sheet thus cannot become detached from the visor holder when struck by a bullet.

Preferably, internal pads, which bear on localized zones of the face and forehead,

are mounted on the coverings. The thickness of the pads is preferably approximately 4 cm. The pads are made from foam material or other soft resilient substance.

- 5 By way of example, an embodiment of the invention will now be described in greater detail by reference to the drawings, in which:

Figure 1 is a front perspective view of 10 a head protector according to the invention,

Figure 2 is a front view of the head protector,

Figure 3 is a section on the line III-III 15 of Figure 2, and

Figure 4 is a plan view of the head protector.

The head protector illustrated has a face plate 10 and two side plates 11 and 12. 20 The face plate 10 is convex outwardly, being slightly curved about a vertical axis and has a rectangular viewing opening 13. The front edges of the side plates 11 and 12 abut the face plate 10 and their upper 25 edges abut a top plate 14. The face plate 10 and the side plates 11 and 12 are however each stitched into fabric coverings 15 and 16 which are matched to the shape of the plates and are interconnected by sewing. 30 Thus, the plates are able to move relatively to each other within certain limits, but are so firmly secured to each other that no gaps of any great size can form between them.

35 Secured to the rear edge of the top plate 14 is a rearwardly extending strip 17 which extends over the rear of the head of the carrier and is bent downwardly almost at a right-angle. All of the plates 10, 11, 12 40 and 14 and the metal strip 17 are made of bullet-proof sheet metal which is relatively light in weight. Such materials are well-known, so that their composition does not require to be detailed here.

45 Secured to the lower surface of the top plate 14 are, say, ten to twenty superposed fabric layers 18, which are overlapped and shaped by the metal strip 17. The fabric layers consist of Kevlar (Registered Trade 50 Mark) fabric which has a high tensile strength of approximately 30,000 kp/cm<sup>2</sup> and very great rigidity (1,340,000 kp/cm<sup>2</sup>). If several layers of such a fabric are superposed upon each other, they form an effective 55 protection against bullets. Also, they are flexible and soft enough not to interfere with comfortable wearing of the head protector. The fabric layers may extend downwardly as far as the neck of the 60 wearer, so as directly to adjoin the neck portion of a bullet-proof vest. The metal strip 17 provides additional protection for the middle portion of the rear of the head.

The fabric layers 18 extend over the 65 entire zone of the rear of the head as far

as the side plates 11 and 12 and partially overlap the latter at the rear, as clearly shown in Figure 4.

To buffer the impact and prevent 70 hematomas when a bullet strikes the head protector, the fabric layers 18 are backed by a thick layer 19 of foam material which extends under the top plate 14 and runs as far forward as the face plate 10. The pad 19 of foam material is secured to the fabric 75 layers 18, for example, by bonding, and the fabric layers 18 are likewise bonded to the top plate 14. The unit thus formed consisting of the top plate 14, the metal strip 17, the fabric layers 18 and the pad 80 19 of foam material is inserted in the fabric covering 20, which can be opened and for this purpose is provided with a sliding clasp fastener 21 which, as shown in Figure 4, 85 extends along the centre-line of the head protector to the lower zone of the neck portion.

Secured to the side edges of the fabric covering 15 for the face plate 10 is a strap 22 which extends transversely across the 90 front zone of the top plate and is passed through loops 23 on the fabric covering 20. Provided at the ends of the strap 22 are press studs to which can be secured a horizontal 95 tightening strap 24 extending around the rear of the head. The tightening strap 24 runs through loops 25 on the fabric covering 20 and extends around the rear surface of the metal strip 17 and the fabric layers 100 18.

In its interior the head protector is padded with thick strips 26 of foam material and blocks 27 of such material. A strip 26 of foam material extends above 105 the viewing window 13 transversely across the entire forehead zone, whereas blocks 27 of foam material are provided in the zone of the cheeks and the chin. Between the pads are cavities which are suitable for 110 accommodating communication devices, e.g. a microphone and earphones, transmitters and receivers. The spacing of the pads also facilitates circulation of air and breathing.

115 The viewing window 13 is covered on the outside by a sheet 28 of bullet-proof plastics material, which is mounted on a visor holder 29. The visor holder is made of bullet-proof sheet metal and is secured 120 to the face plate 10 by screws which extend through the covering material 15. The sheet metal forming the visor holder 29 has a marginal flange 30 which overlaps the two sides and the upper edge of the sheet 125 28, so that the latter cannot become detached from the visor holder 29 even when struck by a bullet. The sheet 28 is inserted into the visor holder from below, and is 130 secured by lateral screws 31 which can be

screwed into the material of the sheet through holes in the visor holder 29. The sheet 28 consists of several layers of polycarbonate material interconnected by films.

5 Its outer surface is scratch-resistant and its total thickness is 33 mm. Within the visor holder 29 are profiled strips 32 which support the sheet 28 from the rear so that the sheet cannot be displaced rearwardly even  
10 under the impact of a bullet striking it.

Between the surface of the visor holder 29 and the outer fabric covering 15 of the face plate is an arcuate gap 33. Since the visor holder 29 is completely open at the  
15 bottom, good air circulation is ensured and the formation of condensate on the sheet 28 is prevented.

The face plate 10 extends so far downwardly that it can be supported on the  
20 chest portion of a bullet-proof vest or the like. Expediently, the centre of gravity of the head protector is vertically below the centre of the top plate, so that its entire weight is evenly distributed. The coverings  
25 15, 16 and 20 are preferably made from a flame-inhibiting material.

#### WHAT WE CLAIM IS:

1. A bullet-proof head protector comprising a face plate, side plates and a top  
30 plate which plates are of bullet-proof metal and are stitched into or otherwise secured in respective fabric coverings which are interconnected, and a back wall of the protector comprising a plurality of layers of a  
35 high-strength plastics fibre fabric which are superposed to be bullet-proof and are secured to the top plate.

2. A head protector according to claim 1, wherein a rearwardly projecting metal  
40 strip is secured to the rear edge of the top plate, which metal strip curves downwardly behind the fabric layers and locally holds them in position.

3. A head protector according to claim 2,

wherein the top plate, the metal strip and 45 the fabric layers are contained in a fabric covering having external loops through which extend tightening straps.

4. A head protector according to claim 3, wherein the top plate, metal strip and fabric  
50 layers are formed as a unit, and wherein the fabric covering has a sliding clasp fastener through which the said unit can be inserted and removed when the fastener is  
55 open.

5. A head protector according to any one of claims 1 to 4, wherein a transparent sheet of bullet-proof plastics material is fitted in front of a viewing aperture in the face plate, the said sheet being mounted in  
60 a visor holder which is secured to the face plate and which extends around at least the upper and side edges of the sheet.

6. A head protector according to claim 5, wherein the visor holder is open at the  
65 bottom and wherein an air passage is formed at the top of the holder behind the said sheet.

7. A head protector according to claim 4 or claim 5, wherein the visor holder has  
70 flanges which support the sheet against forces tending to push the sheet rearward.

8. A head protector according to any one of the preceding claims, wherein pads for bearing against localized zones of the face  
75 or forehead are mounted on the fabric coverings, which pads are substantially 4 cm. thick.

9. A bullet-proof head protector substantially as hereinbefore described with refer-  
80 ence to the accompanying drawings.

STEVENSON, HEWLETT & PERKINS,  
Chartered Patent Agents,  
5, Quality Court,  
Chancery Lane,  
London WC2A 1HZ.  
Agents for the Applicants.

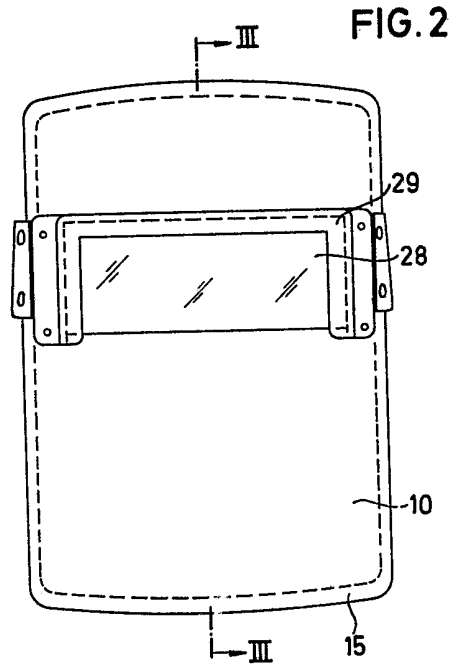
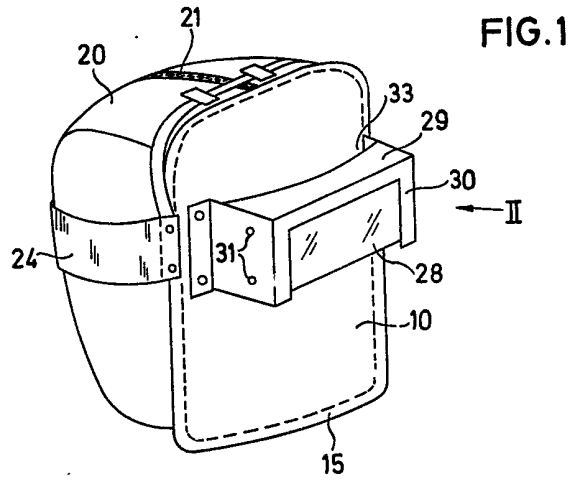


FIG. 3

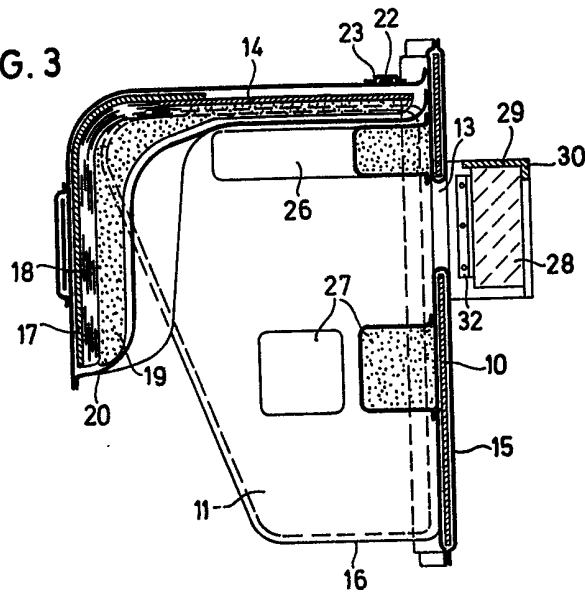


FIG. 4

