March 12, 1957 W. L. MOORE 2,784,408

PROTECTIVE HELMET SUSPENSION

Filed June 3, 1955 2 Sheets-Sheet 1

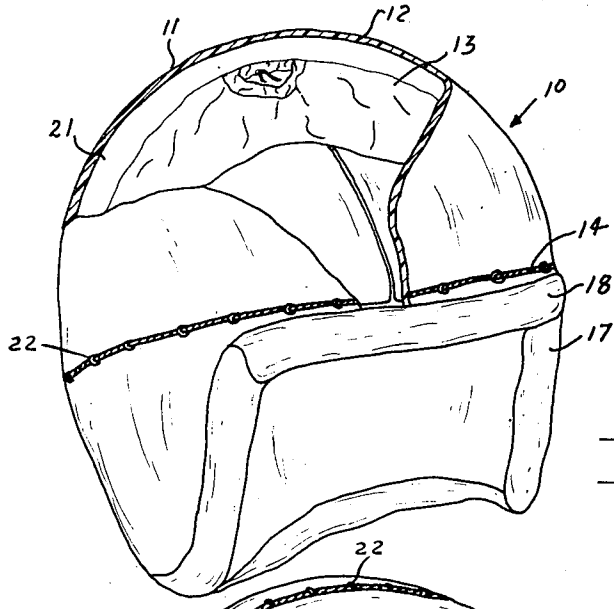


Fig-1

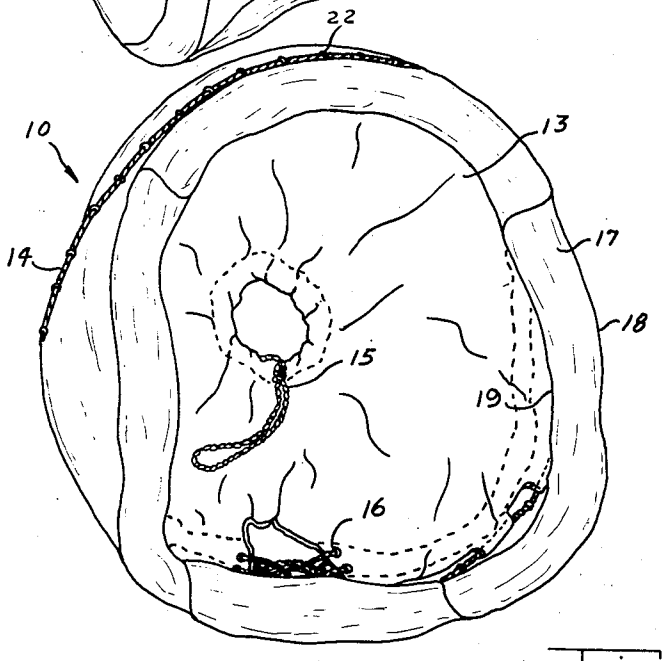


Fig-2

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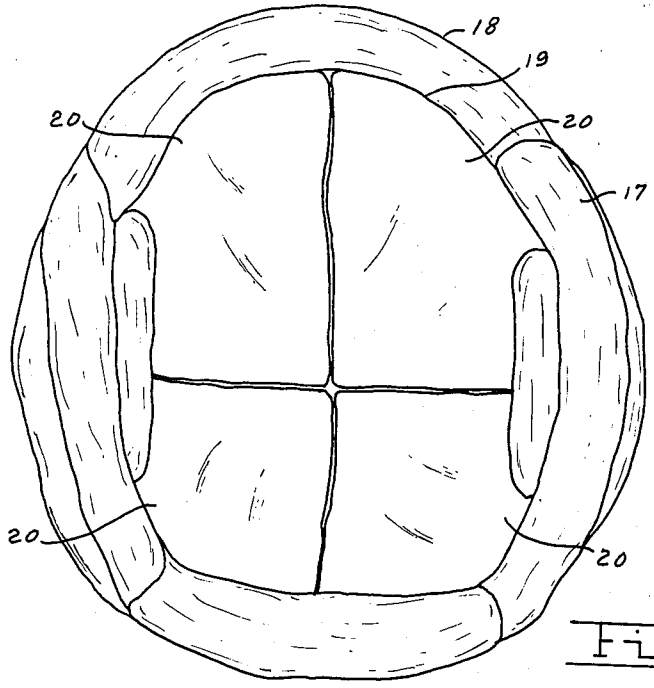


Fig-3

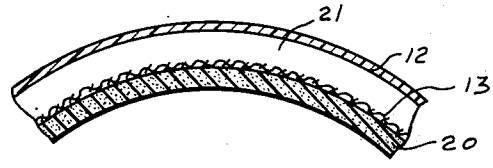


Fig-4

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PROTECTIVE HELMET SUSPENSION

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Application June 3, 1955, Serial No. 513,174

2 Claims. (Cl. 2—3)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the United States Government for governmental purposes without payment to me of any royalty thereon.

The present invention relates to a protective helmet, and in particular, relates to a helmet for use by pilots of jet aircraft to protect the head from externally applied blows due to buffeting, wind blasts or crashing.

The increasing speed of modern jet aircraft has resulted in an intensification of injuries caused by violent maneuvers, flight through turbulent air, bail-outs and crashes. Head injuries are more susceptible to fatal results since even relatively minor blows may result in a loss of consciousness or in mental confusion during a critical period of an aircraft maneuver. Protective helmets are a well known means for guarding against this danger. Obviously, they may be made as strong and protective as desired but practical considerations of comfort and lightness oppose an unlimited development along this line. It is clear, therefore, that any means for increasing the protective qualities of a helmet without sacrificing comfort or increasing weight would be very useful.

The principal object of this invention is to provide a comfortable light protective helmet with a plurality of shock absorbing elements disposed in a compact arrangement.

A further object of this invention is to provide a protective helmet with spaced shock absorbing elements.

An additional object of this invention is to provide a protective helmet which transforms a heavy localized blow adjacent the top surface of the helmet into a light pressure distributed uniformly over a substantial portion of the top surface of the head.

A still further object of this invention is to provide means for securing shock absorbing material to the helmet, said means having the added function of ventilating the interior of the helmet.

A specific embodiment of this invention is shown in the accompanying drawings, wherein:

Fig. 1 is a perspective view of the front and top of the helmet with a portion cut away to show the arrangement of the shock absorbing elements and the air space in the helmet.

Fig. 2 is a perspective view of the interior of the helmet showing the adjustable shock absorbing material which acts as a boundary for the air space, and a base for the shock absorbing quadrant-shaped pads.

Fig. 3 is an interior view of the helmet showing the quadrant-shaped concave pads that are in contact with the helmet wearer's head.

Fig. 4 is an enlarged view showing the arrangement of the shock absorbing material in the helmet.

Referring to Fig. 1, a helmet indicated generally at **10** incloses an outer shell **11** formed from a material which is sufficiently resilient to absorb some impact energy from a blow, but is rigid enough to maintain its shape under normal circumstances. "Royalite," a vinyl and rubber plastic made by the U. S. Rubber Company, has been

found suitable for this purpose. Spaced from the interior surface of shell **11** and covering the top and upper side surfaces of the head is a continuous and integral adjustable sling **13** made from a resilient and somewhat elastic material such as nylon web. The sling is secured to the shell by means of a lacing cord **14**, see Figs. 1 and 2, which penetrates a plurality of lacing and ventilating apertures **22** in shell **11**. The sling is adjustable for different head sizes by means of ropes or cords at **15** and **16**, see Fig. 2. A bead **17** made from a resilient shock absorbing material, is secured to the edge of the shell. The bead projects inwardly and outwardly of the shell. The outwardly projecting portion **18**, acting as a sort of bumper, offers an additional measure of protection from blows landing on the front and lower side portions of the head, and is particularly protective of the sensitive forehead region. The inwardly projecting portion **19** of bead **17** maintains the protective quadrant-shaped concave pads **20** in position in the helmet. The beads are made from "Ensolite," a vinyl foam plastic made by the U. S. Rubber Company. "Ensolite" differs from foam rubber, previously used in protective helmets, in that the air spaces in the body of this material are not sealed from each other, permitting air to escape from them when subject to pressure. This results in a material that is slow to deform under pressure and slow to regain its shape after the pressure is removed. This delay characteristic absorbs energy instead of storing it as in the case of foam rubber. Pads **20**, mounted in the helmet and covering the entire top and upper side surfaces of the head, are also made of "Ensolite." The pads have an outer surface and a concave inner surface adapted to conform to the shape of the wearer's head. As best seen in Figs. 1, 3 and 4, the outer surfaces of the pads bear against the inner surface of sling **13** while only the peripheral portions of the inner surface of the pads bear against the inwardly projecting bead portion **19**. This arrangement retains the pads in position in the helmet. The pads consist of four quadrant-shaped sections covering the top and side surfaces of the head permitting them to be separated in the helmet and providing means for adjusting the helmet to fit different head sizes. The air space **21**, formed by the separation between sling **13** and the inner surface **12** of shell **11**, has several important functions. In the first place, it helps insulate the top of the head from high temperatures applied to the outer surface of the helmet. In addition, it spaces the top of the head from indentations in the shell **12** caused by heavy blows to the top surface of the helmet.

In operation, energy from the force of a blow applied to the top surface of the helmet is partially absorbed in the shock absorbing material of the shell **11** and the balance of the energy is transmitted to the sling **13** through connection **14**. The sling is elastic permitting the force of the blow to drive the helmet downwardly with respect to the head, decreasing the volume of the air space **21**. This movement absorbs energy through the shock absorbing characteristics of the material comprising the sling and through forcing air in air space **21** out past the lacings **14** which secures the periphery of the sling to the helmet. In addition, since the sling is formed from a continuous and integral piece of material and surrounds the top and upper side surface of the head, this downward movement of the helmet effectively transforms a heavy localized blow adjacent the top surface of the helmet into a harmless pressure increase which is transmitted substantially uniformly over a large portion of the top surface of the head. The balance of the energy from the blow is transmitted from the sling to the shock absorbing quadrant-shaped pads to be further absorbed. Thus it is seen that applicant has produced a protective helmet which provides a compact and efficient means for

transforming heavy localized blows on the top surface of the helmet to a much weaker harmless pressure increase which is distributed uniformly over a large area of the top surface of the head.

The invention may be embodied in other forms without departing from the spirit or essential characteristics thereof as set forth in the claims, and the present embodiment is therefore to be considered as illustrative and not restrictive, and it is intended to include all changes which come within the scope and range of the claims.

I claim:

1. A helmet for protecting the wearer's head comprising an outer resilient shell, an integral adjustable sling adapted to surround the top and upper side surfaces of the head, said sling formed as an integral, continuous and flexibly elastic piece, said sling secured to the shell and spaced from the inner surface of the top of the shell to provide an air space, resilient inwardly and outwardly extending bead portions secured to the edge of the shell, the outwardly extending bead portion acting as a bumper to provide additional protection to the sensitive forehead region, a plurality of resilient shock absorbing pads adjustably and removably positioned on said inwardly extending bead portions whereby the pads are held in place in the helmet, said shock absorbing pads having an outer surface and a concave inner surface, the outer surface of said pads positioned to bear against said sling, said concave inner surface of said shock absorbing pads adapted to conform to the shape of the helmet wearer's head.

2. A helmet for protecting the wearer's head comprising an outer resilient shell, an integral adjustable sling adapted to surround the top and upper side surface of the head, said sling formed as an integral, continuous and flexibly elastic piece, a plurality of spaced lacing and ventilating apertures in the shell disposed around the side surfaces of the shell, cord means secured to said sling, said cord means penetrating said lacing and ventilating apertures to adjustably lace said sling to said shell, said sling spaced from the inner surface of the top of the shell to provide an air space, resilient inwardly and outwardly extending bead portions secured to the edge of the shell, the outwardly extending bead portion acting as a bumper to provide additional protection for the sensitive forehead region, a plurality of resilient shock absorbing pads adjustably and removably positioned on said inwardly extending bead portions whereby the pads are held in place in the helmet, said shock absorbing pads having an outer surface and a concave inner surface, the entire outer surface of said pads positioned to bear against said sling, said concave inner surface adapted to conform to the shape of the helmet wearer's head.

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