

[54] **PROTECTIVE HEADGEAR**
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 [58] Field of Search 2/2, 3 R, 5, 6; 267/114, 267/117

[57] ABSTRACT

An impact absorbing covering for protective headgear including a hard shell of one or two material thicknesses and having on its inside surface for contact with the protective headgear, a multitude of fluid chambers normally having direct flow communication with the atmosphere or with a sealed chamber, but which are hermetically sealed when the covering is impacted so as to afford means to absorb the impact.

9 Claims, 8 Drawing Figures

[56] **References Cited**
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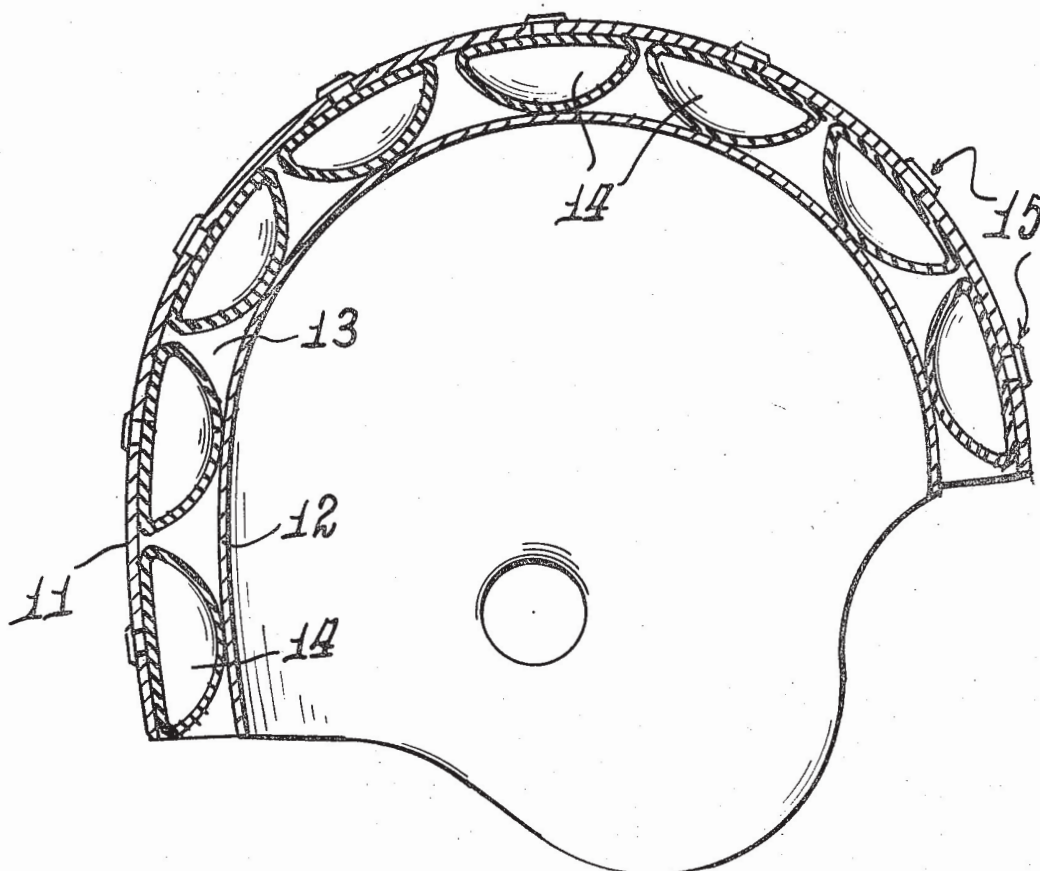


Fig. 1.

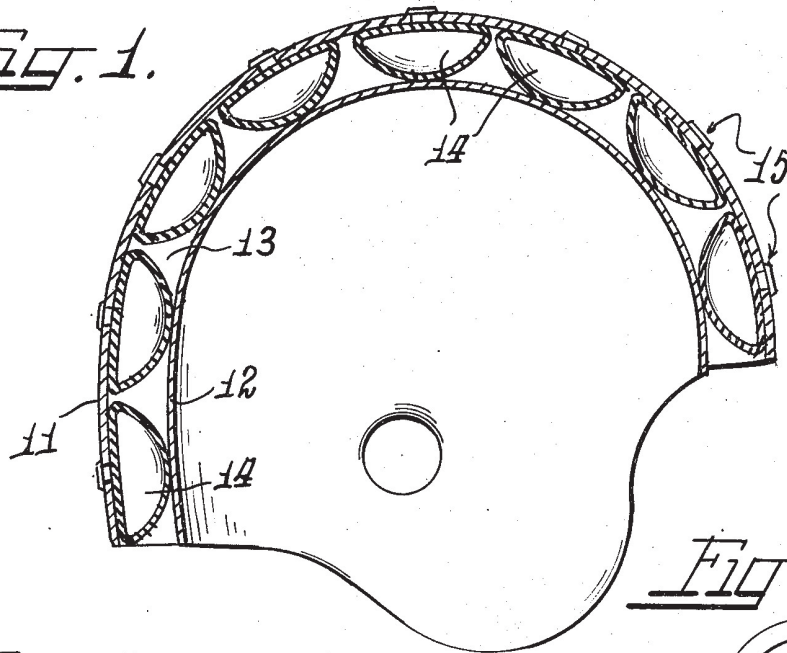


Fig. 2.

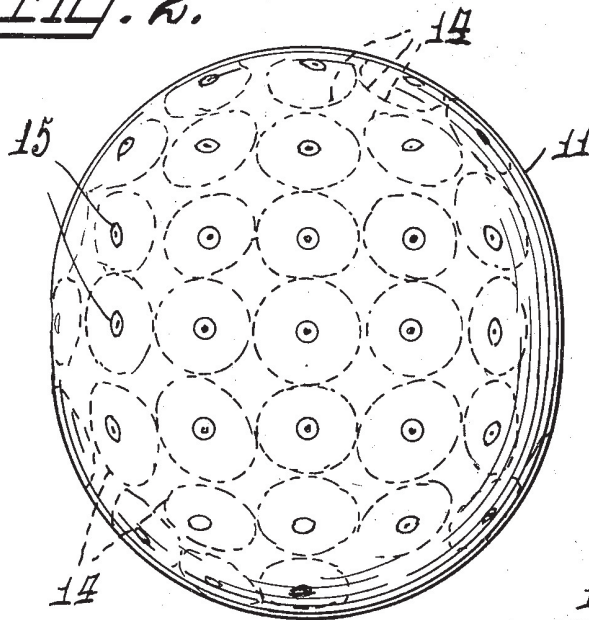


Fig. 5.

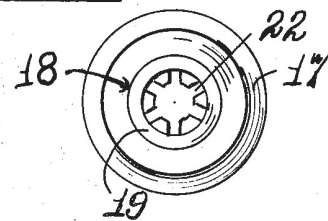


Fig. 4.

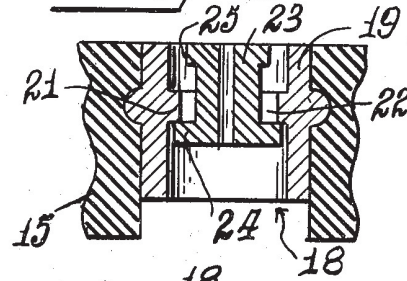


Fig. 3.

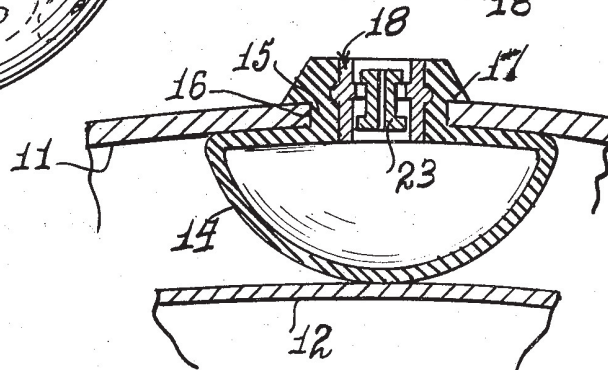


Fig. 6.

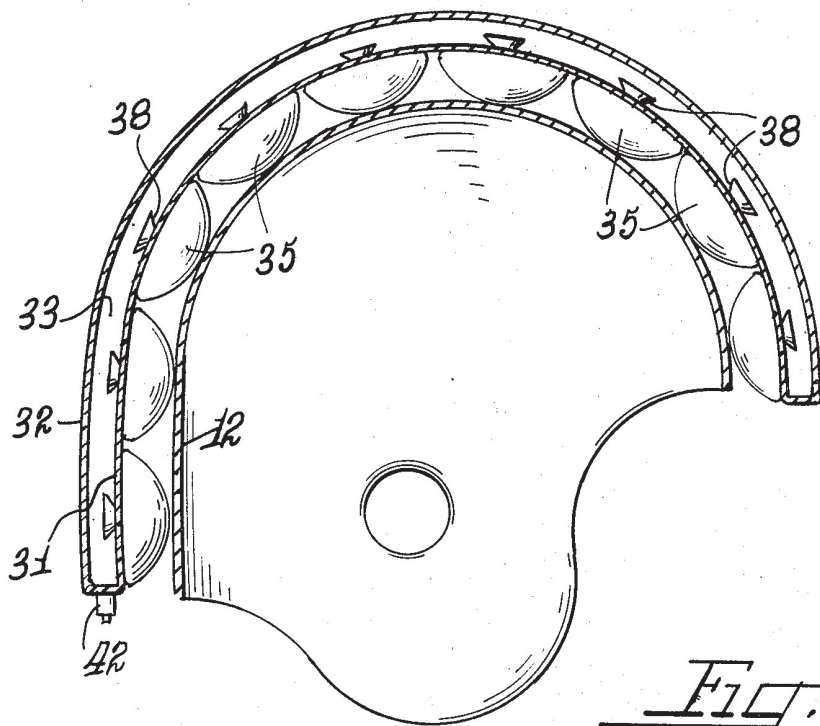


Fig. 7.

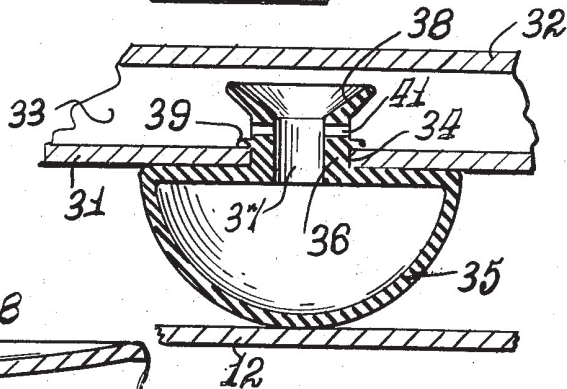
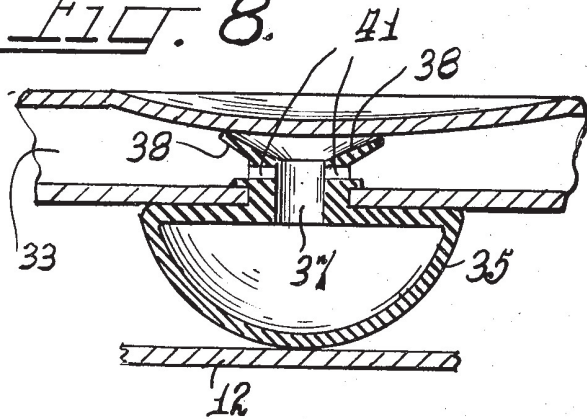


Fig. 8.



PROTECTIVE HEADGEAR

In football, the greatest potential for injuries is when a player, running at full speed, collides with a goal post, a concrete wall at the perimeter of the field, or head-one with another player. Two players colliding head-one may develop a force equal to hitting a concrete wall at 20 miles per hours, and when a player hits the turf, especially the artificial turfs now in general use, following a tackle or block, impact energy varies; that is, the impact energy will be at least twice the velocity of the impact.

Although absolute human tolerances to energy impact cannot be established, it appears evident that the solution is to disperse, dispense, dissipate, and/or absorb the impact energy prior to its reaching the hard shell of the helmet and the cranial cavity of the skull. For most impacts, the injuring energies result from acceleration, deceleration or compression of the head or any combination of these three. The sudden setting of the head (acceleration) or stopping of the head (deceleration) may often result in the generation of intra-cranial pressures and intra-cranial lesions, such as hemorrhages, contusions and concussions.

The lines of force, or energy, of impact are transmitted through the vault and base of the cranial cavity, and should a fracture develop as the result of impact, serious sub-dural or extra dural hematomas may occur. At the moment of great traumatic impact, the skull is pressed against the brain and this may cause contusions of the meninges and brain, especially if the head is held firmly and cannot recoil. Should the head be free a fraction of a second after impact, momentum of the blow throws the brain forcibly against the skull opposite the point of impact. A blow of the posterior region of the skull causes contrecoup lesions (contusions) of the tips of the frontal and temporal lobes when the brain is forced against the irregular bone of anterior and middle cranial fossae.

Response to any injury causes edema and hemorrhage or both. This means an increase in the size of the brain within a bony cavity of limited size and hence an increase in intra-cranial pressures. Brain injury of the kinds sought to be prevented can be defined as laceration of the brain, sub-dural hematomas, cerebral concussion, and extra dural hemorrhaging involving veins and arteries rupturing in sub-dural spaces.

In the present disclosure, which is an improvement over the structure shown and claimed in U.S. Pat. No. 3,787,893, issued Jan. 29, 1974, there is provided, an outside protective covering for the conventional type headgear or helmet. This covering is of a size of to overlay the headgear and be spaced therefrom so as to accommodate a multitude of fluid chambers or cushions arranged over substantially the entire inside area of the covering so as to afford means on the outside of the helmet to absorb the forces of impact on the covering. These fluid chambers function to absorb, dissipate, and dispense most of the shock of impact before it reaches the helmet. Thus, the absorption or dispensation of immediate shock wave exteriorly of the helmet tends to decelerate movement of the brain within the cranial cavity of the skull. It is this acceleration of the brain upon impact that causes about 95% of fatalities arising from football head injuries.

Such exteriorly located air chambers, which are strategically located, will absorb much of the impact energy and disburse its full force over a wide area and

allow the cranial cavity to freely recoil and prevent intra-cranial pressures from developing. Further, in order to protect various articulated areas of the skull it is preferable to provide as an integral part of the helmet and on the interior thereof, a pattern of padded ribs which function to prevent abnormal pressures on the cranial structure.

It is therefore an object of the invention to provide an impact absorbing covering for a hard shell protective headgear.

Another object is to provide a headgear protective assembly which includes a multiplicity of fluid chambers critically arranged on the interior surface of a hard shell protective covering.

Another object is to provide impact resisting air chambers in a protective headgear covering, with novel valve means.

Another object is to provide a protective headgear covering with newly constructed air chambers or cushions having normally direct communication with atmosphere, which communication is restricted when the covering is subjected to impact.

Another object is to provide a protective covering of the character referred to which is not difficult or expensive to manufacture and which is very reliable for the purposes intended.

Other objects and advantages of the invention will become apparent with reference to the following description and accompanying drawings.

IN THE DRAWINGS

FIG. 1 is a vertical central sectional view of a protective covering and associated helmet embodying features of the invention.

FIG. 2 is a top plan view of the protective covering, showing the fluid chambers in dotted outline.

FIG. 3 is an enlarged detail sectional view of one fluid chamber, showing its valve means in open condition.

FIG. 4 is an enlarged detail sectional view of the valve means in closed condition.

FIG. 5 is a top plan view of the valve body, the stem being omitted.

FIG. 6 is a sectional view similar to FIG. 1, but showing a modified form of construction.

FIG. 7 is an enlarged detail sectional view of one of the air chambers in the FIG. 6 assembly, showing its valve in open condition.

FIG. 8 is a view similar to FIG. 7, showing the valve in closed condition.

Referring now to the exemplary disclosures of the invention as shown in the accompanying drawings, and particularly to the embodiment shown in FIGS. 1 through 5, the protective covering for headgear includes a hard shell 11 shaped to fit over the helmet 12 which is in turn fitted on the human head (not shown) in the conventional manner. The helmet 12 may include, on its inside, a padded cage-like liner or the like, not shown.

The hard shell 11 is substantially larger than the helmet so as to leave a space 13 therebetween which space is substantially occupied by a multiplicity of fluid (air) chambers or cushions 14. Each of these chambers 14, which is fabricated from elastic material, such as rubber or a suitable plastic, has a tubular neck 15 (FIG. 3) that extends through an aperture 16 in the shell 11 for mounting the chamber on the inside surface thereof. The neck preferably has an external flange or shoulder

17 that functions to retain the chamber in mounted condition. Such mounting affords means to easily and quickly remove and replace a chamber should it become ruptured or otherwise damaged.

Mounted securely in the tubular neck 15 is a tubular valve element 18 comprised of an externally beaded cylindrical wall 19, having an internal annular flange 21 suitably formed with radial slots 22. Arranged for free axial reciprocation within the valve element 18 is a valve body 23 having a large external flange 24 on one end and a smaller external flange 25 on its other end. As best shown in FIG. 3, when the valve body 23 is in a lowermost position as shown in FIG. 3, atmospheric air is free to enter into the chamber 14 so as to hold the chamber wall extended. Now, when the hard shell 11 receives an impact, it is urged toward the helmet 12 thus tending to collapse the chamber. However, rapid collapse is prevented and instead high resistance is offered against such collapse by the movement of the valve body 18 axially in an outward direction so as to carry its large flange 24 tightly against the radially slotted flange 21 thus closing the radial slots and restricting the escape of air through the small axial passage 26 in the valve body. Accordingly, when impact is applied to one or more of the chambers 14, the impact is instantly partially absorbed by the chambers impacted with any other surrounding impact force being distributed against adjacent chambers. Thus, it is evident that the fluid chambers 14 absorb, distribute and dissipate the impact shock and prevent its full force from impinging upon the helmet 12 and thus onto the skull.

In the FIG. 6 to 8 modification, the same principle of impact absorption is effected. Here the protective covering is comprised of inner and outer hard shells 31, 32 respectively, having a space 33 therebetween.

The inner shell is provided with a multitude of spaced apart openings 34 in each of which is mounted a resiliently collapsible chamber or cushion 35. These chambers are, like the chamber described hereinbefore, fabricated from elastic material, such as rubber or a suitable plastic, and each is formed with a tubular neck 36 having an axial passage 37 therethrough, and terminating in an outwardly flared mouth 38. The neck is inserted through one of the openings 34 and is prevented from inadvertent withdrawal by an external flange 39 that engages over the outer surface of the inner shell 31. Outwardly of the external flange 39 is a pair of radial apertures 41, which communicate with the axial passage 37 and with the space 33 between shells 31, 32.

This construction is such that under normal conditions the space 33 and chambers 35 contain air or other fluid, which is admitted initially through a valve 42 and pressurized. Now, when the outer shell 32 is subjected to a hard impact, it is driven toward the inner shell 31 and in so doing contacts the flared mouth 38 of the related chamber neck thus sealing the axial passage. Both shells 31-32 move inwardly toward the helmet 12 causing pressure to be applied to the impacted chamber 35. Because the passage mouth 38 is closed, the highly pressurized air in the impacted chamber 35 will escape slowly through the radial apertures 41 into the space 33

where the increased pressure is equalized between the space and non-impacted chambers 35. Thus the impact force is distributed over a large area of the covering and is thereby prevented from having its full force impinge directly upon the helmet 12 and thus onto the skull.

Although I have described preferred embodiments of the invention, in considerable detail, it will be understood that the description thereof is intended to be illustrative, rather than restrictive, as details of the structures may be modified or changed without departing from the spirit or scope of the invention. Accordingly, I do not desire to be restricted to the exact construction shown and described.

I claim:

1. In a protective headgear adapted to fit over a hard shell football helmet, said assembly comprising a substantially rigid shell shaped to fit over the standard football helmet and of a size to be spaced away from said helmet, spaced apart resilient cushions attached to and arranged over substantially the entire inner surface of said shell, and a neck on each resilient cushion each engageable in an aperture in the shell for retaining said cushions in place, said cushions having substantial contact with said helmet and being adapted to partially or wholly collapse when the shell is subjected to severe impact.

2. In the protective headgear assembly recited in claim 1, in which each resilient cushion comprises a fluid filled chamber.

3. In the protective headgear assembly recited in claim 2, in which valve means is provided in each chamber.

4. In the protective headgear assembly recited in claim 3, in which the valve means is comprised of a reciprocable element movable into full open and partially closed positions.

5. In the protective headgear assembly recited in claim 1, in which the neck includes valve means.

6. In the protective headgear assembly recited in claim 1, wherein the assembly includes an outer substantially rigid shell overlying and connected to but spaced from the rigid shell.

7. In the protective headgear assembly recited in claim 6, wherein each cushion comprises a hollow chamber opening into the space between the inner and outer shells.

8. In the protective headgear assembly recited in claim 7, wherein the outer shell substantially closes the opening into said space when the outer shell is subjected to substantial impact.

9. In the protective headgear assembly recited in claim 6, wherein each cushion comprises a hollow chamber having valve means opening into the space between said shells, said valve means including a normally open large fluid intake opening and a small fluid outlet opening and wherein the outer shell closes the fluid intake opening when said outer shell is subjected to substantial impact so as to retard the collapse of the chamber.

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