United States Patent [19]

Larcher

[11] **3,787,893**

[45] **Jan. 29, 1974**

[54] **PROTECTIVE HEADGEAR**

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[22] Filed: **May 4, 1972**

[21] Appl. No.: **250,173**

[52] **U.S. Cl.** ..... **2/3 R,** 2/187, 2/DIG. 3

[51] **Int. Cl.** **A42b 3/00**

[58] **Field of Search** ..... 2/3, 5, 6, 205, 187, DIG. 3

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Primary Examiner—James R. Boler

[57] **ABSTRACT**

Protective headgear including a hard shell and a plurality of inflated fluid chambers on the outside surface of said shell. Fluid delivery means is connected to each chamber and valve means in said chambers prevents reverse flow of fluid.

2 Claims, 4 Drawing Figures

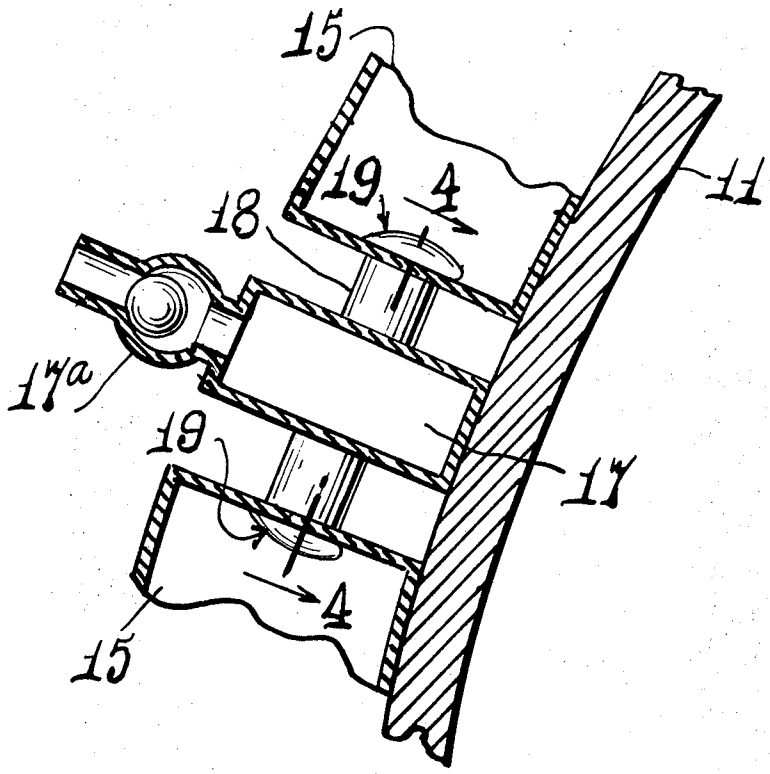


Fig. 1.

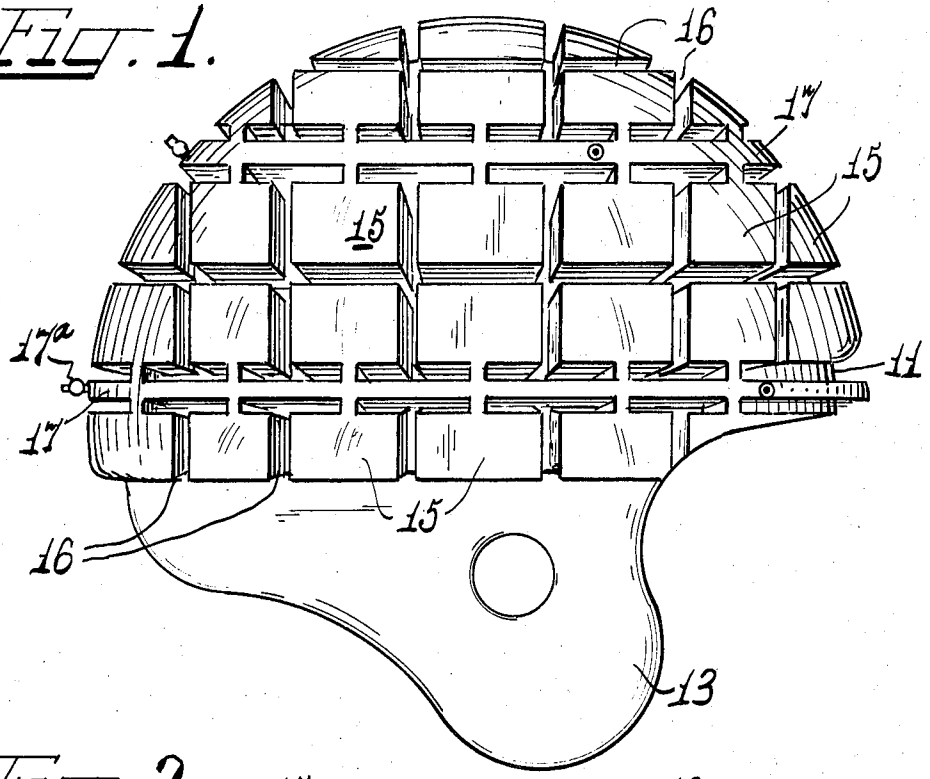


Fig. 2.

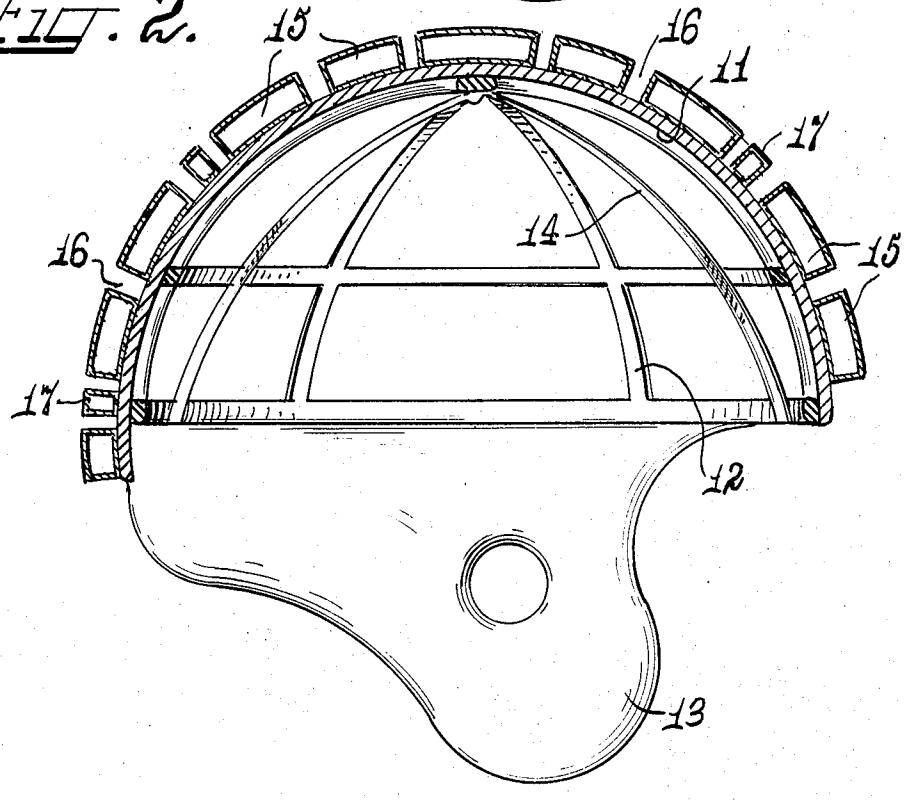


Fig. 3.

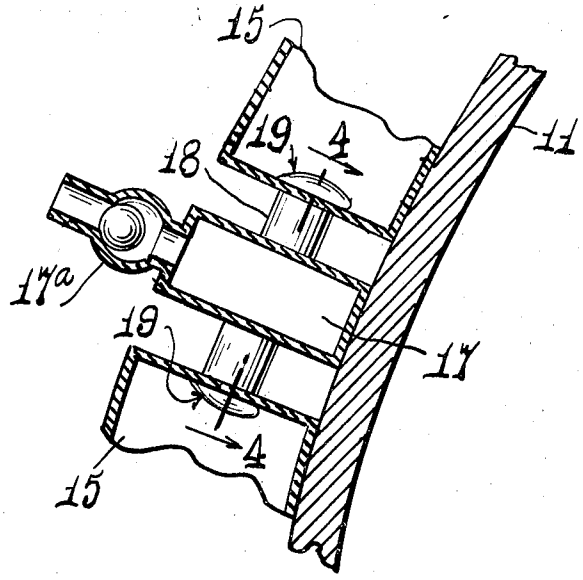
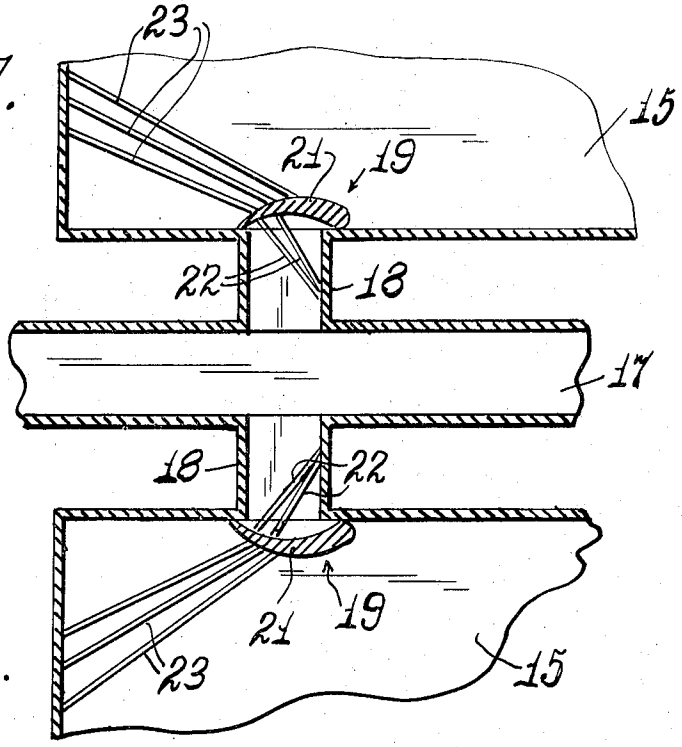


Fig. 4.



PROTECTIVE HEADGEAR

The invention relates to improvements in protective headgear, such as helmets for athletic participants, particularly football players. The construction comprises means for directly receiving impact forces and for dissipating, dispersing and absorbing the forces to thereby materially reduce the adverse effects of the impact.

Many types of helmets have been designed in the expectation of absorbing impact energy but, to applicant's knowledge, not one known type of helmet is capable of effectively absorbing, dissipating or dispensing the impact force prior to its reaching the conventional hard exterior shell of the helmet. In most instances, the force of impact could result in serious head injuries.

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-on with another player. Two players colliding head-on may develop a force equal to hitting a concrete wall at 20 miles per hour 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 the impact, momentum of the blow throws the brain forcibly against the skull opposite the point of impact. A blow on 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 boney 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, extra dural hemorrhaging, and sub-dural hematomas, involving veins and arteries rupturing in sub-dural spaces.

In the present disclosure there is provided, on the outside surface of the hard shell of the helmet, a multiplicity of chambers that are inflated with air or perhaps helium. These chambers absorb, dissipate, and dispense most of the shock of impact before it reaches the hard shell. Thus the absorption or dispersion of immediate shock waves exteriorly of the hard shell 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 percent of fatalities arising in football head injuries.

Such exterior 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 this invention to provide a headgear of novel construction.

Another object is to provide a helmet construction which includes a multiplicity of air chambers critically arranged on the exterior of the hard shell of the helmet.

Another object is to provide impact resisting air chambers with valves of novel construction.

Another object is to provide novel air-flow connections between adjacent air chambers, each having valve means therein.

Another object is to provide a headgear 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 drawing.

IN THE DRAWINGS:

FIG. 1 is a side elevational view of a protective headgear embodying the features of this invention.

FIG. 2 is a central sectional view thereof.

FIG. 3 is an enlarged detail sectional view of some of the inflatable air chambers.

FIG. 4 is an enlarged detail sectional view taken substantially on line 4—4 of FIG. 3, illustrating the valve assembly between the lead-in tube and adjacent inflated chambers.

Referring now to the exemplary disclosure of the invention as shown in the accompanying drawings, the protective headgear assembly includes a hard shell **11** shaped to fit over a human head having arranged therein a padded cage-like liner **12** and its depending temporal members **13.** Inner support straps **14** may also be provided.

The hard shell **11** has a plurality of inflatable sacks or chambers **15** mounted on its exterior surface, each substantially square in outline and of considerable depth. These are fabricated from elastic material such as rubber or a suitable plastic, and the chambers **15** are spaced one from the other as by spaces **16.** The chambers further are interconnected, preferably in groups, with a related filling tube **17** that is connected to each related chamber by a conduit **18,** all also of elastic material. Each tube has a valved filling inlet **17***a*.

In order to prevent collapse of all interconnected chambers, should one or more of said chambers be ruptured upon impact, each chamber includes a flap valve **19** located at the inlet end of its connecting conduit **18.**

As best shown in FIG. **4,** each of these flap valves **19** includes a flap **21** of relatively stiff material which over-

lies the conduit opening and has its peripheral edge seated on the inside surface of the related chamber wall. In order to retain the valve flap **21** in closed condition one or more elastic cords **22** connect said flap to the wall of the conduit **18**, and its displacement, upon being opened during the inflow of air, is prevented by a series of guide lines **23** which are connected at one end to the flap **21** and at their other end to the chamber wall. It should be evident that when air is delivered to the chambers to inflate them, the flap valves will open whereas, after filling, the chambers will remain sealed. Obviously, if desired other suitable valve means may be provided.

The chambers **15** react instantly to absorb the energy force upon impact. When the impact is applied to one of the cushion chambers, the impact is instantly partially absorbed by the chamber impacted with any other surrounding pressure force being distributed against adjacent chambers. One important advantage of the exterior arrangement of the cushioning chambers is that they absorb, distribute and dissipate the impact shock and prevent its full force from impinging

upon the hard shell and thus onto the skull.

Although I have described a preferred embodiment 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 structure 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 assembly, a relatively rigid shell shaped to fit over a human head, spaced apart resilient cushions attached to and arranged over substantially the entire outer surface of said shell for protection against severe impact, said cushions comprising fluid filled chambers, a plurality of filling tubes interconnecting said chambers in groups and valve means provided between each chamber and its related filling tube.

2. The assembly recited in claim **1**, in which said valve means comprises check valves.

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