United States Patent [19]

Rappleyea

[11] **3,729,744**

[45] **May 1, 1973**

[54] **PROTECTIVE HELMET FOR FOOTBALL OR THE LIKE**

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[22] Filed: **Apr. 1, 1971**

[21] Appl. No.: **130,308**

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

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

[58] **Field of Search** 2/3, 6, 181.4, 182.1, 2/182.2, 183, 197

[56] **References Cited**

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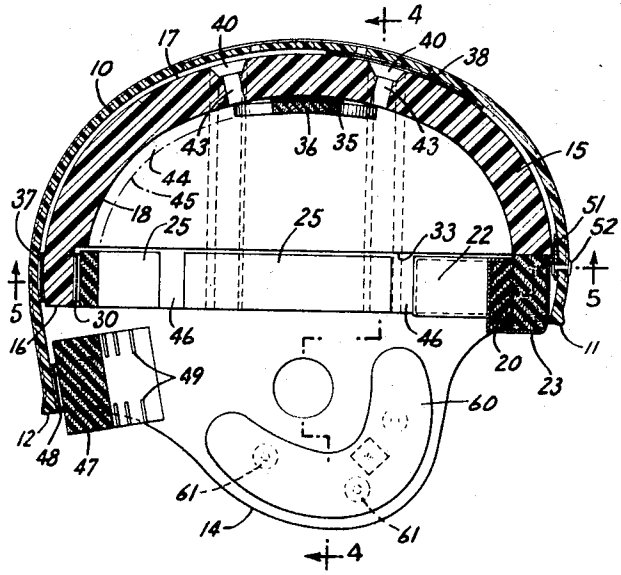
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[57] **ABSTRACT**

A protective helmet having an outer durable shell and an inner replaceable liner of expanded, closed cell, plastic material of a type which is capable of absorbing energy by taking a permanent set. The liner is fitted about its inner periphery, with spaced sizer pads of foam rubber or the like, the sizer pads being removably secured by pairs of fabric fastening strips having surfaces formed with hooks and loops respectively. An insert of foam rubber or the like is provided at the front edge of the liner and extending slightly below the edge of the shell to protect the bridge of the nose as well as the forehead. The liner is moreover provided with grooves encircling the liner in a vertical direction, and the liner and shell both have perforations which communicate with the grooves for ventilating the space between the head of the wearer and the liner as well as between the liner and the shell. A neck piece in the form of a pad of resilient foam rubber or the like is removably secured inside the rear edge of the shell and extending below the level thereof in a position to bear against the neck of the wearer.

12 Claims, 6 Drawing Figures



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FIG. 1

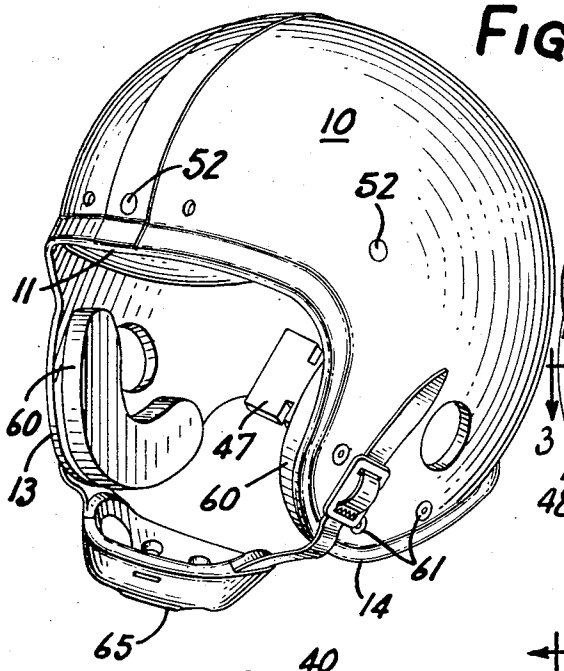


FIG. 2

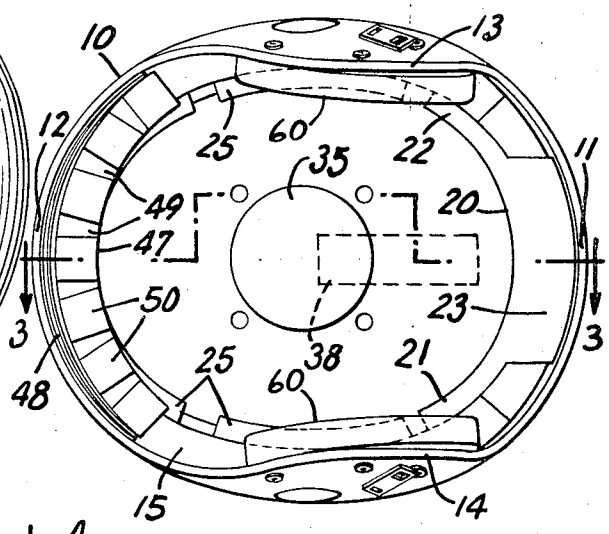
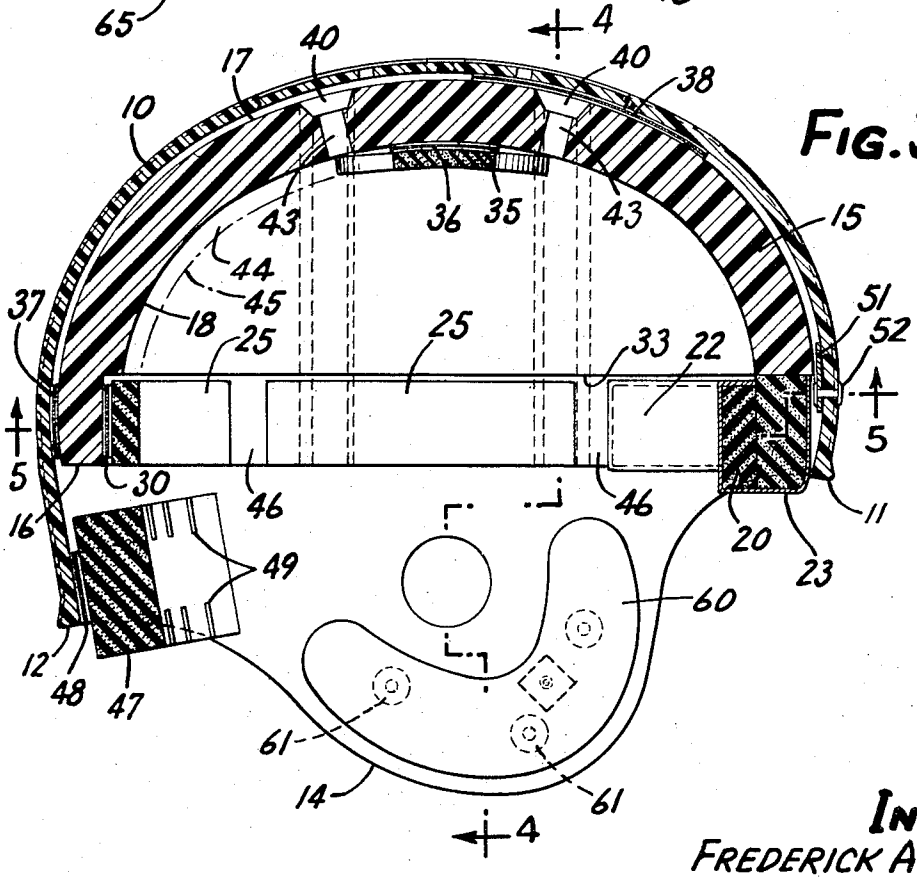


FIG. 3



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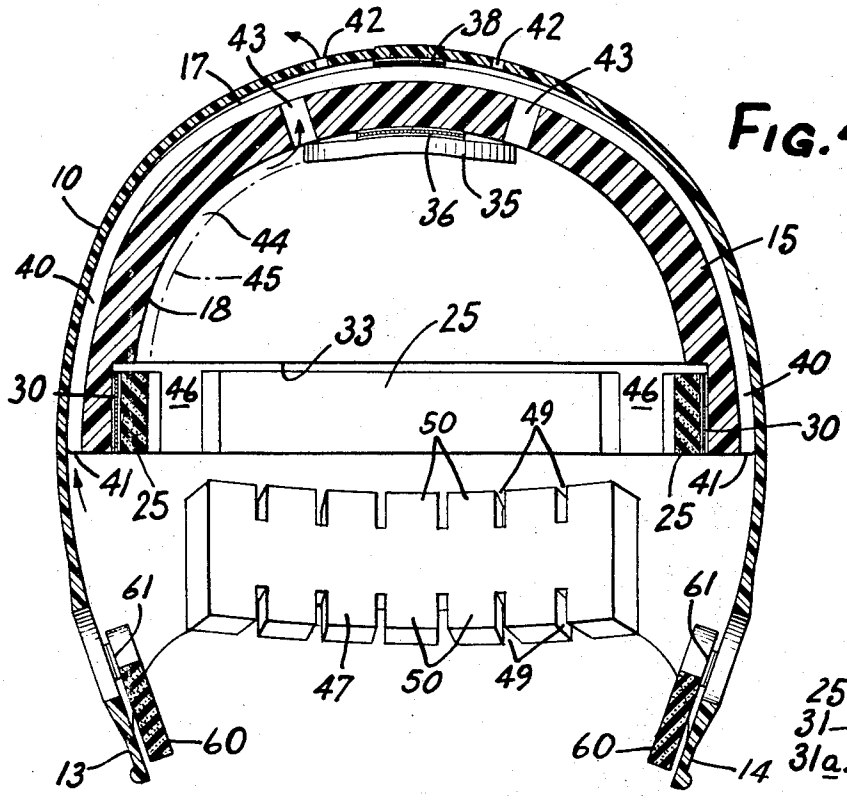


FIG. 4

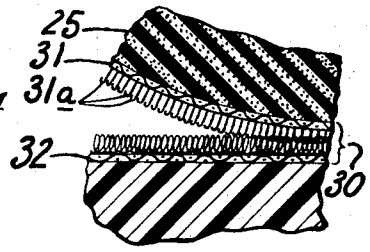


FIG. 3a

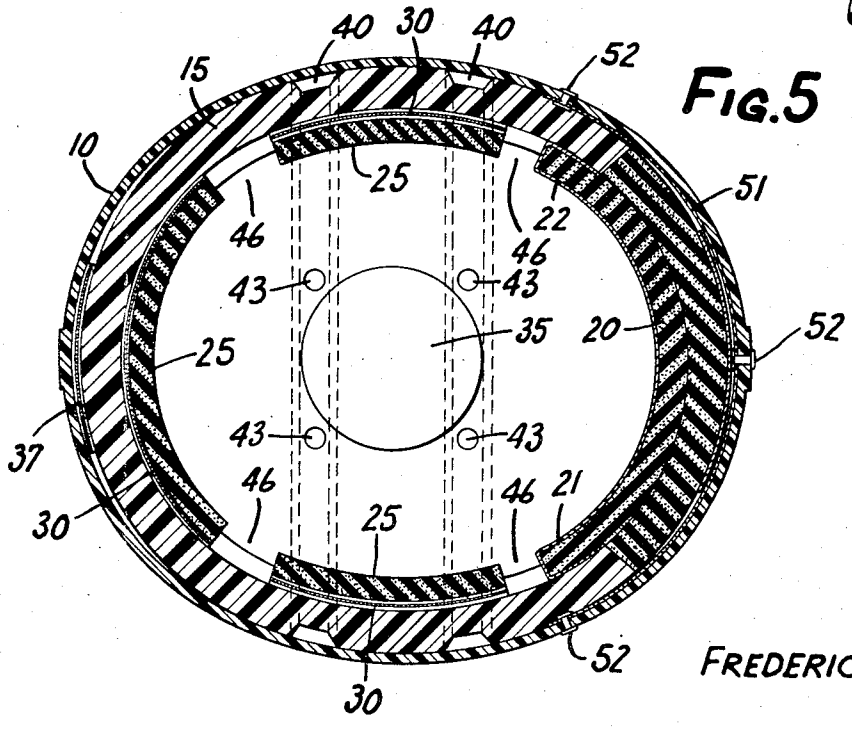


FIG. 5

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PROTECTIVE HELMET FOR FOOTBALL OR THE LIKE

It is an object of the present invention to provide a protective helmet for football or the like which offers a high degree of protection against all types of impact, which is cool and comfortable to wear even in the most strenuous play, and which may be quickly and easily adjusted to conform to the size and shape of the head of the wearer, either for optimum comfort or to adapt the helmet to a player having a different head size or contour. It is a more specific object to provide a helmet which makes unique use of fabric fastening strips having hook-and-loop engagement giving secure retention even in the face of repeated usage or adjustment.

Other objects and advantages of the invention will become apparent upon reading the attached detailed description and upon reference to the drawings in which:

FIG. **1** is a general external view of a helmet constructed in accordance with the present invention.

FIG. **2** shows a helmet of FIG. **1** as viewed from the bottom.

FIG. **3** is a vertical section looking along the line **3—3** in FIG. **2**.

FIG. **3***a* is an enlarged fragmentary section illustrating the structure of the adherent surfaces and the nature of the gripping action.

FIG. **4** is a transverse section looking along the line **4—4** in FIG. **3**.

FIG. **5** is a horizontal section looking along the line **5—5** in FIG. **3**.

While the invention has been described in connection with a preferred embodiment, it will be understood that I do not intend to be limited to the particular embodiment shown but intend, on the contrary, to cover the various alternative and equivalent constructions included within the spirit and scope of the appended claims.

Turning now to the drawings there is shown at **10** the outer shell of a football helmet having a front edge **11** and a rear edge **12** as well as ear-covering side portions **13**, **14**. Recessed in the shell is a liner **15** of slightly elongated but generally hemispherical shape having a lower edge **16**, an outer curved surface **17** which conforms to the inside surface of the shell, and an inner surface **18**.

The shell is preferably made of acrylonitrile-butadiene-styrene, a material having a high impact resistance combined with light weight, and the liner **15** is preferably made of expanded polystyrene pellets or beads to form an extremely light weight foamed construction formed of closed cells having the characteristic of acquiring a permanent set when locally stressed, thereby to absorb the energy of a severe blow. For a discussion of the energy absorbing characteristics of such material reference is made to prior U.S. Pat. No. 2,625,683 which is directed toward an insert per se and not to the combination which forms the present invention. The liner preferably is die-molded of slightly oval shape in a thickness which substantially exceeds the thickness of the shell and which may be thicker, if desired, at the front than at the back.

For the purpose of accommodating the liner **15** to the size and shape of the head of the wearer while obtaining an extra degree of resilient protection at the forehead region, an insert of foam rubber or the like is

provided at the front of the liner cooperating with peripherally spaced sizer pads in the form of a series of rectangular strips of foam rubber or the like removably secured within the lower edge of the liner. Referring to the drawings, the forehead pad, or insert **20**, extends across the front of the liner and, to provide maximum resilience, it preferably occupies a portion, or all, of the thickness dimension of the liner. To secure the insert in place it is preferably fitted with integral wings **21**, **22** which extend laterally outwardly from the center line and overlie the interior surface of the liner as shown in FIG. **2**. The insert may either be cemented in place with tacky adhesive or removably secured in the same fashion as the other removable elements to be described. The insert is covered with a layer **23** of porous "sweat band" material to improve comfort particularly under warm playing conditions. The insert **20** may, if desired, be applied to the inside surface of the liner.

The peripheral sizer pads, indicated at **25**, are in the form of strips of foam rubber of uniform cross section spaced along the inner periphery. To secure the strips **25** in place within the liner a pair of mutually adherent and mutually releasable fabric fastening strips are used, the backs of the strips being cemented respectively to the inside surface of the liner and the surface of the resilient sizer pad. Thus, referring to FIG. **3***a*, a pair of fabric strips **30** includes a first strip **31** having an overall covering of small, resilient plastic hooks **31a** and a second strip **32** which has a felt-like layer of looped fibers. Such strips, which are commercially sold under the trade name, VELCRO, are disclosed in prior U.S. Pat. Nos. 2,717,437, 3,009,235, 3,083,737 and 3,154,837. The action is such that when the hooked layer **31** is pressed into the felted layer **32**, which presents numerous loops, the hooks tend to become embedded and caught in the loops so that the two layers adhere tightly to one another. Nevertheless, by grasping one edge of a pad **25** and curling it upwardly, the pad, and the fabric layer **31**, may be readily disengaged with the flexible hooks straightening temporarily to release the loops in the face of the applied force. Tests show that the pads **25** may thus be applied and removed many hundreds or thousands of times without deterioration of the hooked and looped surfaces.

For the purpose of more easily applying the pads **25** and to accommodate a greater resilient thickness of the pad material, the liner has, along its edge, an internal recess **33** of constant width and of a radial depth which is less than the minimum thickness of the pads. The pads **25** are supplied in different thicknesses in graded increments of one sixteenth inch so that a given helmet may be quickly adjusted to head size, even on the field, by replacing one or more of the pads **25** with others of slightly greater or lesser thickness. Since, practically speaking, one's head is not perfectly oval, strips of different thickness may be used in different positions. Moreover, the helmet may be fitted in the vertical direction by providing a crown sizer pad **35**, for example, of circular shape, the central portion of which is secured to the top inside surface of the liner by a pair of fabric fastening strips **36** similar to the strips **30** previously discussed. The crown sizer pad **35**, made of resilient foam rubber or the like, is also provided in graded thickness so that the helmet may be caused to

stand comfortably clear of the scalp to the exact amount desired by the player.

For the purpose of preventing the liner from sliding movement with respect to the shell, the liner may be secured to the shell by means of a first pair of mutually adherent and mutually releaseable strips **37** interposed between the liner and the shell at the back of the helmet and a second pair of strips interposed between the liner and the shell in top position as shown at **38** in FIGS. **2** and **3**. Prevention of relative slippage between liner and shell is important since it is desirable to maintain the cushion **20** at the forward portion of the helmet in a relative downwardly jutting position, as shown in FIG. **3** in readiness to protect the bridge of the nose in the event that the helmet is bodily rocked in a forward direction on the head of the wearer. While anchoring strips of the hook-and-loop type offer great resistance against relative slippage of shell and liner, the liner may, nevertheless, be easily "peeled" from position within the shell. Thus, where the liner has become deformed, or taken a "set," because of a particularly hard blow, it may be removed and a new liner having pre-attached "loop" strips may be simply slipped into place.

In accordance with one of the features of the present invention the liner is provided, on its outside surface, with continuous vertically extending grooves which provide channels for passage of ventilating air between the liner and the shell, the grooves communicating with perforations in the shell. By "continuous" is meant that the grooves provide a continuous path of air flow from inlet to outlet. Moreover, perforations are provided in the crown of the liner so that the space between the head of the wearer and the inside surface of the liner is continuously vented. Thus, referring particularly to FIGS. **4** and **5**, vertically extending grooves **40** are integrally molded in the liner defining inlet openings **41** at the lower edge of the liner and communicating with registering vent openings **42**. Openings **43** perforating the crown portion of the liner permit escape of air from the region **44**, the profile of the head of the wearer being indicated by the dot-outline **45**. Air is admitted to the space **44** by reason of the gaps **46** between the ends of the sizer pads **25**. To summarize, the helmet is doubly vented, with air flow passages being provided both on the outside surface and on the inside surface of the liner for common venting through vent holes at the top of the shell.

For the purpose of cushioning the helmet with respect to the neck of the wearer, a neck piece is provided in the form of a rectangular block of foam rubber or the like secured to the shell of the helmet below the level of the liner by a pair of mutually adherent and mutually releasable fabric fastening strips, the region around the neck piece being unobstructed so that the neck piece may be moved either upwardly or downwardly to provide maximum comfort to the wearer. Thus, referring to FIGS. **3** and **4**, the neck piece, indicated at **40**, is attached by a pair of adherent but releasable fabric strips **41** which are the same as the pair of strips **30** detailed in FIG. **3***a*, one of the pair being cemented to the shell and the other being cemented to the neck piece. To permit the neck piece, which is in thick section, to be bent into a curve for seating on the shell without any wrinkling or buckling and to soften the edge thereof engaging the neck of the wearer, it is formed with through-notches **42** which extend all the way through the thickness and which separate the material of the neck piece into resiliently cantilevered tabs **43**. Here again, the great resistance provided by the hook-and-loop attachment to relative sliding movement insures that the neck piece will stay in place, projecting downwardly below the rear edge of the shell, while nevertheless permitting easy replacement or position adjustment. Replacement units are of graded thickness.

The spherical portion of the shell is inherently strong. To permit the advantages of thin section and light weight all the way out to the forward edge, it is one of the features of the construction that the forward edge is reinforced by a thin but strong horizontal strip of metal which follows the contour of the front of the shell and which is secured to the shell by riveting. Thus, referring to FIGS. **3** and **5**, a strip **51** is provided just ahead of the front pad **20** and held in place by rivets **52** which may, for example, be three in number.

To complete the helmet assembly, the ear-protecting portions **13**, **14** are fitted with foam rubber jaw pads **60** of crescent shape which are secured in place by snap fasteners **61**, or the like. Such jaw pads are also provided in a range of thickness so that a new pair may be snapped in to meet the requirements of the wearer and to adapt the helmet to the requirements of different individuals. Finally, an adjustable chin strap **65** is provided having provision for snapping the ends on the outer surface of portions **13**, **14** of the helmet.

Experience shows that the particular combination of features embodied in the present helmet design meets the conflicting requirements of safety and comfort plus easy replacement or adjustment of the resilient sizer pads and neck piece. A particularly high level of protection is provided in the forehead area and there is no possibility of injuring the bridge of the nose, or the back of the neck, by rotational impact against the helmet during the course of rough play. In the event that the liner acquires a permanent set because of an unusually hard blow, it is a simple matter to strip out the whole liner and replace it with a new one. Proper fit of a helmet after such replacement is assured since the sizer pads and neck liner may be put back in the same position with all fit dimensions being preserved. The helmet is highly economical since a wide variety of helmet sizes and shapes is not required. Any player can be easily and quickly fitted using a standard shell, a standard liner, and a kit of sizer pads of different thicknesses.

In spite of the unique combination of advantages provided by the present helmet construction, it may be economically manufactured for sale at a price no greater than conventional helmets and economically serviced by addition of inexpensive liner and sizer pads whenever replacement or adjustment of these wear elements becomes necessary.

The term "foam rubber" as used herein includes any foamed material having the resilient characteristics generally associated with rubber, with either open or closed cells, and, if desired, with an outer coating of flexible vinyl plastic.

The term "mutually adherent and mutually releasable fabric fastening strips," while particularly applica-

ble to hook-and-loop engagement, is not intended to be limited thereto and includes any flexible anchoring material which provides a tight, non-slip joint and which permits repeated attachment and disengagement for adjusting to the size and comfort requirements of the wearer.

While the helmet construction has particular application to football, it is by no means limited thereto and helmets of the claimed design may be advantageously used by others in games involving bodily contact or potential hazard, such as skiing, or by workers in the construction field, by racing drivers or, indeed, wherever insurance is desired against injury by a blow to the head.

I claim as my invention:

1. In a protective helmet for activities such as football, the combination comprising a thin outer shell of relatively hard durable material, a relatively thick inner liner of slightly elongated hemispherical shape made of expanded plastic foam of the closed cell type having the capability of taking a permanent set accompanied by absorption of energy of impact upon application of a severe blow to the outer shell, means for securing said inner liner within the outer shell against relative slippage but removable therefrom, said liner having an insert of foam rubber inside its front edge and extending to the region of the front edge of the shell for cushioning the forehead of the wearer, said liner having peripheral sizer pads in the form of resilient strips of foam rubber or the like spaced from one another end to end about its inside edge for conforming to the size and shape of the head of the wearer, pairs of mutually adherent mutually releasable fabric fastening strips interposed between and respectively secured to the strips of foam rubber and the liner for ready replacement of the resilient strips by ones of different thickness thereby to adjust to a desired head size and shape.

2. The combination as claimed in claim 1 in which the liner has a crown sizer pad of foam rubber for engaging the top of the head of the wearer and which, with the sizer pads, defines an air space between the head of the wearer and the liner.

3. The combination as claimed in claim 1 in which one strip of each pair of fabric strips is surfaced with resilient hooking elements while the other strip is surfaced with a layer providing loops engageable by the hooks.

4. The combination as claimed in claim 1 in which the liner has a recess of constant width along its inner edge for registered reception of the peripheral sizer pads, the recess being shallower than the thickness of the pads and the pads being spaced end to end to provide air access openings.

5. The combination as claimed in claim 1 in which pairs of mutually coherent and mutually releasable fabric fastening strips providing hook-and-loop engagement are provided between the shell and liner.

6. The combination as claimed in claim 1 in which the rear portion of the shell extends downwardly beyond the liner and in which the rear portion of the shell has secured to its inside surface a resilient neckpiece in the form of a rectangular block of foam rubber or the like, a pair of mutually adherent and mutually releasable fabric fastening strips interposed between the neck piece and the shell for retaining the neck piece in place.

7. The combination as claimed in claim 6 in which the neck piece has through-notches formed in its upper and lower edges to facilitate conforming to the curvature of the shell free of wrinkling and to provide a softer surface for resting against the neck of the wearer.

8. The combination as claimed in claim 1 in which the insert substantially occupies the thickness dimension of the liner and extends slightly below the level of the front edge of the shell to provide a resilient surface for engaging the bridge of the nose of the wearer in the event that the helmet is rocked forwardly about the head of the wearer as result of forwardly directed force.

9. In a protective helmet for activities such as football, the combination comprising a thin outer shell of relatively hard durable material, a conforming inner liner of generally hemispherical shape made of material having the physical characteristics associated with expanded polystyrene, said inner liner having means for fastening within the shell in such manner as to prevent relative slippage between the two, said liner having sizer pads in the form of resilient strips of foam rubber peripherally extending along its inner edge, and means including mutually adherent and mutually releasable fabric fastening strips interposed between the resilient strips of foam rubber and the liner for permitting easy removability and replacement of the foam rubber sizer strips for changing the head size, said resilient strips being longitudinally spaced end-to-end in oval configuration at the front, back and sides of the liner for independent adjustment to the length and width of the head of the wearer, the liner having a peripheral recess along its inside edge of a relatively constant width which corresponds to the width of the foam rubber pads for registered reception of the pads and in which the pads have a thickness greater than the depth of the recess for spacing the liner away from the head of the wearer.

10. The combination as claimed in claim 1 in which the liner has continuous vertically extending grooves to define air conducting channels between the liner and the shell when the liner is in inserted position and in which both the liner and the shell have perforations at the top communicating with the grooves for venting of the air space between the head of the wearer and the liner and between the liner and the shell.

11. The combination as claimed in claim 1 in which the shell has a reinforcement in the form of a strip of metal extending horizontally along the forward portion of the shell adjacent the edge thereof and opposite the foam rubber insert.

12. The combination as claimed in claim 1 in which the foam rubber insert has a thickness which is greater than the thickness of the liner at the forward portion of the insert and is provided with integral extensions for overlying the adjacent portions of the liner for securing of the insert in place.

* * * * *