

[54] **PROTECTIVE HEADGEAR**
[76] Inventors: **Michael T. Marietta; Charles W. Marietta**, both of 5538 University Blvd., Dallas, Tex. 75209
[22] Filed: **Mar. 19, 1973**
[21] Appl. No.: **342,440**
[52] **U.S. Cl.**..... **2/3 R**
[51] **Int. Cl.**..... **A42b 3/00**
[58] **Field of Search**..... **2/3 R, 3 A, 3 B, 3 C, 5, 2/6, 181.4, 2; 5/345; 297/458, 460, DIG. 1**

[56] **References Cited**
UNITED STATES PATENTS

2,619,639	12/1952	Hendler	2/6
2,634,415	4/1953	Turner et al.	2/3 R
3,248,738	5/1966	Morgan	2/3 R
3,273,180	9/1966	Feinerman	297/DIG. 1
3,289,212	12/1966	Morgan	2/181.4 X
3,447,162	7/1969	Aileo	2/3 R
3,471,865	10/1969	Molitoris	2/3 R

3,590,388	7/1971	Holt	2/3 R
3,605,113	9/1971	Marietta	2/3 R
3,673,609	7/1972	DeSimone	2/3 R

Primary Examiner—James R. Boler
Attorney, Agent, or Firm—Emory L. Groff; Emory L. Groff, Jr.

[57] **ABSTRACT**
A helmet includes a plurality of cushion pads specially constructed and arranged within a shell to provide head protection against impact forces as well as ready means for custom sizing of the one shell to fit various head sizes and configurations. Each pad comprises a cover containing an improved cushion filling of compound layers of discrete material while the rear of each pad is provided with manually separable fastening means for ready attachment to and removal from the shell interior. One or more of the pads may be varied in thickness by the selective insertion/removal of shims within the cover.

13 Claims, 11 Drawing Figures

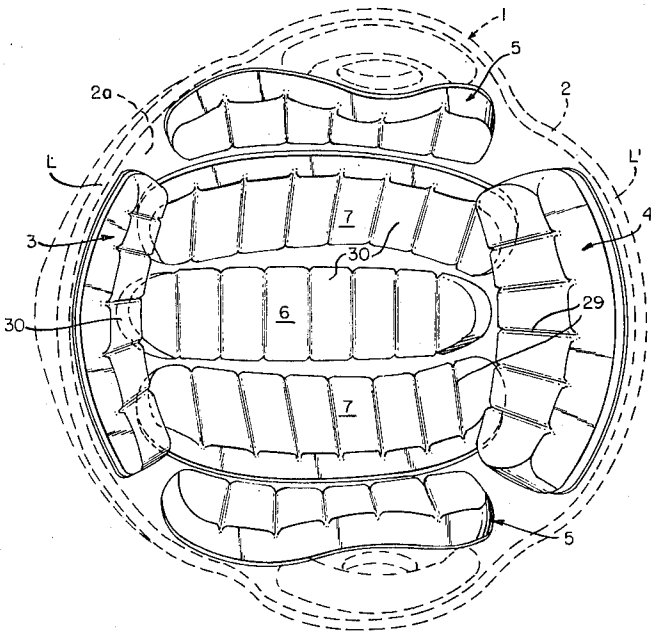


FIG. 1.

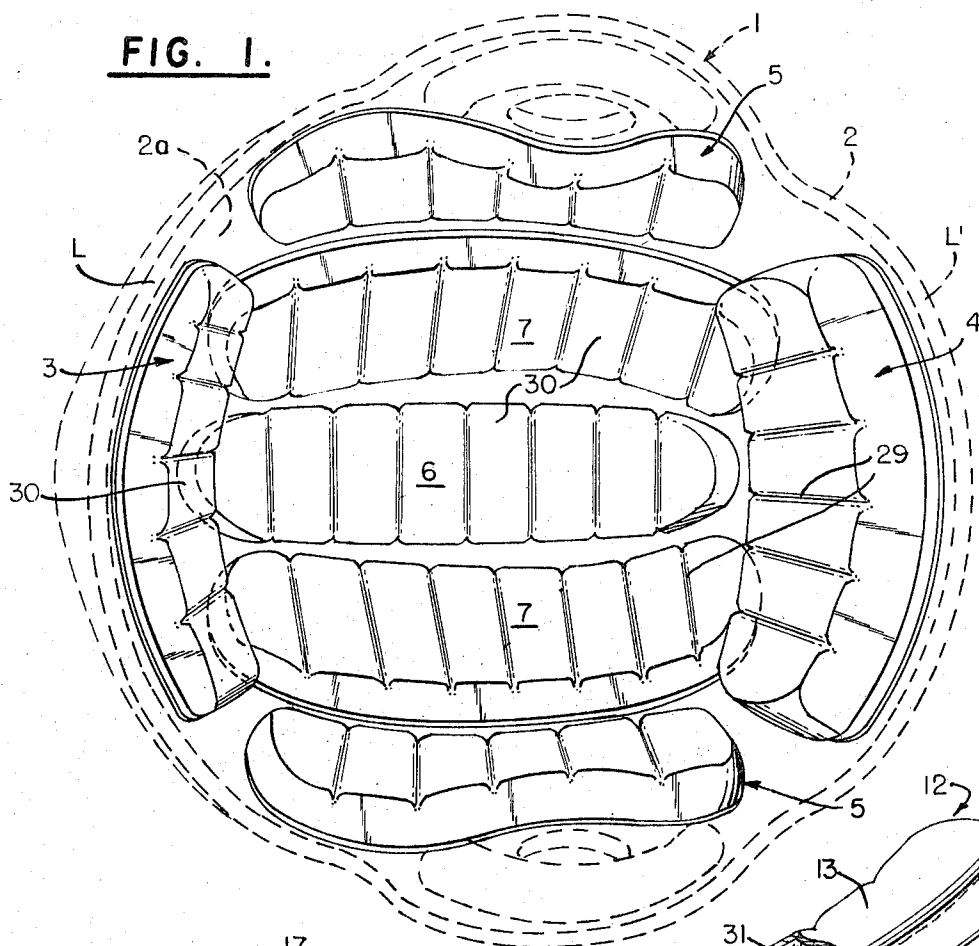


FIG. 2.

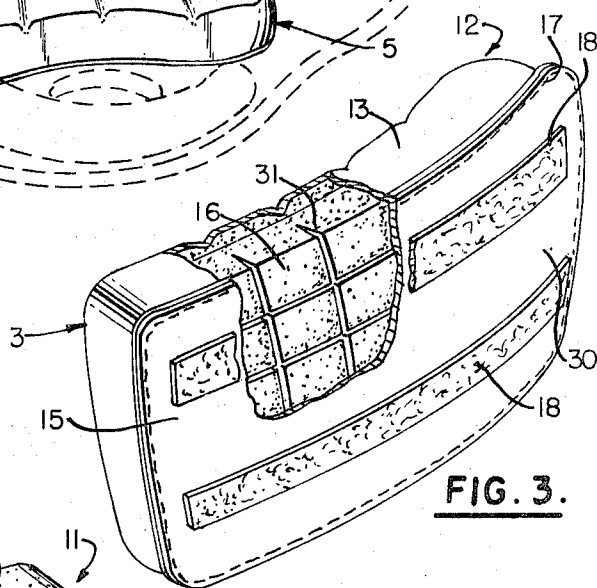
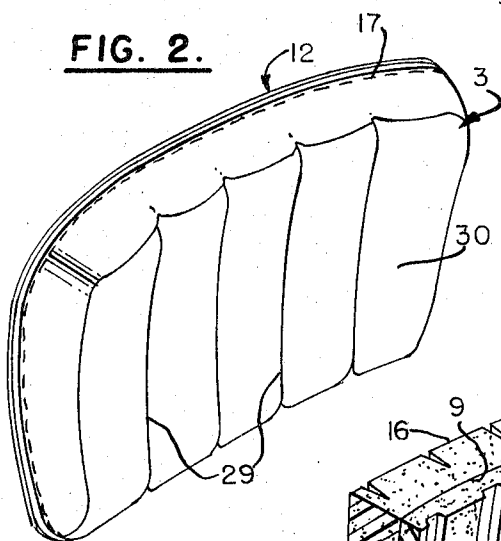


FIG. 3.

FIG. 4.

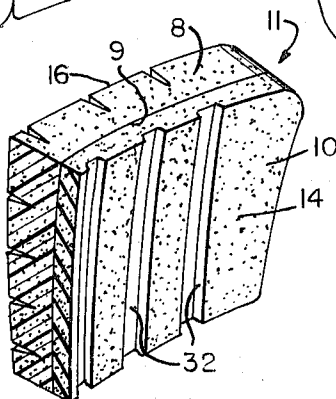
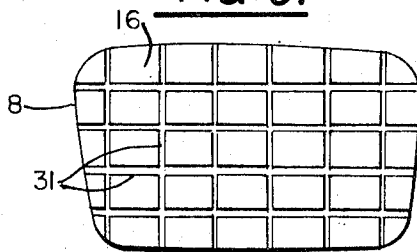


FIG. 5.



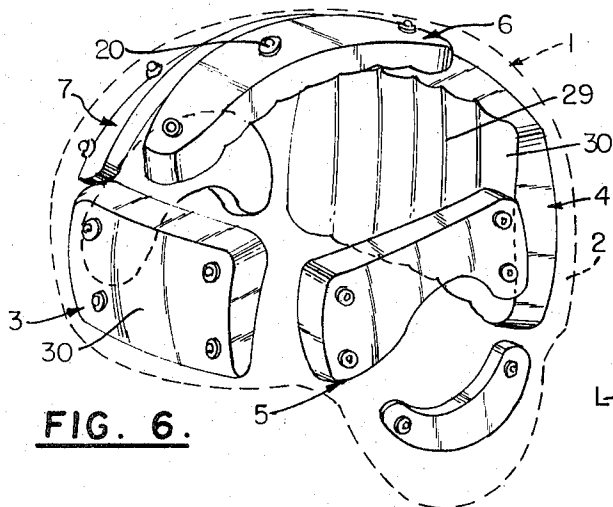


FIG. 6.

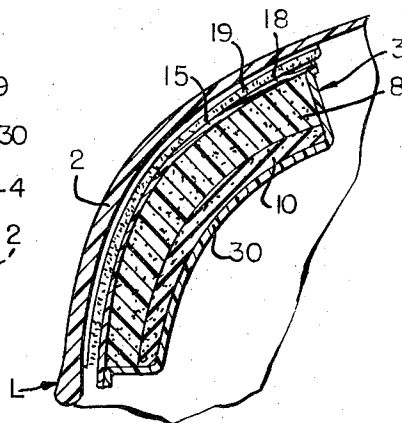


FIG. 7.

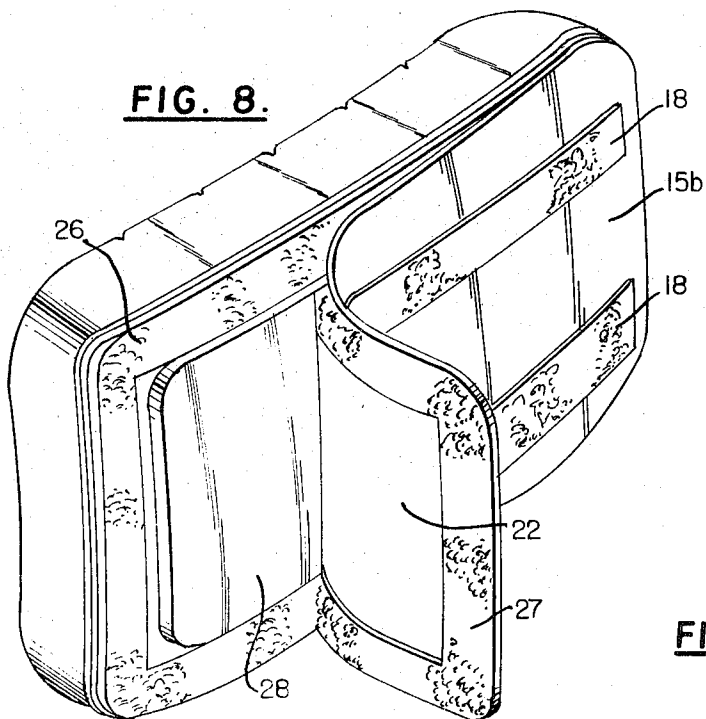


FIG. 8.

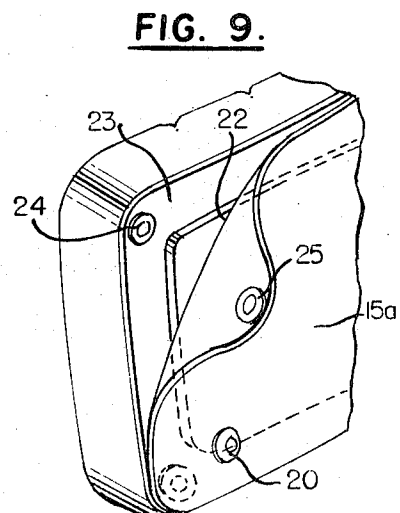


FIG. 9.

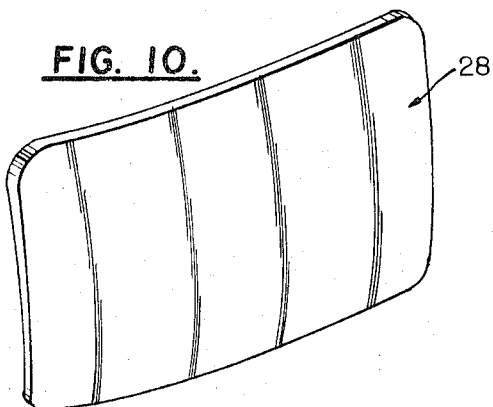


FIG. 10.

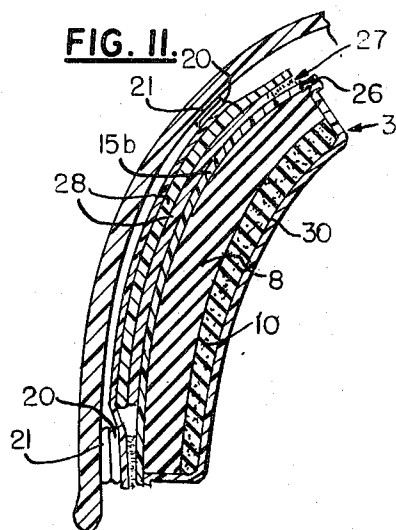


FIG. 11.

PROTECTIVE HEADGEAR

This invention relates generally to headgear and more particularly to an improved protective helmet offering not only the most desirable cushioning effect from the standpoint of the wearer's safety, but also providing for ready adaptability of any particular helmet to one individual's head size.

Medical studies have shown that concussions of the human brain begin to occur when the brain is subjected to a shock force of 200 Gs for a period of as little as four milliseconds. Increased attention has been directed recently to the safety aspect of contact sports and several efforts have been made to improve the construction of helmets as worn in these sports by offering various adaptations of cushioning assemblies for use in the helmet shell. Those versed in the art are well aware of the numerous forms of strap suspension systems, with or without pads or cushions, as well as other arrangements involving only pads or cushions. Additionally, several attempts have been made to achieve the ultimate in protection for the wearer by the provision of sealed fluid cells which may contain regulated amounts of air or liquid.

In practically all of the previous attempts, the resultant headgear will fail to pass one accepted test now being used to evaluate helmets and which comprises the use of a force-impact testing device wherein the test helmet is fitted to a magnesium head form of the average size and weight of the human head. This head form contains a force transducer which is connected to an oscilloscope. The thus equipped helmet is dead dropped from numerous heights upon a hard metal surface with various portions of the helmet shell being subjected to these drops. The time-acceleration curves read out on the oscilloscope indicate the G forces subjected to the head form and the objective is now to provide a suitable protective headgear wherein the head form always would be subjected to forces below 200 Gs for less than 4 milliseconds. One test now being utilized on various presently available helmets is called the 20 drop, 5 point test wherein a series of 20 drops are made at one-minute intervals from a height of 6 feet to each of the five key points of the helmet. Many other helmets recently tested in this manner showed a total breakdown of protective qualities in either the padding, suspension, or shell, and in most cases this breakdown occurred between the second and fifth drop. Applying the same test procedure to a helmet constructed according to the present invention, entirely satisfactory results have been obtained throughout the complete extent of all testing thus clearly indicating the superior impact protection as now proposed.

The improved protective cushioning offered by the plurality of pads employed in the present helmet has been produced without sacrificing adaptability of any one single helmet to various sizes and shapes of head forms. This is possible due to a unique construction of one or more of the seven pads used in each helmet wherein means are provided to permit not only complete exchange of sizes of any one of the pads for one helmet but also to allow individual variation of the overall thickness of one or more pads in a particular helmet. In either instance, it will be appreciated that this sizing procedure is practically instantaneous since snaps or Velcro fastening elements are preferably employed to provide a direct connection between the

back of each pad and the interior of the helmet shell.

By the present arrangement exact custom sizing of a helmet is achieved in a manner vastly superior to many prior structures. A prior attempt involves the use of a single unitary exchangeable head form cushion element adapted to provide a particular sizing when fastened within a helmet shell. Such structure falls short of providing for perfect sizing in view of variations between human head shapes considered to be of the same size, which size is based upon the circumferential measurement of the head. The instant structure, on the other hand, truly allows for custom sizing by providing for selective insertion into the helmet shell of separate cushion pads adjacent both ends of both the major longitudinal axis and minor lateral axis of the wearer's head. In this manner a perfect fit may be readily achieved regardless of whether the subject head is of a long oval configuration or is nearly circular in shape.

Accordingly, one of the primary objects of the present invention is to provide an improved protective headgear comprising a helmet shell including a plurality of cushion pads each one of which contains a combination of cushioning elements therein.

Another object of the present invention is to provide an improved helmet containing cushioning and sizing elements therein all of which are readily removable for replacement by other pads of varying thicknesses.

A further object of the present invention is to provide an improved protective cushioning pad for use in headgear comprising an outer cover containing therein a soft resilient member disposed next to the wearer's head and which is backed up by a thicker, higher-density layer of resilient material juxtaposed the interior of the helmet shell and wherein the high density layer is especially modified to permit contouring of the pad.

Another object of the present invention is to provide an improved helmet cushioning pad comprising a cover containing resilient cushion elements therein and having an accessible pocket for the selective insertion or removal of one or more shim members to vary the overall thickness of the pad and thus the helmet sizing.

Another object of the present invention is to provide an improved helmet cushion pad including resilient elements enclosed within a cover and wherein the resilient elements are curved and provided with grooves on the inner face and slices on the outer face to facilitate the retention of curvature in the pad.

A further object of the present invention is to provide an improved protective helmet having a plurality of separate cushion pad elements including air pathways therebetween allowing the free passage of air throughout the helmet interior during usage.

Still another object of the present invention is to provide an improved protective helmet having a plurality of readily replaceable cushion pads including frontal, rear, side and a plurality of longitudinally extending crown pads whereby head size may be altered by selectively replacing individual pads with pads of different thicknesses.

With these and other objects in view which will more readily appear as the nature of the invention is better understood, the invention consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

A preferred and practical embodiment of the invention is shown in the accompanying drawings, in which:

FIG. 1 is a bottom plan view of a protective helmet according to the present invention and illustrates the plurality of pads or cushion elements mounted inside the helmet shell.

FIG. 2 is a perspective view of the frontal pad of FIG. 1.

FIG. 3 is a perspective view of the rear of the frontal pad of FIG. 2 with a portion of the cover removed to show the sliced areas of the interior cushioning member.

FIG. 4 is a fragmentary perspective view of the interior cushioning members found in each pad.

FIG. 5 is a rear view of one of the cushioning members found in each pad.

FIG. 6 is a fragmentary perspective view illustrating the arrangement and one form of attachment means of the various cushioning pads of the present invention.

FIG. 7 is a fragmentary sectional view through the frontal pad of the helmet of the present invention and illustrates another form of attachment.

FIG. 8 is an enlarged rear perspective view of one of the cushion pads and illustrates the pocket arrangement for receiving selected shims.

FIG. 9 is a partial rear perspective view illustrating an alternate pocket closure means.

FIG. 10 is a perspective view of a shim as used to alter the sizing of the cushion pads.

FIG. 11 is a fragmentary sectional view illustrating an installed cushion pad containing a pair of shims.

Similar reference characters designate corresponding parts throughout the several figures of the drawings.

Referring now to the drawings, particularly FIG. 1, the present invention will be seen to relate to protective headgear of the type such as represented by the helmet generally designated 1 and which includes an outer shell 2 formed of any suitable lightweight high-impact material such as the well known laminated plastic compositions. Although an athletic type helmet such as used in football is illustrated in the drawings, it will be readily appreciated that the present invention may be applied in providing protective headgear as used in any of several other environments such as in the military, construction trades, or other athletic sports requiring adequate protection for the participant's head.

Unlike many other types of helmets which employ a suspension system within the shell comprising a plurality of straps and bands for supporting and retaining the helmet upon the wearer's head, the instant arrangement utilizes a plurality of specially constructed cushion pads intended to be removably attached directly to the shell interior to serve not only to retain the helmet upon the wearer's head, but also to provide a marked improvement in impact absorbing. Additionally, a ready means is provided for specifically sizing any one helmet shell to a particular user's head size. Thus, it will follow that for most users, only a single size shell 2 will be needed and a custom fit for any particular wearer is readily achieved merely by substituting or replacing one or more of the novel cushion pads as will be described hereinafter.

The disposition of the plurality of cushion pads will be most readily apparent from a review of FIGS. 1 and 6 if the drawings wherein it will be seen that a frontal pad 3 is disposed within the interior 2a of the shell 2

and attached immediately adjacent the forward lip L of the shell and extends laterally a sufficient distance to overlie a substantial portion of the interior surface 2a of the front area of the shell adapted to engage the wearer's forehead. Oppositely disposed with respect to the frontal pad 3 is a posterior or rear cushion pad 4 located immediately adjacent the rear lip L' of the helmet shell 2 and which is of a greater height than the frontal pad 3. In the areas adapted to overlie the sides of the wearer's head are disposed a pair of side pads 5—5, each of which extends a sufficient length to place the distal portions at points closely spaced from the respective distal portions of the adjacent frontal and posterior pads, as shown most clearly in FIG. 1 of the drawings. Thus it will be observed that a substantially continuous area of cushioning is provided throughout the circumferential extent of the shell 2 in a manner to laterally surround the user's skull.

The remaining cushioning means is provided by a plurality of crown pads 6—7 which may be of identical configuration and each of which comprises a longitudinal member attached to the upper portion of the shell inner surface 2a. Along the centerline of the top of the shell inner surface is attached a center crown pad 6 while adjacently disposed with respect to each side thereof and substantially parallel thereto is a lateral crown pad 7—7.

A description of the general construction of any one of the above-mentioned cushion pads will be understood to serve as a description of the construction of all of the pads, although, as will be seen hereinafter, various modifications may be practiced in connection with any of several selected pads. The improved protection offered the wearer's head by the cushion pads of the instant invention is achieved by a unique combination of components comprising each pad. The bulk of the impact absorption is obtained by means of the use of a high density, relatively hard rubber-like substance forming a first layer 8 in each pad and which preferably comprises a closed cell substance. As will be seen most clearly in FIGS. 3, 4 and 7, this first layer 8 accounts for the majority of the thickness of each cushion pad and is adapted to be disposed adjacent the inner surface 2a of the helmet shell 2. Overlying the extent of the inner face 9 of each first layer 8 is a second layer 10 comprising a relatively soft rubber-like cushion member and which may be affixed to the first layer 8 by any suitable adhesive composition. For reasons which will become obvious, the substance forming the second layer 10 is preferably quite resilient and thus readily deformable as opposed to the higher density, less resilient composition of the first layer 8.

The combination of the first layer 8 and attached second layer 10 comprises an integral cushion filling generally designated 11 and which is adapted to be enclosed within a cover generally designated 12, which cover may comprise any suitable pliant material such as soft leather or plastic and which, when fabricated to provide a substantially rectangular enclosure for the cushion filling 11, will readily provide a skin-tight cover therefor. In this connection, the cover 12 may be provided with a front housing 13 adapted to overlie the face 14 of the second layer 10 and extend about the periphery of the combined first and second layers forming the filling 11. Depending upon the composition of the material comprising the cover 12, any suitable means may then be employed to secure the free edge of the

front housing 13 to the rear flap 15 of the cover, which flap completely overlies the outer face 16 of the first layer 8, such as the stitching 17 in the case of leather material. Quite obviously, if a plastic composition were employed, heat sealing may be utilized to provide this seam attachment.

Several means of attachment may be used to provide for the removable installation of all of the cushion pads used in the helmet. In the case of the frontal pad 3 as shown in detail in FIGS. 3 and 7, it will be observed that the cover rear flap 15 is provided with a pair of longitudinally extending Velcro component strips 18—18 which may be readily affixed such as by stitching or with an adhesive, to the rear surface of the flap 15 and which will be understood to be adapted to cooperate with mating Velcro components such as the base tapes 19 likewise suitably attached to the inner surface 2a of the helmet shell 2 as shown in FIG. 7. In this manner, instant sizing of a fixed-dimensioned shell 2 may be achieved merely by manually removing one frontal pad 3 and substituting another cushion pad of greater or lesser thickness therefor. Alternate means of attaching the cushion pads may comprise the use of snap-fasteners 20 as shown in FIGS. 6, 9, and 11 of the drawings, wherein one of the fastener components is permanently affixed to the rear surface of the flap 15a of the cushion pad and is adapted to cooperate with mating snap fastener components 21 suitably affixed to the inner surface 2a of the helmet shell 2, as shown in FIG. 11, whereby the same ready attachment of the cushion pads may be easily achieved.

Users of the protective headgear of the present invention may maintain an inventory of various thickness cushion pads adapted to be substituted for any one of the pads as shown in FIG. 1 or, on the other hand, modifications of the cushion pad structure itself may be used wherein it is not necessary to maintain a supply of cushion pads of different thicknesses and wherein the basic allotment of seven different pads may be used to provide a helmet usable with head sizes of any dimensions. Such an arrangement is possible if one or more of the cushion pads is constructed to permit ready variation of its thickness by the user. The embodiments of such a cushion pad are shown in FIGS. 8, 9, and 11 wherein it will be seen that the rear flap or back 15a or 15b may be manually opened to expose a pocket 22 between the inner surface of this rear flap and the outer face 16 of the cushion filling 11 within the cover 12. As shown in FIG. 9, the housing 13 of the cover of this cushion pad extends rearwardly to join with a rear facing 23 enclosing the back of the cushion filling and the periphery of this facing is provided with suitable snap fastener components 24 adapted to cooperate with mating fastener components 25 attached to the inner surface of the rear flap 15a, while in the embodiment of FIG. 8, mating Velcro components 26 and 27 provide the closing means for securing the rear flap 15b to the remainder of the cushion cover 12.

Quite obviously, the rear flap in both of the above embodiments may be completely removable while, on the other hand, it is possible to provide access to the cushion pocket 22 merely by utilizing the separable fastener means for one end of the rear flap 15a or 15b. The very purpose of providing separable fastening means for the rear flap 15a and 15b is to permit insertion and removal from within the pocket 22 of one or more shims 28. These shims preferably are constructed

of a substantially dense material such as hard rubber and are adapted to be selectively inserted into the pocket 22 between the inner face of the cushion rear flap and the outer face 16 of the cushion filling in order to increase or decrease the overall thickness of the respective cushion pad and thus alter the head size of the helmet utilizing the cushion pads. In order to reduce stresses on the rear flap of a cushion pad, it will be appreciated that the peripheral edges of the shims 28 may be tapered thus providing a smoother transition in the area of the rear of the cushion pad. Additionally, it will follow that in altering a pad thickness, either several shims of relatively thin stock may be utilized, or alternately, a single thicker shim may be used.

As shown most clearly in FIG. 1 of the drawings, all of the cushion pads are provided with a relatively smooth skin-tight cover and include a plurality of substantially parallel well defined creases 29. In order to achieve this arrangement, an improved construction is necessary involving the cushion filling 11, particularly in the cases of the frontal pad 3 and posterior pad 4 wherein the curvature of these pads involves a smaller radius. Inasmuch as the present invention obviates the need for a suspension harness arrangement for retaining the helmet upon the wearer's head, the criticality of providing for a smooth close fit between the inner faces of all of the cushion pads and the wearer's head will be readily appreciated. This observation is of even greater importance when considering the frontal pad 3 which will be seen to comprise a compound curvature on its inner face which compound curvature serves to provide a locking fit of the helmet upon the wearer's head as the inner face 30 of the cover 12 follows the general contour of the wearer's forehead. The afore-described curvature and resulting skin-tight fit of the cushion pad cover is achieved as a result of providing the rear portion of the cushion first layer 8 with a plurality of slices 31 which are made through the body of this layer in a crossing arrangement to provide a grid-like structure as shown in FIGS. 3, 4, and 5. The extent of the depth of these slices 31 will quite obviously be dependent upon the specific density of the material comprising this layer; however, experiments have shown that the slices 31 should extend through the thickness of the first layer for a significant distance, preferably greater than one-half of its thickness, and may even extend throughout the entire thickness of the first layer since it will be understood that the inner face between the juxtaposed first and second layers is permanently bonded. Cooperating with the slices 31 in the first layer 8 are a plurality of vertically extending grooves 32 provided in the face 14 of the second layer 10 as shown most clearly in FIG. 4. With the foregoing arrangement, it will be observed that when the thus prepared cushion filling 11 is enclosed within its cover 12 and initially shaped to the desired configuration, the respective vertical and horizontal slices 31 will be opened varying degrees to permit attainment of the required curvature without placing any strain upon the material of the cushion filling while, at the same time, the grooves 32 formed in the face 14 of the second layer 10 will accept the otherwise surplus material of the inner face 30 of the cover to form the well-defined creases 29 below the plane of the pad inner face 30 so that the desired smoothness is achieved in the end product.

To obtain pads offering maximum strength, a preferred procedure is employed. This involves heat form-

ing the cover front housing 13 between male and female dies specifically shaped for each pad. The cushion filling is then cut, glued and grooved and then adhesively attached to the cup-shaped pre-formed cover housing. The thus prepared structure is then placed in another mold to retain its curvature while the cover back 15 with its Velcro or snaps is adhesively attached. The resulting assembly is subsequently placed in another mold and air pressed to firmly tighten both cover elements and remove undesirable wrinkles prior to sewing of the edges as at 17.

What is claimed is:

1. A helmet comprising a shell, a plurality of cushion pads each of selective thickness to provide a specific sizing attached to said shell interior and including separate frontal, posterior, side and crown pads, said crown pad having a longitudinal axis extending from said frontal pad to said posterior pad, said side pads including end portions juxtaposed respectively the end portions of said frontal and posterior pads, said pads including a cover conforming to the curvature of said pads and having an inner face juxtaposed the wearer's head and an outer face juxtaposed said shell interior, a cushion filling within said cover, said cushion filling comprising a composite body including a first layer of resilient material adjacent said cover outer face and a second layer of resilient material adjacent said cover inner face, said filling first layer material of greater density and greater thickness than said filling second layer material, said cushion filling including means adjacent the cover inner and outer faces permitting of molding said pad to provide a pad having a curvature with said cover forming a tight fit therewith, and said means includes a plurality of slices through the outer face of said first layer and a plurality of grooves in the inner face of said second layer whereby said slices permit a convex curvature of said cushion filling outer face and said grooves allow a concave curvature of said cushion filling inner face with said cover forming creases within said

grooves.

2. A helmet according to claim 1 wherein, said crown pad includes a plurality of said longitudinally extending elements disposed substantially parallel to one another.

3. A helmet according to claim 1 wherein, the juxtaposed surfaces of said filling first and second layers are bonded to one another to provide an integral cushion filling.

4. A helmet according to claim 1 including, releasable mating fastener means on said cover outer face and said shell interior to permit manual attachment and removal of said pads.

5. A helmet according to claim 1 wherein, said cover outer face comprises a flap defining a pocket therebeneath and a removable shim in said pocket to vary the thickness of said pad.

6. A helmet according to claim 1 wherein, said slices extend substantially through the thickness of said first layer.

7. A helmet according to claim 1 wherein, said slices are provided both horizontally and vertically through said first layer.

8. A helmet according to claim 4 wherein, said fastener means includes Velcro components.

9. A helmet according to claim 4 wherein, said fastener means includes snap components.

10. A helmet according to claim 5 wherein, at least a portion of said flap is releasably attached to the remainder of said cover by Velcro components.

11. A helmet according to claim 5 wherein, at least a portion of said flap is releasably attached to the remainder of said cover by snap fastener components.

12. A helmet according to claim 5 wherein, said shim is provided with a tapered periphery.

13. A helmet according to claim 1 wherein, said pad defines a compound curvature.

* * * * *

40

45

50

55

60

65