

July 22, 1969

J. A. AILEO

3,456,263

RIGID SHELL HELMET WITH EAR CUP

Filed May 9, 1967

3 Sheets-Sheet 1

Fig. 2.

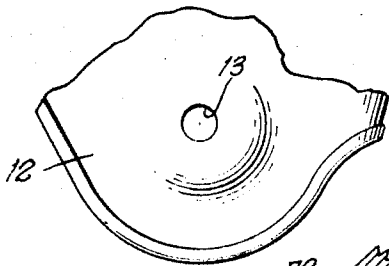


Fig. 1.

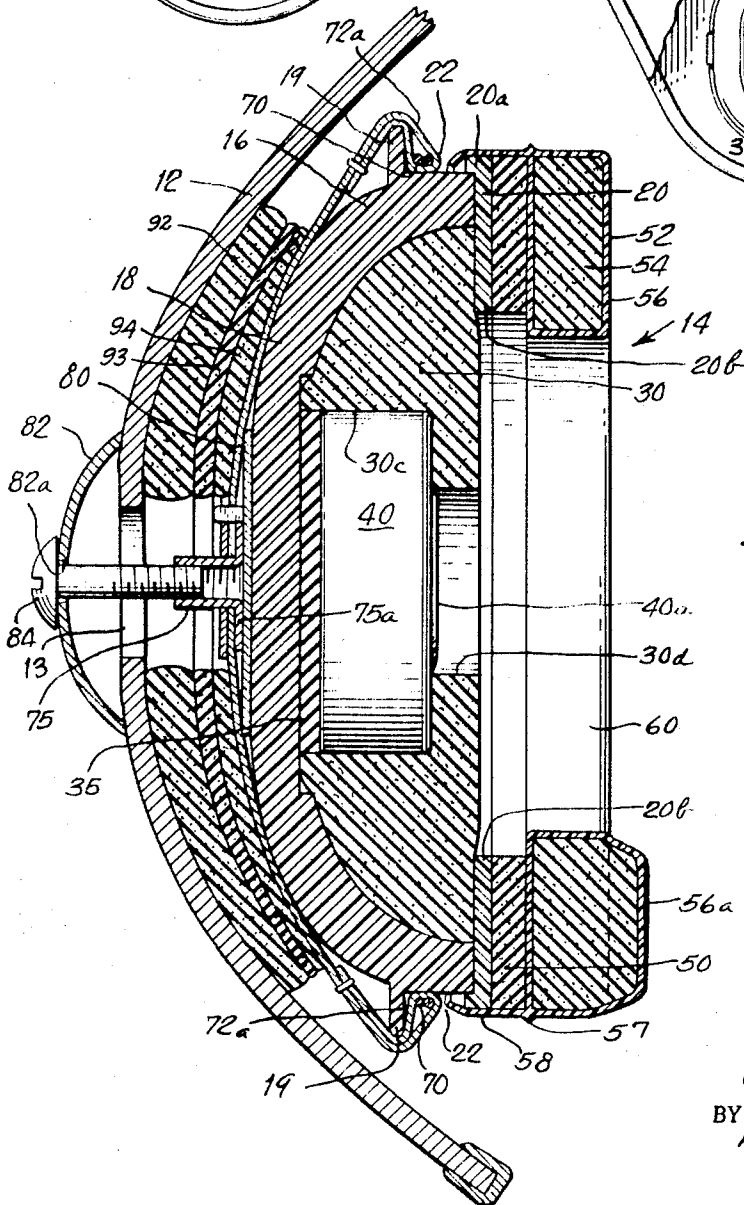
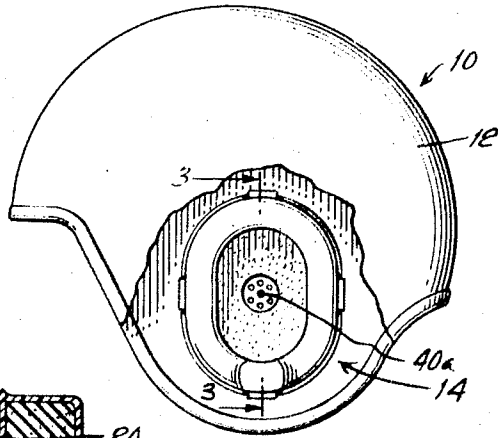


Fig. 3.

INVENTOR
JACKSON A. AILEO
BY *Lester H. Clark*
ATTORNEY

July 22, 1969

J. A. AILEO

3,456,263

RIGID SHELL HELMET WITH EAR CUP

Filed May 9, 1967

3 Sheets-Sheet 2

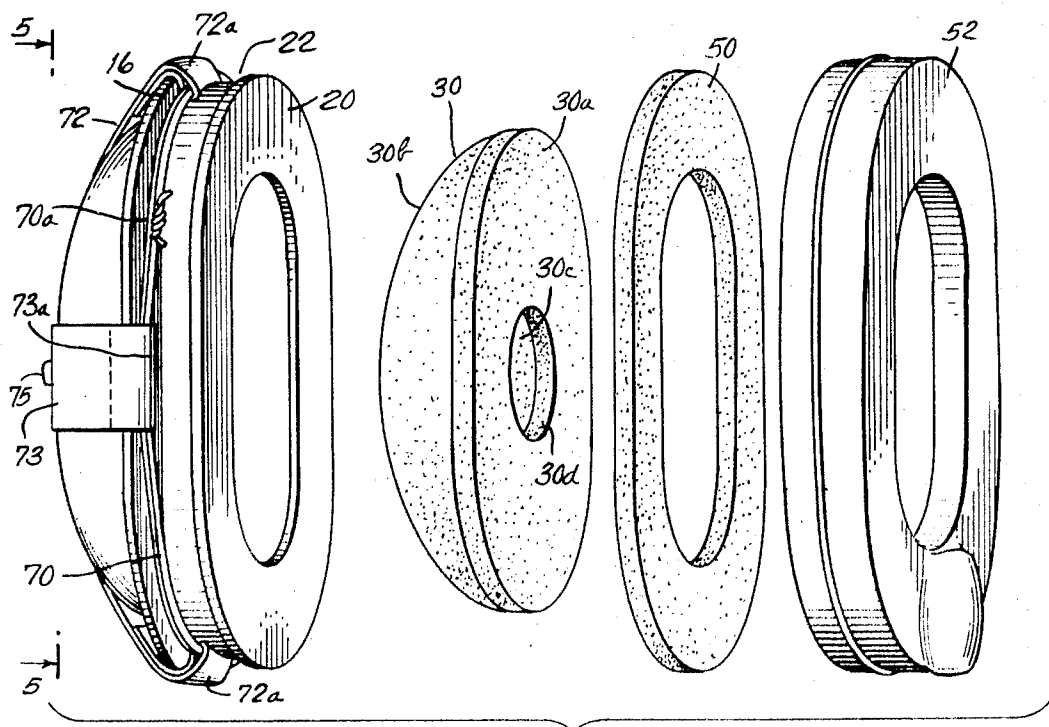


Fig. 4.

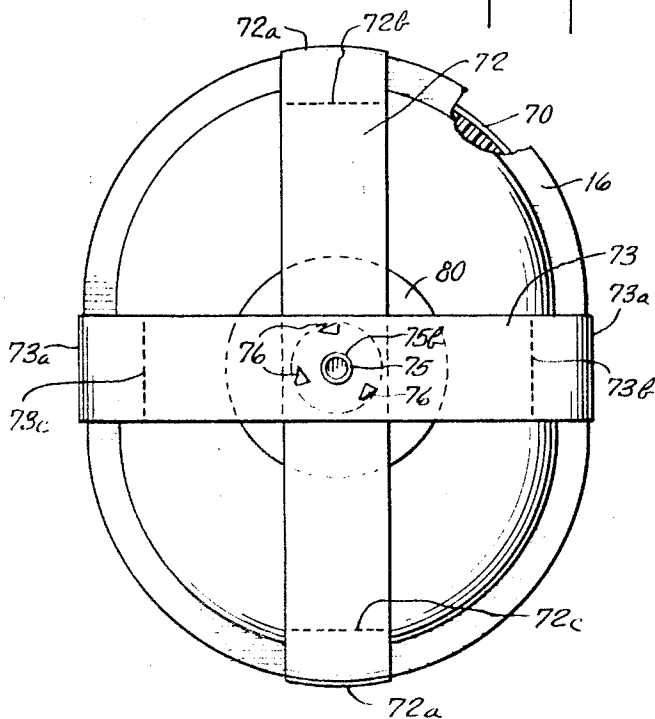


Fig. 5.

July 22, 1969

J. A. AILEO

3,456,263

RIGID SHELL HELMET WITH EAR CUP

Filed May 9, 1967

3 Sheets-Sheet 3

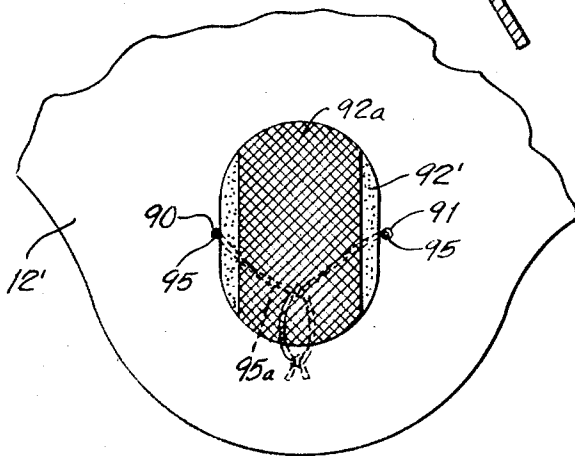
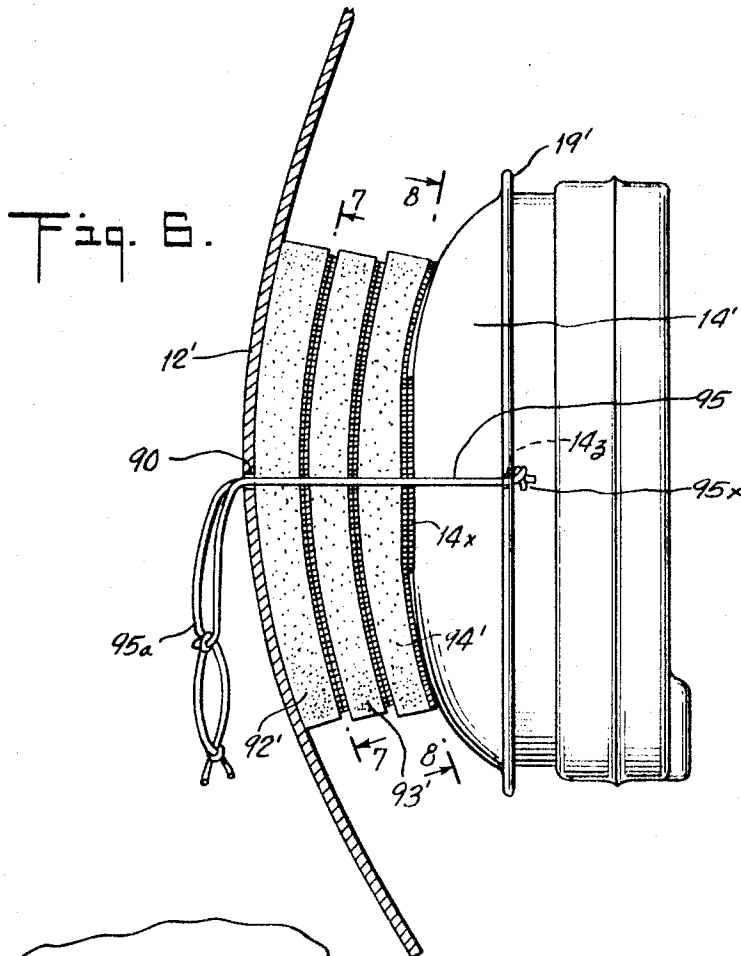


Fig. 7.

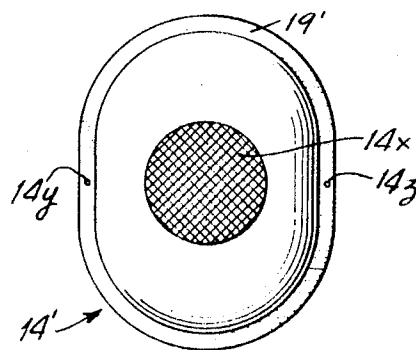


Fig. 8.

1

3,456,263

RIGID SHELL HELMET WITH EAR CUP

Jackson A. Aileo, Carbondale, Pa., assignor to Gentex Corporation, Carbondale, Pa., a corporation of Delaware

Filed May 9, 1967, Ser. No. 637,148

Int. Cl. A42b 1/08

U.S. Cl. 2—3

15 Claims

ABSTRACT OF THE DISCLOSURE

A rigid shell helmet with ear cup, wherein the connection between the two is adjustable, within limits, in both translation and rotation, and wherein the ear cup is relatively free of loads and vibrations from the helmet despite the connection. In one form, such a helmet with ear cup is characterized by a stud connected to the ear cup by means of crossed straps which capture the stud head and drive it against the ear cup; a cord encircling the ear cup, the ends of the straps being secured to the loop of cord at four essentially diametrically opposite positions, so that the tension in each and the position of each is maintained; an aperture provided in the helmet that is appreciably larger in diameter than the stud; and a dished washer and screw arranged so that the screw may be tightened within the internal threads of the stud to draw the ear cup toward the inner wall of the helmet against intermediate padding while clamping the washer down on the outer wall of the helmet. In another form, such a helmet with ear cup is characterized by one or more stacked resilient pads at the ear cup position of the inner surface of the helmet; a Velcro surface on the ear cup adapted to mate removably with the adjacent pad surface; and means, for example in the form of a cord, connected to the ear cup for pulling it toward the helmet inner surface.

BACKGROUND OF THE INVENTION

Helmets with internally attached ear cups are known, and it is known to make the ear cups adjustable in spatial relation to the helmet. However, the means for adjustment is usually relatively complex, and additionally the means for mounting the ear cup to the helmet against loads always involves the stressing of the ear cup body by allowing loads and vibrations at the helmet to find their way to the ear cup body, inducing fatigue or failure there. What is desired is a simple mounting that insulates the ear cup body from helmet loads and vibrations, and is at the same time easily adjustable in translation and rotation.

BRIEF SUMMARY OF THE INVENTION

In one form, an ear cup body is provided with an annular cord, under high tension. Crossed straps are provided with an internally threaded stud through the crossed portions thereof, having the stud head captured by the straps against a pad on the ear cup body. The four strap ends are secured, under tension, to four diametrically opposite portions of the cord loop. The helmet is provided with an aperture much larger in

2

diameter than the diameter of the stud, and a dished washer and screw are provided for anchoring the ear cup to the helmet inner surface. The washer bears against the helmet outer surface, and the ear cup bears against the helmet inner surface, with the threadedly engaged screw and stud connecting the two through the helmet aperture. In another form, one or more stacked pads are attached to the inside of the helmet, and the ear cup is attached to the adjacent pad by a surface contact fastener, e.g., a Velcro type fastener, and means, e.g. a cord loop, is provided for adjusting the ear cup position in translational spacing from the helmet, while the Velcro connection provides two additional degrees of translational freedom, and rotational freedom.

BRIEF DESCRIPTION OF THE FIGURES

Illustrative embodiments of the invention are set forth hereinbelow in a detailed description thereof with reference to the figures, in which:

FIG. 1 is a side elevational view, partly broken away, of a first embodiment of a safety helmet and ear cup according to the invention;

FIG. 2 is a fragmentary elevational view inside the helmet showing one side thereof, with the ear cup shown in FIG. 1 removed;

FIG. 3 is an enlarged cross-sectional view taken along plane 3—3 of FIG. 1;

FIG. 4 is an exploded view of the parts of the first embodiment ear cup shown in FIGS. 1 and 3;

FIG. 5 is a view of the first embodiment ear cup taken along plane 5—5 of FIG. 4;

FIG. 6 is an enlarged view, partially in section, of a second embodiment of a helmet and ear cup assembly according to the invention, showing the portion of the helmet adjacent the ear cup;

FIG. 7 is a detailed view of a portion of the helmet shown in FIG. 6 taken along plane 7—7 therein; and

FIG. 8 is a detailed view of the ear cup shown in FIG. 6 taken along plane 8—8 therein.

Referring now to FIGS. 1—5 inclusive, there is shown there a first embodiment of a helmet and ear cup according to the invention. The protective helmet indicated generally at 10 in FIG. 1 is similar to that shown previously in U.S. Patent 2,926,355 to W. S. Finken. The helmet 10 comprises a rigid shell 12 having an opening at the lower side thereof for receiving the head of the wearer. The helmet is fabricated of a suitable material such as a plastic binder which may typically be reinforced by the use of glass or nylon cloth. Alternatively, the helmet may be injection-molded, and while in this case no reinforcement is required, inclusion of short glass fibers will naturally increase the helmet's strength. The shell 12 may be of the head contact type, or may be adapted to be supported on the head of the wearer by means of a rigging comprising a plurality of headband elements and headstraps (not shown).

The rigid shell 12 has affixed thereto a pair of first embodiment ear cups indicated generally at 14, one of which is shown in the figures. As many be seen in FIG. 2, in the first embodiment of the invention, the rigid shell 12 includes an aperture 13 at either lateral side thereof located at the center of the position at which the ad-

jacent ear cup 14 is mounted. As will appear hereinafter, it is an important feature of the invention that the ear cups 14 are mounted to the rigid shell 12 without any positive interconnection therebetween, and in such a manner that they can be easily adjusted, within limits, both as to their position within the rigid shell 12 and as to their angular orientation with respect thereto.

Referring now to FIGS. 3-5 inclusive, an ear cup 14 according to the invention comprises a rigid body 16 which is of generally elliptical shape in the plane thereof which is parallel to the ear shown in FIG. 1. The contour of a section of the rigid body 16 in the plane perpendicular to the ear is that of a hollow member having a domed wall 18 (FIG. 3) extending about a space within the member. Wall 18 includes an outwardly extending annular flange portion 19. While flange 19 is shown as being annular and complete, it can also be annular and discontinuous, as will become apparent when its function is discussed hereinbelow. Spaced from flange 19 is a second annular flange 20 which includes an outwardly extending portion 20a and an inwardly extending portion 20b. Outwardly extending portion 20a and flange 19 are connected by an annular web 21 so as to define an annular groove 22. As will appear hereinafter, the operation of the present embodiment of the invention does not require the presence of portion 20a; the presence of flange portion 19 being sufficient. The inwardly extending portion 20b of annular flange 20 defines a generally elliptical opening into the interior of rigid body 16.

A cushion body 30 is fitted inside the enclosure defined by rigid body 16. Cushion body 30, when unstressed because of removal from rigid body 16, as in FIG. 4, has an external configuration which is essentially comprised of a planar surface 30a and a curved surface 30b. When cushion body 30 is inserted within rigid body 16 the curved surface 30b presses against the curved interior walls of rigid body 16 to conform thereto, and the rim of the planar surface 30a rests against the interior surface of annular flange 20. Centrally located within cushion body 30 is a generally cylindrical cavity 30c (FIGS. 3 and 4) which communicates with surface 30a at a smaller diameter cylindrical aperture 30d in planar surface 30a. A circular pad 35 is located within cavity 30c against rigid body 16. Cushion body 30, when in place within rigid body 16, forms a nest for the enclosure of a telephone instrument 40 (FIG. 3) having sound emitting orifices 40a (FIGS. 1 and 3) located in alignment with aperture 30d, and resting against pad 35. The pad 35 may be secured, as by gluing, to either the telephone instrument 40 or to the rigid body 16 so that it is located correctly. It should be clearly understood that the present invention is equally advantageous when the ear cups do not contain telephone instruments.

A relatively thin annular cushion 50, having the same inner and outer radii as the flange portion 20, is secured thereto, preferably by gluing. Detachably secured over the outwardly extending portion 20a of annular flange 20 and against the annular cushion 50 is a sound attenuating seal 52 which also serves as a padding means for providing comfort to the wearer's ear. The seal 52 comprises a ring 54 of an elastically compressible material, such as sponge rubber, sponge plastic such as sponge polyurethane, or other suitable material. If desired, the seal 52 may include a liquid, such as glycerine and water, which is contained in an envelope within the ring 54. For the purpose of comfort and for the ready securing of the seal 52 to the flange portion 20a, the elliptically annular ring 54 is loosely covered with a cover layer 56 of plastic film material, e.g. polyvinylchloride. A flap 58 of the same plastic film material is bonded to the ring 54 at annular edge 57, and in the unstressed condition (FIG. 4) the flap 58 is beveled inwardly, so that it is adapted to grasp portion 20a of flange 20 when it is made therewith as shown in FIG. 3.

Thus, the seal 52 is securely held in place, but it may be readily removed and replaced in the event of a defect or in the event that the seal is unsanitary. The cover layer 56 has a protruberant portion 56a for fitting the hollow behind the ear of the wearer. The inner radius of the seal 52 is such that a central, generally elliptical aperture 60 is provided into the ear cup 14, the peripheral wall of which is formed by the congruent seal 52, annular cushion 50, and flange 20. The ring 54 thereby rests against the head of the wearer with the protruberance 56a fitting into the hollow behind the ear as aforesaid, and with the ear itself located within aperture 60 and adjacent to aperture 30d, so that free communication is provided between the telephone instrument 40 and the sound passage of the ear of the wearer. The contour of the surface of the seal 52 and its cover 56 is such as to close off communication with the surrounding environment when the ear cup 14 is pressed against the ear, thereby to attenuate substantially sound from the surrounding environment.

Referring now to FIGS. 2, 3 and 5, there is shown the means for mounting an ear cup 14 to the rigid shell 12 so that no positive connection between the two is provided and yet secure mounting is effected. Furthermore, the mounting arrangement provides the capability for very simple adjustment of the position of an ear cup 14, within limits, relative to the rigid shell 12 in both translational position and angular position.

As is best shown in FIGS. 3 and 4, a cord 70 encircles rigid body 16 twice within annular groove 22, and is secured at a knot 70a which may be impregnated with glue or the like. The cord 70 may for example be braided nylon, having very high tensile strength, and it is very tightly wound and secured by knot 70a, so that it is thereby securely located within annular groove 22.

As may be best seen in FIG. 5, a pair of crossed straps 72, 73 is provided, preferably formed of a material of high tensile strength, e.g. braided nylon. A stud 75, which is internally threaded, has its head 75a (FIG. 3) underneath both of crossed straps 72, 73 and its shank 75b protruding through an aperture in both straps and outwardly thereof, as may be seen in FIG. 5. The straps 72, 73 are secured by pointed spurs 76 from the rim of head 75a, and a quantity of glue is potted around the outside of shank portion 75b adjacent to each of straps 72, 73. The head 75a of stud 75 rests upon a generally circular pad 80 which can be any appropriate soft material, e.g. chamois. The spurs 76 extend through the straps 72, 73, and are turned over to secure the head 75a and straps 72, 73 together.

Each end of each of straps 72, 73 is secured to cord 70 at a looped over portion thereof which encircles a portion of the periphery of cord 70. While this means of mounting the ends of straps 72, 73 is preferred, it is also possible to mount them to mounting means (not shown), at flange portion 19 itself, e.g. slots therein. In FIG. 3 upper and lower looped portions 72a can be seen encircling portions of the periphery of cord 70 and in FIG. 4 one of the two looped portions 73a can be seen encircling the lateral portion of the periphery of cord 70. The looped ends of straps 72, 73 may be secured by sewing at 72b, 72c and 73b, 73c, or by other appropriate means. The straps 72, 73 are under considerable tension, but since the cord 70 can resist considerable tension the two looped portions 72a and the two looped portions 73a work against each other and serve to increase the tension in the cord 70, thereby providing a stable and secure configuration. It is because cord 70 is urged against flange portion 19 by the tension in straps 72, 73 that the portion 20a is not necessary to retention of the cord 70, as aforesaid. Since the domed wall 18 of rigid body 16 is curved outwardly to an apex at stud 75, the tension in straps 72, 73 serves to drive the head 75a of the stud 75 against the pad 80, so that the stud 75 is very securely located and has no degrees of freedom.

Thus stud 75 is very securely located on rigid body 16 despite the fact that no aperture is formed in rigid body 16 to receive stud 75, and indeed no positive connection of any kind to the material of body 16 is employed, and accordingly this means of mounting stud 75 with respect to rigid body 16 avoids cracking or other stress and fatigue problems which might occur due to loads and/or vibrations transferred from the rigid shell 12 to the rigid body 16 through stud 75 if they had a rigid, direct connection.

As may best be seen in FIG. 3, when the ear cup 14 is mounted to rigid shell 12 at aperture 13 therein, a plurality of stacked pads, e.g. a thick pad 92, and a pair of thin pads 93, 94, each fabricated in a sponge material such as polyvinylchloride foam, is interposed between the shell 12 and the ear cup 14. Each of the planar, oval-shaped pads 92-94 includes a central aperture of approximately the same diameter as aperture 13, so that stud 75 may extend therethrough with unimpeded freedom. Stud 75 is located near or even actually within aperture 13, which as aforesaid is much greater in diameter than the stud 75. A concave disk washer 82 is provided, having an outer diameter larger than the diameter of aperture 13, and itself having a centrally located aperture 82a. A screw 84 is passed through aperture 82a and into threaded communication with the internal threads of stud 75. It will be appreciated that when screw 84 is tightened, the pads 92-94 are compressed, and sufficient friction builds up between the ear cup, the pads 92-94, and the interior surface of rigid shell 12, so that the ear cup 14 is held in place, and yet no positive and stress concentrating connection is made therebetween. Moreover, because of the manner in which stud 75 is connected to ear cup 14, any vibration and/or loads which do reach stud 75 will not cause deleterious effects to rigid body 16 thereof. That is to say, very little stress or vibration is transferred from rigid shell 12 to stud 75, and very little in turn of that small amount is transferred to the body 16.

Despite the important advantages of the invention inherent in the method of mounting ear cup 14 to rigid shell 12, just described, there is an equal advantage in the great degree of ease and flexibility in adjusting the position of ear cup 14 with respect to rigid shell 12 in the present invention. When screw 84 is loosened somewhat, the ear cup 14 can be translated, within limits, in any direction along the inner surface of rigid shell 12, because the aperture 13 is considerably larger than the stud 75. Also, the ear cup 14 can be moved closer or farther from the interior surface of shell 12 by adding or subtracting one or more of pads 92-94, and by adjusting their degree of compression by approximately manipulating screw 84. Thus the ear cup 14 can be moved forwardly or rearwardly, upwardly or downwardly, and toward and away from shell 12, all within limits, to suit the peculiarities of the positioning of the ears on the head of a particular wearer. Moreover, the ear cups 14 can be rotated, within limits, again to suit the convenience of the wearer.

Referring now to FIGS. 6-8 inclusive, there is shown therein a second embodiment of a helmet and ear cup according to the invention. In this embodiment, the rigid shell 12' is modified slightly from the form shown in the first embodiment, in that the aperture 13 is omitted and a pair of apertures 90, 91 (FIG. 7) of much smaller diameter are instead located in spaced relation fore and aft at the ear positions of the shell 12'. A foam pad 92', of generally oval shape is glued or otherwise adhered or affixed to the inner surface of shell 12' between and bordering apertures 90, 91. The foam pad 92' can be of any suitable resilient and shock absorbing material, e.g. high density polyvinylchloride foam. The exposed surface of pad 92' carries a patch of fabric 92a having one of a set of two cooperating surface contact fastening elements adapted to give removable surface contact fastening with another surface having the other of the two cooperating elements, presently to be described. For example, a hook-

and-loop fastener, such as that sold under the trademark Velcro may be employed. In the illustrated embodiment the patch of fabric 92a comprises a continuous plurality of small loops to form the one of the aforesaid set of two cooperating elements.

As may best be seen in FIG. 8, the ear cup indicated generally at 14' according to the second embodiment has glued or otherwise affixed to the domed surface thereof in place of the stud 75 and straps 72, 73 of the first embodiment, a patch of material 14x which comprises the second of the aforesaid set of two cooperating surface contact fastening elements. In the illustrated embodiment, and continuing the example of employment of the "Velcro" fastener system, the patch 14x comprises a continuous plurality of hooks designed to mate with the loops of the fabric 92a previously described. That is to say, when the hooks of patch 14x are pressed against the loops of surface 92a, the hooks and loops engage, fastening the two surfaces together, and requiring an appreciable manual force to pull them apart again.

It will be appreciated that it is possible to mate the patch 14x of ear cup 14' directly to the surface 92a of pad 92', and under some use circumstances, this will be done. However, in the illustrated embodiment, two additional pads 93', 94' are shown stacked upon pad 92', between pad 92' and the ear cup 14'. This is meant to illustrate the possibility of building any desired thickness of padding between the ear cup 14' and the shell 12' by means of the system of this second embodiment of the invention. Each of auxiliary pads 93', 94' comprises one broad surface having one of the set of two cooperating surface contact fastening elements already described, and the other broad surface constituting the other of the set of two elements. When, to continue the example shown in the illustrated embodiment, the "Velcro" type fastener is employed, one of the broad surfaces of each pads 93', 94' will include a patch of material comprising a continuous plurality of hooks, and the other broad surface will include a patch of material comprising a continuous plurality of loops. By pressing the hook bearing surface of pad 93' against the loop bearing surface 92a of pad 92', and then pressing the hook surface of pad 94' against the loop surface of pad 93', the stack shown in FIG. 6 is built up. The loop surface of pad 94' will then be adapted to mate with the hook surface of patch 14x of ear cup 14' already described.

Flange 19' of ear cup 14' includes a pair of apertures 14y, 14z (FIG. 8) on either lateral side thereof, and a cord 95 is passed from aperture 14z through aperture 90 in shell 12' to a loop portion 95a outside shell 12' back through aperture 91 in shell 12', and to and through aperture 14y. In the illustrated embodiment, the ends of cord 95 which pass through apertures 14y, 14z are knotted to secure a connection between the cord 95 and the ear cup 14' at apertures 14y, 14z as can be seen in knot 95x at aperture 14z in FIG. 6.

This arrangement according to the second embodiment allows adjustment of the position of the ear cup in various modes of translation and rotation, as well as insulating the ear cup from vibration and other loads transmitted by the shell 12'. Thus, where pad 92' is employed alone, or where one or more pads such as 93', 94' are also employed in stacked relation with pad 92', the ear cup 14' can be removed from surface contact connection with the adjacent pad, and then rotated slightly as desired, or translated slightly in the plane of contact as desired, and then recontacted with the adjacent pad to again fasten the hook surface of patch 14x to the loop surface of the adjacent pad, e.g. the hook surface of pad 94'. It is evident that the "Velcro" type fastener thus provides the means for quickly and easily re-aligning the position in two degrees of translational freedom (i.e. in the plane of the adjacent pad, e.g. pad 94') and one degree of rotational freedom of the ear cup 14' relative to the pads 92'-94', and thereby relative to the shell 12'.

In addition, the loop 95a, when pulled manually or by any appropriate mechanical means, draws the ear cup 14' toward the inner surface of shell 12' to compress the pad or pads 92'-94' therebetween. This offers another degree of translational freedom for ear cup 14', which can be utilized in any of several ways. First, it can be utilized to spread a pair of opposed ear cups apart for easy insertion of the head into the helmet. second, it can be employed to temporarily draw the ear cup 14' away from the ear of the wearer, as for example to hear what is being said aurally or to sample the environmental sound or the like. And third, it can be employed to make a permanent adjustment in the spacing of the ear cup 14' relative to the head of the wearer; i.e. the pad or pads 92'-94' can be compression stressed by virtue of shortening of the loop 95a (e.g. by a knot therein), thus relieving the ear cup pressure on the head of the wearer. Alternatively this latter feature can be practiced simply by removing one or more of the intermediate pads 92'-94' for the comfort of the wearer

The apparatus of the second embodiment thus also, as well as that of the first embodiment, provides three degrees of translational freedom, and one degree of rotational freedom for the ear cups, combined with shock and vibration insulation of the ear cups from the helmet shell.

What has been described is a presently preferred, but merely illustrative embodiment of the inventive principles. Those skilled in the art will recognize that because the embodiment is merely illustrative, various changes in details and form thereof can be practiced without departing from the spirit and scope of the invention.

What is claimed is:

1. In a combined rigid shell helmet and ear cup, the improvement, in combination therewith, comprising:

- (a) means defining a mounting aperture through a lateral portion of said rigid shell helmet;
- (b) said ear cup including
 - (i) a rigid body having a domed outer wall facing the helmet inner surface adjacent said mounting aperture,
 - (ii) means having an enlarged head bearing against the apex of said domed outer wall, and a threaded shank extending outwardly of said head toward said mounting aperture, said shank being appreciably smaller in cross-sectional area than said mounting aperture,
 - (iii) flexible means extending over said domed outer wall under tension, including an aperture therein through which said shank protrudes, the portion of said flexible means immediately surrounding said aperture overlying and bearing against said enlarged head, and
 - (iv) means for anchoring said flexible means to the periphery of said rigid body remote from said apex at a sufficient number of locations to provide translational stability thereto;
- (c) a compressible pad interposed between the inner surface of said rigid helmet and said ear cup; and
- (d) means located at the outer surface of said helmet, bearing against portions thereof surrounding said mounting aperture, and including a threaded portion threadedly engaged with said shank through said mounting aperture.

2. An apparatus according to claim 1, wherein said flexible means comprises a pair of crossed straps, said aperture therein being through the crossed portion of said straps.

3. An apparatus according to claim 2, wherein said enlarged head includes spurs passing through said straps at their crossed portions and bent over to secure said head and straps together.

4. An apparatus according to claim 1, wherein said means for anchoring said flexible means comprises a loop under tension, stably mounted with respect to said rigid

body periphery, to which said flexible means is anchored at various locations around said loop.

5. An apparatus according to claim 4, wherein said flexible means comprises a pair of crossed straps, said aperture therein is through the crossed portion of said straps, and the four ends of said straps are anchored to four locations on said loop.

6. An apparatus according to claim 1, wherein said means for anchoring said flexible means comprises an annular flange on said rigid body remote from said apex, and a loop located on the side of said flange remote from said apex, said loop having a smaller peripheral length than the outer periphery of said flange, and being under tension.

7. An apparatus according to claim 6, wherein said flexible means comprises a pair of crossed straps, said aperture therein is through the crossed portion of said straps, and the four ends of said straps are anchored to said loop at four equi-angular spaced portions thereof.

8. An apparatus according to claim 1, wherein said means located at the outer surface of said helmet comprises a washer and a screw assembly, the washer having a larger diameter than that of said mounting aperture.

9. An ear cup for mounting to a rigid shell helmet, comprising:

- (i) a rigid body having a domed outer wall,
- (ii) a stud, having an enlarged head bearing against the apex of said domed outer wall, and a threaded shank extending outwardly of said head for co-operation with a helmet engaging fastener,
- (iii) flexible means extending over said domed outer wall under tension, including an aperture therein through which said stud shank protrudes, the portion of said flexible means immediately surrounding said aperture overlying and bearing against said stud head, and
- (iv) means for anchoring said flexible means to the periphery of said rigid body remote from said apex to provide translational stability of said cup when attached to the helmet.

10. An earcup as defined in claim 9, in which:

- (a) said flexible means comprises a pair of crossed straps, said aperture in said flexible means being through the crossed portion of said straps; and
- (b) said anchoring means comprises:
 - (1) a peripheral flange on said rigid body;
 - (2) a loop extending around said body on the side of said flange opposite said domed outer wall; and
 - (3) means connecting each end of each of said straps to said loop.

11. In a combined rigid shell helmet and ear cup, the improvement, in combination therewith, comprising:

- (a) a first of two cooperating complementary pressure actuatable surface contact fastening elements secured to a lateral portion of the inner surface of said rigid shell helmet;
- (b) said ear cup including:
 - (1) a rigid body having an outer wall facing the helmet inner surface adjacent said first surface contact fastening element, and
 - (2) a second of said two cooperating, complementary pressure actuatable surface contact fastening elements secured to said ear cup outer wall and removably contactable with said first element; and
- (c) a compressible pad interposed between the inner surface of said rigid helmet and said ear cup, and
- (d) means for drawing said ear cup toward said rigid shell surface against the compression resistance of said pad.

12. An apparatus according to claim 11, wherein one of said elements comprises a surface having a continuous plurality of hooks, and the other comprises a surface having a continuous plurality of loops.

13. An apparatus according to claim 11, wherein said

pad connects the inner surface of said rigid helmet to said first surface contact fastening element.

14. An apparatus according to claim 13, wherein an additional pad is interposed between said first and second fastening elements, said additional pad including a third surface contact fastening element similar to said second fastening element and mated with said first fastening element, on one face thereof, and a fourth surface contact fastening element similar to said first element and mated with said second fastening element, on the other face thereof.

15. An apparatus according to claim 11, wherein said drawing means comprises a cord having opposed ends secured to opposed lateral portions of said ear cup, and a looped portion extending through said helmet rigid shell lateral portion to form a pull cord for drawing said ear cup toward said inner shell surface.

References Cited

UNITED STATES PATENTS

3,344,433	10/1967	Stapenhill.	
631,880	8/1899	Ross	2—3
2,805,419	9/1957	Finken	2—3
2,858,544	11/1958	Roth	2—3 X
3,091,771	6/1963	Bixby	2—3
3,148,376	9/1964	Aileo	2—6
3,178,723	4/1965	Aileo	2—6
3,190,973	6/1965	Aileo	179—156
3,241,154	3/1966	Aileo	2—3

FOREIGN PATENTS

397,985	9/1933	Great Britain.
---------	--------	----------------

HERBERT F. ROSS, Primary Examiner

U.S. Cl. X.R.

2—209; 179—156