SAFETY HELMET WITH IMPROVED STABILIZING AND SIZE ADJUSTING MEANS

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ABSTRACT OF THE DISCLOSURE

Safety helmet including a rigid shell adapted to receive the wearer's head with substantial space between the head and the shell, an internal rigging for supporting the shell on the head, and stabilizing means for limiting movement of the shell to prevent contact between the shell and the head. The rigging includes front and rear headband elements of fixed length. Headstraps extend over the crown of the head. Padded flaps attached to the headbands extend upwardly therefrom and spread any stress from the headband across a substantial area of the head. Size adjustment is accomplished by insertion of pads of different thickness at the rear of the helmet, and also between ear enclosures and the helmet. Several modifications of size adjusting pads are shown and others are described. Stacks of pads on the inner surface of the shell, e.g., in the temple areas, stabilize the shell and limit its movement.

A peripheral heading has a channel-shaped portion engaging the margin of the shell, and an inwardly projecting cylindrical portion which serves as a buffer to prevent contact between the shell and the head, and also partially blocks air flow through the space between the shell and the head.

BACKGROUND OF THE INVENTION

This invention relates to safety helmets, which are commonly used by workers in dangerous occupations where their heads may be subject to accidental or other impacts with external objects. Such occupations include construction workers, police, and various military occupations. Safety helmets are also commonly used in various sports involving similar hazards, such as motorcycle riding and auto racing.

Such a helmet commonly comprises a rigid shell adapted to receive the head of the wearer with substantial clearance. Attached to the inside of the shell is a rigging for supporting the shell on the wearer's head while maintaining it spaced from the wearer's head. Such a rigging commonly includes a headband extending generally horizontally around the wearer's head, and one or more head straps extending over the crown of the wearer's head. In addition to its supporting function, the rigging provides a cushion effect from external blows. In other words, it is constructed to absorb the energy of such external blows. In that connection, it is commonly constructed so as to prevent direct contact between the shell and the head, since such a contact would permit direct transmission of an external impact through the shell to the wearer's head.

A rigging for a safety helmet must be provided with a size adjustment so that it may properly fit the wearer. Commonly, the size adjustment is secured by changing the length of either the headband or the head strap, or both.

It has been recognized that the size adjustment presents an inherent problem, since if the size adjustment mechanism is not limited in its range, a wearer who does not properly understand its function may set the adjustment in a manner so that it permits contact between the shell and the wearer's head. There is shown in the patent to Finken, No. 2,926,355, a rigging in which the headband consists of a front section which is fixed with respect to the shell so that it cannot be adjusted. All head size adjustments are made by changing the length of the rear section of the headband. That arrangement protects against the combination of hazards consisting of an improper adjustment of the headband and an external blow from the front of the helmet shell. However, it does not protect against the combination of an improper adjustment and a blow at the rear of the helmet shell.

BRIEF SUMMARY OF THE INVENTION

The safety helmet of the present invention is provided with a headband including front and rear headband elements, both of which are fixed as to length, so that an improper adjustment of the headband length is impossible. Size adjustment of the helmet is accomplished by the use of pads of various thickness inside the headband. The size adjustment may be accomplished either by the complete substitution of one pad for another of different thickness, or by the variation in thickness of a stack of thin pads by the insertion or removal of pads from the stack. These variable thickness pad size adjustments may be provided between the rear headband and the nape of the wearer's neck. They may also be provided between the ear cups which enclose the wearer's ears and the helmet shell. Additional stabilizing stacks of pads of variable thickness may be provided at other locations in the helmet, for example, in the temple areas.

A feature of the invention is the provision of a flexible headband to absorb part of the energy of external blows, particularly side blows. This headband has a channel section adapted to receive the edge of the helmet shell and a section of cylindrical cross-section extending inwardly from the inner flange of the channel. Since the fixed front and rear headbands are attached to the helmet shell at the sides, this headband provides the primary energy absorbing function against lateral blows. It also provides secondary energy absorbing characteristics at the front and rear of the helmet. Furthermore, the headband partially blocks the air passage existing between the helmet shell and the wearer's head and thus reduces the velocity of air currents passing through that region, which otherwise might be particularly troublesome in some cases, particularly with motorcycle riders.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a safety helmet embodying certain features of the present invention;

FIG. 2 is a front elevational view of the helmet of FIG. 1;

FIG. 3 is a fragmentary sectional view on the line 3—3 of FIG. 1;

FIG. 4 is a sectional view on the line 4—4 of FIG. 1;

FIG. 5 is a sectional view on the line 5—5 of FIG. 4;

FIG. 6 is a sectional view on the line 6—6 of FIG. 4;

FIG. 7 is a sectional view on the line 7—7 of FIG. 4;

FIG. 8 is a sectional view on line 8—8 of FIG. 7;

FIG. 9 is an exploded perspective view of a stack of pads constructed in accordance with the present invention;

FIG. 10 is a detailed and somewhat diagrammatic view on an enlarged scale of a portion of FIG. 9;

FIG. 11 is a fragmentary view of the helmet of FIG. 1 with a portion cut away to show a stack of temple pads constructed in accordance with the present invention;

FIG. 12 is a sectional view along the line 12—12 of FIG. 11, on an enlarged scale;

FIG. 13 is a perspective view of one of the pad elements shown in FIGS. 11 and 12;

FIG. 14 is a fore-and-aft cross-sectional view through a helmet showing a modification of the invention;
FIG. 15 is a cross-sectional view taken on the line 15—15 of FIG. 14; and FIG. 16 is a perspective view, partly broken away and partly shown in section, illustrating a size adjusting pad usable with the helmet of FIG. 14.

FIGS. 1 and 2 show a helmet 20 having a rigid integral one-piece shell 21 of suitable material and having an opening at the lower side thereof for receiving the head of a wearer. The shell 21 has a forefront portion 21a and a rear portion 21b, and may have an ear-covering portion 21c, as in the embodiment shown, Shell 21 is joined by continuous seams 24d, shown by the dotted line in FIG. 1.

The interior surface of shell 21 is covered with a lining 26 which follows the contours of the shell. Lining 26 may be made of padding or a relatively stiff foam-like material which is energy-absorbent. Bonded to the interior of lining 26 are a pair of padded, generally elliptical ear cups 28, to receive the wearer's ears. Alternatively, ear cups 28 may be bonded directly to the interior of shell 21 if an opening of corresponding size and shape is made in lining 26. Ear cups 28 are positioned in the shell to have their long axis vertical when the helmet is being worn. As another alternative, the ear cups 28 may be made as a stack of pads of adjustable thickness, such as the stack shown at 80 in FIGS. 2, 4 and 7 or the stack 90 shown in FIG. 12. Still another alternative mounting for the ear cups 28 is illustrated in FIGS. 14 and 15.

A chinstrap assembly 30 is attached to ear-covering portions 21c of shell 21 by means of screws 29. As shown, this assembly may comprise a woven fabric strap 31 dependent from one side of the helmet and a pair of metal rings 32 dependent from the opposite side. Strap 31 may be looped through rings 32 to fasten the chinstrap, to any degree of tightness desired. Padded elements 33 may be provided on the inside of the chinstrap assembly 30 to prevent the face and skin of the wearer from abrasion by the fabric strap 31 and rings 32. As shown in FIG. 2, rings 32 may be attached to padding 33 directly.

An elongated beading element 35 is disposed along the bottom edge 21d of the shell. It may be disposed only along selected segments of the bottom edge 21d, or, preferably, and as shown, along the whole length thereof. A patch 40, shown in FIGS. 2 and 7, may be bonded to the ends of beading 35, so as to cover the juncture thereof. These two ends may be bonded together, or merely held in abutment by the patch.

FIG. 3 illustrates a preferred cross-section for beading 35. Channel portion 35c has two flanges 35e received and is bonded to the bottom edge 21d of shell 21. To facilitate such engagement, it is preferable to have the width of channel 35c substantially equal to the thickness of shell 21. A web or neck portion 35e is integral with, and extends laterally from, the inside flange 35e. A cylindrical portion 35d is integrally connected to the web 35e. Cylindrical portion 35d may be of any convenient cross-section, although circular is preferred and illustrated; similarly, it may be solid or hollow, although the latter is also preferred. As shown in the preferred embodiment of FIG. 3, web portion 35e is radially disposed with regard to cylindrical portion 35d, and is spaced from both the top and bottom edges of the flange 35b to which it is connected. Such a relationship allows flexible vertical movement of cylinder 35d in either direction with regard to channel 35c. Also, as shown web portion 35e is a solid element but, if desired, it may be made with openings so that certain segments of cylinder 35d are not directly connected to channel 35c.

It is therefore seen that the whole beading 35 is one integral element; thus, it may be readily manufactured by means of an extrusion process. It should be made of a resilient material, such as natural or synthetic rubber, polyvinyl chloride, polyethylene, or the like. These features of flexibility and resiliency allow the beading to comfortably conform to the contours of the wearer's head in those areas in which there is contact between the two, and to adjust to minor relative movements between the helmet and the head which occur during wearing. For example, looking at the cross-section illustrated in FIG. 3, if the wearer's head presses against the cylindrical portion 35d, the hollow circular shape of the latter would permit a resilient deflection into a somewhat elliptical cross-section with the major axis being vertical.

The beading 35 serves to protect the head and face of the wearer from abrasions due to edge 25, both during wearing the helmet and in whatever manner it is stored. It also is effective to absorb energy from external impacts which tend to reduce the spacing between the head and the shell. Furthermore, beading 35, and especially the cylindrical portion 35d, serves to partially occupy the peripheral space about the wearer's head, between the head and the helmet edge 25. Thus, it reduces the flow of air into and through the clearance space between the head and the helmet, which occurs when the helmet is worn by one moving at a substantial velocity, e.g., a motorcycle rider. This makes wearing the helmet more comfortable by reducing the noise level in the clearance space, and protecting the wearer from possible physiological harm due to the currents themselves. However, in the normal wearing of the helmet, the head of the wearer will not be in contact with beading 35 along all of its length; the open spaces thus provided do allow some air flow through the clearance space thus ventilating it and removing body heat emanating from the head and neck.

FIGS. 4-10 inclusive illustrate another feature of the present invention whereby greater comfort and safety are obtained in the wearing of a safety helmet. Disposed within shell 21 is a rigging consisting, as shown in FIG. 4, of a front headband 45, a rear headband 46, a central head strap 47 and two diagonal head straps 48. The three head straps cross over each other at the crown of the head, but are not attached directly or indirectly to each other in this region. The headbands 45 and 46 and the head straps 47 and 48 are made of an inelastic material, such as a woven fabric. The headbands are anchored near their ends to shell 21 by two screws 49, one of which is adjacent to each ear cup 28. Each headband may be a single integral piece with its ends anchored directly to the shell, as shown in FIG. 4 in the case of rear headband 46. Alternatively, as in the case of the front headband 45, such a headband may be anchored through loops 50 of inelastic material stitched to the ends of the middle portion of headband 45. Each loop 50 passes through a slot in a metallic plate 51. Plate 51 is held in place by screw 49 and nut 52. The headbands 45 and 46 are further connected to the shell 21 by fabric loops at the six points where the ends of head straps 47 and 48 are anchored to the shell. As best seen in FIG. 4, these connections are located at the front portion 21a of the shell (see also FIG. 5), the nose portion 21b of the shell (see also FIG. 7), and at four other points, located midway between each of the previously-mentioned two locations and each of the two screws 49 (see also FIG. 6).

Employing such connecting structures and using other inelastic elements, as described in detail below, assures that the shell and the central portions of the headbands never come into contact with each other, so that a hard blow on the shell is not transmitted directly to the wearer's head.

Fore-and-aft head strap 47 is attached, as by spaced rows of stitching 47a and 47b to front headband 45 at the front portion of the helmet, as shown in FIG. 5. Padding 54 is attached to the front headband by the same two rows of stitching, and is disposed inwardly of the headband 45 to protect the wearer's forehead. A metal plate 55, is used to attach head strap 47 to shell portion 21a. A screw 56 passes through an aperture in plate 55, and, in cooperation with a nut 57, holds the plate against the front shell portion 21a. The lower end of the headstrap extends from the stitching 47b under the bottom edge of
plate 55, upwardly between the plate and the shell, thence through another aperture in the plate and back to the same row of stitching 47b. It is then looped back upon itself and through the same aperture and upwardly between the plate and the shell, over the top of the plate to the stitching 47a. The looping of headstrap 47 as described, and the stitching thereof to the headband 45 at more than one plate, provide a flexible but inelastic connection of the head strap and the headband to shell 21. The location of the padding lining 26 and a portion of the heading cylinder 35d between headband 45 and the shell 21 further prevent the headband from coming in contact with the shell if the shell should move relative to the head, as from a hard blow.

The head of screw 56 is also used to retain a snap element 58 to allow apparatus (not shown, e.g., a face mask or goggles) to be used in conjunction with the forehead portion of the helmet. FIG. 6 shows one of the four end portions of diagonal head straps 48, the others being similar. The end of diagonal head strap 48 is looped through slots in a buckle 60. The end of the head strap 48 is not stitched; it is held frictionally by slots in the buckle 60. Thus, the length of head strap 48 may be adjusted by pulling more or less of it through the buckle. Buckle 60 contains another slot through which is looped a head strap connecting element 61, which is made of inelastic material. A binding to that used for head strap 48. Connecting element 61 is also looped through a slot in a metal plate 62, and it is doubled back and stitched upon itself. Plate 62 is attached to shell 21 by a screw 63 and nut 64. The head of screw 63 may be used to retain a snap element, not shown in FIG. 6 but similar to that shown at 58 in FIG. 5. Headband 46 passes through the interior of a saddle loop 65 and is stitched to it. Saddle loop 65 is attached and passes between the plate 62 and a washer 66 on the screw 63. A secondary headband element 44 may be employed, parallel to rear headband 46 and disposed inwardly of the helmet shell with regard to the headband 46 and saddle loop 65. The secondary element provides a smooth inner surface, uninterrupted by the saddle loop, to support a size adjusting means 80. A similar secondary headband could be employed with the front headband 45, although this had not been shown in the drawing. Secondary headband 44 is employed to adjust the position of headband 46, and by being stitched to headband 46 and saddle loop 65 at their place of juncture, it reinforces that juncture. Another view of these elements is shown in FIG. 8. Secondary headband 44 and saddle loop 65 are also made of inelastic material.

As shown in FIGS. 7 and 8, at the rear portion of the safety helmet, center head strap 47 is looped through slots in a buckle 70 and folded back upon itself. The end of the head strap is not stitched; it is held frictionally by buckle 70. Thus, the length of head strap 47 may be adjusted by pulling more or less of it through the buckle. An inelastic connecting strap 71 is also looped through a slot in buckle 70; the upper end of this strap is doubled over and stitched to the strap itself. The other end of strap 71 is attached to nape shell portion 21b by means of a metal plate 72. The plate is held in engagement with shell nape portion 21b by screw 73 and nut 74. Strap 71 passes between the inwardly disposed flat surface of plate 72 and nut 74, thence through one aperture and then doubles back upwardly between of the opposite flat surface and underside of shell nape portion 21b. Connecting strap 71 passes through a saddle loop 75 stitched at its ends to headband 47. Strap 71 and headband 47 are thereby held in loose engagement. As shown most clearly in FIG. 7, headband 46 and secondary headband 44 are stitched to each other and to the two ends of a headband anchor loop 76. This loop 76 is inelastic. Its central segment passes through the same aperture in plate 72, that strap 71 passes through and this segment is clamped against the interior of the shell portion 21b by the plate 72.

Disposed on the inward surface of secondary headband 44 is a sizing means 80. This sizing means 80 comprises a stack of intermediate pads 81 and a neck pad 86. The pads 81 are of energy absorbing material, such as high density polyvinylchloride. The stack 80 may be varied in thickness by adding or removing pads 81. To accomplish this, each pad 81 has one of a set of two cooperating elements of a fastening means 82 arrayed on one of its surfaces, and the other of the set of two complementary co-operating elements arrayed on the opposite surface. For example, as better illustrated in FIGS. 9 and 10, a hook-and-loop fastener, such as that sold under the trade-mark "Velcro" may be employed. One side of pad 81 bears a number of small hooks 83 on one of its surfaces, and a number of small loops 84 on the other. When the hooks 83 on one pad are pressed together with the loops 84 on an adjacent pad, the hooks and loops engage, fastening the two pads into a stack.

The stack of pads 81, 86 is mounted on the headband 44 by an attachment member 85. It is a fabric member attached, as by bonding, to the interior of secondary head band 44 and bearing on its inner surface either one of the set of two fastener elements. In FIG. 9 member 85 is shown as bearing loops 84. The pad at the innermost end of the stack is a made of inelastic material similar to that used for head pad 81, and is of a material such as low density polyvinylchloride, covered, as with leather, and having a concave surface 87 disposed inwardly and contoured to engage the back of the wearer's head or neck. The convex outer surface of neck pad 86 bears an array of fastener elements complementary with those carried on attachment member 85. As shown in FIG. 9, it bears hooks 83. Thus neck pad 86 may be fastened directly to attachment member 85, and such an arrangement will represent the minimum thickness of stack 80. Alternatively, a number of pads 81 may be inserted between the attachment member 85 and neck pad 86 to create a thicker stack 80.

The wearer will adjust the thickness of stack 80 to comfortably fit helmet 20 to his head. The sizing adjustment allows the rear headband 46 to be manufactured of fixed length, which eliminates the possibility of an improper adjustment which might allow the helmet shell to come in contact with the headband, so that an external blow on the shell might be transferred directly to the wearer's head.

In the present invention, if the contoured neck pad 86 is properly positioned by the wearer, it will loosely engage the back of his head, absorbing the impact of blows received by the helmet, and preventing the helmet from twisting or turning violently with regard to his head in the event of a collision. Such stabilization is a desirable attribute of a safety helmet as it insures that the head is adequately protected by the helmet throughout the duration of a collision or accident. The position of stabilizing and sizing stack 80 within the cavity of shell 21 may be seen in FIGS. 2, 4 and 7.

Sizing pad 86 may include a layer of the greater density, energy-absorbing, material from which pads 81 are constructed, although this is not specifically shown in the figures. An additional stabilizing feature in the safety helmet of the present invention is illustrated in FIGS. 11–13. Within shell 21, attached to the inner surface of lining 26, is a stack 90 of stabilizing pads 91 made of energy absorbing material. Stack 90 may be positioned anywhere within the shell, but is preferably in the region adjacent the wearer's temples, as shown in FIG. 11. Stack 90 is also variable in thickness by adding or removing pads from it. To accomplish this, each of pads 91 has fastening elements on its surfaces, as described above with regards to pads 81. Alternatively, the surfaces of pads 91 may bear an adhesive substance which will hold
one pad in engagement to another by the application of moderate pressure.

Analogous to the above description of stack 80, stack 90 has two unique end components. One of these is the pad adjacent to the wearer's head; it has no adhesive on the surface closest to the head. The other unique element of stack 90 is the one at the opposite side of the stack. This element fixes the position of the stack within shell 21 and may be an ordinary pad 91 which is adjacent to lining 26 and not removable from contact therewith, or it may consist of a portion of lining 26, equal in size and shape to a contact surface of a pad 91, bearing a fastener element or a layer of adhesive.

The present invention may be equipped with any number of stabilizing stacks 90, although in practice the number employed would be limited so as not to interfere with the necessary and desirable ventilation of the helmet cavity which has been previously discussed. By only filling in selected areas with such stacks, comfort is retained for the wearer by permitting ventilation.

The wearer adjusts the thickness of stack 90 according to the space between his head and the interior lining 26. Preferably, the stack should not contact the head but just clear it. In the event of a collision or violent blow, the stack of pads will engage the wearer's head, preventing the helmet from turning violently. This stabilization of the helmet is desirable, as has been discussed above. In addition, pads 91 will absorb at least part of the energy of a blow and not transmit it to the head.

If pads 91 are held together by adhesive material, rather than cooperating fastener elements, it should be recognized that the holding power of a layer of such material may decrease as the number of cycles of engagement-disengagement is increased.

The size adjusting means 80 performs both size adjustment and stabilizing functions. Similarly, the stacks 90 also perform both size adjustment and stabilizing functions.

The term “rigging,” as used in this specification, is intended to be a comparative term, inclusive of the rigging, as mentioned above, includes the headbands 45, 46 and the headstraps 47, 48. The term “stabilizing means” is intended as a generic term inclusive of the headbands of the size adjusting means 80 of FIGS. 4–10, the stacks 90 of FIG. 11, the size adjusting means 102 of FIG. 16 and the size adjusting means of FIG. 15.

FIGS. 14–16

The helmet shell 21 shown in these figures and the headbands 45 are the same as corresponding parts shown in FIGS. 1 to 13.

The front headbands 45 and the rear headband 46 are the same as the front and rear headbands bearing the same reference numerals in FIGS. 1 to 13. Stitched along the upper edge of each of the headbands 45 and 46 is a wide perforated flap 100 of leather or other suitable soft material for engaging the wearer's head. Bonded to the outer surface of each of the flaps 100 is a thin cushion 101 of sponge rubber or the like. The flaps 100 and the cushions 101 serve to protect the wearer's head from direct contact with the headbands. One of these arrangements is applied to those straps over a larger area of the wearer's head.

The size adjusting mechanism mounted on the rear headband 46 is slightly different in FIGS. 14–16 than in the helmet of FIGS. 1 to 13. The rear headband 46 is attached thereto an attachment member 85 similar to the attachment member 85 of FIG. 9. The size adjusting pad mounted on the attachment member 85 consists of a single pad 102, which may consist of a sponge rubber core 103 covered by a layer 104 of soft leather or the like. On the back side of the pad 102, as it appears in FIG. 16, there is provided a strip 105 including the hooks of a hook and loop fastener, similar to the strip 83 of FIG. 9. Thus, the size adjusting mechanism of FIG. 14 differs from that of FIG. 9 in that only a single pad is employed and in that the pad is not contoured in an effort to approximate the contours of the wearer's head. It has been found that such contouring of the pad is not necessary or even desirable in all cases. Furthermore, where a helmet is to be worn by only one person, it is more convenient to make the size adjusting permanently by the installation of a single pad of the proper thickness. This requires the dealer to maintain a stock of pads of varying thicknesses. Nevertheless, the completed helmet is much simpler and less likely to become disarranged than where multiple pads are used.

The size adjustments at the sides of the helmet, i.e., between the ear cups and the shell, are different in the helmet of FIGS. 14 to 16 than in the helmet of FIGS. 1 to 13. This size adjustment mechanism is best shown in FIG. 15. Each ear cup 106 is mounted on a flat sheet 107 of stiff fabric or other suitable material. The sheet 7 carries two recessed snap fastener elements 108 which cooperate with projecting snap fastener elements 109 mounted at the ends of an elastic strap 110 which extends along the inside of the helmet shell and covers the mounting plate 51 by which the front and rear headbands are attached. The central portion of the elastic strap 110 is simply bonded to the shell. A foam rubber or other suitable resilient pad 111 is also bonded to the shell over the strap 110. One or more loose pads 112 are inserted in the stack between the pad 111 and the ear cup 106. Pads 112 may be inserted or removed by simply unsnapping the fasteners 108, 109, and removing the ear cup 106 so that the stack of loose pads 112 becomes accessible. Thus, the size of the helmet in FIG. 14 may be adjusted at each ear cup and at the nave of the neck, thereby providing an effectively complete peripheral size adjustment. Note that if the spacing between the wearer's head and the helmet shell is adjusted at three sides, it need not be adjusted at the fourth side, i.e., the front of the helmet. Any necessary changes in spacing may be taken up with the three adjustments provided.

Numerous modifications and adaptations of the safety helmet of the invention will readily be apparent to those skilled in the art. Thus it is intended by the appended claims to cover all such modifications and adaptations as fall within the true spirit and scope of the appended claims.

I claim:

1. A safety helmet comprising:
(a) a rigid outer shell shaped to fit over a human head and having an open bottom defined by a continuous bottom edge; and
(b) rigging means attached to the shell and adapted to support the shell on the head of a wearer and to limit movement of the shell with respect to the wearer's head; wherein the improvement comprises:
(c) an elongated headband element in said rigging means, for limiting movement of the shell with respect to the wearer's head, including:
(1) a portion of channel-shaped cross-section having side flanges;
(2) a portion of cylindrical cross-section; and
(3) a flexible web portion extending laterally from the outer face of one flange, said web portion being spaced from both longitudinal edges of the flange, and integrally connecting said flange to the cylindrical portion;
(4) said bottom edge of the shell being received within said channel-shaped portion so that the headband element is disposed along said bottom edge of said shell with said cylindrical portion projecting toward the inside of the shell and the cylindrical portion being movable vertically with respect to the channel-shaped portion by virtue of the flexibility of the web portion.
2. A safety helmet comprising:
   (a) a rigid outer shell shaped to fit over a human head and having a forehead end, a nape end and an open bottom defined by a continuous bottom edge; and
   (b) rigging means attached to the shell and adapted to support the shell on the head of a wearer and to limit movement of the shell with respect to the wearer’s head, said rigging means including:
      (1) a front headband and a rear headband, each of inelastic material and fixed length, and directly anchored at their end portions to the interior of said shell at points in the sides thereof, said headbands being shorter in length between said anchorage points than the corresponding distance as measured along the interior circumference of said shell; and
      (2) size adjusting means located only between said rear headband and the wearer’s head;
   wherein the improvement comprises:
      (c) a single elongated head engaging pad element in said size adjusting means having a continuous surface contourd to engage a wearer's head in an area extending horizontally a substantial distance on both sides of the centerline of the helmet;
      (d) mounting means for said pad element including:
         (1) two cooperating elongated separable hook and loop fasteners of substantially equal length, one of said elements being fastened on the side of the pad element opposite said head engaging surface and extending substantially the full length thereof; and
         (2) the other of said fastener elements being permanently attached on the inner surface of the rear headband only and extending symmetrically on both sides of the centerline of the helmet;
      (3) said pair of fastener elements cooperating to insure that the size adjusting pad element is mounted only on the rear headband and only at a locality symmetrically disposed on both sides of the nape portion of the wearer's head.

3. A safety helmet as defined in claim 2, wherein said head-engaging pad element is thicker at its ends than at its middle.

4. A safety helmet comprising:
   (a) a rigid outer shell shaped to fit over a human head and having a forehead end, a nape end and an open bottom defined by a continuous bottom edge; and
   (b) rigging means attached to the shell and adapted to support the shell on the head of a wearer and to limit movement of the shell with respect to the wearer’s head, said rigging means including:
      (1) a front headband and a rear headband, each of inelastic material and fixed length, and directly anchored at their end portions to the interior of said shell at points in the sides thereof, said headbands being shorter in length between said anchorage points than the corresponding distance as measured along the interior circumference of said shell; and
      (2) size adjusting means located between one of said headbands and the wearer’s head comprising replaceable pad means of variable thickness;
   wherein the improvement comprises:
      (c) a pad element in said size adjusting means having a surface adapted to engage a wearer’s head;
      (d) mounting means for said pad element including cooperating separable hook and loop fastener elements located respectively on the side of the pad element opposite said head-engaging surface and on the inner surface of the rear headband for removably connecting the pad element to the inner surface of the rear headband to occupy at least part of the space between the rear headband and the rear of the wearer’s head;
      (e) at least one additional pad insertable between said first-mentioned pad and said cooperating element on the rear headband to provide a stack of variable thickness, each said additional pad including a pair of cooperating separable fastener elements on its opposite surface, so that the additional pads may be held by said cooperating elements in said stack.

5. A safety helmet as defined in claim 4, in which said stack includes at least one layer of energy absorbing material.

6. A safety helmet as defined in claim 4, in which said additional pad includes complementary elements of a hook and loop fastener on its opposite major surfaces and in which said cooperating element on the rear headband is one of the complementary elements of such a fastener and said head engaging pad includes the other complementary element thereof on its non-head engaging surface.

7. A safety helmet comprising:
   (a) a rigid outer shell shaped to fit over a human head and having a forehead end, a nape end and an open bottom defined by a continuous bottom edge; and
   (b) rigging means attached to the shell and adapted to support the shell on the head of a wearer and to limit movement of the shell with respect to the wearer's head, said rigging means including:
      (1) a front headband and a rear headband, each of inelastic material and fixed length, and directly anchored at their end portions to the interior of said shell at points in the sides thereof, said headbands being shorter in length between said anchorage points than the corresponding distance as measured along the interior circumference of said shell; and
      (2) size adjusting means located between one of said headbands and the wearer's head and comprising replaceable pad means of variable thickness;
   wherein the improvement comprises:
      (c) an elongated beading element in said rigging means for limiting movement of the shell with respect to the wearer's head, including:
         (1) a portion of channel-shaped cross-section having side flanges;
         (2) a portion of cylindrical cross-section; and
         (3) a flexible web portion extending laterally from the outer face of one flange, said web portion being spaced from both longitudinal edges of the flange, and integrally connecting said flange to the cylindrical portion;
      (4) said bottom edge of the shell being received within said channel-shaped portion so that the beading element is disposed along said bottom edge of said shell with said cylindrical portion projecting toward the inside of the shell, said cylindrical portion being movable vertically with respect to the channel-shaped portion by virtue of the flexibility of the web portion.

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