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GEODETIC STRAP SUSPENSION FOR HELMETS

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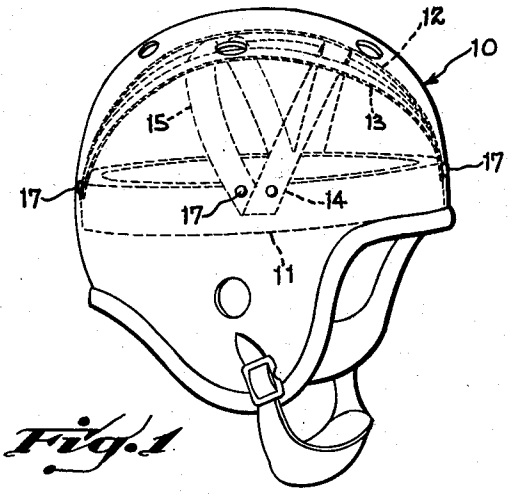


Fig. 1

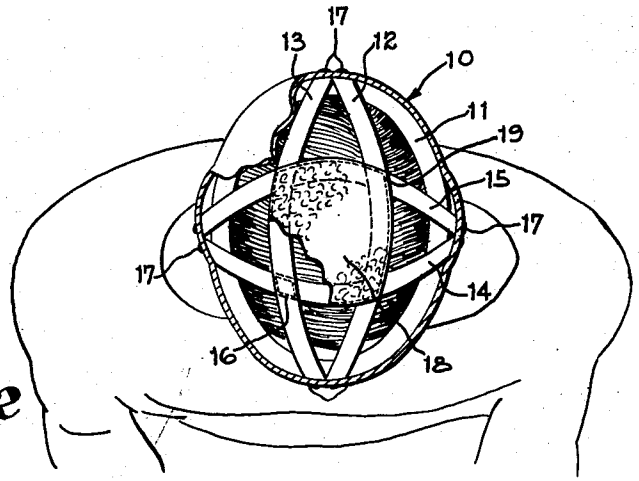


Fig. 2

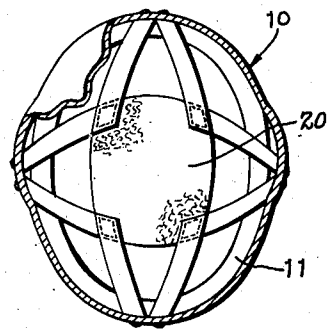


Fig. 3

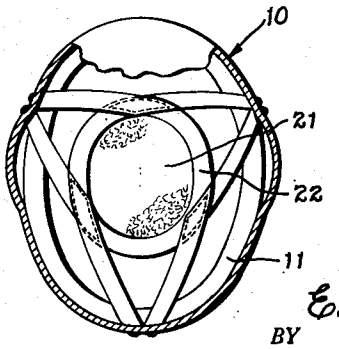


Fig. 4

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GEODETIC STRAP SUSPENSION FOR HELMETS

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9 Claims. (Cl. 2—3)

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This invention relates to helmets which are suitable for use as football helmets or crash helmets. More particularly, the invention relates to a particular method of suspending the helmet on the head of the wearer.

The type of helmet to which this invention is primarily applicable is a shell type of helmet, that is a helmet which is constituted by a dome shaped outer shell of semi-resilient material such as plastic or sheet metal. In general, and particularly for football helmets, it is desirable to make the helmet as a whole as light as possible so that it provides the least possible annoyance or impedance for the wearer. At the same time, it is necessary that the helmet be firmly anchored or moored on the head of the wearer so as not to slip, either as a result of sudden motion on the part of the wearer or as a result of a blow delivered against the exterior of the helmet.

The displacement of the helmet in relation to the head of the wearer is highly undesirable for two reasons. In the first place, the displacement is disconcerting and annoying to the wearer and in the second place, the displacement may permit the force of a displacing blow to be transmitted to the head of the wear in whole or in part.

Customarily, this shell type of helmet has a band of padding about its rim which spaces the head of the wearer from the rim and yet affixes the rim of the helmet in relation to the wearer's head. Customarily, the shell itself of the helmet is spaced from the wearer's head by means of flexible straps, each of which is affixed at each end to the inside of the shell of the helmet to provide a loop between the ends which passes over the head of the wearer and bears downwardly against it. Customarily, each strap is affixed to the rim of the helmet at two points diametrically opposite each other so that all of the straps meet and cross in the center of the dome of the helmet immediately over the center of the head of the wearer upon which the rest collectively.

This type of suspension has one outstanding disadvantage regardless of whether two straps or three or four or more are employed, and that is that the straps collectively provide more resistance than is necessary to a blow directed downwardly on the center of the top of the helmet but do not provide enough resistance individually or collectively to a blow which is directed against the helmet at an angle.

For the purpose of analysis of the problem, each strap, when looped over the head of the

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wearer, may be considered as lying in a plane which passes through the center of the strap. In the conventional type of suspension, the planes defined by the straps intersect one another in a common line which is the vertical axis of the helmet. If a line is drawn between the ends of each individual looped strap, then the looped strap may be conceived as a semicircle and the lines between the ends as a cord. Each strap will offer maximum resistance to a blow which is in the plane of the strap at right angles to the cord and in the center of the strap. If a line is drawn from the center of the strap to the cord at right angles to the cord, this line may be said to define the angle of maximum resistance of the strap. Now with the conventional type of helmet suspension, the line defining the angle of maximum resistance of each strap coincides with the vertical axis of the helmet so that all of the straps offer equal and maximum resistance to a straight down blow in line with the vertical axis of the helmet, yet none of the straps offers maximum resistance to any other blow.

Further, each strap loses effectiveness in relation to blows in its plane as the angle of the blow varies from straight down, which I shall call 90°, to horizontal, which I shall call 0°. In fact, in case of a straight horizontal blow, it is the padding in the rim of the helmet, rather than the straps which absorb the shock. The most vulnerable area of the helmet having the conventional strap suspension lies between top and rim, if the blow is an angular blow which is above the padded rim and is neither sufficiently horizontal to be absorbed by the padded rim nor yet sufficiently vertical to be absorbed by the straps. On the conventional helmet, this vulnerable area is quite extensive whereas the area of maximum protection is very limited.

The objective of the inventor is to provide a strap suspension for a helmet which in relation to the conventional strap suspension, provides far greater areas of maximum effectiveness in offering resistance to crushing and/or displacing blows.

This objective is accomplished by angulating the planes of the individual straps whereby the angle of maximum resistance of each strap is different from that of each other strap. This arrangement has been made possible by my determination that each strap, in and of itself, has sufficient strength to resist the maximum blow which the helmet can withstand if the blow

is delivered at the angle of maximum resistance of the individual strap. Hence, it is unnecessary to have these angles of maximum resistance coinciding or directly supplementing one another, but rather it is much better to have these angles of maximum resistance pointing in different directions, so to speak, so that they complement one another in the sense of increasing the area of maximum resistance of the helmet as a whole and correspondingly reducing area of vulnerability. The invention will be better understood in relation to the description of the accompanying drawings in which:

Figure 1 is a side elevational view of a conventional football helmet with the suspension straps of this invention shown in dotted lines.

Figure 2 is a top plan view of a helmet in place upon a person's head in which the upper or crown portion of the helmet is broken away, to illustrate the suspension straps.

Figure 3 is a view similar to Figure 2 illustrating a modified form of the invention.

Figure 4 is also a view similar to Figure 2 illustrating an additional modification of the invention.

For the purpose of exemplifying my invention, I choose a football helmet which is constituted by a plastic shell 10, rim padding 11 and, in the preferred embodiment disclosed in Figures 1 and 2, four suspending straps 12, 13, 14 and 15. Two of these straps, 12 and 13, extend from front to rear of the helmet and two of them, 14 and 15, extend from side to side of the helmet. Each of these straps intersects with two other straps inside the dome of the helmet thus providing four strap intersections, or four points spaced apart, thereby constituting a head nesting cradle intermediate the four points of intersection. This cradle rests upon the top of the head of the wearer of the helmet and provides anchorage or mooring on the head of the wearer which is firmer than that provided by a series of straps which intersect at their middles.

Further, I angulate the plane of each strap in relation to the vertical axis of the helmet so that the angle of maximum resistance of each strap is different from that of each other strap. Thus, the angle of maximum resistance of strap 12 points upwardly and to the left of the head of the wearer, strap 13 upwardly and to the right of the head of the wearer, strap 14 upwardly and forwardly of the head of the wearer, and strap 15 upwardly and rearwardly of the head of the wearer. As to vertical blows, no one strap offers maximum resistance but each strap offers some resistance so that the helmet is sufficiently steady in respect to downward blows, but at the same time, is not vulnerable to sideward blows.

In the helmet shown in Figures 1 and 2 the straps are secured to one another at the four intersecting points by stitching 16, and attached to the protective shell 10 by rivets as at 17. The points of attachment 17 to the shell preferably are near to or behind the rim padding 11, hence I refer to these points as being on the "rim," or in the "rim area," of the helmet.

Means other than rivets may be employed for fastening the straps at these points. Also in the helmet shown in Figures 1 and 2, the area defined by the four points of intersection is covered by a crown piece 18, preferably made of soft leather, which contributes to the wearer's comfort by supplementing the cradle effect of the straps. In addition to leather however, other materials, including padded devices if desired, may be employed in place of the particular one shown. Preferably the crown piece 18 is sewn to the respective straps marginally as at 19, but in this regard also, other fastening means including adhesive, lacing, or the like may be used.

The straps themselves, in the preferred embodiment, are fabricated from the materials commonly employed for helmet suspension straps, consisting of flexible webbing of limited stretchability. The straps shown in Figure 2 are riveted at the front, back and two sides of the helmet. However, a somewhat similar cradling effect can be obtained by displacing the fastening points 45 degrees to the right or left looking down upon the helmet. If desired, a greater number of straps may be employed. Doubling the number and offsetting the second set of four, 45 degrees from the first set, as described above, is one way of doing this. The more straps, the better is the distribution of the force of blows, but of course, the fabrication is also more expensive.

Another way of obtaining the cradling effect is shown in the modifications illustrated in Figures 3 and 4. In Figure 3 the straps are discontinuous and a crown piece 20 is utilized which is made of material similar to that from which the straps are made in that it is of limited stretchability. The straps in this modification are attached to the crown piece 20 marginally, but lie in the same planes described above. Otherwise expressed, the straps are provided in pairs, the straps of each pair having their lower ends riveted to the helmet in the rim area at adjacent points and their upper ends affixed to the margin of the crown piece 20 at spaced points. Thus, the straps of each pair diverge from the helmet rim upwardly, and although they stop at the crown piece, they form with the straps of the pair opposite them, and the intervening crown piece, continuous contact with the head of the wearer in the same areas contacted by the straps of the preferred embodiment.

In the form shown in Figure 4, three points, or zones, or areas of the helmet rim are utilized as suspension foci for a helmet supporting crownpiece 21 adapted to rest upon the head of the wearer. This crownpiece may comprise a layer of leather or cloth which is marginally bounded by cord or tape 22. The marginally bounded cord or tape is secured to the rim of the helmet by means of a series of straps of the type disclosed in the other views. As disclosed, two straps radiate from each local area or zone of the helmet rim to two more widely spaced points on the crownpiece margin. In this way, the crownpiece is cradled or slung in hammock-like fashion from a plurality of shell zones, the number of which may be three, i. e. odd, as disclosed in Figure 4, as well as even, as disclosed in the other figures.

Thus the crownpiece may be cradled from anywhere from three to ten or more points on the helmet rim, the number utilized depending upon the size and strength of the individual straps and the desirability of establishing maximum stability for the crownpiece. It is to be noted that in helmets of the usual design where the straps all pass through the vertical axis of the helmet, the margin of the crownpiece is, in effect, attached to the rim of the helmet by a plurality of individual straps which radiate from the margin of the crownpiece to the rim of the helmet. The suspension of this invention is just the reverse in

that the straps radiate from the rim of the helmet to the margin of the crownpiece, thus cradling the crownpiece from a plurality of rim supporting areas. This gives the supporting straps different angles in relation to the crownpiece and in relation to each other, whereby the helmet is steadier on the head of the wearer and there is less tendency of the helmet to sway or displace under the impact of lateral blows.

By analogy to geography, in the old type of helmet suspension, the padded rim of the helmet may be likened to the equator and the individual straps to meridians which all pass over the pole. In the improved helmet of this invention, the straps are positioned as geodetics which do not pass over the pole but which intersect one another to bound a spherical surface which includes the pole. This analogy is not to be taken literally because the head of the wearer is not truly spherical nor the rim of the helmet truly circular, so strict geographic parallelism is impossible. From the engineering point of view, it is the dispersion of the angles of maximum resistance of the individual straps which imparts the greater universal stability and protectivity to the helmet.

I claim:

1. A safety helmet comprising a semi-rigid shell, a pad disposed about the rim of the helmet to space the shell from the head of the wearer, and means for positioning the helmet on the head of the wearer, said means comprising four straps of flexible but substantially non-stretchable webbing, said straps arranged in pairs with one pair extending from front to back in the shell, and the other pair extending from side to side in the shell, said straps secured at their respective ends to the shell adjacent the rim thereof and extending in arcs which are spaced from the inner surface of the shell, said arcs lying in planes angulated with respect to the vertical axis of the helmet whereby four intersections between straps are provided, the intersections being spaced radially outwardly from said vertical axis, and means fastening said straps at each of the four intersections.

2. Means for suspending a helmet of the type having a pad disposed about its rim designed to space the helmet from the head of the wearer, said means comprising four straps of flexible but substantially non-stretchable webbing, each strap secured at its respective ends at points substantially opposite one another adjacent to the rim of the helmet, each of said straps extending between the points at which it is affixed to the helmet in an arc which lies in a plane angulated with respect to the vertical axis of the helmet, the planes of the arcs intersecting at points symmetrically spaced about the vertical axis whereby four strap intersections are provided which are spaced symmetrically with respect to said vertical axis.

3. A safety helmet comprising an outer semi-rigid plastic shell, a pad disposed about the rim of the helmet to space the shell from the head of the wearer, and means for positioning said helmet on the head of the wearer, said means comprising a plurality of flexible straps, each joined at each end to the helmet adjacent to its rim but on relatively opposite sides thereof, whereby each strap passes over a portion of the head of the wearer, said straps interconnected one with another intermediate their ends to provide intersections which are spaced from the vertical axis of the helmet, whereby two straps mutually affix each other angularly so that a plane passing through the center of each strap intersects the vertical axis of the helmet at an angle.

4. A safety helmet comprising an outer shell of semi-rigid plastic material and means for supporting said shell on the head of the wearer, said means comprising a crownpiece adapted to rest upon the head of the wearer said crownpiece spaced from said shell and a series of straps connecting the margin of said crownpiece to the rim of the helmet, said straps radiating in pairs from three or more local areas of the shell rim to more widely spaced points on the margin of the crownpiece.

5. In a safety helmet comprising an outer shell of semi-rigid plastic material, means for supporting said shell on the head of the wearer comprising a crownpiece adapted to rest upon the head of the wearer said crownpiece spaced from said shell, pairs of straps connecting the margin of said crownpiece to the rim area of the helmet, the straps of each pair having their respective lower ends secured to the helmet close to one another and having their respective upper ends secured to the margin of the crown piece at more widely spaced points, whereby the straps of each pair diverge upwardly.

6. A safety helmet comprising a semi-rigid shell, at least three pairs of flexible but substantially non-stretchable straps, the respective pairs of straps being spaced substantially equally circumferentially round the inside of said shell, the straps of each pair having lower ends which are affixed close together to the inside of said shell in the rim area thereof, the respective affixed ends of all straps being in substantially the same plane, the straps of each pair diverging upwardly from their affixed ends, and each strap of a pair being affixed in the crown area of said shell to the strap of another pair which is closest to it in said crown area, and a crownpiece interconnecting all of said straps in said crown area.

7. Means for supporting a protective helmet on a person's head comprising a first pair of straps, the straps of said first pair having their respective opposite ends affixed to the inside of the helmet in the rim area thereof at substantially diametrically opposite places, the respective straps of said first pair diverging upwardly from their affixed ends, a second pair of straps similar to the first pair, but having their respective opposite ends affixed to the inside of the helmet in the rim area thereof at points which are offset circumferentially with respect to the affixed ends of the first pair, the straps of the first pair intersecting the straps of the second pair at places which are spaced outwardly from the vertical axis of the helmet and which are spaced from the top of the helmet, and securing means affixing said straps against sliding movement relative to one another at said intersections to provide a cradle for the head of the wearer.

8. Means for supporting a protective helmet on a person's head comprising a first pair of straps, the straps of said first pair having their respective opposite ends affixed to the inside of said helmet at substantially diametrically opposite places in the rim area thereof, the straps of said first pair diverging upwardly with respect to one another from their affixed ends, a second pair of straps, said second pair of straps having their opposite ends affixed to the inside of said helmet in the rim area thereof at substantially diametrically opposite places which are offset circumferentially of the helmet sub-

stantially 90° with respect to the places where the ends of said first pair of straps are affixed to the helmet, the straps of said second pair diverging upwardly with respect to one another from their affixed ends and intersecting the straps of said first pair at four places which are spaced outwardly with respect to the vertical axis of the helmet, and means to fasten the intersecting straps to one another at said four places.

9. The means for supporting a protective helmet on a person's head as set forth in claim 8

in which a crownpiece is secured to the respective straps in the crown area of the helmet to provide a cradle for the head of the wearer.

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