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Lamb

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[54] **HEAD AND CROWN SUSPENSION FOR PROTECTIVE HELMET**

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

[51] **Int. Cl.** **A24b 3/00**

[58] **Field of Search** ..... 2/3 R, 3 A, 3 B, 3 C, 5, 2/6, 7

[56] **References Cited**

UNITED STATES PATENTS

2,763,863	9/1956	Bowers, Sr.	2/3 B
3,609,765	10/1971	Molitoris	2/3 A
3,619,814	11/1971	Aileo	2/3 A
3,628,190	12/1971	Molitoris	2/3 A

FOREIGN PATENTS OR APPLICATIONS

996,612	12/1951	France	2/3 B
1,017,797	12/1952	France	2/3 B

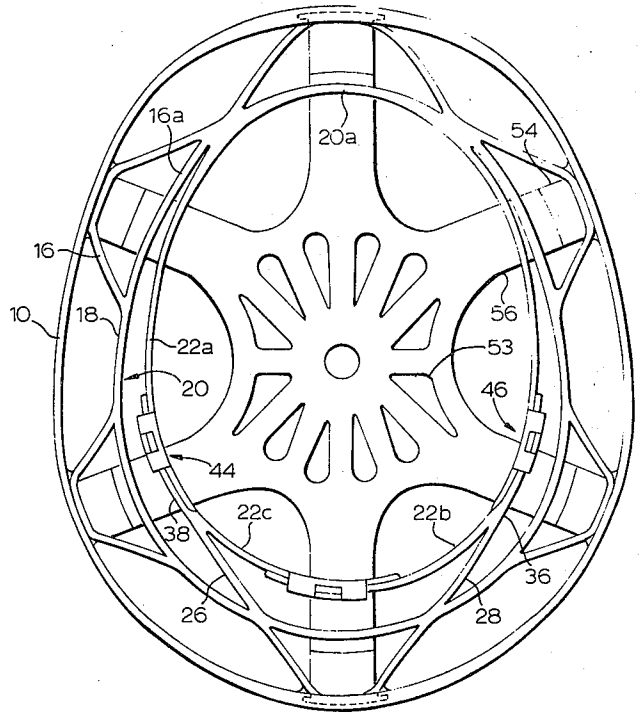
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[57] **ABSTRACT**

The head suspension consists of a continuous rigid outer strap and an inner strap. The outer strap is secured to the inside of the shell of a helmet and consists of a number of tightly stretched loops and links which in part define a continuous band spaced apart from the shell. The inner strap extends circumferentially with the outer strap to contact the wearer's head and is connected to the outer strap preferably at four only points spaced along the inner strap length. Preferably the inner strap is composed of three segments disposed in end-to-end relationship. The segments have overlapping end portions disposed between all but one pair of adjacent points and means is provided for adjusting the overlap of the end portions.

The crown suspension consists of upper and lower dome-shaped elements each having a central portion and radially extending legs. The legs of the upper element are connected to the shell and means is provided for adjusting the position of the legs of the lower element relative to the upper element legs to enable the lower element to be fitted to various sized heads.

6 Claims, 4 Drawing Figures



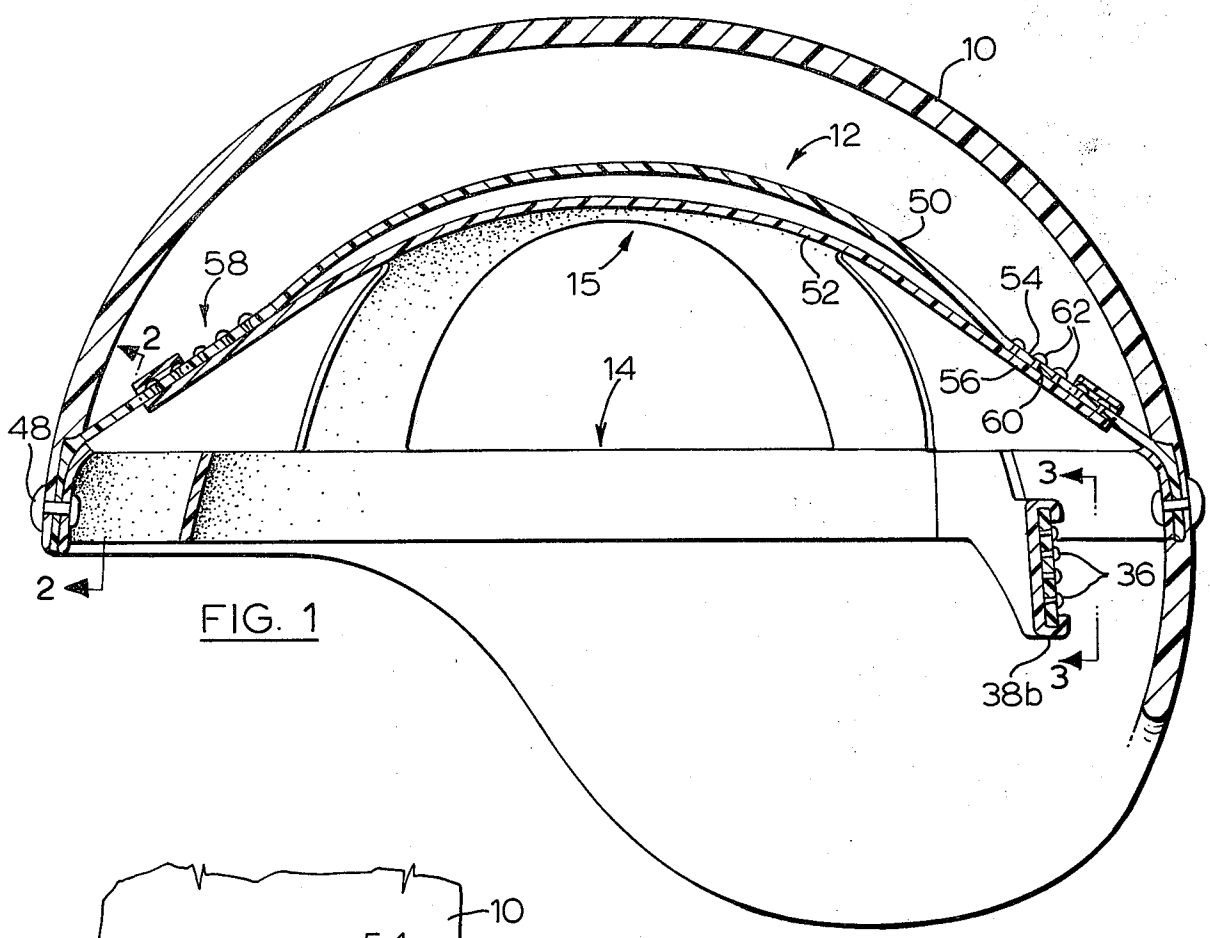


FIG. 1

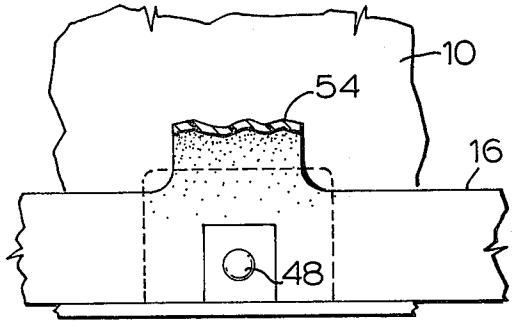
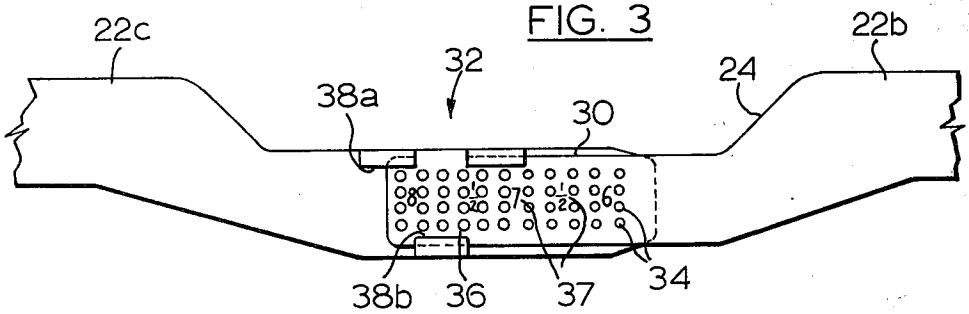


FIG. 2

FIG. 3



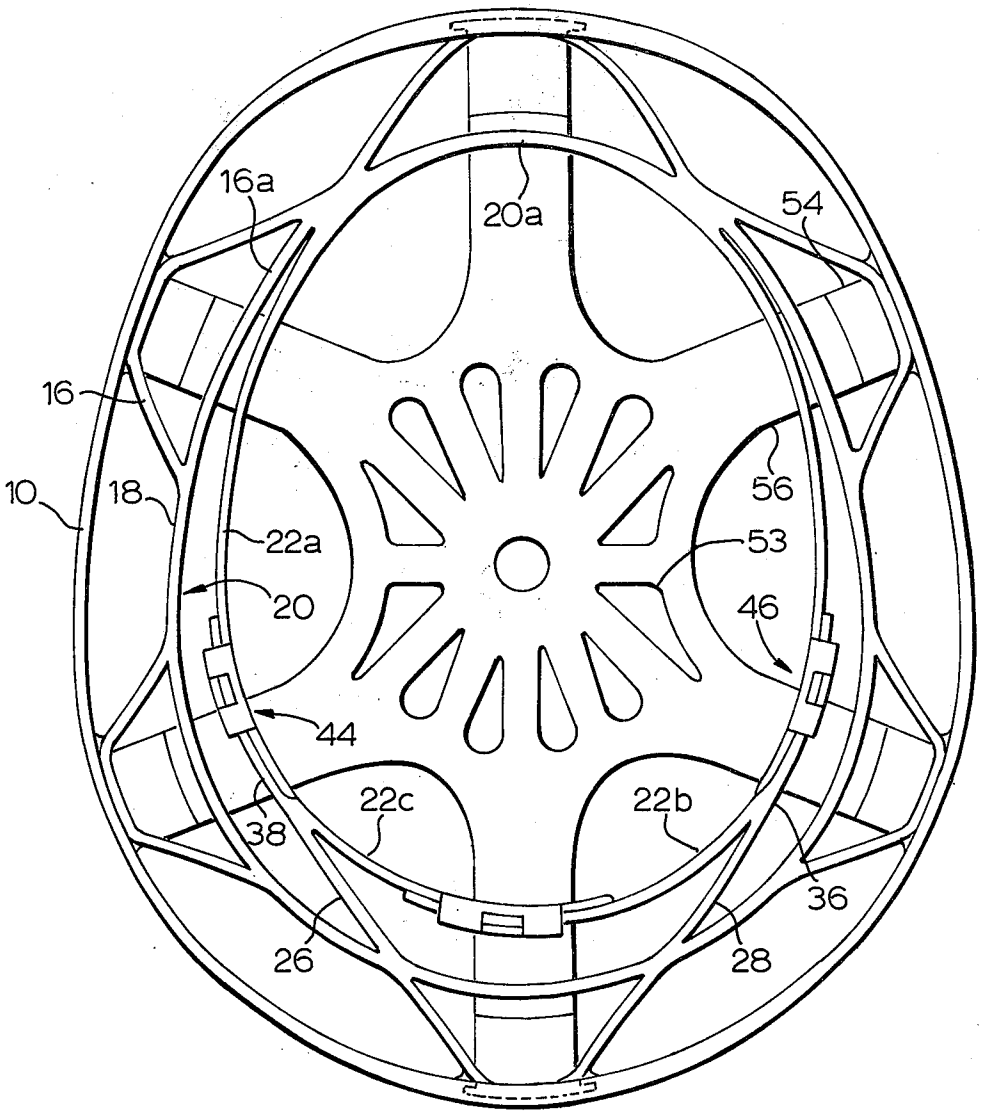


FIG. 4

HEAD AND CROWN SUSPENSION FOR PROTECTIVE HELMET

This invention relates generally to protective hats and more particularly to a novel suspension means or liner for use with helmets. Specifically, the invention is concerned with a suspension means suitable for use with protective helmets and which includes a head suspension and a crown suspension both of which may be adjusted whereby the suspension means will fit a wide range of head sizes.

Suspension or liners for use with protective helmets usually are composed of two basic parts. One part is generally referred to as the "head suspension" and extends horizontally around the wearer's head at approximately the level of an ordinary hat band. The head suspension serves principally to cushion generally horizontally directed blows on the outer shell of the helmet. The other part is generally referred to as the "crown suspension" and extends over the top of the wearer's head. The latter suspension serves to cushion blows directed generally downwardly against the shell.

A shortcoming of many crown and head suspensions is that they are incapable of preventing the shell from contacting the wearer's head when the outside wall of the shell is struck by a blow. The suspensions do not form a rigid "framework" which will maintain the wearer's head in spaced relationship with the shell but rather will permit the shell to move relative to the head. Such suspensions are not satisfactory for use in helmets worn by participants of contact sports or by construction workers who are exposed to violent blows about their heads.

It is a principal object of the present invention to provide a helmet liner having head and crown suspensions which effectively absorb impacts or blows impinging on the helmet and which may be readily adjusted to fit a wide range of head sizes.

It is another object to provide a one-piece head suspension which may be readily molded from plastic or like moldable material and which may be fitted into a protective shell with a minimum of labour.

The head suspension of the invention is intended to be used within a protective helmet having a shell adapted to encircle a wearer's head and in spaced relationship thereto, said head suspension including: a one-piece outer strap composed of a plurality of loops and links, said loops being disposed circumferentially in side by side relationship, successive said loops being connected by a respective said link, said loops adapted to be secured at positions along the inside of the shell in such manner that said loops and links are tightly stretched and such that said links and a portion of said loops define a continuous band which is spaced apart from said shell and which encircles the wearer's head at approximately the level with respect to the wearer's head of a normal hat band, said head suspension further including an inner strap connected to said outer strap and adapted to contact the wearer's head at least in part at said level, and means for adjusting the effective length of said inner strap to increase or decrease the size thereof.

The crown suspension of the invention consists of: upper and lower dome-shaped elements each having a central portion and radially outwardly extending legs, the legs of the upper element extending to and adapted to be secured to said shell, the legs of the lower element extending along and in contact with said upper element legs but terminating short of said shell, means for adjusting the location of the lower element legs relative to the upper element legs to enable the lower element to be fitted to various sized heads.

The invention will be more fully explained with reference to the drawings which show a preferred embodiment of the head and crown suspensions. In the drawings:

FIG. **1** is an elevation, partly in section, of the suspension means of the invention incorporated in a shell;

FIG. **2** is a view on line **2—2** of FIG. **1**;

FIG. **3** is an enlarged fragmentary view on line **3—3** of FIG. **1**; and

FIG. **4** is an elevation of the suspension means and helmet.

Like reference characters refer to like parts throughout the description of the drawings.

Referring to FIG. **1**, the helmet illustrated is of conventional design having a semi-rigid resinous shell **10** and a suspension means, generally **12** to position the shell on a wearer's head in such fashion that it is maintained in spaced relationship with the head to absorb the shock of blows imparted to the external surface of the shell.

The suspension means is composed of a horizontal head-encircling head suspension generally **14** and a crown suspension generally **15.** The components of both suspensions are composed of tough inelastic fabric or polymeric material such as polyethylene or rubber. Preferably, the suspension means is of onepiece molded plastic construction. With reference first to the head suspension **14** and to FIG. **4**, this suspension includes a continuous one-piece outer strap composed of a plurality of tightly stretched loops **16** and links **18.** The loops are spaced apart from one another along the inside wall of the shell and successive loops are interconnected by means of the links **18** which together with the innermost portions or reaches **16***a* or each loop define a smooth continuous band, generally **20** which extends circumferentially within the shell. By means of the loops, the outer band **20** is held rigidly in a position spaced apart from the shell. A continuous inner band or strap **22** extends circumferentially within outer band **20** except for a portion **20***a* thereof which is coextensive with band **20.**

The inner band **22** is composed of a first elongated segment **22***a* adapted in use to extend between the two temporal bones or thereabouts and across the forehead or frontal bone of the wearer. A second segment **22***b* overlaps one end of the first segment **22***a* and extends generally horizontally then diagonally downwardly as at **24** (FIG. **3**) to contact the base of the occipital bone. The latter segment terminates at a point approximately at the rear of the wearer's head. A third segment **22***c* overlaps the end of the second segment and extends to overlap the other end of the first segment **22***a*. The three segments which make up the inner band **22** thus form a continuous ring adapted to contact and to encircle the wearer's head.

The second and third inner band segments **22***b*, **22***c* are attached to the outer band **20** by means of links **26,28** (FIG. **4**).

With reference to FIG. **3**, the overlapping end portions of band segments **22***b*, **22***c* are provided with an adjustment means, generally **32** which permits the selective lengthening and shortening of the distance,

measured along these band segments, between the points of attachment of these segments with links **26**, 28. The adjustment means is composed of a plurality of rows of spaced apertures **34** formed in the overlapping end portion of band segment **22***b*. The overlapping end portion of band segment **22***c* is provided with spaced outwardly projecting studs **36** (FIG. **1**). The spacing of the studs corresponds to the spacing of the apertures so that by moving the end portions of the two band segments relative to one another, the studs are brought into registry with selective apertures **34** along the length of the end portion of band segment **22***b*. The head size with which the various apertures correspond is marked on band segment **22***b* as at **37**.

Each of the studs **36** is provided with an enlarged head which is slightly larger than apertures **34**. Because the material from which the band is fabricated is resilient and flexible, the enlarged heads can be easily forced through the apertures **34** but at the same time the material is sufficiently resilient so as to maintain the connection until it is desired to separate the two end portions as by pulling them apart.

Extending along each side edge of the end portion of band segment **22***c* is an overhanging guide **38***a*, **38***b* which serves to maintain the two end portions of segments **22***b*, **22***c* in slidable contact with one another.

The overlapping ends of band segments **22***a*, **22***b* and segments **22***a*, **22***c* are also provided with adjustments means generally **44**, **46** respectively of the same construction as that of adjustment means **32**. Adjustment means **44** permits variation of the distance, measured along band segments **22***a*, **22***c*, between the point of attachment of segment **22***c* with link **26** and the point of attachment of segment **22***a* with the outer band **20**. Adjustment means **46** permits a like variation in the distance measured along segments **22***a*, **22***b*.

With reference again to FIGS. **1** and **2**, the outer loop segments **16** are connected to the shell by means of metallic or plastic rivets **48**. Rivets **48** also serve to attach the ends of the crown portion **15** to the shell in the manner explained below.

The crown suspension **15** is composed of upper and lower dome-shaped elements **50**, **52** respectively, both of which having slitted central vents as shown in FIG. **4** and indicated **53**, and legs **54**, **56** respectively which radiate outwardly from the central portions. Legs **54** terminate at the shell and are connected thereto by means of rivets **48** while legs **56** terminate short of the shell. Legs **54**, **56** are provided with an adjustment means generally **58** (FIG. **1**) of the same construction as adjustment means **32** to permit adjustment of the curvature of the lower element **52** to accommodate various head sizes. As shown the adjustment means is composed of a plurality of rows of spaced apertures **60** formed in each leg **54** for receipt of upwardly extending studs **62** formed in each leg **56**. As seen the stud heads are enlarged to maintain the connection until it is desired to separate the upper and lower elements **50**, **52**.

It will be understood of course that modifications can be made in the embodiments described and illustrated herein without departing from the scope and purview of the appended claims.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. A head suspension for use within a protective helmet having a shell adapted to encircle a wearer's head and in spaced relationship thereto, said head suspension including: a outer strap composed of a plurality of loops and links, said loops being disposed circumferentially in side by side relationship, successive said loops being connected by a respective said link, said loops adapted to be secured at positions along the inside of the shell in such manner that said loops and links are tightly stretched and such that said links and a portion of said loops define a continuous band which is spaced apart from said shell and which encircles the wearer's head at approximately the level with respect to the wearer's head of a normal hat band, said head suspension further including an inner strap connected to said outer strap and adapted to contact the wearer's head at least in part at said level, and means for adjusting the effective length of said inner strap to increase or decrease the size thereof.

2. A head suspension for use within a protective helmet having a shell adapted to encircle a wearer's head and in spaced relationship thereto, said head suspension consisting of a continuous rigid outer strap adapted to extend within said shell and to be secured at positions spaced along the length thereof to the inside of the shell at approximately the level with respect to the wearer's head of a normal hat band, an inner strap adapted to contact a wearer's head and extending circumferentially within said outer strap, said inner strap being connected to said outer strap at four only points spaced along the length of said inner strap such that said inner strap is adapted to be maintained rigidly in position within and spaced apart from said shell, said inner strap being composed of a plurality of segments disposed in generally end-to-end relationship, said segments having overlapping end portions disposed between all but one pair of adjacent said points, the distance between the pair of said points lacking said overlapping end portions being less than the distance between the remaining pairs of said points, and means for adjusting the amount of overlap of said end portions to vary the circumference of the inner strap to increase or decrease the size thereof.

3. The head suspension as claimed in claim **1**, wherein said inner strap extends in one part at approximately the level with respect to the wearer's head of a normal hat band and in the other part at a level below that of the normal hat band, said first part adapted to extend between the two temporal bones and across the frontal bone of the wearer while the other part adapted to contact the base of the occipital bone.

4. The head suspension as claimed in claim **1** wherein said inner band adjusting means comprises a plurality of apertures formed in one of each pair of overlapping end portions and outwardly extending studs formed in the other of each pair of overlapping end portions, said studs being releasably engageable in selective said apertures.

5. The head suspension as claimed in claim **2** wherein said inner strap is adapted to extend in one part at approximately the level with respect to the wearer's head of a normal hat band and in the other part at a level below that of the normal hat band, said first part adapted to extend between the two temporal bones and across the frontal bone of the wearer while the other part adapted to contact the base of the occipital bone.

6. The head suspension as claimed in claim **2** wherein said inner band adjusting means comprises a plurality of apertures formed in one of each pair of overlapping end portions and outwardly extending studs formed in the other of each pair of overlapping end portions, said studs being releasably engageable in selective said apertures.

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