

March 4, 1969

T. W. JOHNSON ET AL  
SAFETY HAT SUSPENSION

3,430,260

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Sheet 1 of 2

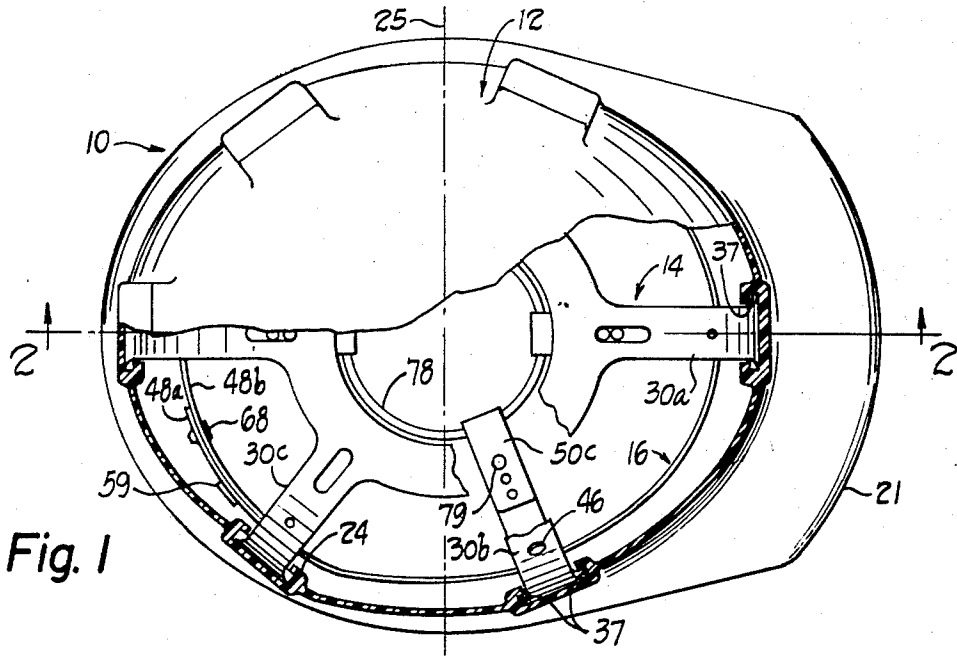


Fig. 1

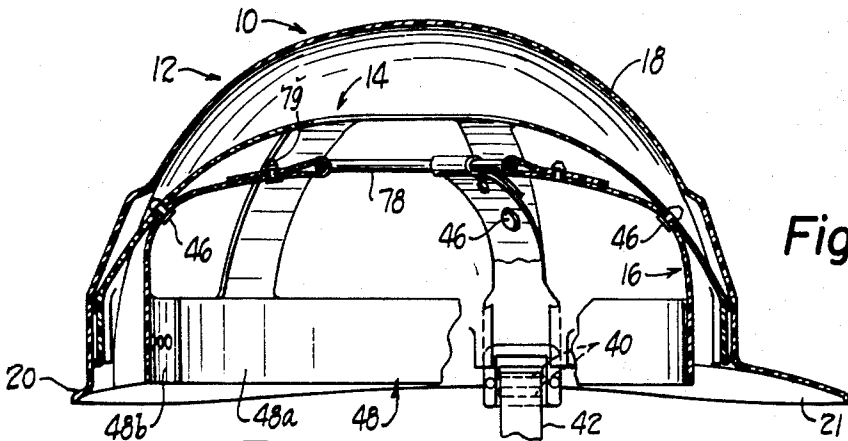


Fig. 2

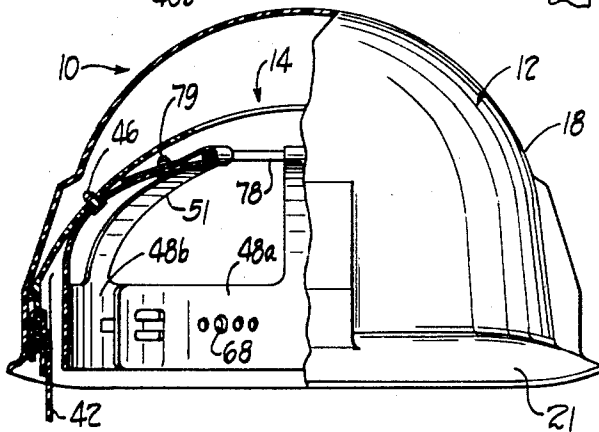


Fig. 3

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Fig. 4

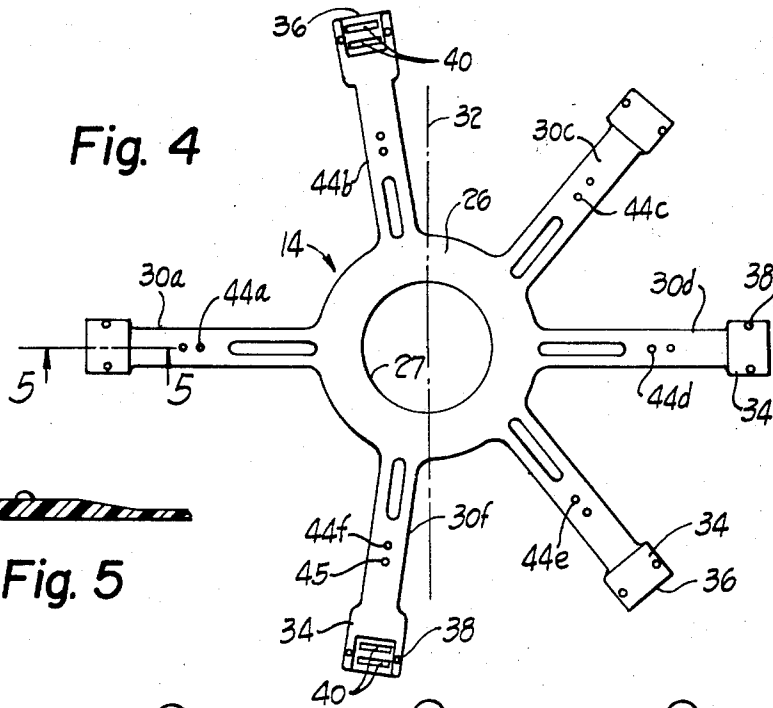


Fig. 5

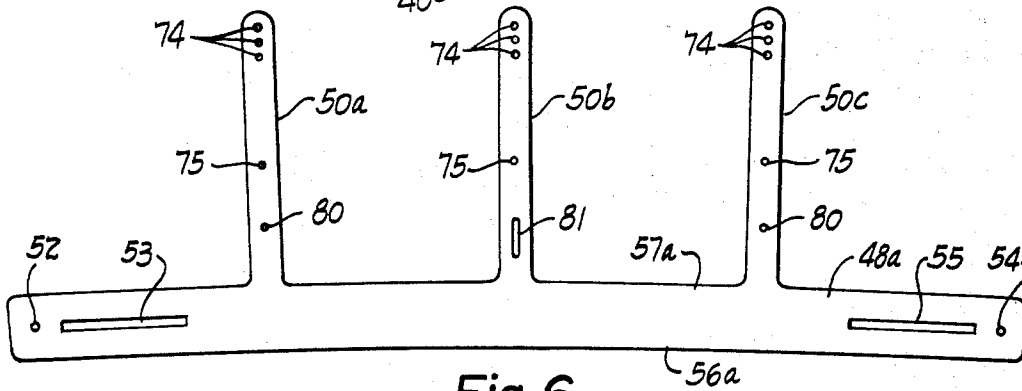


Fig. 6

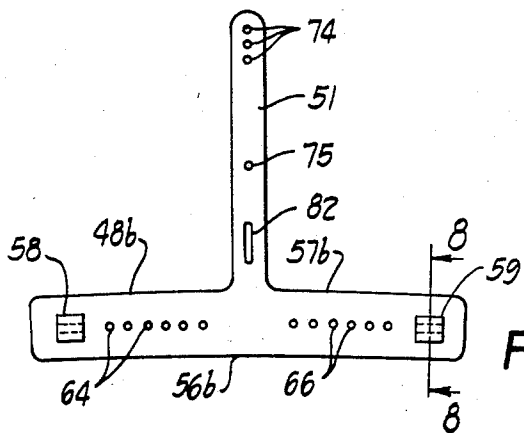


Fig. 7

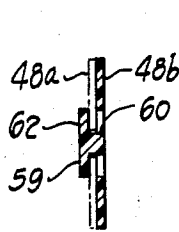


Fig. 8

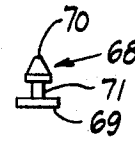


Fig. 9

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**SAFETY HAT SUSPENSION**

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U.S. Cl. 2—3

18 Claims

Int. Cl. A42b 1/08

**ABSTRACT OF THE DISCLOSURE**

A resilient crown support for a hard shell safety hat having a first suspension with legs connected at their free ends to the shell, a second separate suspension within and beneath the first with an adjustable head band and integral straps, the straps being connected together at their ends below the first suspension and connected intermediate their ends to the legs of the first suspension.

This invention relates to a safety hat, and more particularly to a crown support for a safety hat.

Typically, safety hats are constructed of a hard outer shell of strong material, such as metal or plastic. The outer shell includes a crown support that covers the top of the wearer's head. A crown support or suspension, usually of straps, is secured within the shell and fits directly over the wearer's head. The suspension spaces the shell from the wearer's head so that impacts upon the shell are cushioned.

The present invention is directed to a safety hat and novel crown suspension of the general type mentioned in which a resilient, strong and readily adjustable suspension is provided of simple and economic construction.

Two separate suspensions are used in the present construction. A first suspension is connected directly to the inside of the hard shell and spaced from the top of the shell. A second suspension, located within and below the first suspension, is removably secured to the first suspension. The two suspensions allow adjustment of the second or inner suspension independently of the first suspension attached to the shell. In addition, either suspension can be replaced without necessitating the replacement of the other. The inner suspension and the first suspension provide a double spacing arrangement between the wearer's head and the hard shell. The inner suspension is resilient to cushion impacts on the shell, while the first suspension is more rigid to prevent the shell from coming into contact with the inner suspension.

For strength, convenience, and economy, the second or inner suspension that directly engages the wearer's head is formed of a head band that has integral head straps. The head band is formed of two flexible pieces to provide an adjustment in size. The two pieces are arranged so the adjustment takes place symmetrically about a vertical, longitudinal, center plane of the hat. An improved construction permits this adjustment without undesirable distortion of the head band or head straps, even though the inner suspension is fixed at spaced points to the first suspension, and even though the head straps and head band of the second or inner suspension are integrally formed. In the preferred construction, these parts are formed of suitable plastic by conventional injection molding techniques.

In order to enhance the effectiveness of the crown support in absorbing impacts upon the outer shell, a simple yet effective resilient connection is provided between the upper ends of the head straps of the second or inner suspension. This allows the upper portions of the head straps that engage the top of the wearer's head to expand,

stretching the resilient connection and absorbing the force of the impact.

By way of a brief description, the first suspension is formed of legs that radiate from a central circular portion. The free ends of the legs are attached to the inside rim portion of the hard outer shell. Except for the attached ends, the first suspension is spaced from the inner surface of the hard shell.

The second suspension is formed of a circular head band and integral, upwardly extending, head straps. The head straps are secured intermediate their ends to the legs of the first suspension by studs. Upper ends of the head straps are looped through a large elastomeric O-ring and fastened back upon themselves. The O-ring connects the head straps beneath and spaced from the first suspension. Expansion of the upper ends of the head straps is permitted by the resiliency of the O-ring in response to an impact upon the safety hat. The expansion is limited by the legs of the first suspension, which overlie the head straps.

The head band is formed of two separate pieces for adjustment. A large piece encircles the front and sides of the wearer's head and a small piece is at the rear of the hat. The ends of the two pieces are adjustably secured together. All but one of the head straps extend from the larger piece of the head band and are located forwardly of the center of the hat. A single head strap extends from the smaller head band piece at the center, rear, of the hat. Adjustments are made by moving the smaller piece of the head band toward and away from the front of the hat. Due to the location of each of the head straps, adjustments are made without changing the angular relationship of the head straps relative to the head band pieces. As a result, there is no undesirable distortion of the band and straps, even though integrally formed.

It is an object, then, of this invention, to provide an improved safety hat and double suspension crown support that is resilient and strong, adjustable, and which is convenient to assemble and economic to manufacture. Other objects, features and advantages of this invention will become better understood with reference to the following detailed description, when considered along with the accompanying drawings, in which:

FIGURE 1 is a top plan view of a safety hat constructed in accordance with the present invention, with parts broken away, showing a hard outer shell and a crown support comprised of two suspensions;

FIGURE 2 is a transverse sectional view of the hat of FIGURE 1, taken along the line 2—2 and looking in the direction of the arrows;

FIGURE 3 is a front elevational view of the hat of FIGURE 2, with parts broken away and with parts in section;

FIGURE 4 is a plan view of a first suspension in a flattened condition, as formed;

FIGURE 5 is a transverse sectional view along the line 5—5 of FIGURE 4, looking in the direction of the arrows;

FIGURE 6 is a plan view of one of two flat pieces that form a head band of the inner suspension, when assembled;

FIGURE 7 is a plan view of the second flat piece that forms the head band;

FIGURE 8 is a sectional view taken along the line 8—8 of FIGURE 7 and looking in the direction of the arrows, and

FIGURE 9 is an elevational view of a stud used to assemble the suspensions of the crown support.

Referring now to the drawings, an assembled safety hat 10 is shown in FIGURES 1 to 3, constructed in accordance with the present invention. The safety hat 10 consists of a conventional hard protective shell 12, a first suspension 14 secured at spaced locations to the lower

portion of the shell, and a second suspension 16 secured to the first suspension. The second suspension is within and below the first suspension and adapted to directly engage the head of the wearer of the safety hat.

The hard shell 12 of the safety hat includes a crown portion 18 and a brim 20, including a visor 21 at the front of the hat. A plurality of spaced receptacles 24 are formed in the inside portion of the shell 12 at the bottom of the crown 18, adjacent the brim 20. The receptacles 24 are in the form of T-shaped slots open at the bottom and closed at each side on the top. These receptacles receive portions of the first suspension 14 and secure the suspension within the hat against relative upward movement with respect to the shell 12. As best shown in FIGURE 1, three of the receptacles 24 are located in the front half of the hat, i.e., forwardly of an imaginary transverse vertical plane passing through the center of the hat 10, as indicated by the line 25. Three receptacles 24 are also located in the rear half. One receptacle 24 is located at the center front of the hat, and one at the center rear of the hat.

The first suspension 14 is domed-shaped in assembly, as illustrated in FIGURES 2 and 3. It is flexible and strong, preferably formed of suitable plastic by injection molding techniques, and is initially formed in a flat configuration, as illustrated in FIGURE 4. High density polyethylene has been determined after the testing and evaluation of many materials to have particularly suitable high and low temperature characteristics of strength and lack of brittleness for this particular purpose.

The first suspension 14 is of one-piece construction. It is formed of a circular center portion 26 and six legs 30a, b, c, d, e, f in the form of narrow straps that radiate from the center portion 26. A circular central opening 31 is provided in the center portion 26. The radial spacing of the legs 30 corresponds with the locations of the receptacles 24 of the shell 12. The leg 30a is located to cooperate with the receptacle 24 at the center front of the shell 12, and the leg 30d with the receptacle at the center rear. Legs 30b and 30f are located just forward of an imaginary center line indicated at 32 in FIGURE 4 and the remaining two legs 30c and 30e are located to the rear of the center line 32.

Each leg 30 includes a generally rectangular foot portion 34. The foot portions 34 are wider and thicker than the legs 30 to provide increased strength and rigidity. Two small projections 38 are formed on the flat outer surface of the foot portions 34, one adjacent each side edge. The side edges of the foot portions 34 are received within vertical side grooves 37 of the T-shaped receptacles when the inner suspension 14 is positioned within the shell 12, as shown in FIGURES 1 to 3. The projections 38 extend toward the inner surface of the shell 12 within the receptacles 24 and assure a snug fit of each foot in the respective groove. The side grooves 37 are blind at the top, preventing the foot portions 34 from moving upward beyond the top of the associated receptacle 24. The legs 30 of the suspension 14 extend upward between the vertical slot portions of the receptacles and curve to the center of the shell 12, spaced beneath the inner surface.

As illustrated in FIGURE 2, the foot portions 34 of the two side legs 30b, 30f each include an extension formed of thick side edges 39 and a thinner web 40 that extend below the foot portion when assembled in a shell. Two parallel slots 41 are formed in the web 40 of the two side legs 30b, 30f. These slots receive the ends of a chin strap 42.

A small circular aperture 44 (FIGURE 4) is provided approximately mid-way along the length of each leg 30 to facilitate connection of the two suspensions. Thus, apertures 44a, b, c, d, e, f are provided. These apertures 44 receive studs 46 that secure the second suspension to the first suspension, in a manner to be described subsequently. A second aperture 45 is provided adjacent each aperture 44 to provide for adjustment.

The second or inner suspension 14 is also dome-shaped when assembled. It is initially formed flat in the configuration shown in FIGURES 6 and 7. The second suspension, like the first, is also a strap-like affair, preferably formed of strong flexible plastic by suitable injection molding techniques. A low density polyethylene is preferably used to provide comfort since it has been found that the inner suspension does not need the strength of the outer suspension.

The second suspension 16 includes a two-piece head band 48 formed of a larger piece 48a shown in FIGURE 6, and a smaller piece 48b shown in FIGURE 7. The larger piece 48a of the head band 48 includes three integral head straps 50a, b, c. The smaller piece 48b of the head band 48 includes a single integral head strap 51. The head straps extend upward from the head band pieces, essentially perpendicularly.

The two head band pieces 48a, 48b are constructed to be secured together at their opposite ends to form an adjustable, circular band. To this end, the piece 48a includes a small circular aperture 52 and an elongated slot 53 at one end and a similar aperture 54 and slot 55 at the other end, arranged as shown in FIGURE 6. Bottom edges 56a, b and top edges 57a, b of the head bands 48a, b, respectively, are curved slightly upward to improve the configuration of the head band when assembled.

As shown in FIGURE 7, the smaller piece 48b of the head band 48 has two T-shaped guides 58 and 59. One is at each end and extends from the outer surface of the band portion, toward the shell 12, when assembled. Each guide has a narrow leg portion 60 (see FIGURE 8) extending from the band 48b. A wide cross portion 62 is secured to the leg, spaced from the band 48b a distance equal to the thickness of band 48a. A plurality of spaced circular apertures 64 are formed in the piece 48b longitudinally aligned adjacent the guide 58. A similar plurality of aligned apertures 66 are located adjacent the guide 59.

When the two pieces 48a, 48b are joined together to form a circular head band, the opposite ends of the piece 48a are placed over opposite ends of the smaller piece 48b. The T-shaped guide 59 is pushed through the slot 55 by flexing the piece 48a to enlarge the slot. As best understood from FIGURE 8, the leg portion 60 of each T-shaped guide is located within the respective slot of piece 48a, shown in phantom. The cross piece 62 extends above and below the slot, along the outside of head band piece 48a.

In making any change in the size of the head band, both ends of the two pieces 48a, 48b are adjusted equally. The ends are moved so that the aperture 54 is aligned with a selected one of the apertures 66, and the aperture 52 is aligned with a corresponding one of the apertures 64. A stud 68 (see FIGURES 3 and 9) is inserted through each aperture 52, 54 of the large head band piece 48a and also through the aligned apertures 64, 66 of the small head band piece to retain the head band pieces in the adjusted size.

The construction of the stud 68, which is identical to the stud 46 and other studs associated with the suspensions, is shown in FIGURE 9 of the drawings. The stud includes a flat base portion 69 that is located at the inside surface of the band 48b. A tapered head portion 70 is separated from the flat base 69 by a shank 71 of a length equal to the thickness of both head band pieces 48a, 48b. The head portion 70 is tapered outwardly toward the base 69 to facilitate insertion through the apertures 64, 66 and to resist removal. The studs are preferably made of a rigid and strong plastic, such as polycarbonate. By making the studs separate from the suspensions they can be formed of stronger material and can be replaced if broken. In addition this simplifies the mold construction used for molding the suspensions.

Each head strap 50a, b, c and 51 is joined together by a strong, elastomeric O-ring 78, such as an O-ring

formed of high density polyethylene. For adjustment, each strap includes three closely spaced circular apertures 74 at the distal ends and a single aperture 75 centrally located along the length of the strap. As illustrated in FIGURE 2, the distal end of each head strap 50a, b, c and 51 is folded back upon itself about the O-ring 78, which is common to all head straps. Each head strap is secured about the O-ring by a stud 79 similar to the stud 68 previously described. The stud associated with each head strap extends through the aperture 75 and through one of the three apertures 74.

Each head strap includes an additional aperture approximately midway between the head band portion and the aperture 75. See FIGURE 6. Head straps 50a and 50c each include a circular aperture 80. Head strap 50b includes an elongated slot aperture 81, and head strap 51 includes an elongated slot aperture 82.

In assembled condition, the head straps 50a, b, c and 51 contact the overlying legs of the first suspension at the apertures 80, 81 and 82, and are secured at those points by the studs 46. See FIGURE 2. The head strap 50b is located at the front of the hat 10, directly underlying the leg 30a of the first suspension. Head straps 50a and 50c underlie legs 30f and 30b, respectively. The single head strap 51 on the head band piece 48b underlies the leg 30d. The positions of the head straps 50a and 50c with respect to the legs 30f and 30b are fixed by the small circular apertures 75 of the head straps and 44 of the legs, and by the connecting studs 46. Relative longitudinal movement is permitted between the front head strap 50b and leg 30a, and between the back head strap 51 and leg 30d, by the elongated apertures 81, 82, respectively. With this construction the head band size can be adjusted without appreciable distortion of the smooth, desired contour of the band, and without changing the angular relationship between the head band and the head straps.

During adjustment of the head band size, the relative position of the three head straps 50a, 50b, 50c at the front of the hat remains essentially fixed with respect to the first suspension. The smaller head band piece 48b at the rear of the hat is moved relative to the larger head band piece. For example, to decrease the size of the head band 48, the small head band piece 48b is moved toward the front of the hat 10. The free ends of the larger head band piece 48a slide relative to the T-shaped guides 58, 59 into greater overlapping relationship with the smaller head band piece 48b. This results in a smaller diameter head band 48. The change in size takes place behind the head straps 50a, 50c, in the back portion of the hat behind the transverse center line. This prevents distortion of the suspension that would occur if the change in size affected portions of the head band to which the integral head straps are attached. The adjustment is made equally at each end of the head band, keeping the smaller piece 48b centered with the head strap 51 directly to the rear of the hat.

As will be evident from FIGURE 2, inward or outward movement of the smaller head band piece 48b relative to the back of the hat 10 changes the location of the head band piece 48a relative to the first suspension, and particularly relative to the stud 46 extending through the head strap 51 and the leg 30d. This change in position is accommodated by the elongated slot aperture 82 in the head strap 51. In addition to this size adjustment, there will normally be an accompanying adjustment necessary in the shape of the head band in the forward portion when placed upon the wearer's head. This is accommodated by the elongated slot aperture 81 in the front head strap 50b. A small amount of pivotal movement of the side head straps 50a, 50c is permitted about the shanks of the studs 46 that secure the side head straps to the legs 30b, 30f of the first suspension.

Where large adjustments are made in the head band size, accompanying adjustments may be necessary in the

effective length of the head straps 50, 51 to maintain the desired tension on the O-ring 78. This is accomplished by placing the studs 79 through different apertures 74 to provide the desired length.

In manufacture, the first and second suspensions can be conveniently and inexpensively molded by conventional injection molding techniques. The two suspensions are easily formed and assembled by connecting the parts with the studs. Adjustments are made by merely changing the locations of the studs. The same suspensions will adjust to all normal sizes. Notwithstanding the one-piece construction of the first suspension, the integral construction of the head straps and head band of the second suspension, and the fixed relationship of the two suspensions at each side of the hat, size adjustments do not distort the head band and head straps from the desired contour.

In use, the first and second suspensions completely space the hard shell 12 from the head of the wearer. Any blow received upon the top of the shell 12 is cushioned by the expansion of the elastomeric O-ring 78 in response to downward movement of the hat and suspensions upon the wearer's head. The expansion of the O-ring 78 and head straps 50, 51 is limited by the legs 30 and circular central portion 26 of the first suspension. Thus, a double safeguard is provided to prevent the shell 18 from coming into contact with the wearer's head.

While a preferred embodiment of this invention has been described in detail, it will be apparent that many modifications or alterations may be made therein without departing from the spirit and scope of the invention, as set forth in the appended claims.

What is claimed is:

1. A resilient crown support for a hard shell safety hat, comprising:

- (a) a first suspension formed of
  - (i) a plurality of legs having free distal ends and extending from a central area of interconnection, and
  - (ii) means at the distal ends to secure the legs to a hard shell safety hat;
- (b) a second suspension located within and beneath the first suspension and formed of
  - (i) a head band,
  - (ii) spaced straps integral with the head band and extending initially at essentially right angles from the head band upward toward the first suspension and then inward, terminating in end portions located adjacent each other and below the central area of interconnection of the legs of the first suspension,
  - (iii) means connecting the end portions of the straps to form with the straps a dome for engaging the head of a wearer, and
  - (iv) means to adjust the effective size of the head band; and
- (c) means connecting straps of the second suspension to legs of the first suspension intermediate the ends of the strap and legs.

2. A support as defined in claim 1 wherein the legs of the first suspension are integral and the central area includes a circular portion from which the legs radiate.

3. A support as defined in claim 2 wherein the means at the distal ends of the legs includes a foot wider and thicker than the associated leg, constructed to be received in a slot in the hard shell of a safety hat, and a deformable protrusion that increases the thickness of a portion of the foot.

4. A support as defined in claim 3 wherein the means connecting the end portions of the straps is an endless elastomeric ring and the straps of the second suspension terminate in loops that loosely encircle the endless ring and which are adjustable in size to vary the effective length of the straps from the head band to the ring.

5. A support as defined in claim 1 wherein the head band is formed of two separate pieces adjustably secured together and the second suspension includes at least four straps, all but one of the straps being located along one-half of the length of the head band and secured to one of said two pieces and said one strap being secured to the other of said two separate pieces.

6. A support as defined in claim 5 wherein the said one strap is located at the center of the said other of the two separate head band pieces and wherein both ends of each head band piece are adjustable secured to the ends of the other.

7. A support as defined in claim 1 wherein the straps of the second support are in contact with the legs of the first support and the straps and legs are secured together at the locations of contact.

8. A support as defined in claim 7 including apertures in a plurality of the legs, apertures in each of the straps, at least one aperture of each strap being aligned with an aperture in a leg, and a separate fastener passing through the aligned apertures.

9. A support as defined in claim 1 wherein the first suspension is stronger than the second suspension and the second suspension is more flexible than the first suspension.

10. The support as defined in claim 9 wherein the first suspension is formed of high density polyethylene and the second suspension is formed of low density polyethylene.

11. A support as defined in claim 8 wherein the head band is formed of two separate pieces, both ends of each head band piece are adjustably secured to the ends of the other, all straps but one of the second support are connected to one of said two separate pieces and the one strap connected to said other of the two separate pieces is diametrically opposite a strap of said one piece and only the two said opposite straps each include an aperture elongated in the direction the strap extends to receive said separate fastener and to permit longitudinal sliding movement of the strap relative to the connected leg and fastener.

12. In combination, a hard shell safety hat and a crown support for the hat, said support comprising a first suspension secured to the shell of the hat, a second suspension within and beneath the first suspension and secured thereto, said second suspension having a two-piece head band and straps extending from the band to the first suspension, all of said straps except one extending from one of said two pieces, the said one strap extending from the other of said two pieces, means securing the straps

of the second suspension to the first suspension and means adjustably securing both ends of each head band piece to the ends of the other.

13. The combination defined in claim 9 wherein the means securing the second suspension to the first suspension includes means to permit limited relative sliding of the said one strap relative to the first suspension.

14. The combination as defined in claim 12 wherein the straps converge after they extend to the first suspension and are connected by an elastomeric O-ring.

15. The combination as defined in claim 12 wherein the first suspension includes a plurality of legs each of which includes a wider and thicker foot portion constructed to be received in a slot in the hard shell of a safety hat and a deformable protrusion that increases the thickness of a portion of the foot.

16. A crown support for a hard shell safety hat, which comprises a first dome-shaped suspension having a plurality of strap-like legs that radiate outward and downward from a central juncture, and which are constructed to be secured at distal ends to a hard shell safety hat; a second separate dome-shaped expandible suspension having a circular head band and head straps connected to the head band, said head straps being interconnected centrally of and above the head band by an elastic ring; and means connecting the head straps to legs of the first suspension, beneath and in superposed relationship with the legs so that expansion of the head straps is limited by the legs of the first suspension.

17. The support of claim 16 wherein the elastic ring is an endless elastomeric O-ring.

18. A support as defined in claim 16 including a foot at the distal end of each leg, wider and thicker than the associated leg, constructed to be received in a slot in the hard shell of a safety hat, and having a deformable protrusion that increases the thickness of a portion of the foot.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,430,260 Dated March 4, 1969

Inventor(s) Tom W. Johnson, Edward J. Stropkay and James D. White

It is certified that ~~error~~ appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 8, line 4, delete "claim 9" and substitute -- claim 12 --.

SIGNED AND  
SEALED

NOV 18 1969

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

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Commissioner of Patents