March 27, 1962 C. E. BOWERS, SR., ET AL 3,026,523

SUSPENSION HARNESS FOR SAFETY HATS

Filed Dec. 8, 1959 3 Sheets-Sheet 1

Fig. 1.

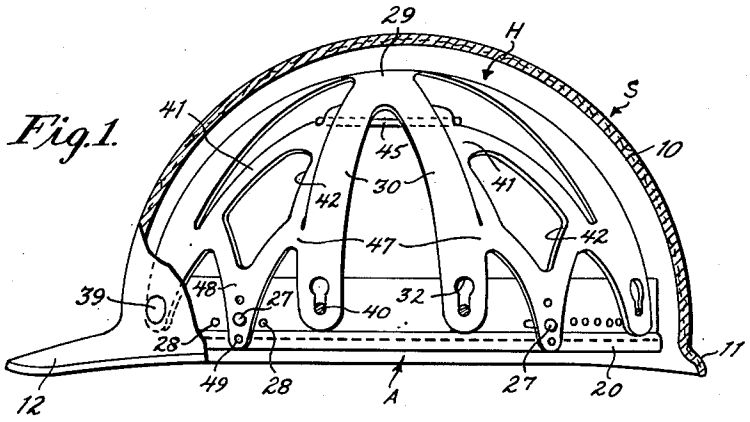


Fig. 2.

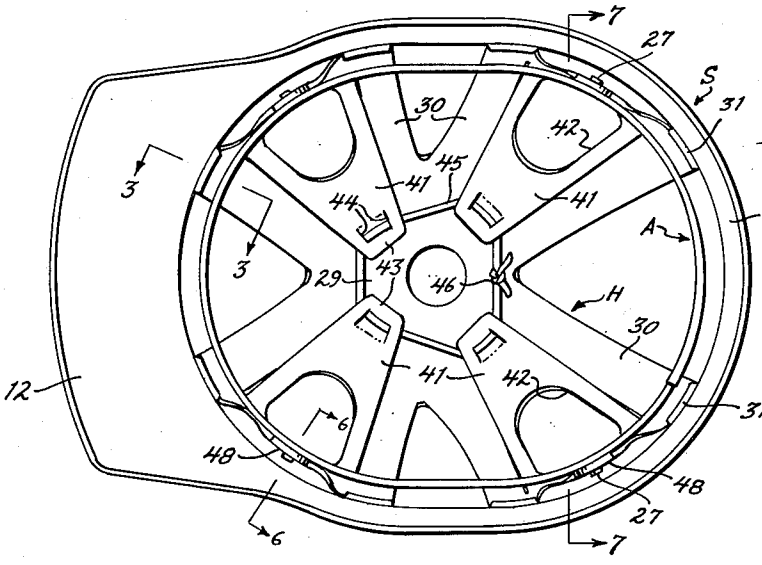


Fig. 3.

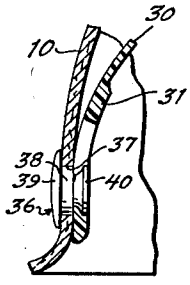


Fig. 4.

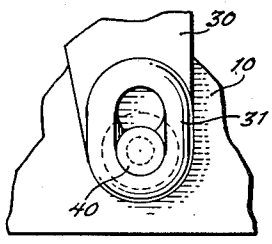
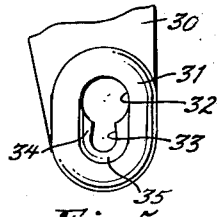


Fig. 5.



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SUSPENSION HARNESS FOR SAFETY HATS

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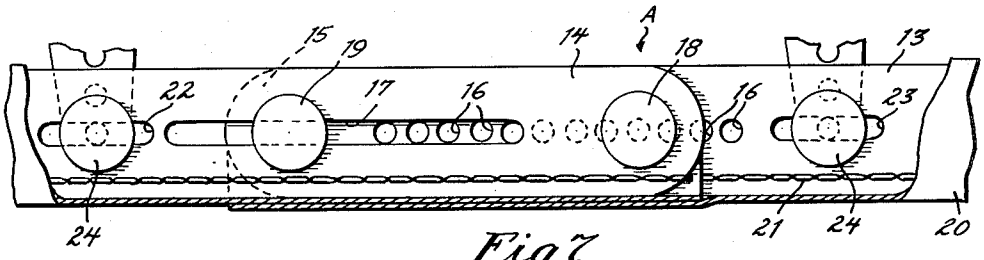

Fig. 7.

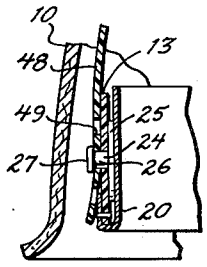

Fig. 6.

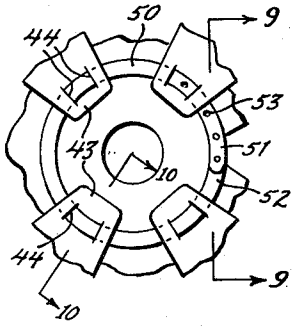

Fig. 8.

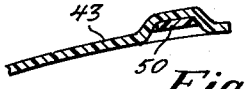

Fig. 10.

Fig. 9.

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SUSPENSION HARNESS FOR SAFETY HATS

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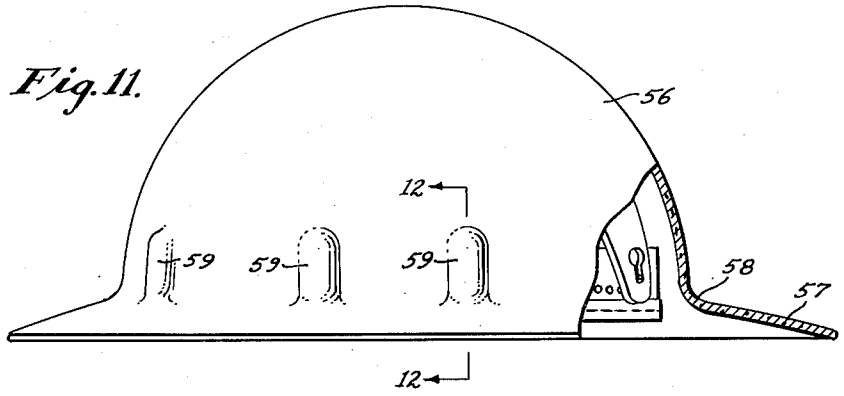
Fig. 11.



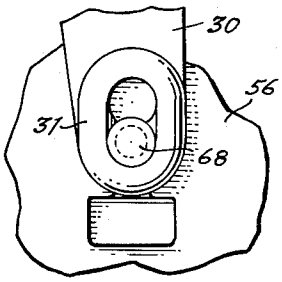


Fig. 13.

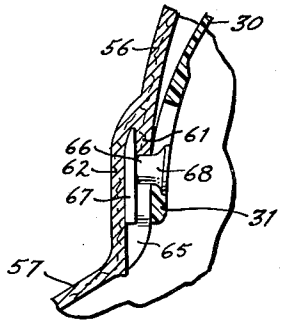


Fig. 12.

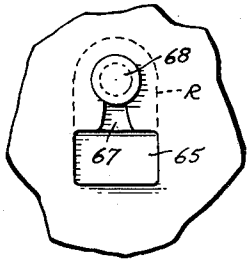


Fig. 14.

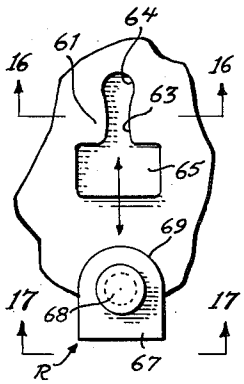


Fig. 15.

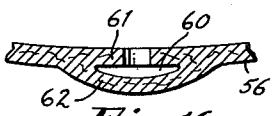


Fig. 16.

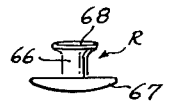


Fig. 17.

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3,026,523

SUSPENSION HARNESS FOR SAFETY HATS

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Filed Dec. 8, 1959, Ser. No. 858,258
9 Claims. (Cl. 2—3)

The present invention deals with safety hats of the type generally known as "head protectors" or "skull guards," and is concerned primarily with improvements in the suspension harness which is an essential part of such a safety hat.

A safety hat of the type with which this invention is concerned ordinarily includes an adjustable headband which is covered by a removable sweatband, a hard outer shell, and a suspension harness which connects the shell to the adjustable headband and functions to support the shell in spaced position from the wearer's head.

It is now well recognized in the field of safety hats that there should be a certain minimum or fixed distance between the center of the shell top and the center of the suspension harness. Such distance is ordinarily fixed by specification. Moreover, it is equally well recognized that the suspension harness should provide a safety factor over and above this fixed distance. With these conditions in mind, an important object of the invention is to provide, in a suspension harness of the character aforesaid, a fixed cradle consisting of a central dome from which extend a plurality of legs that are detachably secured to the shell adjacent to its lower edge, together with an inner adjustable head-engaging assembly comprising a plurality of diverging arms adjustably and centrally joined at the top and the lower ends of which are adjustably and attachably secured to the headband. The arms making up the head-engaging assembly are in turn integrally joined to the legs of the fixed cradle. With this arrangement, the dome of the fixed cradle is assembled in fixed relation with respect to the central portion of the shell top, while the central portion of the head-engaging assembly is spaced beneath the dome of the fixed cradle.

Another highly important object of the invention is to provide a suspension harness of the character indicated which is a one-piece integral affair that is molded from a lineal polyethylene derivative or a plastic such as nylon. The harness consists of this integral unit together with a drawstring of some character which achieves the assembled relation of the upper ends of the arms constituting the head-engaging assembly.

A somewhat more detailed object of the invention is to provide, in a suspension harness of the type noted, arms making up the head-engaging assembly that have molded in their upper end portions slots for accommodating the drawstring aforesaid.

In accordance with well-accepted practice in this art, the lower ends of the legs of the fixed cradle are detachably affixed to the shell on its innerface adjacent to the lower edge thereof. Moreover, it has been common practice to utilize headed rivets presenting heads spaced from the inner face of the shell in achieving this connection. An important object of the invention is to provide a new and improved arrangement whereby the outer face of the rivet heads are substantially flush with the inner or exposed faces of the legs of the fixed cradle thereby eliminating any bumps or protuberances which might prove to be dangerous or uncomfortable during use. In attaining this end, each leg is formed with a keyhole slot for cooperation with the rivet head, and the side edges defining the keyhole slot are undercut, with the rivet heads having a corresponding taper.

Another important object of the present invention is

to provide adjustability in the connections between the lower ends of the arms constituting the head-engaging assembly and the headband. In carrying out this idea in a practical embodiment, the headband is formed at spaced intervals with a plurality of groups of openings, with a headed pin detachably received in any opening of any group. The lower end of each arm is intended for cooperation with one group of openings, and this arm end is formed with a plurality of vertically arranged openings any one of which is adapted to receive the headed pin. Thus, with the headed pin being susceptible of positioning in any one of the openings in the headband and the headed part of the pin in any one of the openings in the arm end, a high degree of flexibility and adjustment is obtained.

While it has been the practice to employ a lace generally comparable to a shoelace as the drawstring for assembling the upper ends of the arms, the invention has as a further object the provision of a suspension harness of the character indicated in which the drawstring takes the form of a plastic strip molded to the generally circular formation required and have elements of a detachable connection molded into the ends thereof. With this arrangement, the same plastic that is used in forming the fixed cradle and head-engaging assembly may be employed in the manufacture of the drawstring.

Safety hats are often designed particularly for use by electric workers. Such hats are commonly known as electric hats, and specifications therefor definitely require that there be no holes extending through the shell. If such holes were present, it would increase the liability of making electrical contact with the wearer's head. An important object of the present invention is to provide an electric hat including the suspension of the harness of this invention and which meets the specifications above noted. Thus the lower ends of the legs of the fixed cradle are detachably secured to headed rivets which do not extend through the shell.

More in detail, the invention has as an object the provision of a safety hat including a shell comprising a circular dome and an outwardly extending brim, with the dome being formed with a plurality of bosses or enlargements at the joinder to the brim, with each boss being formed with a recess for detachably receiving a headed rivet or connecting member. Thus each boss presents spaced walls the innermost of which is slotted, with the space between the walls opening onto an entrance slot and the rivet or connecting member comprising a base member that is received in the space between the walls, a shank that is received in the slot, and a tapered head that is spaced from the inner face of the inner wall and which cooperates with the keyhole slot in the lower end of the leg of the fixed cradle and which slot has undercut edges.

Various other more detailed objects and advantages of the invention, such as arise in connection with carrying out the above-noted ideas in a practical embodiment, will in part become apparent and in part be hereinafter stated as the description of the invention proceeds.

The invention therefore comprises a suspension harness for safety hats which consists essentially of a one-piece plastic unit providing a fixed cradle having a central dome from which extend outwardly depending legs the lower ends of which are formed with keyhole slots having undercut edges, and an adjustable head-engaging assembly comprising arms interposed between and integrally joined to the legs of the fixed cradle, with the lower end of each arm having means for establishing an adjustable and detachable connection to a headband, with the arms converging towards the top when they are adjustably joined by a drawstring; and in that form of harness used with an electric hat the shell of the

hat is provided with bosses where the dome merges in with the brim, and these bosses are recessed to detachably receive rivets or connecting elements which cooperate with the keyhole slots in the lower ends of the legs of the fixed cradle.

For a full and more complete understanding of the invention, reference may be had to the following description and accompanying drawings, wherein:

FIGURE 1 is a side view of a safety hat including a suspension harness which is assembled therein in accordance with the precepts of this invention, with a portion of the shell being broken away and shown in section to facilitate illustration of the harness construction;

FIGURE 2 is a bottom plan view of the safety hat shown in FIGURE 1;

FIGURE 3 is a detailed sectional showing taken about on the plane represented by the line 3—3 of FIGURE 2, and depicting the connection between one leg of the fixed cradle and the shell;

FIGURE 4 is a detail taken on the scale of FIGURE 3 looking from the inside at one of the connections between the cradle leg and the shell;

FIGURE 5 is a detail showing the lower end portion of one of the cradle legs in elevation;

FIGURE 6 is a detailed section taken about on the plane represented by the line 6—6 of FIGURE 2, depicting the adjustable connection between one arm of the head-engaging harness and the headband;

FIGURE 7 is an elevational view looking at the inside of the adjustable headband with the sweatband removed and illustrates the structure which imparts adjustability to the headband. This view is taken about on the plane represented by the line 7—7 of FIGURE 2;

FIGURE 8 is a detail looking from the bottom or inside of a modified form of head-engaging assembly in which a plastic strip is utilized rather than a lace;

FIGURE 9 is a detailed section on an enlarged scale taken about on the plane represented by the line 9—9 of FIGURE 8 and showing the structure which imparts adjustability to the plastic strip in the joining of the ends thereof together;

FIGURE 10 is a detailed section taken about on the plane represented by the line 10—10 of FIGURE 8, showing the manner in which the plastic strip passes through one of the slots that is molded in the end of one arm of the head-engaging assembly;

FIGURE 11 is a side view of the modification constituting an electric hat, with parts broken away and shown in section;

FIGURE 12 is a detailed section taken on an enlarged scale and about on the plane represented by the line 12—12 of FIGURE 11, illustrating the manner in which one of the rivets or connecting members is detachably mounted in one of the bosses;

FIGURE 13 is a detail looking at the inside showing the connection between the lower end of one of the cradle legs and the boss of FIGURE 11;

FIGURE 14 is a detail looking at the insides of that portion of the shell formed with one of the bosses, with the space between the inner and outer walls of the boss depicted in broken lines;

FIGURE 15 is a view similar to FIGURE 14, showing the rivet or connecting member just prior to assembly with the boss;

FIGURE 16 is a detail section through one of the bosses, taken about on the plane represented by the line 16—16 of FIGURE 15; and

FIGURE 17 is a view in side elevation of one of the rivets or connecting members, being taken about on the plane represented by the line 17—17 of FIGURE 15.

Referring now to the drawings, wherein like reference characters denote corresponding parts, and first more particularly to FIGURES 1 and 2, there is shown the safety hat of the type commonly known as a head protector or skull guard, and which item comprises a hard outer shell S, a suspension harness H, and an adjustable headband A.

The hard outer shell S is molded from any of the plastic materials now commonly employed for this purpose and which are well known in this field. It may take any of the several forms now considered as conventional and which are somewhat related to the particular conditions under which the hat is used. Thus, in the form of hat illustrated in FIGURES 1 and 2, the shell S comprises a rounded dome 10 terminating in a lower turned-out edge 11 and formed with a visor 12 at the front. This particular shape of the shell S is not a limitation on the present invention and is merely taken as illustrative.

Referring now more particularly to FIGURE 7, the construction of the adjustable headband A will be described. This headband A comprises a strip of flexible plastic such as nylon, which is indicated at 13. The strip has overlapping end portions 14 and 15. The end portion 15 is formed with a plurality of spaced-apart aligned apertures 16, while the end portion 14 is formed with an elongated slot 17 that registers with the apertures 16. One fastening member, shown at 18, is fixedly secured at one end of the end portion 14 and has a headed shank that is adapted to be detachably received in any one of the slots 16. A second fastening member 19 is received in the slot 17 and has a headed shank that is detachably received in one of the apertures 16. These headed members 18 and 19 are well known in the art, and their construction is not further illustrated or described in detail. It is sufficient to point out that they are made of plastic and are somewhat flexible or yieldable so that the heads thereon may be forced through the apertures 16 to establish an adjusted relation between the overlapping band ends 14 and 15.

A sweatband 20 is stitched to the strip 13 along the line of stitches shown at 21 and covers the strip 13 including the overlapping end portions 14 and 15 in a well-known manner.

On each side of the overlapping ends 14 and 15 the strip 13 is formed with slots 22 and 23. Each of these slots receives a head-fastening member 24 the construction of which is more clearly illustrated in FIGURE 6. It might be noted that these fastening members 24 are substantial duplicates of the fastening members 18 and 19. Each comprises a flat disclike base 25 that engages the outer face of the strip 13, a shank 26 which passes through the slot 22 or 23 as the case may be, and an outer or enlarged head 27.

At the front end of the headband A and at points generally corresponding to the location of the slots 22 are two groups of openings 28 any one of which is designed to receive one of the fastening members 24 with the head 27 thereof disposed outwardly as shown in FIGURE 1.

The suspension harness H is a one-piece integral unit comprising two main parts. One of these is a fixed cradle made up of a central dome 29 with a plurality of outwardly depending legs 30 integrally joined thereto and extending therefrom.

Each leg 30 has a lower end portion formed with a keyhole slot such as depicted in FIGURE 5. Thus the lower end of each leg 30 is formed with a thickened portion 31 (see FIGURE 3) and a keyhole slot made up of a large circular portion 32 and a neck 33. The thickened structure 31 is cut away along the sides of the neck 33 as indicated at 34 to provide inclined or beveled surfaces on the side edges which define the neck and also at the closed end of the neck, which is rounded as indicated at 35.

A plurality of rivets or fastening members 36 (see FIGURE 3) are mounted at spaced intervals around the lower edge of the shell 10, the spacing and location of these rivets corresponding to the location of the lower ends of the legs 30.

Thus the shell is formed with a plurality of openings

37 each of which receives the shank 38 of one of the fastening members 36. Each fastening member 36 has a base or head 39 that engages the outer face of the shell 10, and an inner conically shaped head 40. The taper of each conical head 40 corresponds to the angle at which the surfaces at 34 and 35 are undercut. This head 40 has a diameter substantially equal to or slightly less than the circular portion 32 of a keyhole slot.

It is evident that the fixed cradle of the harness H may be detachably assembled with the shell 10 by first inserting the head 40 of each connecting member 36 in the enlarged part 32 of each keyhole slot. The legs 30 are thereupon moved upwardly to cause the conical heads 40 to be received in the necks 33 of the keyhole slots. In this position the exposed face of each head 40 is substantially flush with the inner face of the thickened portion 31 of each leg 30.

The suspension harness H also includes as an essential part of head-engaging assembly comprising a plurality of arms 41. Each arm 41 is of a shape somewhat resembling that of a diamond and is cut away at its center leaving a recess such as indicated at 42. Thus each arm 41 includes a top tab 43 that is formed with a pair of spaced slots 44 in planes vertical to the surfaces of the tab. A lace 45 passes through all of these slots 44 and serves to maintain the tabs 43 in a desired assembled relation. The ends of the lace 45 are knotted as at 46 to establish a desired adjusted relation.

The arms 41 are widest at the widest part of the diamond-shaped recesses 42 and at each side are integrally joined to one of the legs 30 as indicated at 47. Each arm 41 also includes a bottom tab 48 that is formed with a series of vertically aligned apertures 49. Any one of these apertures 49 is adapted to detachably receive the head 27 of one of the fastening members 18, 19, or 24, as the case may be. Thus, it is evident that there is a high degree of adjustment where the bottom tab 48 of each arm 41 is attached to the headband A.

In the foregoing construction it is evident that there is always a fixed distance between the central dome 29 of the fixed cradle and the top of the shell 10. Thus specifications as to this distance may be accurately met. Moreover, the arms 41 constituting the head-engaging assembly are fitted over the wearer's head, and there is a space between the top tabs 43 of these arms and the fixed cradle. Thus, an additional safety factor is provided by this space. The lower ends of the legs 30 are detachably secured to the shell 10 at its lower edge by connections which leave no bumps or protuberances on the inner face of the legs. Thus, should any extraneous force ever force one particular portion of the shell towards the wearer's head, the engagement will be a surface one and not localized in a bump or projection.

It is evident that the lace 45 provides for accurately adjusting the head-engaging assembly to fit the wearer's head. The headband A is equally adjustable, and the adjustable connections between the bottom tabs 48 of the arms 41 and the adjustable headband insures of an accurate and comfortable fit.

Referring now more particularly to FIGURES 8, 9, and 10, a modification in which a plastic strip is substituted for the lace 45 will be described. A strip 50 is molded into a generally circular formation and may be made from any appropriate plastic such as nylon or any plastic used in the manufacture of the harness H. This strip 50 will pass through the slots 44 in exactly the same manner as does the lace 45. It has two overlapping end portions 51 and 52, such as shown in FIGURE 9. The end portion 52 is formed with a series of aligned openings 53. The end portion 51 is formed with a pair of spaced studs 54 each having a slightly tapered end 55. The studs 54, together with the tapered ends 55, are suitably dimensioned to pass through the openings 53 with the tapered ends providing, what is in effect, a pressed fit. After they have been so passed, it is evident that the ring or circle defined by the strip 50 assumes the locked position shown in FIGURE 9.

Referring now more particularly to FIGURES 11–17, inclusive, a modification of the invention involving an electric hat will be described.

As shown in FIGURE 11, the hat includes a shell comprising a dome portion 56 and a brim 57 which extends entirely therearound, with the joinder between the two being indicated at 58. In an electric hat it is an absolute requirement that the entire shell be imperforate. Thus, just above the line of joinder 58 the dome portion 56 is formed with a plurality of bosses or thickened portions 59. Each boss 59 is in turn cut away to provide a recess or space 60 that is defined by an inner wall 61 and an outer wall 62 (see FIGURE 16). The inner wall 61 will have a slight curvature due to the curvature of the dome 56, and this curvature will perform a function to be later described. As shown in FIGURE 15, the inner wall 61 is formed with a slot 63 that is slightly enlarged at its inner or top end, shown at 64. This slot 63 opens at the bottom onto an entry recess 65. A rivet or connecting member is referred to in its entirety by the reference character R and is shown in detail in FIGURES 15 and 17. This connecting member R comprises a shank 66 which carries at one end a base member 67 which is adapted to be positioned in the recess 60, and an inner conical head 68.

Each connecting member R is first assembled in one of the bosses 59 by positioning the rounded side of the base 67, which is shown at 69 in FIGURE 15, in the entry recess and disposed upwardly therein. The connecting member R is now moved upwardly with respect to the shell 56 so that the shank 66 enters the slot 63. This upward movement is continued until the shank 66 is received in the enlarged end portion 64 of the slot 63. In this position, the base 67 substantially fills the space or recess 60 and is yieldably held in position by the curvature of the inner wall 61 together with the flexible nature of the material from which the connecting member R is made. These connecting members R are made from a molded fibrous or plastic material having good insulating properties and is slightly yieldable or flexible.

The connection between the conical heads 68 and the legs 30 of the fixed cradle are exactly the same as that described above in connection with FIGURES 1 and 2.

While preferred specific embodiments of the invention are hereinbefore set forth, it is to be clearly understood that the invention is not to be limited to the exact constructions, mechanisms, and designs illustrated and described, because various modifications of these details may be provided in putting the invention into practice within the purview of the appended claims.

What is claimed is:

1. In a suspension harness for safety hats having a shell and a headband, the improvement comprising, an integral one-piece plastic unit comprising a fixed cradle and a head-engaging assembly, said cradle having a central dome and outwardly and downwardly extending legs depending therefrom, said head-engaging assembly comprising a plurality of outwardly and downwardly extending arms each interposed between and integrally joined at its medial regions to an adjacent pair of the legs of the cradle, adjustable means for assembling the upper ends of said arms in fixed relation, means at the lower end of each of said legs for establishing a detachable connection to the shell of a safety hat, and means at the lower end of each of said arms for establishing a detachable connection to a headband.

2. In a suspension harness for safety hats having a shell and a headband, the improvement comprising, an integral one-piece plastic unit comprising a fixed cradle and a head-engaging assembly, said cradle having a central dome and outwardly and downwardly extending legs depending therefrom, said head-engaging assembly comprising a plurality of arms interposed between the legs

of said fixed cradle with each of said arms being integrally joined to the legs of the cradle on the opposite sides thereof, the upper end of each arm being formed with a pair of aligned slots, a curved plastic strip passing through said aligned slots and having overlapping end portions, adjustable means for holding said end portions in adjusted relation, means at the lower end of each of said legs for establishing a detachable connection to the shell of a safety hat, and means at the lower end of each of said arms for establishing a detachable connection to a headband.

3. In a suspension harness for safety hats having a shell, a conical rivet head on the inner side of said shell, and a headband, the improvement comprising, an integral one-piece plastic unit comprising a fixed cradle and a head-engaging assembly, said cradle having a central dome and outwardly and downwardly extending legs depending therefrom, said head-engaging assembly comprising a plurality of arms interposed between the legs of said fixed cradle with each of said arms being integrally joined at its medial region to the legs of the cradle on the opposite sides thereof, adjustable means for assembling the upper ends of said arms in fixed relation, means at the lower end of each of said legs for establishing a detachable connection to the shell of a safety hat, the lower end of each of said legs being formed with a keyhole slot consisting of a large opening and a neck terminating in a curved end, the edges of said curved end and neck being undercut for cooperation with the conical rivet head to achieve a flush relation between said rivet head and the inner face of said leg, and means at the lower end of each of said arms for establishing a detachable connection to a headband.

4. In a suspension harness for a safety hat having a shell and a headband, the improvement comprising, a one-piece integral unit comprising a fixed cradle including a central dome and a plurality of angularly spaced legs depending outwardly therefrom; and a head-engaging assembly comprising a plurality of arms each having a top tab, a bottom tab, and side portions integrally joined to the legs of the fixed cradle on the opposite sides thereof, each of said top tabs being formed with a slot a drawstring passing through said slots for establishing an adjusted relation of said top tabs in which they are spaced from the dome of the cradle, means carried by each of said bottom tabs for establishing a detachable connection with a headband, and means at the lower end of each of said legs for establishing a detachable connection with the shell of a safety hat.

5. In combination, a safety hat comprising a hard outer shell, an adjustable headband, and a suspension harness; a plurality of headed rivets carried by said shell in spaced relation and presenting conical heads spaced from the inner face of said shell; a plurality of fastening members carried by said headband and presenting heads spaced from the outer face of said headband, said suspension harness consisting of an integral one-piece plastic unit including a fixed cradle and a head-engaging assembly; said fixed cradle comprising a central dome and angularly spaced legs depending therefrom, the lower end of each of said legs being formed with a keyhole slot including a neck having inclined side edges with each keyhole slot being adapted to receive the conical head of one of said rivets, said conical head being received between the inclined side edges of said neck whereby said cradle is secured in fixed relation with respect to said shell; said head-engaging assembly comprising a plurality of arms interposed between said legs with each of said arms being integrally joined at its medial region to the legs on the opposite sides thereof, a drawstring securing the upper ends of said arms in adjusted relation spaced from said dome, and an aperture at the lower end of each of said arms for detachably receiving one of the headed fastening members carried by the headband.

6. In combination, a safety hat comprising a hard outer shell, an adjustable headband, and a suspension harness; a plurality of inwardly extending headed rivets carried by said shell adjacent to the lower edge thereof and in spaced relation, said adjustable headband carrying a plurality of outwardly extending headed fastening members, said suspension harness comprising a fixed cradle and a head-engaging assembly, said fixed cradle including a dome and a plurality of angularly spaced legs depending outwardly therefrom, the lower end of each of said legs being formed with a keyhole slot receiving one of said headed rivets, whereby said cradle is mounted within said shell in fixed relation thereto, said head-engaging assembly comprising a plurality of arms each having a top tab, and a bottom tab and outermost side portions spaced between said top and bottom tabs integrally joined to the legs on the opposite sides thereof, each of said top tabs being formed with a pair of aligned slots, a drawstring passing through said slots for maintaining an adjusted relation of said top tabs in which they are spaced from said dome, and a series of vertically aligned apertures formed in each of said bottom tabs and any one of which is adapted to receive the headed end of one of said fastening members on the headband.

7. In a suspension harness for safety hats, a drawstring in the form of a curved plastic strip having overlapping end portions, one of said end portions being formed with a series of spaced-apart apertures, the other of said end portions carrying a pair of flanged projections spaced apart a distance corresponding to the spacing of any two of said apertures with said flanged projections being adapted to pass through said apertures whereupon said strip may be distended to cause the flanges on said projections to assume a locking position.

8. In a safety hat designed for use by electric workers, a hard outer shell formed with a plurality of thickened bosses at the lower edge thereof and in spaced relation, each of said bosses being formed with a recess having its lower end open and its upper end closed and defined by inner and outer walls, said inner wall being formed with a slot extending upward from the open end of said recess and terminating in an enlarged portion short of the closed recess end, a plurality of rivet members each comprising a base, a shank, and a head, each of said bases being received in the recess in one of said bosses with its shank being disposed in the enlarged portion of the associated slot and its head spaced from said inner wall, and a suspension harness including a plurality of legs corresponding in number and spacings to said bosses, with the lower end of each leg being formed with a keyhole slot detachably receiving one of said heads.

9. In a safety hat designed for use by electric workers, a hard outer shell comprising a dome and a brim integrally joined thereto and extending outwardly therefrom, there being a line of joinder between said brim and dome, said dome being formed with a plurality of spaced-apart thickened bosses at said line of joinder, each of said bosses having a main recess defined by inner and outer walls and an entry recess communicating therewith, said inner wall being curved and formed with a slot opening onto said entry recess, the recess between said inner and outer walls having a curved upper end, a rivet member removably received in each of said bosses, each of said rivet members comprising a base having a curved upper end corresponding in shape to the curved end of said recess, a shank adapted to be received in said slot, and a conical head spaced from the inner face of said inner wall, each of said rivet members being adapted to be assembled in one of said bosses by first positioning the curved end of the base in the entry recess and then moving the rivet member upwardly with the shank entering the slot and the upward movement continued until the curved end of the base engages the curved end of the recess in which position the curvature of said inner wall yieldable holds said rivet member in said boss, and a suspension harness including a plurality of legs the lower

portion of each of which is formed with a keyhole slot having a neck defined by side edges and a curved end, said edges being inclined for cooperation with one of the conical heads on one of said rivet members.

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