

Oct. 15, 1957

W. S. FINKEN ET AL
CLOSE-FITTING HELMET

2,810,022

Filed Sept. 24, 1953

2 Sheets-Sheet 1

Fig. 1.

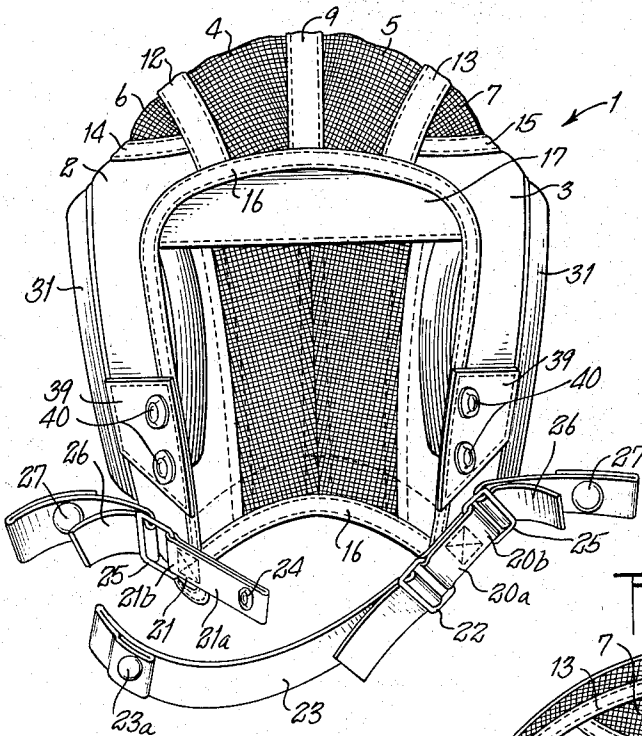


Fig. 2

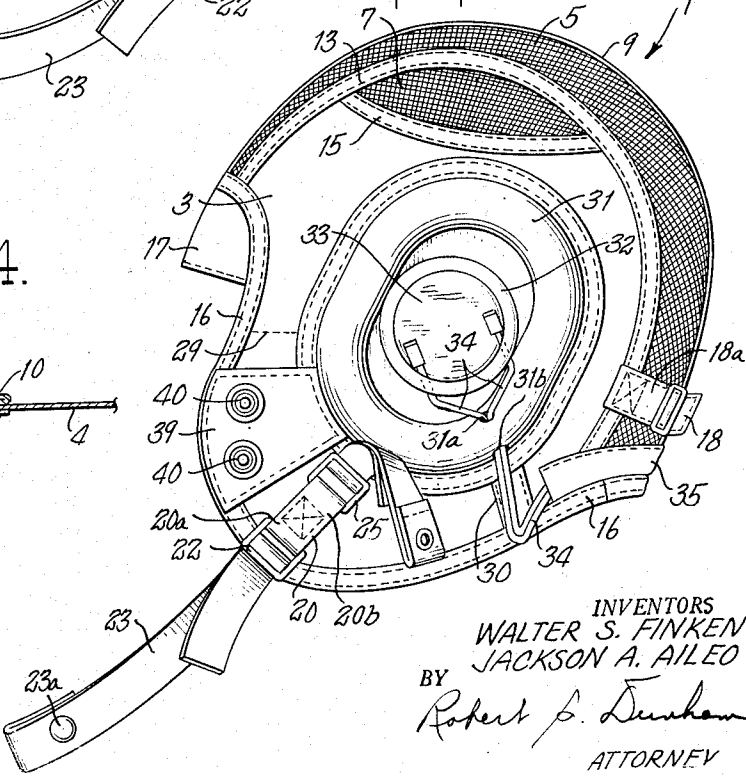
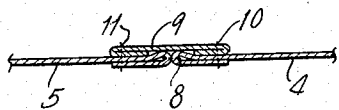


Fig. 4.



INVENTORS
WALTER S. FINKEN
JACKSON A. AILEO
BY
Robert P. Dunham
ATTORNEY

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Fig. 3.

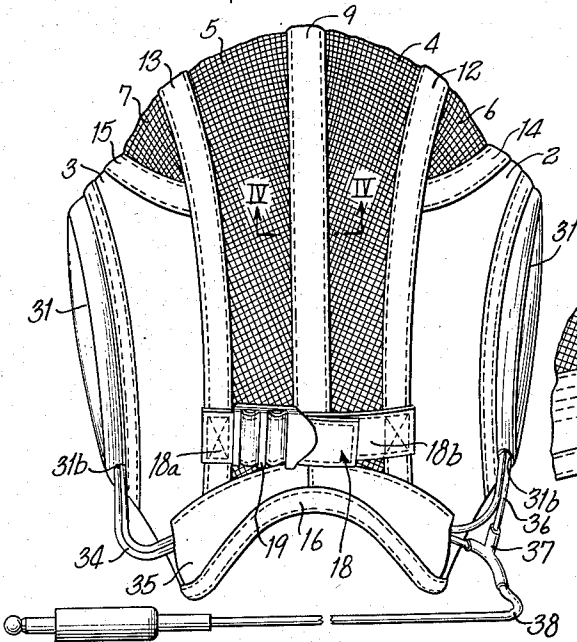


Fig. 6.

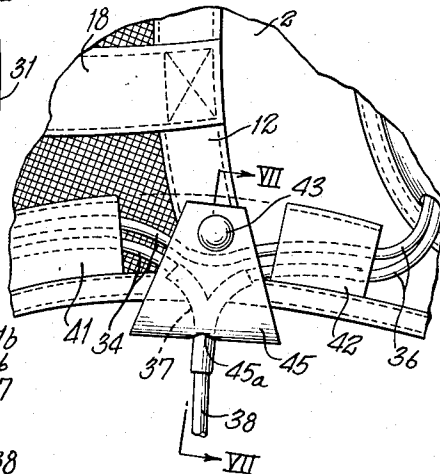


Fig. 5.

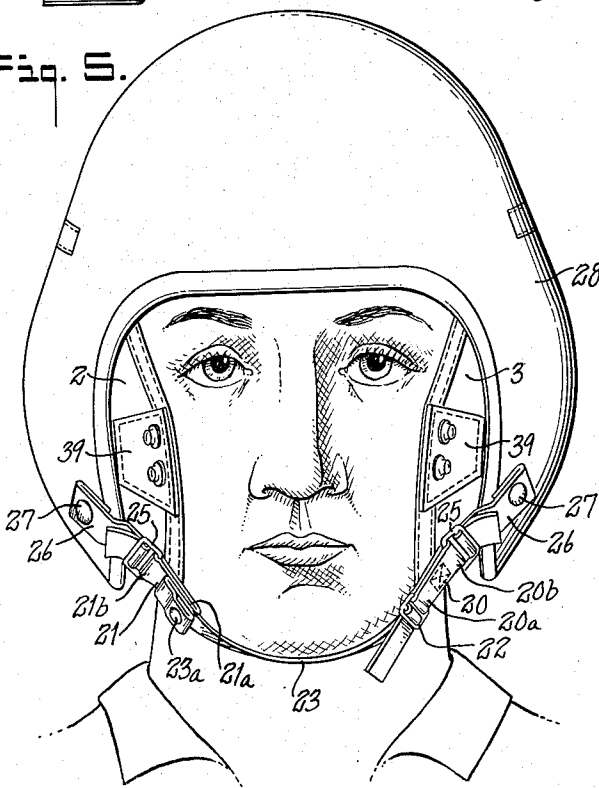
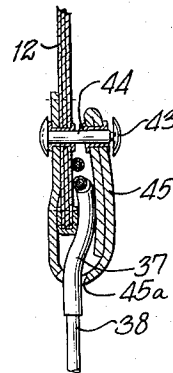


Fig. 7.



INVENTORS
WALTER S. FINKEN
JACKSON A. AILEO
BY
Robert A. Dunham
ATTORNEY

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CLOSE-FITTING HELMET

Walter S. Finken, Brooklyn, N. Y., and Jackson A. Aileo, Carbondale, Pa., assignors to Leonard P. Frieder, Great Neck, N. Y.

Application September 24, 1953, Serial No. 382,048

6 Claims. (Cl. 179—156)

The present invention relates to close-fitting helmets or caps, especially to helmets for supporting earphones and other accessories required by the occupation of the wearer, and intended to be worn at times alone and at other times inside an outer protective helmet.

It is desirable for persons engaged in certain occupations, for example, the pilots of military aircraft, to wear helmets which support earphones in close proximity to the wearer's ears and are also available to support other accessory equipment, for example, an oxygen mask, which may sometimes be necessary. Under many conditions, these supporting functions are all that is required of a helmet for such a person.

At other times, as for example, during military combat, or during high speed maneuvers, or during a forced landing, the pilot may find it desirable to wear a protective helmet, sometimes referred to as a crash helmet, or safety helmet, to protect his head against injury from contact with external objects. Such protective helmet structures tend to be heavy and bulky, and to be uncomfortable, particularly during warm weather. Also, the earphones and other accessories must be fastened to the safety helmet to prevent dislocations which might be uncomfortable or even dangerous.

It has therefore been proposed to provide for such personnel a light, close-fitting helmet which can be employed to support the earphones, oxygen masks and other accessories, and which is comfortable to wear even during the warmest weather. This light helmet is sufficiently compact so that a safety helmet can be put on quickly simply by placing it over the close-fitting helmet and connecting the two helmets together for example, by simple straps and snap connectors, as shown, or by an arrangement incorporating an automatic tension release of the type described in the copending application of Leonard P. Frieder and Walter S. Finken, Serial No. 329,788, filed January 6, 1953.

An object of the present invention is to provide an improved close-fitting helmet of the type described, which will fit the wearer's head snugly. Another object is to provide a helmet of the type described which is quickly adjustable to fit a wide range of head contours. Another object is to provide such a helmet in which the stresses due to tightening of the adjusting straps are distributed over substantial portions of the helmet structure so as to avoid localized pressures on the wearer's head.

Another object of the invention is to provide an improved structure for supporting earphones and other accessory equipment.

Another object is to provide, on such a helmet structure, improved arrangements for anchoring and supporting wires connected to the earphones.

The foregoing and other objects of the invention are attained by constructing the helmet with two side panels of relatively inelastic fabric adapted to support the earphones and other equipment, and two central zones extending from the wearer's forehead and over his head to the back of his neck. These central zones are formed

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of elastic flexible netting and are cut on the bias with respect to one another so that warp-like threads of the two nettings are parallel adjacent the crown of the wearer's head, and intersect elsewhere along the common boundary of the two zones at acute angles which increase toward the extremities of the zones. It is also preferred to include between the middle portions of the central zones and the side panels additional segments of netting, which are also cut on the bias with respect to the nettings in the zones. The boundary between the zones and the boundaries between the zones and the segments are covered by tapes of inelastic fabric, which tapes are stitched to both of the adjacent nettings.

An adjustable back strap is provided having its ends attached to the side panels and extending across the back of the wearer's head at the base of the skull. An adjustable chin strap is also provided extending between the side panels and under the wearer's chin. By tightening these two straps, the flexible netting can be stretched to conform to the contour of the wearer's head.

Another tape of inelastic material extends around the entire periphery of the helmet and is attached to the ends of the boundary tapes mentioned above. The contour of the two zones along their front edges is made arcuate so that this boundary tape recedes above the forehead a distance toward the crown of the head. Across the wearer's forehead, there is provided a gore which is arcuate on the upper side where it is attached to the peripheral tape and substantially straight on its lower edge. The aforementioned tapes and the gore just described cooperate to distribute over the entire area of the gore all stresses due to tightening of the back strap and the chin strap, thus preventing concentration of pressure on the forehead.

Adjustable straps for connection to an outer safety helmet are provided, preferably connected to the side panels by the same tabs to which the chin strap is attached. For mounting an oxygen mask, heavy leather segments are attached to either side of the side panels.

Earphone supports of the type described in detail and claimed in the copending application of Walter S. Finken (Docket 2707), Serial No. 373,795, filed August 12, 1953 are mounted on the side panels.

To provide anchorage for the wires leading to the earphones, tape pockets are provided extending along the outside of the lower periphery of the helmet. These tape pockets are open at both ends and serve to support and anchor the wires. There may be attached to one of the side panels a tab of heavy material for enclosing and anchoring a junction between wires attached to the respective headphones and the wires leading to an external connection. A portion of the earphone support mentioned above may be pierced at spaced localities adjacent the earphone and the wires leading to the earphone may be threaded in and out of the pierced holes so as to anchor them securely and prevent transmission of stresses through the wires to the earphone.

The foregoing and other objects of the invention will become apparent from a consideration of the following specification and claims, taken together with the accompanying drawings.

In the drawings:

Fig. 1 is a front elevational view of a helmet embodying the invention;

Fig. 2 is a side elevational view of the helmet of Fig. 1;

Fig. 3 is a rear elevational view of the helmet of Fig. 1;

Fig. 4 is a cross-sectional view taken on the line IV—IV of Fig. 3 showing the details of the stitching of the seam connecting the central zones and its covering tape;

Fig. 5 is a front elevational view showing a person

wearing the helmet of Figs. 1 to 4 and an outer safety helmet with the two helmets connected together;

Fig. 6 is a fragmentary view on an enlarged scale showing a modified form of wire anchorage structure; and

Fig. 7 is a cross-sectional view taken on the line VII—VII of Fig. 6.

Referring to the drawings, there is shown a helmet generally indicated by the reference numeral 1 and consisting of right and left side panels 2 and 3, right and left central zones 4 and 5 and right and left segments 6 and 7. The side panels 2 and 3 are formed of flexible inelastic material such as a cotton twill fabric. The zones 4 and 5 extend from the wearer's forehead over the top of his head to the back of his neck. These zones are formed of flexible, somewhat elastic netting. The segments 6 and 7 are located between the middle portions of the side panels 2 and 3, respectively, and the middle portions of the zones 4 and 5.

The seams between the central zones 4 and 5, between zone 4 and segment 6, and between zone 5 and segment 7 are formed as shown in detail in Fig. 4. The zones 4 and 5 are placed in registering relation and the marginal edges which will be adjacent in the finished helmet are stitched together by a seam 8. The margins are then folded back and the seam is covered by a tape 9 whose edges are stitched to the margins of the nettings 4 and 5, forming seams 10 and 11, respectively. The tape 9 is of relatively inelastic material, similar to the side panels 2 and 3. The seam between zone 4 and segment 6 is covered by a similar tape 12, similarly attached to the nettings. Another tape 13 covers the seam between zone 5 and segment 7. Additional tapes 14 and 15 cover the seams between the segments 6 and 7 and the panels 2 and 3, respectively. Another tape 16 extends around the entire lower periphery of the helmet 1, encircling the wearer's face, the lower and forward parts of the side panels 2 and 3, and around the back of the wearer's neck. The contours of the two zones 4 and 5 along their front edges is made arcuate so that the boundary tape 16 recedes above the forehead a distance toward the crown of the head. A gore 17 is attached to the tape 16 so as to extend across the wearer's forehead. The gore 17 has an arcuate upper edge to correspond with that of tape 16, while its lower edge is substantially straight.

A back strap 18 extends between side panels 2 and 3 at the base of the wearer's skull. The back strap 18 consists of a loop 18a sewed to the tape 13 and the adjacent portion of the side panel 3. A buckle 19 is attached to the loop 18a and receives the end of a strap 18b which projects from the opposite side panel 2. By adjusting the length of the strap 18, the fit of the helmet at the back of the wearer's neck can be readily changed to suit the contour of the head. A pair of webs 20 and 21, each forming a double loop, are attached to the side panels 2 and 3 respectively, near their lowest and most forward points. The loops 20a and 21a of the double loops 20 and 21 extend downwardly and forwardly toward the wearer's chin, while the other loops 20b and 21b extend upwardly and rearwardly. On the left side of the helmet, as shown in Fig. 2, the downwardly extending loop 20a is attached to a buckle 22. A chin strap 23 is adjustably received in the buckle 22 and is adapted to extend under the wearer's chin. The other end of chin strap 23 carries a snap fastener 23a adapted to engage another snap fastener 24 on the loop 21a on the opposite side of the helmet. The gore 17 spreads the stress due to tightening of back strap 18 and chin strap 23, particularly the former, over the entire area of the gore, thus preventing the concentration of pressure under the seam 16 to the discomfort of the wearer.

The upwardly and backwardly extending loops 20b and 21b carry buckles 25 which adjustably receive the ends of straps 26. The opposite ends of the straps 26 carry snap fasteners 27 adapted for attachment with co-

operating snap fasteners mounted on an outer protective safety helmet such as that shown at 28 in Fig. 5. As an alternative to the straps 26 and snap fasteners 27, 28, there may be provided connections incorporating an automatic tension release, as shown and claimed in the copending application of Leonard P. Frieder and Walter S. Finken, Serial No. 329,788, filed January 6, 1953, mentioned previously.

The lower forward portions of the side panels 2 and 3 may be made of double thickness, as between the seam 29 (see Fig. 2) and the seam 30.

The side panels 2 and 3 are provided with central generally elliptical apertures to receive the base members 31 of earphone supports of the type shown in detail and claimed in the copending application of Walter S. Finken, Serial No. 373,795, filed August 12, 1953. The base member 31 has a peripheral, elliptical, inwardly opening groove or recess adapted to receive a protective pad, as disclosed in the said Finken application. The base member 31 is also provided with a central collar 32 recessed to receive an earphone 33, to which are attached electric wires 34. The wires 34 are threaded through two openings 31a and 31b formed in the base member 31. Along the back of the neck of the helmet 1, just above the tape 16 is provided a wire anchorage pocket 35. This pocket is a strip of inelastic material, similar to the material of panels 2 and 3, which is stitched along its top and bottom margins to the helmet so as to form a passage open at both ends for the wires 34. At least one wire 34 from the left-hand earphone may join a wire 36 from the right-hand earphone at a junction, as shown at 37, connecting those wires to an external wire 38.

Heavy leather segments 39 are attached to the side panels 2 and 3 and are provided with snap fasteners 40 for the attachment of auxiliary equipment such as an oxygen mask. It should be noted that the segments 39 are sewed to the double thickness section of the side panels 2 and 3. Since oxygen masks commonly have only one snap fastener on each side, it may be seen that the provision of two such fasteners on the segments 39 permits adjustment of the mask to accommodate the wearer.

It should be noted that the nettings of the zones 4 and 5 are cut on the bias with respect to each other so that the warp-like threads of the two nettings are parallel at that part of the common boundary of the zones adjacent the crown of the wearer's head and that these warp-like threads intersect elsewhere along that common boundary at acute angles which increase toward both extremities of the zone. In a similar manner, note that the warp-like threads in the segments 6 and 7 are parallel to the adjacent zone threads at a locality near the crown of the head and that these threads intersect at increasing angles from that locality toward both extremities of the segments. By cutting the nettings of the zones in segments in this manner, the applicant has constructed a helmet which conforms closely to the wearer's head. Furthermore, by adjusting the back strap 18 and the chin strap 22 until both are tight, the wearer can pull the entire helmet structure into close-fitting engagement with his head. Since the zones 4 and 5 and the segments 6 and 7 are elastic, they do not withstand any substantial stress, but stretch to fit the wearer's head, transmitting the stresses applied to them to the tapes 9, 12, 13, 14 and 15. These elastic zones and segments are also effective to spread the stresses over substantial portions of the tapes, so that the wearer is not made uncomfortable by the tightening of the helmet. In a similar fashion, the stress applied to the front tape 16 is distributed throughout the area of the forehead gore 17.

The tapes 9, 12 and 13 form stable ridges from which elastic or bias movements of the netting zones and segments radiate. The stretching of each netting zone and segment to accommodate the head contour is thereby

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largely confined to the stretching required by the contour of that portion of the head surface covered by the particular zone or segment. The stretching of each zone and segment is thereby limited so that stress is never concentrated in any part of the helmet.

The location of segments 6 and 7 as shown is important to the proper positioning of the earphones. The zones 4 and 5 stretch both longitudinally and laterally as required to accommodate major differences between the shape of the wearer's head and the unstressed shape of the helmet. While the segments 6 and 7 cooperate to some extent with the zones 4 and 5 in performing that function, the principal function of segments 6 and 7 is to stretch laterally so that the earphones will be supported comfortably adjacent the wearer's ears.

The gore 17 is preferably lined with chamois or other soft material. In addition to its stress distributing function previously mentioned, it provides warmth and also protects the wearer's forehead. For example, such protection is especially desirable when the helmet is worn in a location subject to a high velocity air stream or blast. When the helmet is worn with goggles, the gore 17 provides protection of the wearer's forehead in the zone between the goggles and the main part of the helmet.

In tropical climates, it may be desirable to remove the gore 17 so as to make the helmet as cool as possible. This may be done readily by cutting the thread which binds it to the tape 16. When the gore 17 is so removed, the helmet functions substantially as well as before, except that the stress spreading function of the gore 17 is no longer available. However, any discomfort which may arise from this cause may well be less than the discomfort due to heat caused by the presence of the gore when the helmet is worn in a warm climate.

It may be seen from the foregoing that the applicant has provided a close-fitting helmet which may be adjusted into tight engagement with all parts of the wearer's head. This helmet is light in weight and comfortable but is nevertheless capable of supporting earphones and an oxygen mask or other auxiliary equipment. Furthermore, suitable means are provided for anchoring to the helmet structure the wires leading to the earphones, so that the connections between the wires and the earphones will not be stressed by movement of the helmet. Means are provided for connecting the helmet to an outer safety helmet which may be quickly put on over the close-fitting helmet.

Figs. 6 and 7

These figures illustrate a modified form of wire anchoring means which may be used in place of the wire anchoring means shown in Fig. 3. In Fig. 6, the pocket 35 of Fig. 3 is replaced by two pocket sections 41 and 42. Between these pocket sections, there is attached to tape 12, as by means of a bolt 43 and a nut 44, a downwardly depending loop 45 of leather or similar fabric. This loop is open at both sides to receive the wires 34 and 36, and is provided with an aperture 45a in its lower part through which the external connection wire 38 may pass. It may be seen that the loop 45 provides an anchored enclosure for the junction 37.

While we have shown and described certain preferred embodiments of our invention, other modifications thereof will readily occur to those skilled in the art, and we therefore intend our invention to be limited only by the appended claims.

We claim:

1. A close-fitting helmet and earphone support, adapted to be worn either alone or under an outer safety helmet, comprising a pair of zones of flexible, yieldable netting extending side by side from a front edge adjacent the wearer's forehead over the head to a rear edge at the base of the wearer's skull, the netting of each said zone being biased with respect to the netting of the other zone with the warp-like threads of the two nettings parallel at that part of the common boundary of the zones adjacent

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the crown of the wearer's head and intersecting elsewhere along the said common boundary at acute angles which increase from the crown toward both extremities of the zones, side panels of relatively inelastic material attached to the sides of said zones adjacent the front and rear ends thereof, a pair of segments of flexible, yieldable netting between the central portions of said side panels and said zones, the netting of each said segment being biased with respect to the netting of the adjacent zone with the warp-like threads of the zone and segment nettings parallel adjacent the middle of their common boundary and intersecting elsewhere along their common boundary at acute angles which increase toward both extremities thereof, earphone support means attached to said side panels at central localities thereof, said segments being stretchable laterally to accommodate earphones on said support means, a pair of straps, one attached to each side panel adjacent the wearer's chin and extending diagonally therefrom both in a backward and upward direction and in a forward and downward direction and a chin strap of adjustable length connecting the forward ends of said pair of straps, said chin strap being effective when tightened to draw the helmet into close-fitting relation with the top of the head of a wearer, the backward ends of said pair of straps being adapted for releasable connection to said safety helmet.

2. A combined helmet and earphone support, comprising a close-fitting helmet structure including side panels of inelastic material, earphone support means attached to at least one of said side panels, inelastic tape means extending around the back periphery of the helmet and means attached to said side panels and said tape means for anchoring at spaced localities wires leading to the earphones.

3. A combined helmet and earphone support as defined in claim 2, including at least one central panel connecting said side panels across the back of the head, a tape of inelastic material attached to the lower edges of said panels and extending across the back of the wearer's neck, and in which said wire anchoring means comprises a band attached along one edge to said tape and along its opposite edge to said panels, said band cooperating with the adjacent portions of said panels to form a pocket wider than said wires and open at both ends for receiving and loosely anchoring said wires.

4. A combined helmet and earphone support as defined in claim 2, in which said wire anchoring means comprises a band of flexible inelastic material attached at both ends to a locality on the lower periphery of the helmet along the back thereof between the peripheral portions immediately below the wearer's ears, said band forming a loop depending downwardly from said helmet periphery and open at both horizontal ends, said loop having an aperture opening downwardly at its lowest point, said aperture being adapted to receive wires forming external connections for both earphones, said loop being adapted to receive and support loosely a junction structure connecting said external wires to two sets of wires, each set leading to an individual earphone, said sets passing out of said loop through the respective open ends thereof.

5. A combined helmet and earphone support, comprising a close-fitting helmet structure including side panels of inelastic material, at least one central panel connecting said side panels across the back of the wearer's head, a tape of inelastic material attached to the lower edges of said panels and extending across the back of the wearer's neck, a pair of earphone support means each attached to one of said side panels, earphones on said support means, means for anchoring the wires leading to said earphones comprising a band of flexible inelastic material attached at both ends to a locality on the lower periphery of the helmet along the back thereof between the peripheral portions immediately below the wearer's ears, said band forming a loop depending

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downwardly from said helmet periphery and open at both horizontal ends, said loop having an aperture opening downwardly at its lowest point, said aperture being adapted to receive wires forming external connections for both earphones, said loop being adapted to receive and support loosely a junction structure connecting said external wires to two sets of wires, each set leading to an individual earphone, said sets passing out of said loop through the respective open ends thereof, a pair of bands attached along one edge to said tape and along their opposite edges to said panels, said bands extending in opposite directions from the open ends of said loop, each said band cooperating with the adjacent portions of said panels to form a pocket wider than said wires and open at both ends for receiving and guiding loosely one of said sets of wires toward one of the earphones.

6. A close-fitting helmet comprising a pair of zones of flexible, yieldable netting extending side by side from a front edge adjacent the wearer's forehead over the head to a rear edge at the base of the wearer's skull, the netting of each said zone being biased with respect to the netting of the other zone with the warp-like threads of the two nettings parallel at that part of the common boundary of the zones adjacent the crown of the wearer's head and intersecting elsewhere along the said common boundary at acute angles which increase from the crown toward both extremities of the zones, side panels of relatively inelastic material attached to the sides of said zones

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adjacent the front and rear ends thereof, a pair of segments of flexible, yieldable netting between the central portions of said side panels and said zones, the netting of each said segment being biased with respect to the netting of the adjacent zone with the warp-like threads of the zone and segment nettings parallel adjacent the middle of their common boundary and intersecting elsewhere along their common boundary at acute angles which increase toward both extremities of said common boundary, earphone support means attached to said side panels, said segments being stretchable laterally to accommodate earphones supported on said support means, and means attached to inelastic portions of the helmet structure for anchoring wires leading to the earphones.

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