

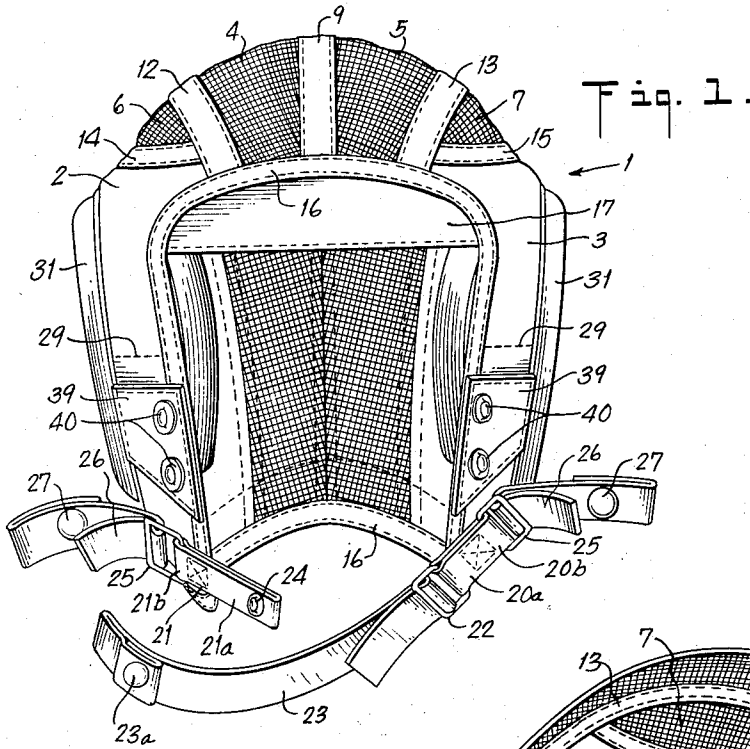
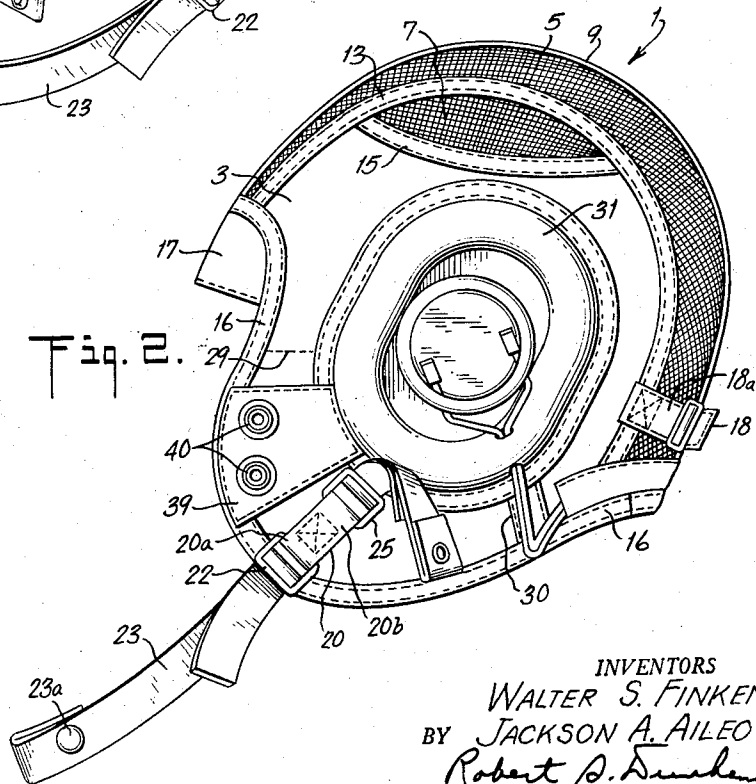
Feb. 3, 1959

W. S. FINKEN ET AL
CLOSE-FITTING HELMET

2,871,484

Original Filed Sept. 24, 1953

3 Sheets-Sheet 1



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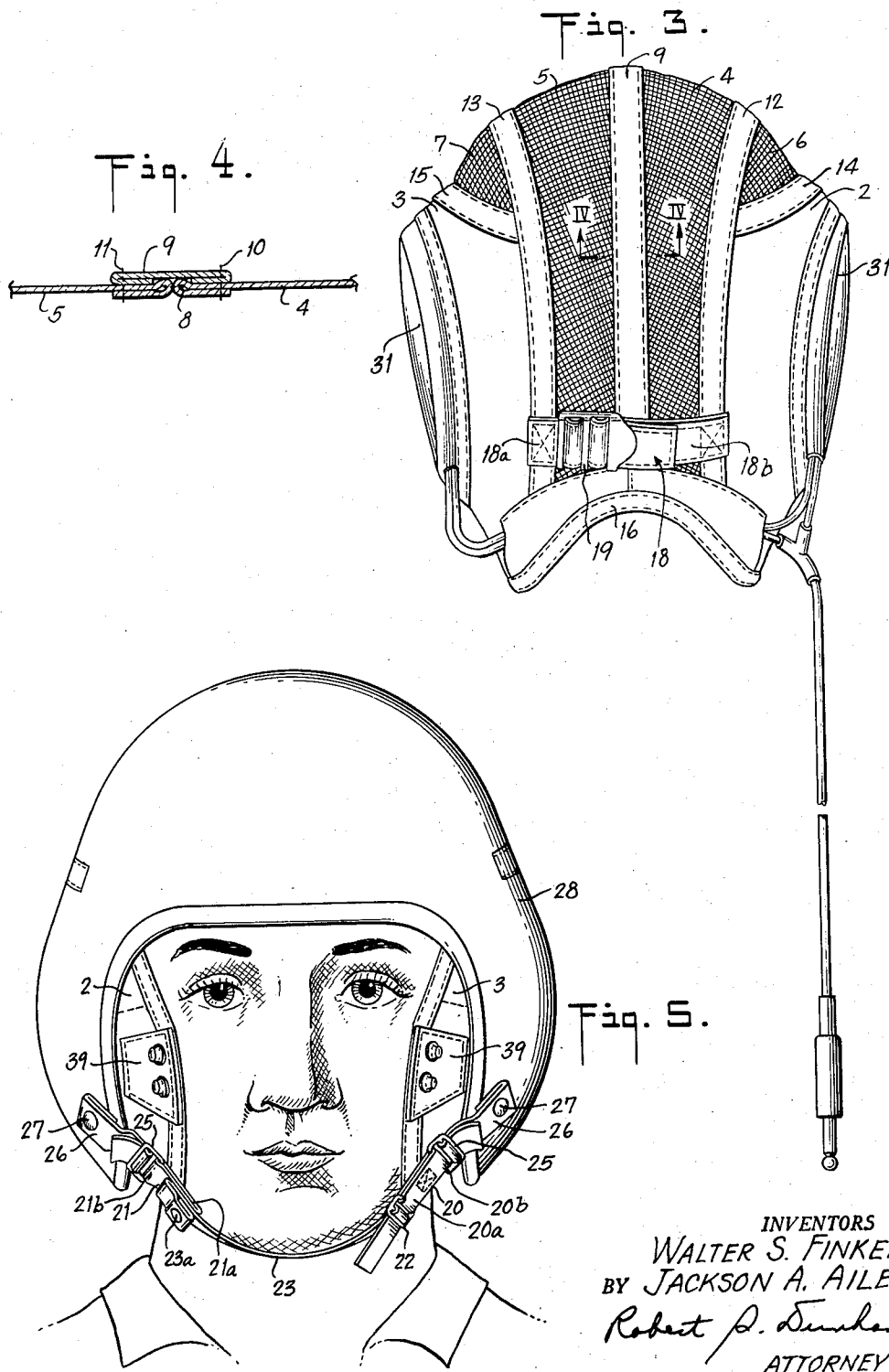
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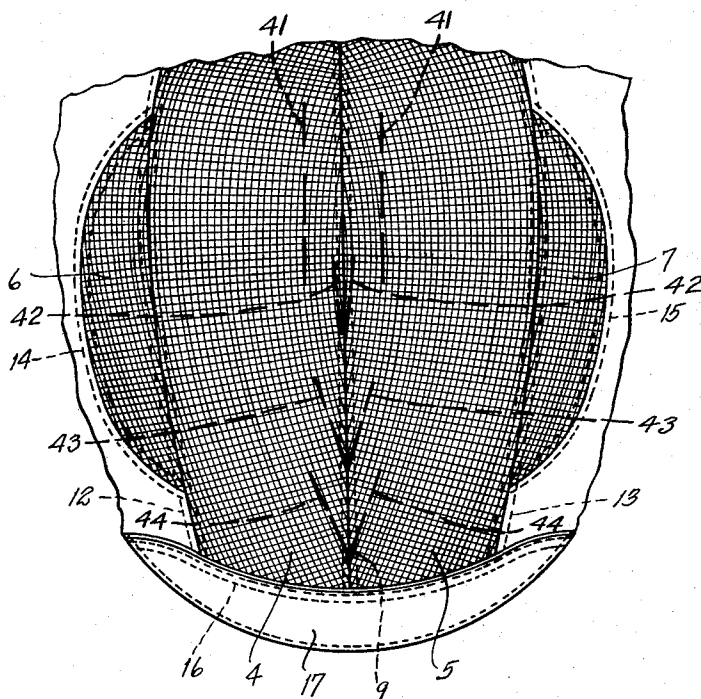


Fig. 6.

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2,871,484

CLOSE-FITTING HELMET

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Original application September 24, 1953, Serial No. 382,048. Divided and this application March 14, 1956, Serial No. 571,451

7 Claims. (Cl. 2—195)

This application is a division of our copending application, Serial No. 382,048, filed September 24, 1953, entitled "Close-Fitting Helmet," now U. S. Patent No. 2,810,022. 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, now U. S. Patent No. 2,825,112, issued March 4, 1958.

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.

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 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 tangent to lines parallel to the common boundary of the two zones adjacent the crown of the wearer's head, and meet 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 strip 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 strip just described cooperate to distribute over the entire area of the strip 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.

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; and

Fig. 6 is a fragmentary plan view of the central portion of the helmet of Figs. 1 to 4, with the helmet turned inside out to illustrate the relationships of the warp-like threads in the several zones and segments.

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 strip 17 is attached to the tape 16 so as to extend across the wearer's forehead. The strip 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 strip 17 spreads the stress due to tightening of back strap 18 and chin strap 23, particularly the former, over the entire area of the strip, 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 cooperating 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, there may be provided connections incorporating an automatic tension release, as shown and claimed in the United States patent to Leonard P. Frieder and Walter S. Finken, now U. S. Patent No. 2,825,112, issued March 4, 1958, 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 mem-

bers 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, now U. S. Patent No. 2,805,419.

The earphone connections and the wire anchorage structures are described in detail and claimed in our copending application Serial No. 382,048, filed September 24, 1953, now U. S. Patent No. 2,810,022, referred to above.

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, as best seen in Fig. 6, the warp-like threads of the two nettings are tangent to lines 41 parallel to the common boundary of the zones at that part of the boundary adjacent the crown of the wearer's head and that these warp-like threads meet elsewhere along that common boundary at acute angles which increase toward both extremities of the zone, as shown by the angles between the lines 42, 43 and 44 in Fig. 6. In a similar manner, note that the warp-like threads in the segments 6 and 7 are tangent to lines parallel to the adjacent zone boundaries at localities near the crown of the head and that these threads meet at increasing angles from that locality toward both extremities of the segments. By cutting the nettings of the zones and 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 strip 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 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 strip 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.

including a relatively firm tape fastening the adjacent edges of the zones together, side panels of relatively inelastic material attached to the sides of said zones adjacent the front and rear edges thereof, a pair of segments of relatively flexible, yieldable material attached to and between said side panels and said zones, said attachment of the segments to the zones being at localities along the sides thereof between the localities where the side panels are attached to said zones, a chin strap of adjustable length connecting said side panels at points spaced from both edges of the panels, said chin strap being effective when tightened to draw the helmet into close-fitting relation with the top of the head of the wearer, a back strap of adjustable length connecting said side panels at points adjacent the rear edges thereof, said back strap spanning said zones and effective when tightened to draw the helmet into close-fitting engagement with the back of the head of the wearer, a tape of relatively inelastic material attached to the front edges of said zones and panels and adapted to extend partially around the wearer's face, and a strip adapted to substantially cover and snugly fit the forehead of the wearer,

said strip being substantially wider than said tape and extending along said front edges, said strip having an arcuate edge attached to said tape to lie above the wearer's forehead and a straight edge to extend across the forehead, and being effective to distribute the stress on said tape.

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When the helmet is worn with goggles, the strip 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 strip 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 strip 17 is so removed, the helmet functions substantially as well as before, except that the stress spreading function of the strip 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 strip when the helmet is worn in a warm climate.

It may be seen from the foregoing that the applicants have 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.

While we have shown and described a preferred embodiment 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 having front and rear edges adapted to fit snugly respectively the forehead and skull base of the wearer's head, comprising a pair of zones of relatively flexible, yieldable material extending side by side from said front edge to said rear edge, means including a relatively firm tape fastening the adjacent edges of the zones together, side panels of relatively inelastic material attached to the sides of said zones, a chin strap of adjustable length connecting said side panels, said chin strap being effective when tightened to draw said zones into close-fitting relation with the top of the head of the wearer, a back strap of adjustable length spanning said zones and connecting said side panels, and effective when tightened to draw the helmet into close-fitting engagement with the back of the head of the wearer, a tape of relatively inelastic material attached to the front edges of said zones and panels and adapted to extend partially around the wearer's face, and a strip adapted to substantially cover and snugly fit the forehead of the wearer, said strip being substantially wider than said tape and extending along said front edge, said strip having an arcuate edge attached to said tape to lie above the wearer's forehead and a straight edge to extend across the forehead, and being effective to distribute the stress on said tape due to tightening of said straps.

2. A close-fitting helmet having front and rear edges adapted to engage respectively the forehead and skull base of the wearer's head and comprising a pair of zones of flexible, yieldable woven netting having warp and weft threads, said zones extending side by side from said front edge to said rear edge, means including a relatively firm tape fastening the adjacent edges of the zones together with the netting of each said zone biased with respect to the netting of the other zone so that the longitudinally extending warp threads of the two nettings are tangent to lines parallel to said adjacent edges at a part of the common boundary of the zones spaced from said front and rear edges and adapted to engage the crown of the wearer's head, and the warp threads of one zone meet the warp threads of the other zone along the portions of said common boundary located forwardly and rearwardly of said part, at acute angles which increase from said part toward both extremities of the zones.

3. A helmet as defined in claim 2, comprising a pair of segments of flexible, yieldable woven netting having

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warp and weft threads, said segments extending alongside the outside lateral edges of said zones adjacent the middle portions thereof, the netting of each said segment being biased with respect to the netting of the adjacent zone so that the longitudinally extending warp threads of the zone and segment nettings are tangent to lines parallel to the common boundary of said zone and segment at localities spaced from the front and rear edges of the segments, and adapted to engage the crown of the wearer's head, and the warp threads of the segments meet the warp threads of the zones along the portions of said common boundary located forwardly and rearwardly of said localities, at acute angles which increase toward both extremities of said common boundary.

4. A close-fitting helmet having front and rear edges adapted to engage respectively the forehead and skull base of the wearer's head, comprising a pair of zones of flexible, yieldable woven netting having warp and weft threads, said zones extending side by side from said front edge to said rear edge, means including a relatively firm tape fastening the adjacent edges of the zones together with the netting of each said zone biased with respect to the netting of the other zone so that the longitudinally extending warp threads of the two nettings are tangent to lines parallel to said adjacent edges at a part of the common boundary of the zones spaced from the front and rear edges and adapted to engage the crown of the wearer's head, and the warp threads of one zone meet the warp threads of the other zone along the portions of said common boundary located forwardly and rearwardly of said part at acute angles which increase from said part toward both extremities of the zones, side panels of relatively inelastic material attached to the sides of said zones adjacent the front and rear edges thereof, a pair of segments of flexible, yielding woven netting having warp and weft threads, said segments being attached to and between said side panels and the middle portion of the sides of said zones, said attachment of the segments to the zones being at localities along the side thereof between the localities where the side panels are attached to said zones, the netting of each said segment being biased with respect to the netting of the adjacent zone with the longitudinally extending warp threads of the zone and segment nettings tangent to lines parallel to the common boundary of said zone and segment at a pair thereof spaced from the front and rear edges of the segments and adapted to engage the crown of the wearer's head, and with the warp threads of the segments meeting the warp threads of the zones along the portions of said common boundary located forwardly and rearwardly of said part at acute angles which increase toward both extremities of said common boundary.

5. A helmet as defined in claim 4, including a back strap of adjustable length connecting said side panels at points adjacent the rear edges thereof, said back strap spanning said zones and effective when tightened to draw the helmet into close-fitting engagement with the back of the head of a wearer.

6. A helmet as defined in claim 4, in which the front edges of said zones are contoured to recede arcuately over the forehead a distance toward the crown of the head, and including a tape of relatively inelastic material attached to the front edges of said zones, and a strip to substantially cover and snugly fit the forehead of the wearer, said strip being substantially wider than said tape and extending along said front edges, said strip having an arcuate edge attached to said tape to lie above the wearer's forehead and a straight edge to extend across the forehead, and being effective to distribute the stress on said tape.

7. A close-fitting helmet having front and rear edges adapted to engage respectively the forehead and skull base of the wearer's head, comprising a pair of zones of relatively flexible, yieldable material extending side by side from said front edge to said rear edge, means

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,871,484

February 3, 1959

Walter S. Finken et al.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 45, for "pair" read -- part --; line 48, for "segmentts" read -- segments --.

Signed and sealed this 1st day of September 1959.

(SEAL)

Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents