June 8, 1965 J. A. AILEO 3,187,342

CHIN STRAP FOR A HELMET

Filed Feb. 26, 1964

Fig. 1.

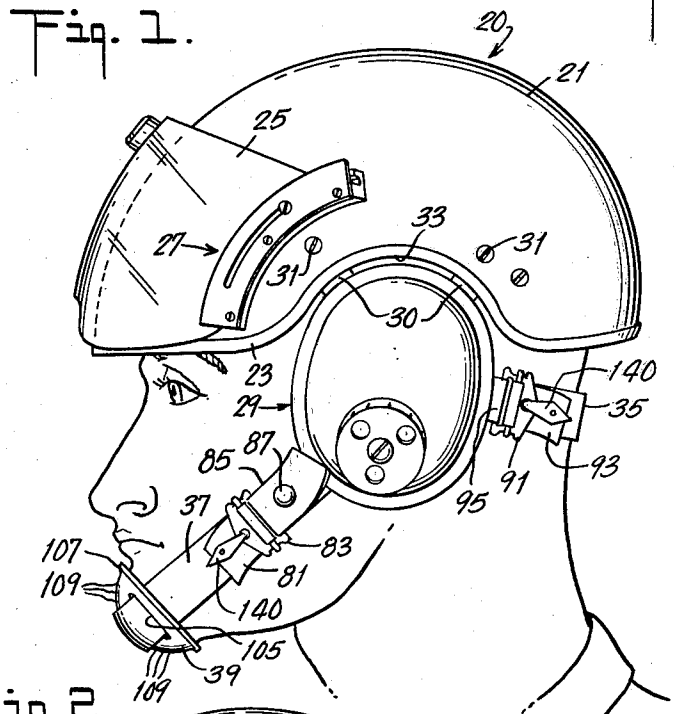


Fig. 3.

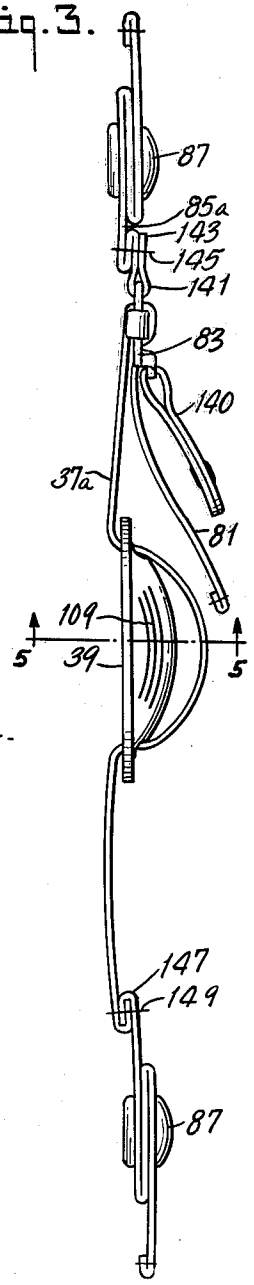


Fig. 2.

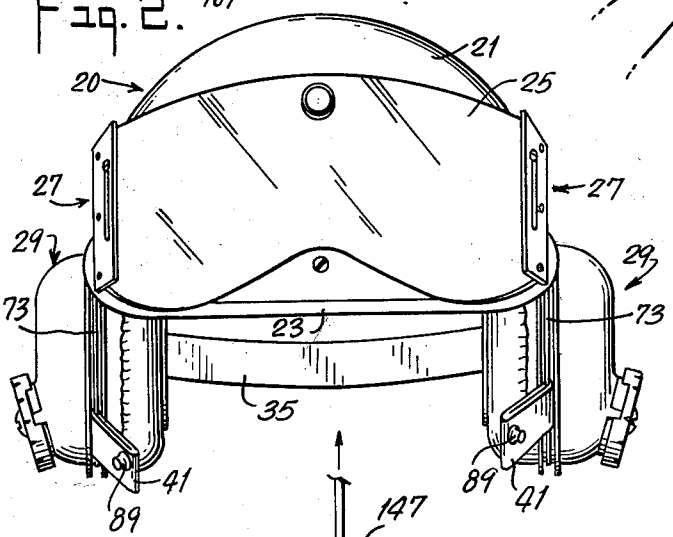
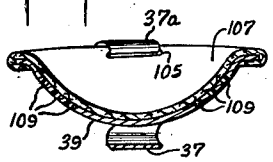


Fig. 5.



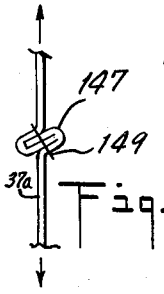


Fig. 4.

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CHIN STRAP FOR A HELMET

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6 Claims. (Cl. 2—3)

This is a continuation in part of patent application Serial Number 29,026, filed May 13, 1960.

This invention relates to a protective helmet and more especially to a helmet providing a rigid outer shell for warding off blows and impact. The invention particularly relates to improved means for supporting the shell upon and in spaced relation to the head of the wearer of the helmet and to means for securing the helmet in place.

It is an object of the invention to provide a helmet having a rigid shell open at the lower side thereof for receiving the head of the wearer, with improved rigging means.

Another object of the invention is to provide an impact resistant head covering including improved rigging means including improved means for retention of the head covering upon the head of a wearer.

Another object of the invention is to provide a helmet having improved means for retention upon the head of a wearer which does not interfere with the comfort of the wearer and which, nevertheless, retains the helmet very securely.

Another object of the invention is to provide a helmet including a comfortable retaining means including a chin strap having a chin cup of improved construction.

One of the problems with protective helmets and head coverings for resisting impacts to the head is related to the requirement that they must be retained upon the head of the wearer under conditions of impact and various other stresses in order to be effective to give the desired head protection. For this purpose, straps are provided to embrace the lower extremities of the head of the wearer for the purpose of retaining the helmet in place upon the wearer's head. However, there are occasions when the head covering is subjected to extreme momentary stress in a rotational mode tending to rotate the shell of the head covering above the head of the wearer, or the stress may be in a direction to displace the shell away from the head of the wearer. In either case, the resultant stress transmitted to the lower extremities of the head of the wearer by means of the straps may be of a truly dangerous magnitude. The source of such a stress may be derived from an accidental impact or collision of a vehicle in which the wearer of the protective head covering is an occupant, or if the wearer of the head covering is a police officer who is helping to control a riot, for instance, such sudden impacts or stresses may result from hand to hand physical engagement with rioters. No matter what the source of the stress, if the stress is sufficiently great; the possible risk of injury from the stress transmitted through the strap to the head of the wearer is very serious.

Accordingly, it is a further object of this invention to provide an improved protective head covering with retaining means surrounding the lower extremities of the head of the wearer which are sufficient to maintain the

covering upon the head of the wearer under all normal stress conditions, but which are releasable under abnormal stress conditions in order to avoid injury to the wearer.

In carrying out the above objects, a preferred embodiment of the helmet of the invention comprises a rigid shell made of suitable material which may be of known composition, for example one utilizing a plastic binder, which is capable of being molded to shape as a hollow shell open at the lower side thereof for receiving the head of the wearer, the opening being defined by the edge of the shell extending about the head generally horizontally. The structure may provide for suspending by flexible suspending means sound attenuating means in positions to engage the ears of the wearer. The suspending means is secured to the side wall of the shell, preferably adjacent a bay formed in the edge portion of the shell which extends about the head receiving opening thereof, so that a sound attenuating means which may be in the form of an ear cup of substantial size may be disposed in position to cover the ear of the wearer without engaging the shell. The suspending means, moreover, includes a flexible element, preferably elastic, to provide for stretching and contraction thereof generally in the direction between the shell and the ear cup, this flexible element at its lower end engaging an endless cord extending about a hollow member and over the outer surface thereof, this hollow member providing the main body of the ear cup. The flexible element may be of such form as to loop about the endless cord so as to slip along the length of this cord to different positions in relation thereto.

Means also may be provided in accordance with the invention for restraining the ear cups against forward movement thereof. This means may include a nape strap connected between the two hollow members serving as ear cups which are disposed at opposite sides of the head and engaging the cords carried by the hollow members at the respective sides. Adjustment of the length of this strap by means of a buckle serves to hold the ear cups in relation to the head against forward movement when the strap extends across the back of the neck.

Further, a chin strap may extend between and may be connected as by snap fasteners to a pair of loops respectively engaging the cords of the hollow members at the sides of the head. This chin strap may carry a buckle for adjustment and may be provided with a chin cup for engaging the chin of the wearer.

In carrying out another feature of the invention, a modified strap is employed which has at least one break link which remains intact under normal stress conditions, but which is capable of breaking at a predetermined limit of abnormal stress which is generally less than that which will cause serious injury to the wearer.

The cord engaging loops which cooperate with the nape and chin straps ordinarily may be non-elastic since they are readily adjustable by means of the buckles referred to. These straps and the loops cooperating therewith, however, may be made of elastic material if desired.

In accordance with another feature of the invention, a telephone instrument is supported within the hollow member by a resilient sound absorbing material, such as foam rubber or plastic, this supporting material being

formed to fit to the inner surface of the hollow member.

Means also may be provided which in addition to serving as a nape strap for the purpose above mentioned may comprise a fabric member which engages the cords that extend about the hollow members to provide for the slipping adjustment of the hollow members as described. This fabric member may carry means for attachment of an oxygen mask disposed on the face of and covering the nose and mouth of the wearer and held in place by the fabric member and the nape strap portion thereof engaging the back of the neck.

Novel construction and support of the visor of the helmet and of detent means therefor are provided for movement of the visor between eye shielding and retracted positions and for holding the visor in desired positions.

Other objects and features of the invention will be understood from the description to follow of the drawings in which:

FIG. 1 shows in perspective a helmet of the invention and the parts supported thereby mounted in position on the head of the wearer, the visor thereof being raised to retracted position;

FIG. 2 shows a front elevation of the helmet;

FIG. 3 is an edge view of an improved chin strap structure in accordance with the present invention;

FIG. 4 is a detail view showing a break link portion of the strap structure of FIG. 3 under stress; and

FIG. 5 is a cross-sectional view through the cup along line 5—5 in FIG. 3 showing internal details of construction.

In FIG. 1 is shown a helmet **20** having a rigid shell **21** of suitable material and having an opening at the lower side thereof for receiving the head of the wearer and defined by edge **23** disposed at a level somewhat above the eyes and the nape of the neck. The shell is supported in this position on the head by rigging and headband means and carries visor **25** supported on track means **27**.

The shell also supports a pair of ear cups **29**, as shown in FIGS. 1 and 2, suspended by means **30** secured thereto and secured to the shell by screws **31**. The edge **23** of the shell extends about a bay **33** formed in the shell to accommodate the ear cups **29**. The ear cups **29** are angularly adjustable with respect to the suspension means generally in planes parallel to the ears so as to fit suitably to the ears of the wearer. A strap **35** connects the two ear cups and extends across the nape of the neck. Connecting also to the two ear cups **29** is a chin strap **37** carrying a chin cup **39** engaging the chin of the wearer. The chin strap is omitted in FIG. 2 but loops **41** are shown in FIGS. 1 and 2 for removably connecting the chin strap thereto.

In order to hold the ear cup **29** in the adjusted position with respect to the ear, the chin strap **37** above mentioned may be adjusted by adjusting the end portion **81** engaging a buckle **83** connected to a fabric element **85** which carries a snap fastener **87** engageable with the cooperating fastener **89**, FIG. 2 secured to the loop **41** above mentioned. The loop **41** engages and is held in assembled relationship with the ear cup **29** by means of a cord **73**, FIG. 2, which surrounds cup **29** in a peripheral channel therein. Loop **41** may be moved along the cord **73** while being held in frictional relation thereto, or the ear cup may be rotated with corresponding relative movement of the cord **73** and the loop **41**. At the opposite side of the head from that shown in FIG. 1, a similar cord engaging loop **41** is disposed, FIG. 2 carrying snap fastener **89**, a cooperating fastener **87**, not shown, being provided at that end of the strap **37**.

By adjusting the buckle **83**, a certain amount of pull may be brought upon the ear cup against the bias of the loops **39**. This tension serves to hold the ear cups in the desired position in the generally vertical direction as well as to draw the ear cups toward the ear.

The strap **35** which extends across the nape of the neck, as above mentioned, also is provided similarly with a buckle **91** through which the end **93** of the strap **35** is passed for adjustment, this buckle also being carried by a loop **95** which engages the cord **73** in the same manner as the loop **41** for sliding movement relative to the cord. The opposite end of the strap **35** may be directly looped about the cord **73** of the ear cup at this opposite side of the head. It will be understood that the pull of the straps **35** and **37** may have a resultant directed generally downward in FIG. 1 against the elastic bias of the loops **39**, so that the ear cups are held by these opposed tensions in the desired relation to the ears.

As shown in FIG. 1 the chin cup **39** is provided with slots **105** disposed at the respective ends of the chin cup at either side of the chin. The strap **37** which extends between the loops **41** passes through these slots and over the outer surface of the chin cup, which is of generally outwardly convex form, so as to hold the chin cup **39** against the chin. The chin cup also is provided with a lining **107** which may be made of soft leather for engagement with the chin of the wearer, this lining extending over the edge of the cup. For ventilation, the rigid shell **39** of the chin cup may be provided with perforations **109** extending through the wall thereof but not through the leather lining. These perforations serve to ventilate the leather lining to provide for the evaporation of moisture which may be absorbed by the leather from the chin. The perforations may be disposed in the portions of the chin cup at either side of the strap **37** or may extend in distributed relation over a greater part of the chin cup including the part beneath the chin strap **37**. It will be understood, because of the arrangement described, that the chin cup may be slipped along the chin strap **37** in order to adjust it comfortably to the chin of the wearer. The chin cup **39** may be made of a plastic material molded to rigid form. Instead of the leather lining of the chin cup other materials which are suitable for absorption of perspiration and for comfortable engagement with the chin may be utilized.

The chin strap **37** and nape strap **35** also may be made of elastic material if desired but preferably are of strong tapes without substantial elastic extensibility in order that, when the buckles are adjusted, the parts supported by these straps will remain adjusted to the head and chin of the wearer of the helmet. Quick connection or disconnection, therefore, may be effected by snapping or unsnapping the snap fasteners **87** with respect to the corresponding fastener **39** with assurance that the parts will remain in position for fitting the head, ears and chin of the wearer.

The buckles **83** and **91** may be provided with lifting tabs **140** which easily may be pulled away from the straps **37, 35** for quick release of the buckle from the strap, when desired, to cause the buckle to move along the strap. Pull upon the end of the strap will effect tightening of the strap and with the buckle released from the hand, gripping engagement of the strap by the buckle again will take place.

FIGURE 3 is an edge view of a modified chin strap **37*a*** which incorporates the break link feature for the protection of the wearer of the head covering from undue stresses imparted from the strap to the wearer. All of the parts and components of the strap **37*a*** of FIG. 3 and components associated therewith, which have counterparts in the structure shown in FIGURE 1 are numbered similarly to the corresponding parts of FIGURE 1. Wherever there is a structural difference in the embodiment of FIGURE 3, the part having that structural difference is numbered with an added subscript "*a*."

In this embodiment of the chin strap, the end portion **85*a*** shown at the top of the figure is connected to the buckle **83** by means of a loop **141** which is closed at **143** by bartack stitching **145**. As shown in the drawing, the body of the strap is doubled upon itself at bartack stitching **145**. With this construction, and with bartack stitch-

ing which is carefully applied over a given length of stitch with a predetermined stitch density, it is possible to obtain a breaking action at the bartack stitching **145** within rather narrow limits of tension stress upon the strap. For instance, it is possible to provide a breaking strength at 125 lbs. of tension stress within a range of plus or minus 25 lbs. This is achievable with ordinary manufacturing procedures, and without serious practical difficulty. Generally, the row of bartack stitching does not extend quite to the side edges of the strap because this makes the breaking point stress of the bartack stitching and the associated connection much more predictable.

The precise breaking point stress of the break link which is to be provided with a particular protective head covering structure is largely a matter of design choice. Essentially any break point requirement can be provided and maintained within tolerances similar to that stated above for a strap having a breaking strength of 125 lbs. The actual nominal breaking strength selected will depend largely upon the design of the head covering, the means of fastening the retaining strap to the head covering, and various other factors which may include the size and physical strength of the wearer, etc. In general, however, it can be stated that the strength of the retaining strap and the break point stress of the break link must be greater than the normal stresses to be encountered by the retaining strap, but must be less than the abnormal stresses which are of a magnitude sufficient to cause injury to the wearer.

At the other end of the strap **37***a*, there may be provided another break link at **147** which is also fastened by bartack stitching at **149**. At the break link joint **147**, two separable ends of straps are joined in an arrangement in which each strap and has a single fold to form a hook-like configuration which engages with the hook of the other strap end, and the four strap thicknesses are attached together by the bartack stitching **149**. This variation of the break link structure also serves efficiently as a structure having a predictable stress break point.

Either of the break links **143** or **147** provides for a complete separation of the strap at the link when the break point stress is achieved. Each includes a discontinuity in the strap body structure, with the ends of the strap body at the discontinuity being joined by the sewing at the break link. Therefore, a single break link at either location in the strap is sufficient for accomplishing the objectives of the break link feature. However, it is preferred that both break links **143** and **147** should be included, since together they provide more complete protection. Furthermore, when the unusually high stresses are encountered, they can be localized to a degree on one side because of the engagement of the strap across the lower extremities of the head of the wearer. This is particularly true of the chin strap **37***a* because of the operation of the chin cup **39**. Therefore, it is logical to have break link protection on each side. Furthermore, with two breakable links, wider break point stress tolerance limits are acceptable because of the improbability that the break points of both links will be at the high end.

It is characteristic of both of the break links **143** and **147** that when extreme tension is applied to the strap, the bartack stitching **145** and **149** is subjected to a rather direct tension stress. This provides a more clearly predictable breaking action at the stitching. This is exemplified for link **147** by the detail shown in FIG. 4.

FIGURE 4 is a detail view showing the break link **147** and the associated portions of the strap **37***a* as it appears when under a severe stress condition approaching the breaking point stress magnitude. This view clearly illustrates that the bartack stitching **149** is substantially in tension when the strap is stressed in this manner. Furthermore, while not clearly shown in FIGURE 4, since the bartack stitching **149** does not extend all the way to the side edges of the strap, the edges of the strap have a tendency to pull away from one another and to place the ends of the bartack stitching under the greatest localized stress. This feature of the structure also contributes to the predictability of the break point stress limit of the break link structure.

The predictability of the break point stress limit is basically provided by the features of construction of the break links as described above. Employing these features of construction, there are many possible variations in thread sizes, thread materials, the type of stitching to be used, the number of stitches to the inch, and the length of the line of stitching which may be employed in order to obtain a predictable result. However, in order to exemplify this invention and to provide a complete teaching of the manner in which this invention may be carried out, a specific example of a break link structure in accordance with the teachings of this invention is as follows:

With standard bartack stitching, a thread material of silk-finish cotton having a thread size of 30/3, and with 61 stitches to the inch, and an effective stitched length of 11/16 inch provides a break point stress limit of 150 lbs. plus or minus 25 lbs. Working from the above example as a point of departure, variations in the stitching of the break link provide predictable break point stresses.

In the several embodiments of the invention described and in the different parts shown and described by way of illustration of operative devices embodying the features of the invention, variations may be made both in the form of the different parts and in the materials of which they are made while securing the functions as described, or equivalent functions, which carry out the features of the invention. The invention is not limited, therefore, to the particular embodiments disclosed and all such variations are intended to come within the scope of the appended claims.

I claim:

1. A chin strap assembly for a helmet comprising a chin-receiving member; and means for connecting the lateral portions of said chin-receiving member to the lateral portions of said helmet, including at least one break link portion in said means comprising a folded portion having stitches holding said folded portion together against unfolding, said stitches collectively having less tensile strength than the other portions of said connecting means.

2. A chin strap assembly for a helmet comprising a chin-receiving member having an inner surface of a soft, moisture-permeable and air-permeable material; and means for connecting said chin-receiving member to said helmet for lateral adjustment therebetween comprising strap guiding means near each lateral extreme of said chin-receiving member, a strap engaged by said strap guiding means so as to contact said chin-receiving member across the convex surface thereof, and means for connecting opposed ends of said strap to respective lateral portions of said helmet, including at least one break link portion in said means comprising a folded portion having stitches holding said folded portion together against unfolding, said stitches collectively having less tensile strength than said means.

3. In a chin strap assembly for a helmet wherein a strap connects a chin-receiving member and the helmet, the improvement comprising at least one break link portion in said strap for releasing tension therein above a critical amount, said break link portion comprising a folded portion of said strap having stitches holding said folded portion together against unfolding, said stitches collectively having less tensile strength than said strap.

4. In a chin strap assembly for a helmet wherein a strap means connects a chin-receiving member and the helmet, the improvement comprising at least one break link in said strap means for releasing tension therein above a critical amount, said break link comprising a portion of a strap folded back upon itself, and stitching

through said folded portion holding against unfolding thereof under tension, said stitching having less tensile strength than said strap.

5. The improvement according to claim 4 in which said strap comprises at least one loose strap end captured by said stitching at said folded portion so that rupture of said stitching completely disconnects one end of the chin-receiving member from the helmet.

6. The improvement according to claim 3 in which said strap comprises two overlapping strap ends captured by said stitching into said folded portion so that rupture of said stitching completely disconnects one end of the chin-receiving member from the helmet.

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