United States Patent [19]

Aho

[11] 3,795,919

[45] Mar. 12, 1974

[54] **METHOD OF JOINING A HEARING PROTECTOR AND A PROTECTIVE HELMET AND DEVICE FOR APPLYING SAME**

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[22] Filed: **June 21, 1972**

[21] Appl. No.: **264,854**

[30] **Foreign Application Priority Data**

June 21, 1971 Finland 1750/71

[52] **U.S. Cl.** **2/6**

[51] **Int. Cl.** **A42b 3/00**

[58] **Field of Search** 2/6, 3, 209; 179/156

[56] **References Cited**

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[57] **ABSTRACT**

Method of joining a hearing protector and a protective helmet wherein the yoke part between the earcup and the helmet has been made of a leaf spring, which has been attached to the helmet or to an intermediate part on same either integrally or turnably in a longitudinal vertical plane for the purpose of turning the earcups up into a position at rest, and which comprises an arrangement for spring force adjustment, characterized in that the upper end of the leaf spring has been shaped to be a spiral resembilng a watch spring and that adjustment of the spring tension has been arranged to take place by turning the centre shaft of the spiral or the device serving this function.

5 Claims, 4 Drawing Figures

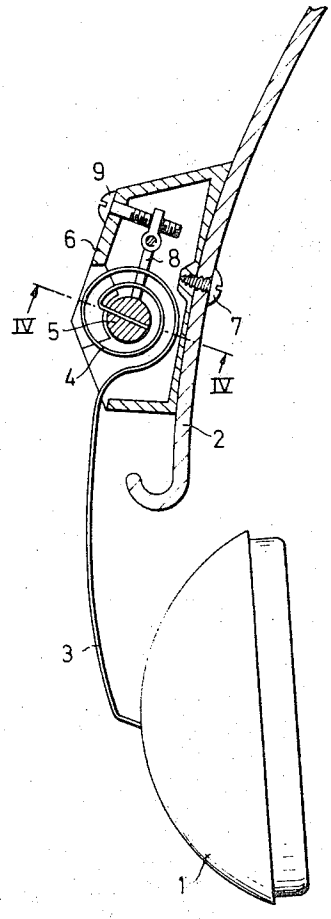
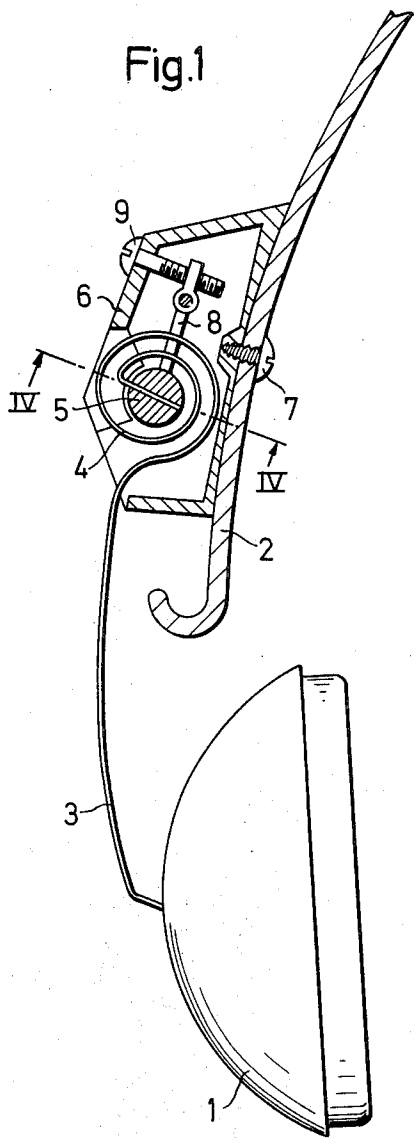


Fig.1



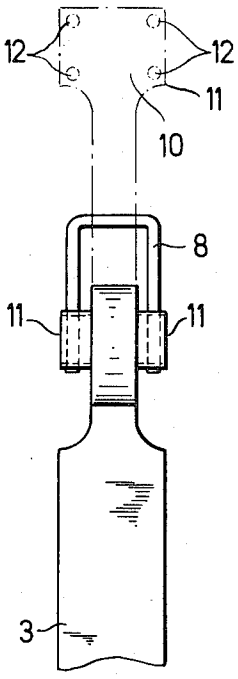


Fig.2

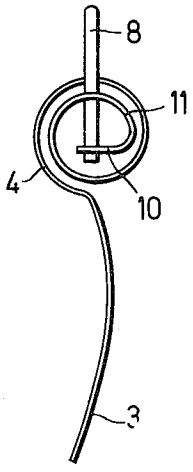


Fig.3

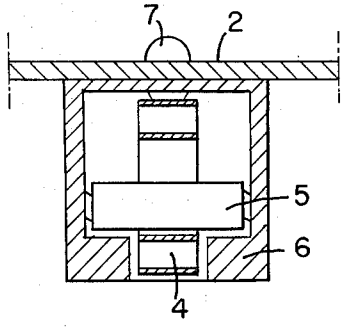


Fig.4

METHOD OF JOINING A HEARING PROTECTOR AND A PROTECTIVE HELMET AND DEVICE FOR APPLYING SAME

The joining of a hearing protector with a protective helmet in a manner enabling sufficient adjustability of the earcups of the protector and their free position adaption to be achieved without impeding the use of the protective helmet itself is a difficult undertaking, as can already be concluded from the great number of mutually different designs presented heretofore.

The spring force pressing the earcups against the ears is frequently produced by means of various wire spring designs, but these have usually the drawback of an excessively high spring constant, which leads to the condition that the ears of a person having a narrow head are not subject to adequate spring pressure for proper sealing of the cup, whereas one with a broad head has to suffer under an unnecessarily high clamping force.

If the wire springs are shaped to be helical springs, the elastic properties improve, but the design becomes more complex.

By means of a leaf spring a favourable elastic constant could be achieved by simple structures if only the spring could be made to have sufficient length. Attempts have been made to solve this problem by making reciprocating bends in the leaf spring, but this has resulted in excessively protruding structures; impacts directed against these structures may in fact knock the helmet off its user's head. The aim of the present invention is to eliminate said drawbacks and to achieve a mode of applying a leaf spring wherein a long leaf spring with good elastic properties has been accommodated in a small space and simultaneously provided with adequate facilities for adjustment of the spring force.

The invention concerns a method of joining a hearing protector and a helmet wherein the yoke part between the earcup and the helmet has been made of a leaf spring attached to the helmet or to an intermediate part on same either integrally or turnably in the longitudinal vertical plane for the purpose of turning the earcups up into a position at rest, and which comprises a spring force adjustment arrangement.

The invention is characterized in that the upper end of the leaf spring has been shaped to be a spiral resembling a watch spring and that tension adjustment of the spring has been arranged to take place by turning the centre axis of the spiral or the device serving this function.

Furthermore, the invention concerns a device for applying the method disclosed above, the characteristic features of said device being those set forth in claims 5 and 6.

In the attached drawing:

FIG. 1 shows an embodiment of the invention, partly sectioned, and

FIGS. 2 and 3 show an alternative design of a certain detail, to be described later on.

FIG. 4 is another cross-sectional view taken on line IV—IV of FIG. 1.

The conventional earcup of the hearing protector, 1, has been connected to the protective helmet 2 by means of a leaf spring 3. The joining of the earcup 1 and leaf spring 3 has been accomplished in a suitable manner elastically so that the cup will settle tightly over the ear. Moreover, the spring 3 has the necessary facility for length adjustment, which has not been depicted, since the manner in which it is accomplished is immaterial in view of the object of the invention.

The upper end 4 of the leaf spring 3 has been shaped to be a spiral resembling a watch spring. The spring has been attached at its upper end to the helmet 2 by the centre of the spiral, whereby in a small structural length a great functional length has been accommodated and it has been possible to provide the spring with favourable elastic properties. In the embodiment shown in FIG. 1 the attachment of the spiral has been carried out by using a split shaft 5, which in its turn has been journalled in a housing 6, this housing further being attached by a screw 7 to the helmet 2 to be turnable in the first place in a longitudinal vertical plane so that the earcups 1 may be turned up into a position at rest on top of the helmet 2. The journalling of the shaft 5 in the housing 6 is normally secured to be immovable by means of the adjustment arm 8. If the pre-tensioning of the spring shall be altered, the shaft 5 is rotated by the aid of an adjustment screw 9 acting upon the adjustment arm 8.

In the embodiment presented in FIGS. 2 and 3, the spring, which usually has greater width at its lower end for reasons associated with the length adjustment structures, has been made narrower in its spiralling part in order to obtain an appropriate spring force. At the same time the separate shaft has been rendered unnecessary by leaving the extreme end 10 of the spring unnarrowed, whereby, after the spiral 4 has been formed, there remain in its centre shaft projections 11 consisting of the same spring material and in connection with which the journalling required for adjustment may be provided. The adjustment arm 8 has been attached to holes 12 punched in the shaft projections 11.

At those points which have not been mentioned in this description, principles commonly known in the art of attaching hearing protectors to a protective helmet are applied. For instance, instead of being immediately fixed to the helmet, the housing 6 may be connected to a fork-like intermediate part, from which it can be detached by a simple motion and without tools when the helmet is used in conditions free of noise.

I claim:

1. A tension adjusting device for an ear protector mounted on a helmet comprising a leaf spring element fixed at one end to the ear protector for urging the ear protector against the head, the opposite end of said spring element having a spiral portion with the extreme end portion of said opposite end located at the center of said spiral and with the axis of said spiral portion transverse to the longitudinal plane of said leaf spring, mounting means associated with the helmet, means mounted on said mounting means and secured to the inner central end of the spiral portion of said spring for turning the inner end about its axis to vary the tension of said spring to thus increase or decrease the pressure of the ear protector against the head.

2. A device as claimed in claim 1 wherein the means for turning the inner end of the spiral portion of said spring comprises a shaft rotatably mounted on said mounting means, the inner end of the spiral portion of said spring being fixed to said shaft and means for rotating said shaft to vary the tension of said spring.

3. A device as claimed in claim 2 wherein the means for turning said shaft comprises an adjustment arm fixed to and extending radially from said shaft and

screw means mounted on said mounting means for engaging the outer end of said radial arm for turning said shaft about its axis to vary the tension of said spring.

4. A device as claimed in claim 1 wherein the means for turning the inner end of the spiral portion of said spring comprises an adjustment arm fixed to the inner end of the spiral portion of said spring and extending substantially radially of said spiral portion and screw means mounted on said mounting means for engaging the outer end of said adjustment arm for rotating said arm about the axis of the spiral portion to vary the tension of said spring.

5. A device as claimed in claim 4 wherein the inner end of the spiral portion of said spring is wider than the remainder of the spiral portion and extends laterally therefrom and said adjustment arm comprises a U-shaped element, the ends of the legs of which are secured to the inner widened portion of the spiral portion and said screw means engages the base of the U-shaped element.

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