March 27, 1962 G. T. BIXBY 3,026,524

HELMET EAR CUP ASSEMBLY

Filed March 15, 1960

3 Sheets-Sheet 1

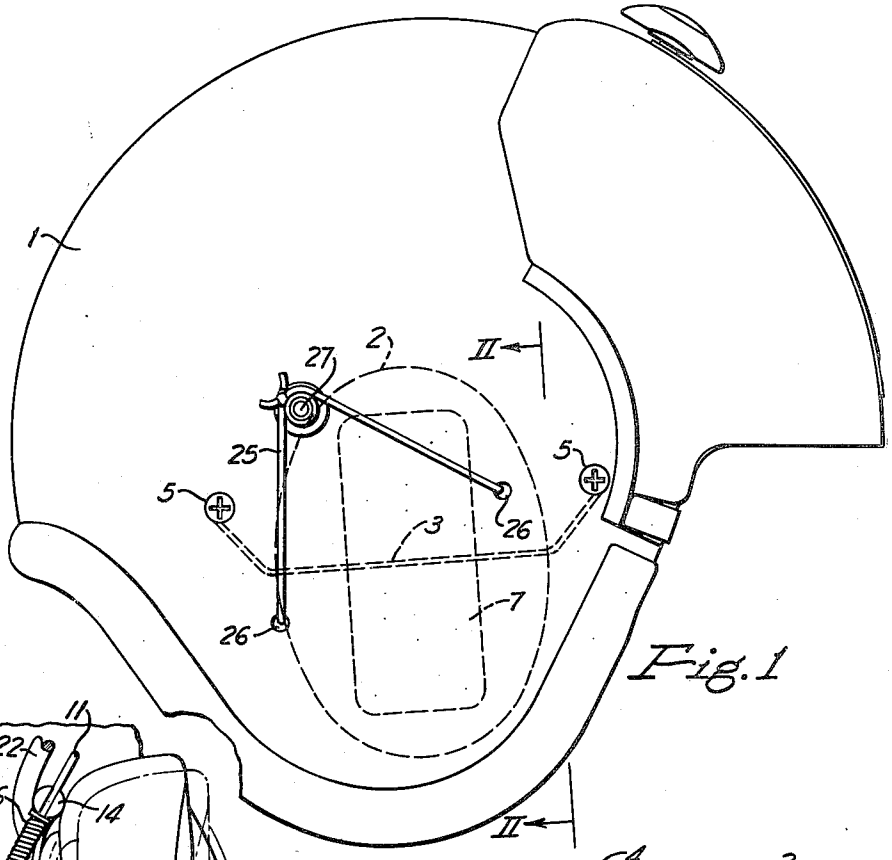


Fig. 1

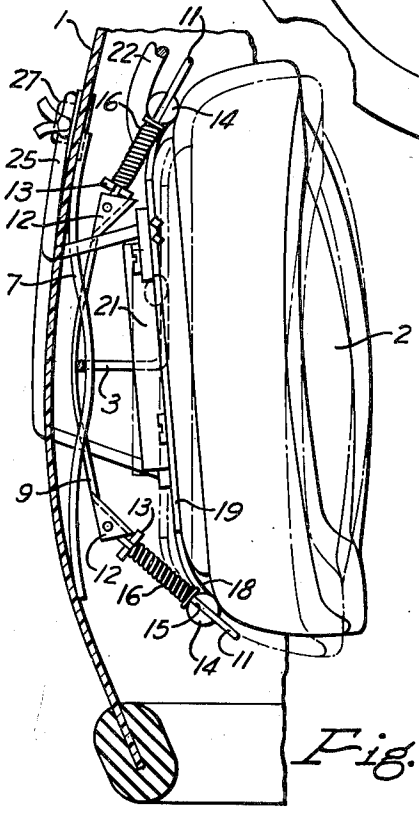


Fig. 2

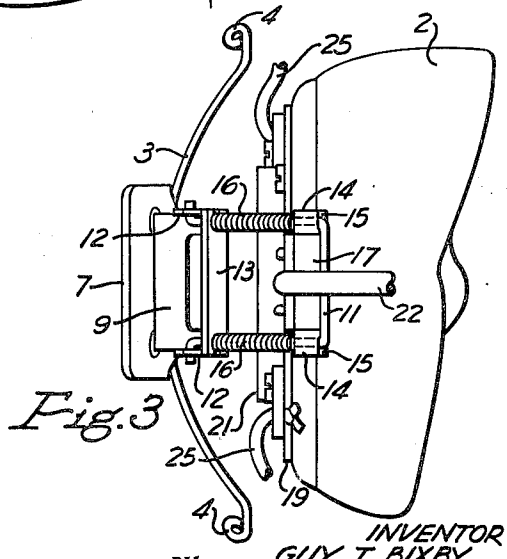


Fig. 3

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HELMET EAR CUP ASSEMBLY

Filed March 15, 1960 3 Sheets-Sheet 2

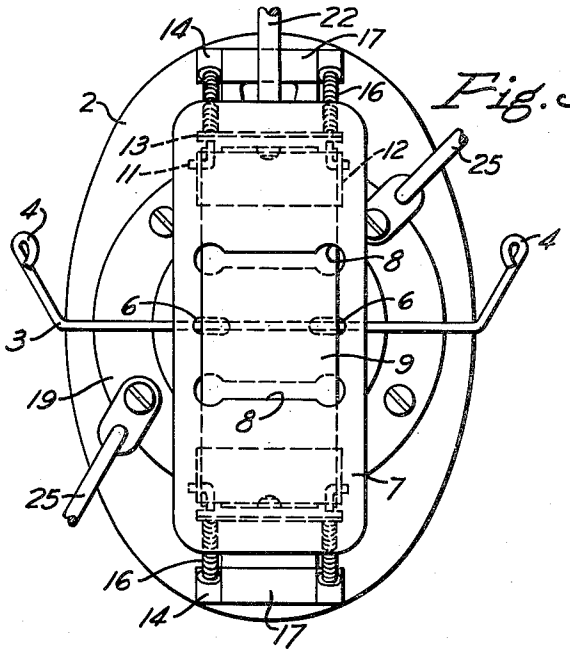


Fig. 5

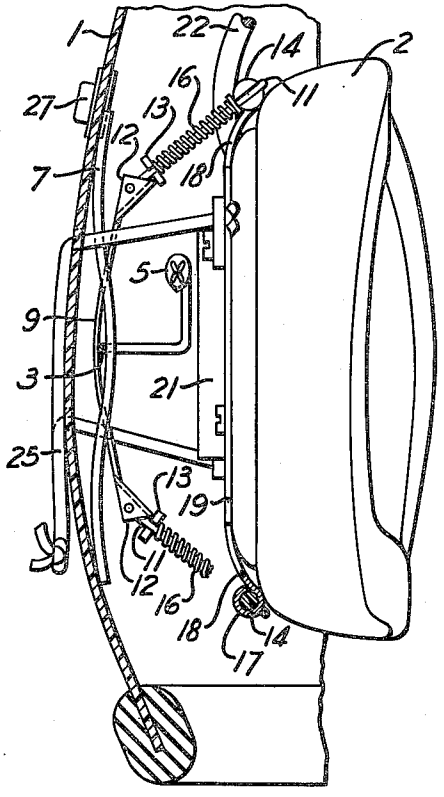


Fig. 4

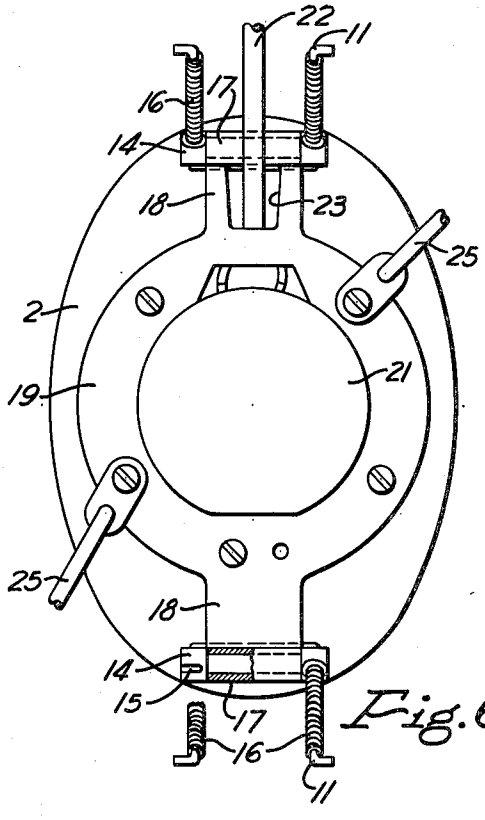


Fig. 6

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HELMET EAR CUP ASSEMBLY

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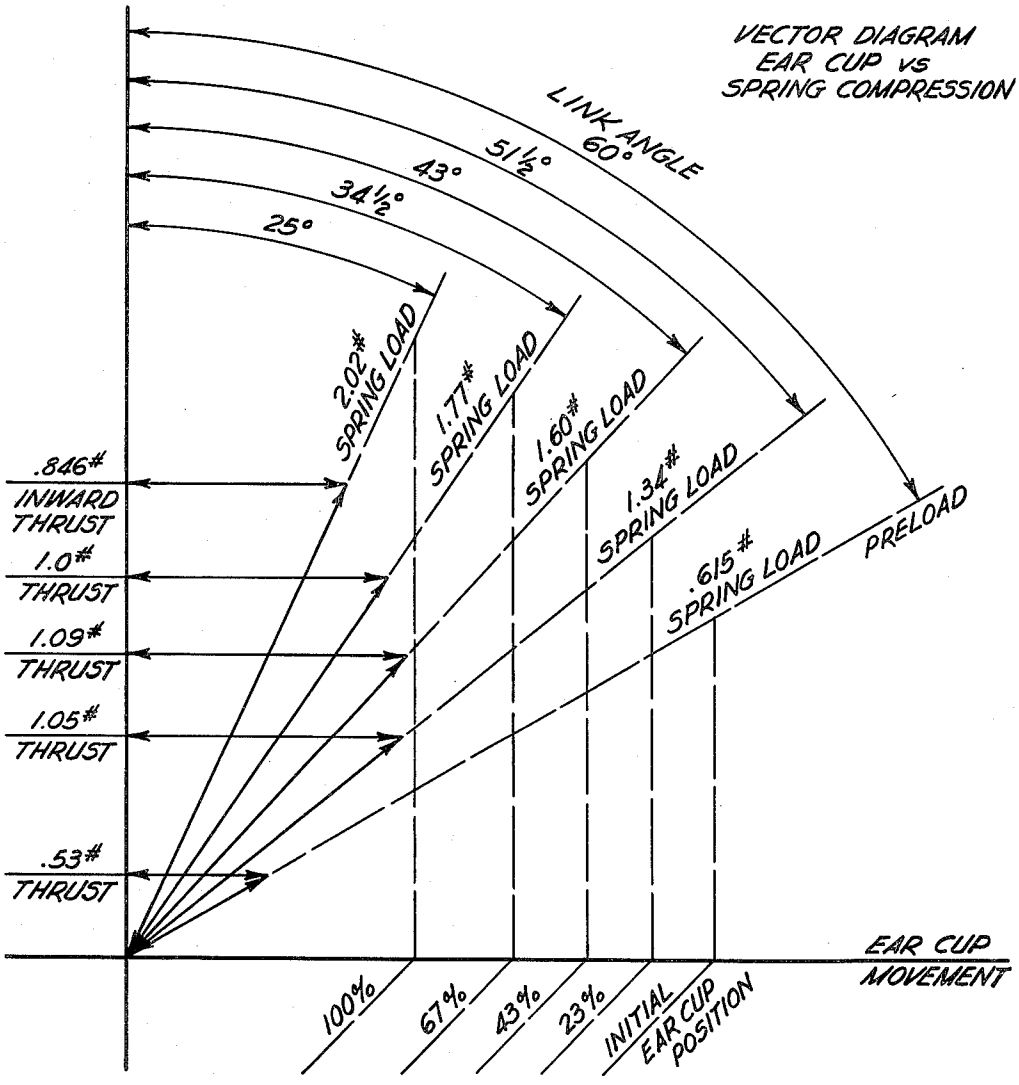


Fig. 7

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HELMET EAR CUP ASSEMBLY

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8 Claims. (Cl. 2—6)

This invention relates to aviators' helmets, and more particularly to cushioned cups therein that fit around the ears.

Aviators' helmets are equipped with ear phones which must be held close to the ears. To hold the phones in place and also reduce interference from outside noises, it is customary to mount the phones in cups that enclose the ears and are pressed against the head by resilient means, such as springs. The cups are made of a soft material so that they will fit comfortably against the head. However, since heads vary considerably in width, ear cups that are comfortable for a narrow head may press too tightly against a wide head, because the more the springs that press against the cups are compressed, the greater the pressure they will exert.

It is among the objects of this invention to provide a helmet with ear cups which will engage heads of different widths with substantially the same pressure, which are adjustable up and down and forward and backward, and which can be held in spread apart relation when not in use.

In accordance with this invention, the inner side of a frame supports a cup-like cushion that is adapted to engage the head around an ear. Spaced from the outer side of the frame is a vertical supporting member, the top and bottom of which pivotally support links on parallel axes. The links diverge toward the frame and are pivotally connected to it on parallel axes. The links also are slidable lengthwise across the means that connect them to the frame, but springs extend along the links to urge the frame away from the supporting member. The latter can be adjustably attached to the inside of a helmet. When the cushion frame is pressed toward the supporting member, the links will be swung outward farther away from each other as the springs are compressed, so the pressure that the springs exert perpendicularly to the frame will remain about the same.

The preferred embodiment of this invention is illustrated in the accompanying drawings, in which

FIG. 1 is a side view of a helmet equipped with my ear cup assemblies;

FIG. 2 is a vertical section of the helmet taken on the line II—II of FIG. 1, showing a front view of the right-hand ear cup held in a tilted outer position;

FIG. 3 is a plan view of the right-hand ear cup assembly;

FIG. 4 is a view similar to FIG. 2, but with the ear cup released and disposed in its normal inner position;

FIG. 5 is a view of the outer side of the ear cup assembly;

FIG. 6 is a similar view, but with the supporting means removed and the outer ends of the links swung apart; and

FIG. 7 is a vector diagram showing the relation of ear cup loading to spring compression.

Referring to the drawings, an aviator's helmet 1 of any suitable construction has sides that completely cover the opposite sides of the head and extend down below the ears. Mounted inside of the helmet at each side is an ear cup 2 for receiving the adjacent ear. The support for each cup includes a stiff curved wire 3, the ends of which extend upward and are bent to provide loops 4, through which fasteners 5 extend that connect the wire to the helmet behind and in front of the ear. As shown in FIG. 5, the central portion of the wire extends through a pair of horizontally spaced holes 6 in the central portion of a resilient

rectangular plate 7 that is elongated vertically. The end portions of the plate engage the inner surface of the helmet. Above and below these holes the plate is provided with horizontal slots 8, through which extends a supporting member shown in the form of a fairly stiff metal strip 9. The central portion of the strip is at the outer side of the plate, so that the central portion of the wire is located between them. It will be seen that strip 9 can be adjusted up and down through the slots in the plate, and that both the strip and the plate can be adjusted forward and backward along the wire.

Pivotally connected to the upper and lower ends of the metal strip are the outer ends of links 11. Preferably, each link is formed from a wire bent into U-shape with its ends turned outward through holes formed in parallel ears 12 bent outward from the corners of the metal strip. Each link is locked in the ears by a spreader bar 13 that has notched ends receiving the opposite sides of the link close to the end of the strip. Extending across the opposite or inner end of each link is a cylindrical pivot 14, the opposite ends of which are provided with notches 15 slidably receiving the sides of the link. A coil spring 16 encircles each side of the link and is compressed between the pivot 14 and the bar 13.

The pivots 14 at the inner ends of the links are rotatably mounted in sleeves 17 integral with upper and lower extensions 18 of an annular frame 19, as shown in FIG. 6. The sleeves are farther apart than the pivoted outer ends of the links, so the links diverge from strip 9 toward the frame. Due to this construction, when the frame is pressed toward the strip the pivots 14 will slide outwardly on the links as the springs are compressed, and the pivots will therefore swing the links farther apart. Ear cup 2 is a soft cup-like cushion that is secured to the inner face of frame 19 for receiving an ear, and it is shaped to fit as snugly as possible against the head around the ear. The center of the cushion is provided with an opening, at the outer end of which there is a radio receiver or telephone receiver 21 encircled by the frame. The electric cord 22 for the receiver extends up through a hole 23 in the upper extension 18 of the frame and out around upper pivot 14.

Secured to substantially diametrically opposite points on frame 19 are the opposite ends of a flexible cord 25 that extends out through holes 26 in the side of the helmet to form a loop outside of it. By pulling on this cord and looping it over a projecting boss 27 on the outside of the helmet, the adjoining ear cup will be pulled toward the side of the helmet and held there as shown in FIG. 2. This allows the cup to be held away from the ear when desired, and it also spreads the two cups in a helmet farther apart so that the helmet can be applied more easily to a head that is considerably wider than the normal distance between the cups, which is only slightly less than the width of the narrowest head with which it is intended the helmet should be used.

By having the pivoted links 11 diverged from metal strip 9 toward the frame 19 of the cup, the angle between the frame and the links will be reduced as the frame is pressed outward toward the side of the helmet. Therefore, even though springs 16 are being compressed, the change in link angle will prevent them from exerting appreciably more pressure against the frame in a direction parallel to its axis. In this way the spring pressure normal to the frame and cushion can be maintained substantially uniform while the helmet is in use, regardless of the spacing between the two cushions. For best results, the normal divergence of the links should be about 60°, and the ear cup is designed so that the divergence can be increased to about 130°. The vector diagram shown in FIG. 7 illustrates how the thrust of a spring 16 against an ear cup remains near-

ly constant as the cup is pushed outward toward the adjacent side of the helmet.

In that diagram five different positions of the ear cup are indicated relative to the side of the helmet, indicated by the vertical line parallel to the side of the sheet. In the "initial ear cup position" the cup is not in engagement with a head. A spring **16** is preloaded, however, to about .615 pound on an upper link **11** making an angle of 60° with the vertical. While in that condition, the thrust exerted by the spring inwardly or perpendicularly against the ear cup is slightly greater than a half pound. By the time the cup has been pushed back 23% of the distance it can be moved, the spring load will have more than doubled and the horizontal thrust will be just double. However, that is in the neighborhood of the thrust that is desired for proper and comfortable engagement of the cup with the head. If the head width requires the cup to be moved even closer to the side of the helmet, the spring load will continue to increase materially but the spring thrust will increase an unappreciable amount and then start to decrease. If the cup is pushed out as far as it will go, the spring load will be about two pounds, but the spring thrust will be little less than one pound. Consequently, the pressure of the ear cup against the head remains nearly the same and within the comfort range whether the head pushes the cup back a short or a long distance.

In some cases the ear cup may be tilted as shown in FIG. 2, even when pressed against the head. That, however, will not change the pressure of the cup appreciably because, as pointed out above, the thrust exerted by the springs stays about the same regardless of the angles of the links while the helmet is in use.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. An ear cup assembly for the inside of a helmet, comprising a frame, a cup-like cushion supported by the inner side of the frame and adapted to engage the head around an ear, a vertical supporting member spaced from the outer side of the frame, a pair of vertically spaced links having inner and outer ends, the outer ends of the links being pivotally connected respectively to the top and bottom of said member on parallel axes, the links diverging from the supporting member toward the frame, means pivotally connecting the links to the frame on parallel axes, the links being slidable across said means transversely of said last-mentioned parallel axes, springs extending along the links urging the frame away from said supporting member, and means for attaching said supporting member to the inside of a helmet.

2. An ear cup according to claim 1, in which said links normally diverge at an angle of approximately 60°.

3. An ear cup assembly for the inside of a helmet, comprising a frame, a cup-like cushion supported by the inner side of the frame and adapted to engage the head around an ear, a vertical supporting member spaced from the outer side of the frame, a pair of vertically spaced rigid wire links having inner and outer ends, the outer ends of the links being pivotally connected respectively to the top and bottom of said member on parallel axes, the links diverging from the supporting member toward the frame, means pivotally connecting the links to the frame on parallel axes, the links being slidable across said means transversely of said last-mentioned parallel axes, coil springs encircling the links urging the frame away from said supporting member, and means for attaching said supporting member to the inside of a helmet.

4. An ear cup assembly for the inside of a helmet, comprising a frame, a cup-like cushion supported by the inner side of the frame and adapted to engage the head around an ear, a vertical supporting member spaced from the outer side of the frame, a pair of vertically spaced U-shaped links at top and bottom of said member diverging toward the frame, the sides of each link being pivotally connected at one end to said supporting member on a substantially horizontal axis, a pin pivotally connected to the frame at the opposite end of each link and having transverse slots through its ends retaining and slidingly receiving the sides of the adjoining link, coil springs encircling the sides of each link and compressed between the supporting member and the side of the adjoining pin to urge the frame away from said member, and means for attaching said supporting member to the inside of a helmet.

5. An ear cup assembly for the inside of a helmet, comprising a frame, a cup-like cushion supported by the inner side of the frame and adapted to engage the head around an ear, a vertical supporting member spaced from the outer side of the frame, a pair of vertically spaced links having inner and outer ends, the outer ends of the links being pivotally connected respectively to the top and bottom of said member on parallel axes, the links diverging from the supporting member toward the frame, means pivotally connecting the links to the frame on parallel axes, the links being slidable across said means transversely of said last-mentioned parallel axes, springs extending along the links urging the frame away from said supporting member, a wire extending across said supporting member and having ends adapted to be rigidly attached to the inside of a helmet, and means slidingly connecting the supporting member with said wire for vertical and horizontal adjustment relative to it.

6. An ear cup assembly for the inside of a helmet, comprising a frame, a cup-like cushion supported by the inner side of the frame and adapted to engage the head around an ear, a vertical supporting member spaced from the outer side of the frame, a pair of vertically spaced links having inner and outer ends, the outer ends of the links being pivotally connected respectively to the top and bottom of said member on parallel axes, the links diverging from the supporting member toward the frame, means pivotally connecting the links to the frame on parallel axes, the links being slidable across said means transversely of said last-mentioned parallel axes, springs extending along the links urging said supporting member away from the frame, a resilient plate provided with a pair of spaced horizontal slots in which said supporting member can slide up and down, the plate being provided between said slots with a pair of horizontally spaced holes, and a wire extending through said plate holes and into engagement with the supporting member between it and the plate, the opposite ends of the wire being formed for attachment to the inside of a helmet to support said plate therein with its upper and lower portions engaging the helmet.

7. An ear cup assembly for the inside of a helmet, comprising a frame, a cup-like cushion supported by the inner side of the frame and adapted to engage the head around an ear, a vertical supporting member spaced from the outer side of the frame, a pair of vertically spaced links having inner and outer ends, the outer ends of the links being pivotally connected respectively to the top and bottom of said member on parallel axes, the links diverging from the supporting member toward the frame at an angle of approximately 60°, means pivotally connecting the links to the frame on parallel axes, the links being slidable across said means transversely of said last-mentioned parallel axes, springs extending along the links urging the frame away from said supporting member, the frame being movable far enough toward said supporting member to cause said links to diverge at an angle of more than 120°.

8. Aviation headgear comprising a helmet adapted to cover the head and extend down past the ears, a sup-

porting member mounted in each side of the helmet, a frame spaced inwardly from each supporting member, a cup-like cushion supported by the inner side of the frame and adapted to engage the head around an ear, a pair of vertically spaced links having inner and outer ends, the outer ends of the links being pivotally connected respectively to the top and bottom of said member on parallel axes, the links diverging from the supporting member toward the frame, means pivotally connecting the links to the frame on parallel axes, the links being slidable across said means transversely of said last-mentioned parallel axes, springs extending along the links urging the frame away from said supporting member, the sides of the helmet being provided with holes, cords

attached to said frames and extending out through said holes, and means on the outside of the helmet for holding the cords with the frames pulled thereby toward said supporting members to increase the space between said cushions.

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