

- [54] **EAR-PROTECTING DEVICE** 3,505,684 4/1970 Huthinson et al.2/209
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 [51] Int. Cl.A41d 21/00
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[57] **ABSTRACT**

An ear-protecting device is provided which is mounted so as to be substantially self-adjusting and thus, conform substantially to the portion of the head of the wearer which is circumjacent the accommodated ear. The device includes a supporting arm and an ear-accommodating unit which is connected thereto and is adjustable about a plurality of angularly disposed axes.

[56] **References Cited**

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7 Claims, 7 Drawing Figures

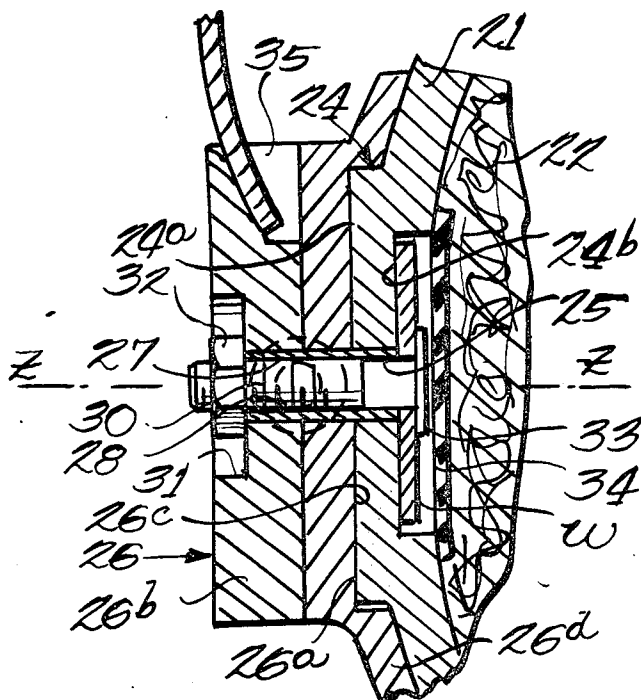


Fig. 1.

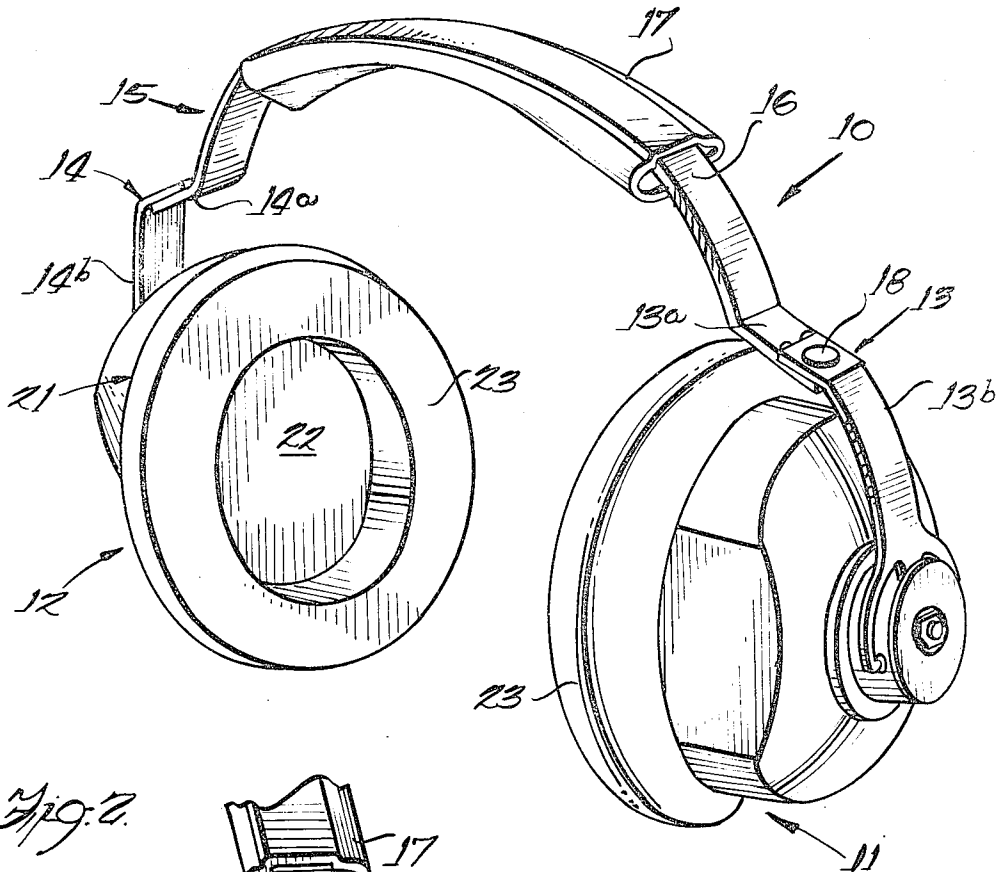
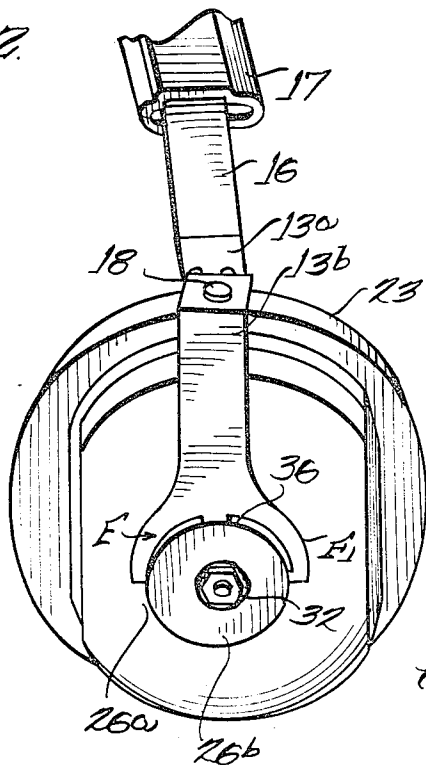
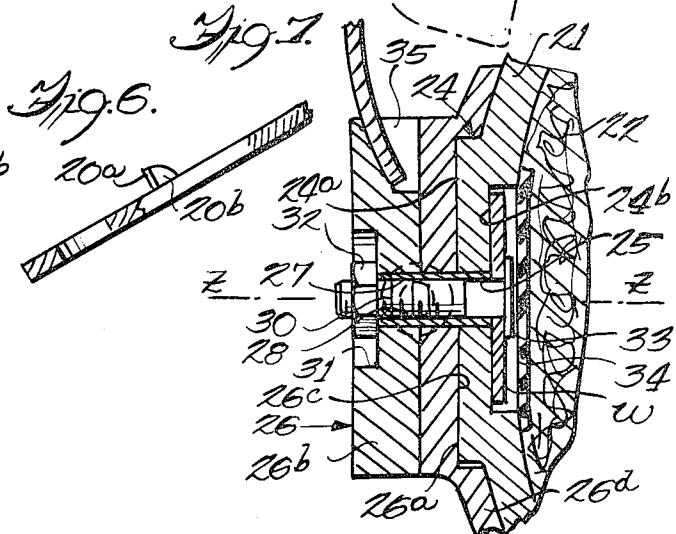
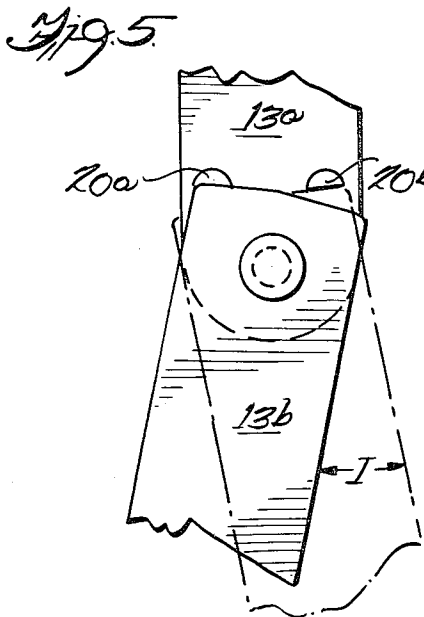
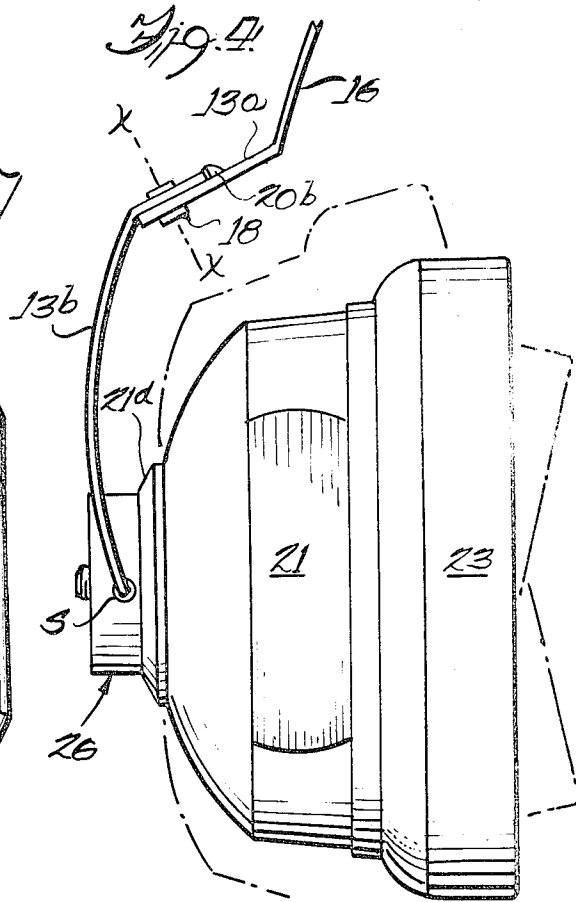
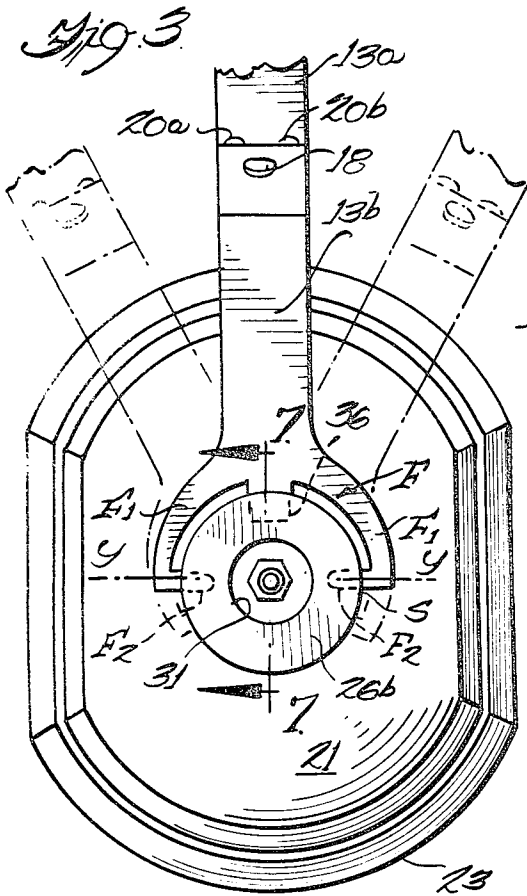


Fig. 2.



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EAR-PROTECTING DEVICE

BACKGROUND OF THE INVENTION

Various ear-protecting devices for use in protecting the ears of the wearer against excessive noises, extreme temperature variations and the like have heretofore been provided, but due to certain design characteristics are beset with one or more of the following shortcomings (a) the device is not self-adjusting and thus, is uncomfortable to wear and reduces the effectiveness of the protection afforded the ear, (b) the device is of complex and costly construction, and (c) the device is of bulky construction and is awkward to wear with a cap, helmet or the like.

SUMMARY OF THE INVENTION

Thus, it is an object of this invention to provide an ear-protecting device which is self-adjusting, is of simple, yet sturdy construction, and is comfortable to wear whether worn with or without a cap, helmet or the like.

It is a further object of this invention to provide an ear-protecting device which is easy to apply to or remove from the ear of the wearer and yet, when in an ear-accommodating position, will remain in place notwithstanding that the wearer engages in vigorous physical activity.

Further and additional objects will appear from the description, accompanying drawings, and appended claims.

In accordance with one embodiment of the invention, an ear-protecting device is provided which includes an elongated supporting arm having the outer end thereof terminating in proximity to the ear of the wearer and a substantially self-adjusting ear-accommodating unit connected to the outer end of the arm. The unit comprises an outer casing provided with first and second complementary connector means, which are mounted together so that one complementary connector means may rotate relative to the other about a first axis. The second complementary connector means is mounted on the outer end of the supporting arm for limited pivotal movement about a second axis which is angularly disposed with respect to the first axis. The supporting arm is formed of sections which are connected to one another for limited pivotal movement about a third axis which is angularly disposed to the first and second axes.

DESCRIPTION

For more complete understanding of the invention reference should be made to the drawings wherein:

FIG. 1 is a perspective view of one form of the improved ear-protecting device.

FIG. 2 is a fragmentary perspective top view of the device shown in FIG. 1.

FIG. 3 is an enlarged fragmentary end view of one of the ear-accommodating units shown in FIG. 1 with the supporting arm therefor shown in broken lines in various positions of rotational adjustments about the first axis.

FIG. 4 is a side elevational view of the unit of FIG. 3 and with the unit shown in broken lines in a position of pivotal adjustment about the second axis.

FIG. 5 is an enlarged fragmentary top view of the supporting arm sections, and with the sections shown in

broken lines in a position of pivotal adjustment about the third axis.

FIG. 6 is a fragmentary side elevational view partially in section of one of the supporting arm sections.

FIG. 7 is an enlarged fragmentary sectional view taken along line 7-7 of FIG. 3.

Referring now to the drawings and more particularly to FIG. 1, one form of the improved ear-protecting device 10 is shown which includes a pair of ear-accommodating devices 11 and 12 connected to elongated supporting arms 13 and 14 respectively; the latter forming a part of a head-engaging band 15. The central portion 16 of the band 15 is curved and adjustable longitudinally so as to fit the head of the wearer. The mechanism for effecting longitudinal adjustment is of conventional design and encased in a soft rubberlike sleeve 17. The central portion 16 and supporting arms 13 and 14 are preferably formed from a strap of spring metal or plastic.

Each supporting arm 13 or 14 comprises an inner section 13a or 14a and an outer section 13b or 14b. The inner section is preferably made integral with the end of the central portion 16 and extends laterally outwardly and slightly downwardly therefrom, see FIG. 4. The outer or distal end of the inner section is pivotally connected to the adjacent end of the outer section 13b or 14b by a pin or rivet 18. The axis of rivet 18 defines an axis X-X, see FIG. 4. The inner section 13a or 14a in each case is provided with a pair of laterally spaced protuberances 20a and b which are adapted to engage the end of the outer section and limit the relative pivotal movement thereof to a predetermined sector I, see FIG. 5.

The outer or distal end of each outer arm section 13b or 14b is shaped like a fork F with the tines or legs F₁ thereof spreading divergently and arcuately outwardly and having the outer ends F₂ thereof offset inwardly towards each other so as to define a second axis Y-Y, see FIG. 3. The offset ends F₂ are adapted to be disposed in suitable sockets S formed in each unit 11 and 12.

Each unit 11 and 12 is preferably of like construction and comprises an outer casing 21 of substantially cup-shaped configuration. The interior of the casing 21 may be provided with a suitable liner 22 of sound absorbing and/or insulating material. The open side of the casing is preferably delimited by a soft, spongelike ring 23 which is adapted to engage the side of the head of the wearer circumjacent the wearer's ear which is accommodated by the unit. The ring 23 is carried by the casing. The opening of the ring 23 is sized so as to permit the ear to readily pass therethrough when the unit 11 or 12 is applied to or removed from the ear. The liner 22 and the interior of the casing 21 are shaped so as to form a suitable pocket in which the wearer's ear is disposed when the unit is in place.

The outer casing 21 is preferably of molded plastic (e.g. ABS polymer) which is hard, shock-resistant, and is possessed of a high sound resistance characteristic. At approximately the center of the exterior of casing 21 is formed an annular protuberance 24, see FIG. 7, which functions as a first complementary connector means. The outer face 24a of the protuberance is flat and is provided with an opening 25, the inner end of which terminates at a recessed annular flat surface 24b,

see FIG. 7. The surface 24b is adapted to accommodate a washer W, see FIG. 7, the function of which will be described more fully hereinafter.

Overlying and accommodating the protuberance 24 is a socket piece 26. The piece 26, as shown in FIG. 7, is provided with an inner section 26a and an outer section 26b. Section 26a is provided with a recessed pocket 26c which is adapted to receive the exterior of protuberance 24. The fit between pocket 26c and the exterior of protuberance 24 is such that the protuberance is free to rotate relative to piece 26 about an axis Z—Z. Section 26a is provided with a skirt 26d which slidably overlies the exterior of the casing surrounding the protuberance 24.

The socket piece sections are provided with an opening 27 which is disposed in registered relation with the opening 25 formed in protuberance 24. Openings 25 and 27 are adapted to receive a bushing 28 and a screw pin 30. The exposed central surface of section 26b is provided with a recess 31 which is adapted to accommodate a lock nut 32 threaded onto the outer end of screw pin 30. The head 33 of the screw pin 30 is adapted to engage washer W.

A rubber or felt disc 34 may be positioned over the recessed surface 24b between the liner 22 and the interior of the casing 21.

The portion of the exterior of socket piece 26 adjacent the juncture of the fork tines F₁ is provided with a slot 35 into which extends a tongue or lug 36 carried by the arm outer section 13b or 14b. The tongue 36 projects downwardly from the juncture of the fork tines F₁, see FIG. 3. The tongue 36 cooperates with slot 35 to limit the pivotal movement of the unit 11 or 12 about the axis Y—Y, see FIGS. 3 and 4.

The sockets S, aforementioned, are formed in the exterior of socket piece 26, see FIGS. 1, 3, and 4 and are adapted to receive the offset ends F₂ of the fork tines F₁. In lieu of the sockets S and offset ends F₂, the exterior of piece 26 may be provided with laterally extending nubs or posts, not shown, which would be embraced by loops formed at the ends of the fork tines.

The socket piece 26, while shown as formed of two sections, may be of unitary construction, if desired. Furthermore, the shape and size of the outer casing 21 may be varied from that shown. The supporting arm 13 and 14 may also be attached to a helmet, not shown, or other head-protecting member without departing from the scope of the invention.

Thus, with the improved device, the wearer is not required to pre-set each ear-accommodating device with respect to the supporting arm before applying the device. In prior structures of this general type, pre-setting of the ear-accommodating device to either top or bottom, left or right, front or back, or in or out positions was required and thus, was undesirable and awkward. The improved device is self-adjusting and thus, more comfortable to wear and provides better protection.

I claim:

1. An ear-protecting device comprising an elongated supporting arm having one end thereof adapted to be

disposed in proximity to an ear of the wearer of said device, and a substantially self-adjusting ear-accommodating unit; said unit including an outer casing having an open side through which the ear of the wearer passes when said device is worn and a first complementary connector means disposed on the exterior of said casing opposite said open side, a second complementary connector means engaging said first connector means and mounted for rotation only with respect thereto about a fixed first axis disposed substantially perpendicular to the open side of said casing, said second complementary connector means being mounted on said supporting arm for limited pivotal movement about a fixed second axis; said first and second axes being transversely disposed relative to one another.

2. The ear-protecting device of claim 1 wherein said elongated supporting arm comprises an inner section and an outer section; said sections being interconnected for relative pivotal movement about a third axis; said outer section being connected to said second complementary connector means; said third axis being angularly disposed relative to said first and second axes and in non-intersecting relation with respect to at least said second axis.

3. The ear-protecting device of claim 2 wherein the outer section of said supporting arm terminates in a fork having tines with the ends thereof pivotally connected to the second complementary connector means of said ear-accommodating unit, said pivotal connection defining said second axis.

4. The ear-protecting device of claim 3 wherein the outer section of said supporting arm is provided with stop means engageable with said second complementary connector means for limiting pivotal movement thereof about said second axis to a predetermined sector; said stop means comprising a lug projecting from the juncture of the tines of said fork and movable within a slot formed in said second complementary connector means.

5. The ear-protecting device of claim 1 wherein said supporting arm carries stop means cooperating with said unit for restricting pivotal movement of the latter about said second axis to a predetermined sector.

6. The ear-protecting device of claim 1 wherein an elongated supporting arm is provided at each end of a head-engaging band and a substantially self-adjusting ear-accommodating unit of like construction is connected to each supporting arm.

7. The ear-protecting device of claim 1 wherein said first complementary connector means includes a protuberance formed on the exterior of said casing opposite the open side of said casing, said protuberance having an annular periphery and an axially disposed opening formed therein; said second complementary connector means includes a socketlike element encompassing said protuberance, said socketlike element being provided with an opening coincident to said protuberance opening, and fastener means disposed within said coincident openings for retaining said complementary connector means in assembled relation; said fastener means defining said first axis.

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