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3,579,640

HEARING PROTECTOR HEADSETS

Filed Feb. 11, 1970

2 Sheets-Sheet 1

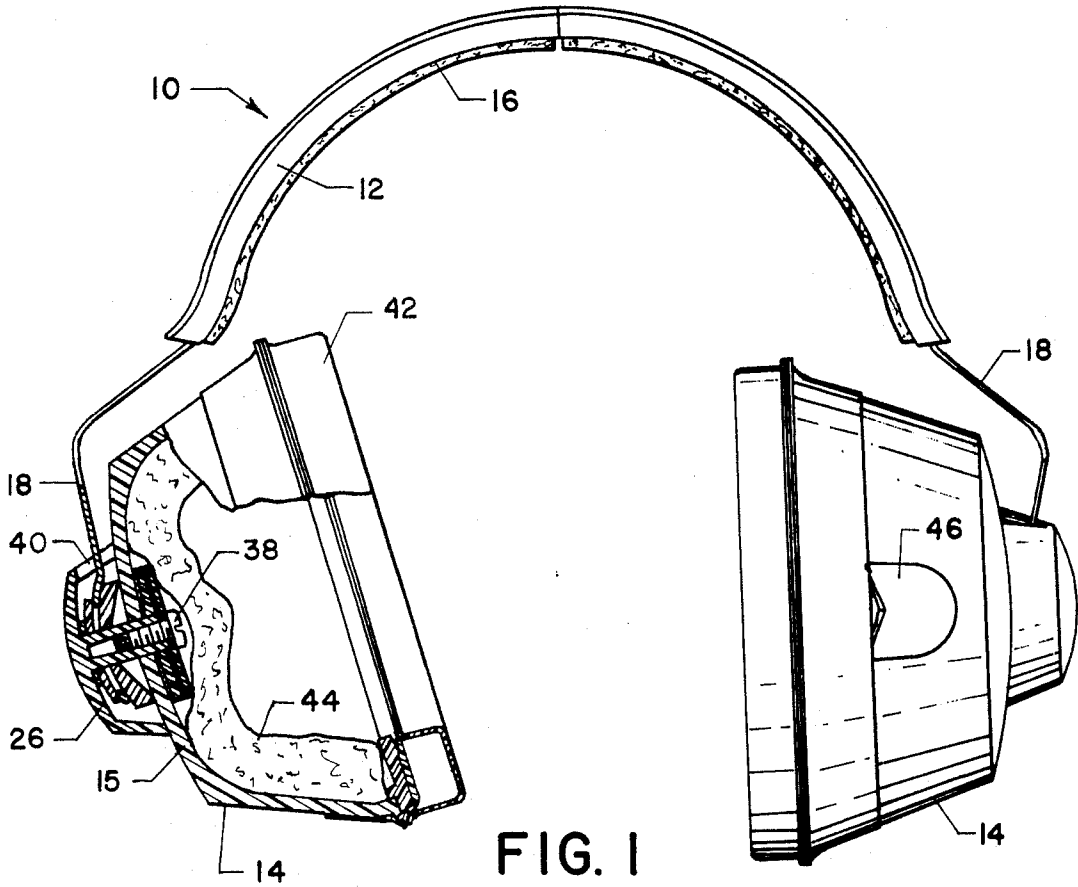


FIG. 1

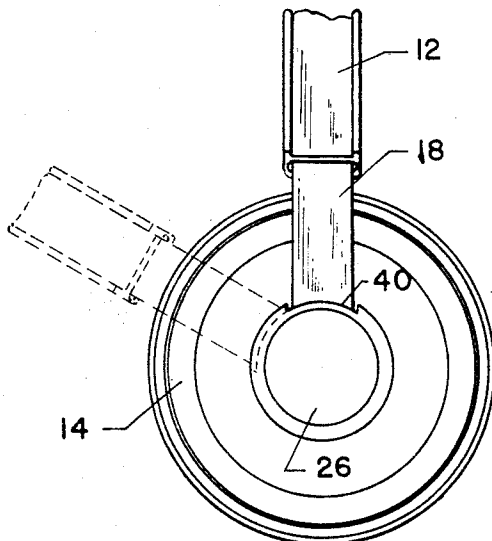


FIG. 2

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2 Sheets-Sheet 2

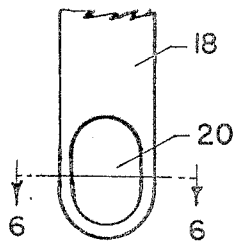


FIG. 4

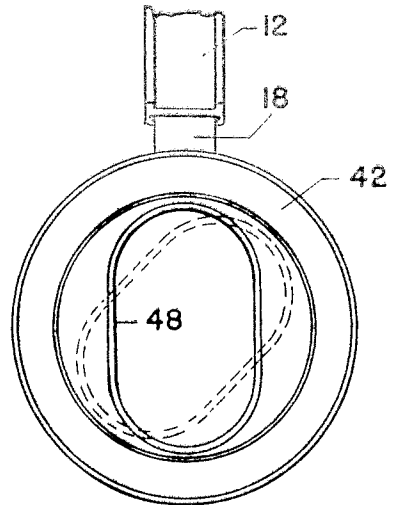


FIG. 3

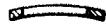


FIG. 6

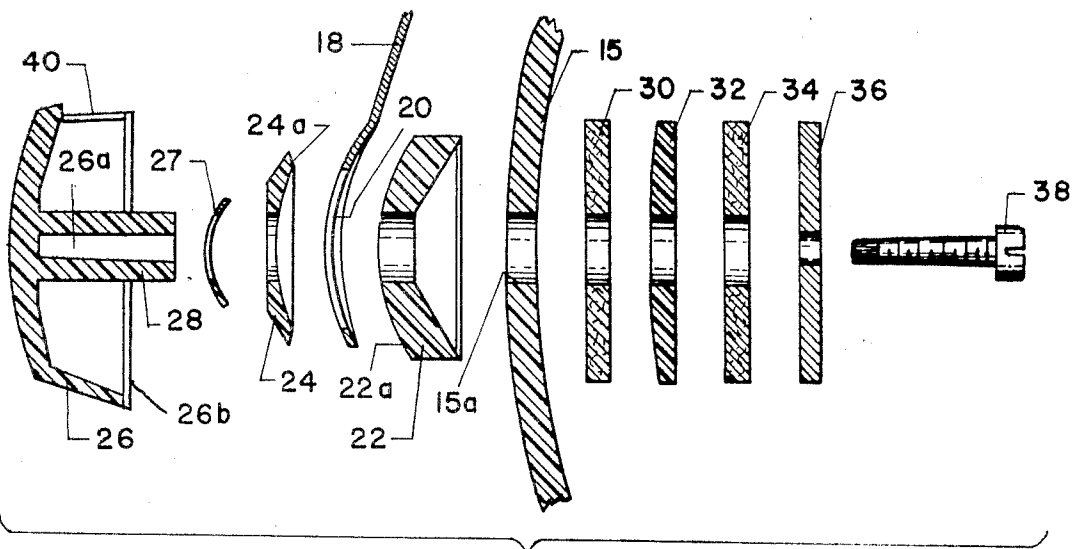


FIG. 5

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HEARING PROTECTOR HEADSETS

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4 Claims

ABSTRACT OF THE DISCLOSURE

Hearing protector headsets comprising an adjustable headband, sound-attenuating earcups, and attachment and supporting means for rotatably supporting and universally slidably tilting each earcup for adjustment of headband and earcups as needed while being worn. The adjustment and supporting means for each earcup includes at each end portion of the headband a spherically-shaped aperture formation through which parts of the attachment and supporting means extend and against the sides of which spherically-shaped end clamping members of selected kind and shape frictionally engage.

BACKGROUND OF THE INVENTION

Field of invention

Hearing protector headsets designed with particular attention to the headband and earcup attachment and supporting means for good sound-attenuation while providing universal tilting action for the earcups as well as pivotal adjustment thereof and pivotal adjustment of said headband relative to the earcups.

Description of prior art

Headsets comprising pairs of hearing protector earcups supported by headbands are currently being used which have elongated ovaly-shaped openings formed in the cushions of the earcups within which openings the ear auricle is to be positioned when the earcup is in "sealing" engagement with the head of the wearer. The normal use of such equipment requires that the earcups and cushions thereon be readily rotatable and the earcups universally tiltable so as to be easily oriented relative to the wearer's ears and tiltable for comfortably accommodating different heads and different facial configurations and, at the same time, allow the headband to be pivoted into any one of several different operative positions. Of course, also good sound-attenuation should be provided.

Heretofore, in one form of construction, hearing protector earcups have been supported by pivoted yokes at the end portions of the headband for adjustment about vertical axes and have been provided with pairs of pivotal connections at diametrically opposite sides of the earcups for permitting vertical tilting action of the earcups. However, such an arrangement prevented rotational adjustment of the earcups and even precluded rotational adjustment of the cushions of the earcups without removal of the headset from the wearer's head. Also, pivoting of the headset into any one of the several different operative positions just mentioned was not possible. Consequently, in order to achieve such adjustments of the earcup cushions, it was required that off-the-head adjustments be made. In fact, these earlier constructions usually required that the headset be removed and adjusted several times before an acceptable fit could be achieved. Even then, such an adjustment might not be the best adjustment possible.

In another form of prior art construction in order to allow the hearing protector earcups to be rotated, the headband differently located and the earcups universally tilted relative to the headband, each earcup was provided

with a relatively large aperture or opening in a central part of the outwardly curved outer wall portion thereof through which a supporting structure extended, the large opening allowing the supporting structure to be moved laterally limited distances in any direction for accomplishing the tilting action of the earcup. Rotation of the earcup was accomplished by pivoting on this supporting structure. However, in order to effect as good a closing of this aperture or opening in the outer wall of the earcup as possible for sound-attenuation, a thin large meniscus-shaped plate-like filler member apertured to fit the supporting structure was used in overlying relation with the opening. Even though this large opening for allowing sliding movement of the supporting structure for the tilting of the earcup was covered at all times by this plate-like member, such did not always provide as good sound-attenuation as might be desired. This was particularly true when low-frequency vibrations were involved.

The invention

The present invention, on the other hand, overcomes such objectionable conditions and drawbacks as mentioned above relative to prior art constructions by providing a headset which gives excellent sound-attenuation for all or selected frequencies as desired and, at the same time, allows rotational movement of each earcup, allows universal sliding tiltable adjustment of each earcup in any desired direction from its normally centered position, and allows the headband to be pivoted as desired; all being easily accomplished while the headset is being worn. Thus, not only can each earcup be easily rotated relative to the headband for allowing the earcup cushion opening to be correctly oriented but also the headband may be moved so as to assume any desired operative position relative to the wearer's face also while being worn. Additionally, each earcup may be tilted or angled in any direction into a comfortable fitting position in sealing engagement with the wear's face also while being worn; all such adjustments being permitted without the wearer, in any way, being required to loosen or tighten any movable parts.

SUMMARY OF THE INVENTION

The present invention provides in a headset construction the improvements mentioned above by employing a resilient headband which has its opposite end portions spherically shaped and concavely curved with reference to the earcups disposed adjacent thereto and each end portion is provided with a relatively large aperture or opening through which earcup mounting and attachment means pass. This means includes a shaft-like part which passes through a relatively small central opening in the earcup outer wall and through inner and outer friction washers which are spherically curved on the sides thereof facing the spherically-curved end portion of the headband so as to fit the inner and outer curved sides of this end portion while bridging the relatively large central opening in the end portion. All of these parts are held together by an adjustable stud in threaded clamping engagement with the shaft-like part which is integrally formed as a portion of an outer dome-shaped retaining member. A resilient pressure upon the opposed inner and outer friction washers in such a manner as to effect a firm gripping action upon the headband end portion will be more fully described hereinafter. However, it is of interest to note that the dome-shaped retaining member has its extended shaft-like part provided with a central bore arranged to receive and frictionally retain a self-threading end of the adjustment stud whereby the amount of friction provided by this arrangement may be varied. Also, the outer diameter of the shaft-like part is of such controlled size as to just pass through the central open-

ing in the inner and outer friction washers and just pass through the opening in the earcup. It is, on the other hand, considerably smaller in diameter than the size of the larger opening in the end portion of the headband so that the desired lateral adjustments for tilting action of the earcup may be accomplished. Other associated parts of the structure will be described later.

Thus, no passageway or area of shallow wall thickness is provided in the earcup connecting and supporting arrangement with the headband in the improved construction and, furthermore, if desired, the outer wall portion of the earcup may be made of any thickness required; such being an important consideration particularly when it is found that an extra heavy wall construction may be desired in order to add weight and thereby afford greater sound-attenuation for low-frequency vibrations.

The present invention will be more fully understood by reference to the detailed description which follows when taken in conjunction with the accompanying drawing.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevation view of a hearing protector headset comprising the invention, a part of the structure being broken away in order to better show details of construction;

FIG. 2 is a partial side elevational view of the structure of FIG. 1;

FIG. 3 is a side elevational view for showing an earcup embodying the invention as viewed from the wearer's head-engaging side thereof;

FIG. 4 is a side elevational view showing an end portion of a headband which has been shaped and apertured in accordance with the present invention;

FIG. 5 is a sectional view showing parts of the headband and earcup connecting and supporting structure of FIGS. 1-4, showing parts in an exploded arrangement in order to better present details of construction; and

FIG. 6 is a cross-sectional view taken upon section line 6-6 of FIG. 4 and looking in the direction of the arrows.

Referring to FIG. 1 of the drawings, it will be seen that a headset 10 comprises a flexible, yieldable headband 12 and a pair of similar earcups 14 supported thereby and adapted and arranged for sound-attenuation purposes. The headband would preferably be formed of spring steel or other rigid yieldable material capable of exerting a desired inward pressure on the earcups when being worn and of a type which is extensible intermediate its opposite end portion in known manner, the details of which are not here shown, but which would include two overlapping strap-like parts which are slidably extensible relative to each other and contained within a soft plastic tubing 16 or the like.

The opposite end portions 18 of the headband are each arranged to rotatably and universally angularly support an earcup so that the headset may be adjusted to the size required in accordance with the manner in which it is being used and also adjusted to angle the earcups into a comfortable fit in engagement with the wearer's head and in surrounding relation to his ear. Also, the earcups can be tilted as required for fitting against the wearer's face.

As better shown in FIG. 4, each end portion 18 of the headband is provided with a large oval opening 20 therein. Additionally, as suggested in FIG. 5, the end portion 18 is shaped by being pressed or otherwise treated to form a "spoon-shaped" configuration of spherical curvature. Additionally, in FIG. 5, a pair of friction washers 22 and 24 are shown which have spherically-shaped facing surfaces 22a and 24a for engaging the headband end portion 18 at its similarly spherically-curved areas. A dome-shaped member 26 is provided with a central shaft-like part 28 of such diameter and length as to extend a spring washer 27, through the pair of spherically-shaped friction

washers, as well as through the larger opening 20 in the end portion 18 of the headband. It also extends through an opening 15a in the earcup outer wall portion 15. This shaft portion of the dome member 26 is of such diameter as to closely fit within the central openings in the washers 22 and 24 as well as closely fit within the central opening 15a in the wall portion 15 of the earcup. Its inner end also extends through a yieldable felt washer 30 and a yieldable plastic washer 32 (of Delrin or nylon) having a spherical curvature on its side toward the curved earcup wall 15. Inwardly thereof is disposed a second felt washer 34 and a rigid clamping washer 36 of steel or the like.

Accordingly, the self-threading stud 38 for clamping the assembled parts together is arranged to extend into the bore 26a and form a thread in the shaft-like part of the dome-shaped member 26.

Thus, when the parts of the connecting and attachment means for securing the earcup to the end portion of the headband are in position, as shown in FIG. 1, the stud 38 pressing washer 36 may be used to draw the shaft-like part 28 toward the stud which will cause spring washer 27 to create a clamping action of the spherically-shaped washers 22 and 24 upon opposite sides of the spherically-shaped end portion 18 of the headband. At the same time, the earcup wall 15 will be pressed by this clamping action while still being rotatable upon the shaft portion 28. Also, the entire assembly may be shifted laterally by a sliding action in any direction relative to the shaped terminal portion 18 of the headband. The complementary spherically-shaped surfaces on the end portion 18 and on the facing sides 22a and 24a of the clamping washers 22 and 24 cause the shaft portion 28 with the earcup wall 15 carried thereby and the stud 38 inserted therein to tilt as they are shifted laterally. In order to accommodate this universal tilting movement of the earcup relative to its supporting end portion 18, the dome-shaped member 26 is recessed or cut-away at 40 to loosely receive the terminal portion 18 extending therethrough. This is possible since the dome-shaped member 26 does not rotate; on the contrary, rotation of stud 38 is used to vary the frictional resistance of the structure as to rotation of the earcup or lateral shifting thereof.

The parts shown in FIG. 1 would be assembled by first removing the head-engaging cushion 42 on the earcup and then the sound-attenuating foam liner material 44. This will expose the inner end of stud 38. When the parts are assembled as shown in FIG. 1, adjustment of the stud 38, as desired, is a very easy operation.

In the assembled position, as shown in FIG. 1, the earcup will have no large wall openings therein through which sound, even at low frequencies, may penetrate. On the other hand, the small opening 15a provided therein for the shaft-like part and stud is just large enough to accommodate same and, additionally, the shaft-like part is closely surrounded and "enclosed" by felt washer 30 as well as plastic washer 32, felt washer 34 and steel washer 36 all being urged together by resilient spring washer 27.

The result is that an assembly for a headset construction for efficient sound-attenuation purposes is effected wherein not only may universal tilting adjustment of the earcups be made smoothly and easily at all times while the headset is in position upon the wearer's head but also the earcups may be readily pivoted around as desired merely by feeling for the opposed flat projections 46 provided on each earcup to assist in the aligning of the earcup cushion opening 48.

Additionally, the headband may be pivoted as required without disturbing the earcups.

If desired, communication transducer equipment may be housed within the earcups of the present invention without, in any way, impairing or producing a change in the principles of operation of the herein-described headsets.

It should be noted that the proportions of the parts of the supporting and connecting means between the head-

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band and the earcup can be made such that skirt portions 26b of the dome-shaped member 26 may be drawn by adjustment of stud 38 into firm engagement with outside wall portions of the earcup wall 15 in such a manner that rotational friction between the earcup and the headband may be varied appreciable amounts even after a desired looser frictional engagement between the headband and the opposed clamping washers 22 and 24 has been obtained. Thus, it will be appreciated that the friction between parts may be such that the headband will be firmly held in any adjusted position but may, nevertheless, be forcefully rotated into a different operative position and at such times, furthermore, the frictional engagement between the headband and the washers 22 and 24 will allow swivelling, tilting action of the earcups for comfortable fit upon the head. This double control of friction in the parts, it will be appreciated, is accomplished by the fact that after a small amount of pressure is exerted by the washers 22 and 24 upon the end portion 18 by the spring pressure of washer 27, the skirt portions of the dome-shaped member 26 will come into firm engagement with the outer wall of the earcup.

Having described our invention, we claim:

1. A hearing protector headset comprising a flexible headband, a pair of sound-attenuating earcups carried by opposite end portions of said headband, said headband being of such C-shaped formation and such resilient characteristics as to tend to urge said earcups into close fitting engagement with opposite sides of a person's head during normal use thereof, each earcup having a solid outer wall except for a central opening extending therethrough, each earcup also having an endless side wall peripherally integrally connected to said outer wall so as to provide therewith an enclosed sound-attenuating air space when said earcup is being used, means for securing each earcup upon an end portion of said headband, said securing means including a clamping member having a shaft-like part extending through said earcup opening in close fitting relation thereto, each end portion of said headband being concavely spherically curved with respect to the earcup adjacent thereto and having a relatively large aperture formed centrally therein, a pair of friction washers disposed at opposite sides of said spherically-shaped end portion and each washer having a spherically-curved side facing and closely fitting said spherically shaped end portion, said shaft-like part extending through said friction washers in closely fitting relation thereto, an earcup retaining stud threaded into said shaft-like part in such a manner as to frictionally restrain said earcup against rotation relative to said shaft-like part and also cause said

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spherically-shaped friction washers to exert a clamping pressure upon the opposing sides of said spherically-shaped end portion engaged thereby, the clamping pressure exerted by said friction washers normally tending to prevent relative sliding movement between said spherically-shaped clamping washers and the spherically-curved end portion engaged thereby.

2. The combination defined in claim 1 and wherein said friction washers are formed of a plastic material having a relatively low coefficient of friction and high resistance to mechanical wear.

3. The combination defined in claim 1 wherein said securing means between each cup and its supporting end portion of said headband includes a cylindrical part closely fitting within the aperture extending through the outer side wall portion of said earcup for allowing smooth rotational movement therebetween and wherein said stud may be adjusted relative to said shaft-like portion for control of frictional resistance provided by said securing means.

4. The combination defined in claim 1 and wherein the length of said shaft-like portion is so controlled as to allow said stud in frictional engagement therewith to be adjusted sufficiently to place a clamping action upon said spherically-shaped washers engaging opposite sides of said spherically-shaped end portion and upon said earcup wall which is such as to preclude undesired relative movement between the headband and each earcup during normal use of said headset, said shaft-like portion and said stud nevertheless providing upon the clamped parts such a frictional resistance as to allow movement of the headband from one operative position to another when an external force is applied to said headband, same being possible without displacement of the earcups from their normal operative positions.

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