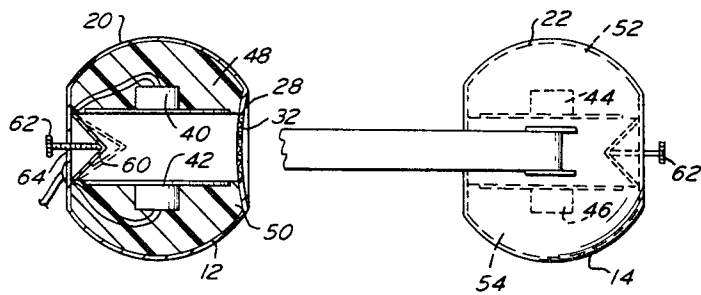


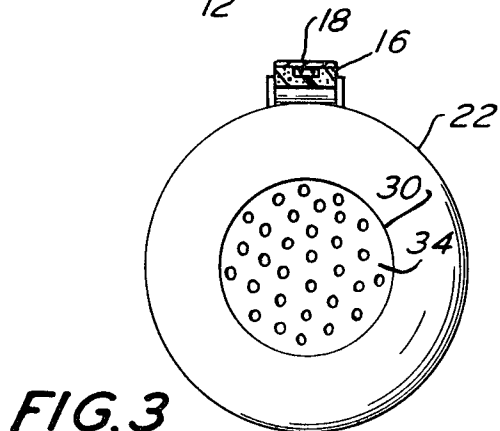
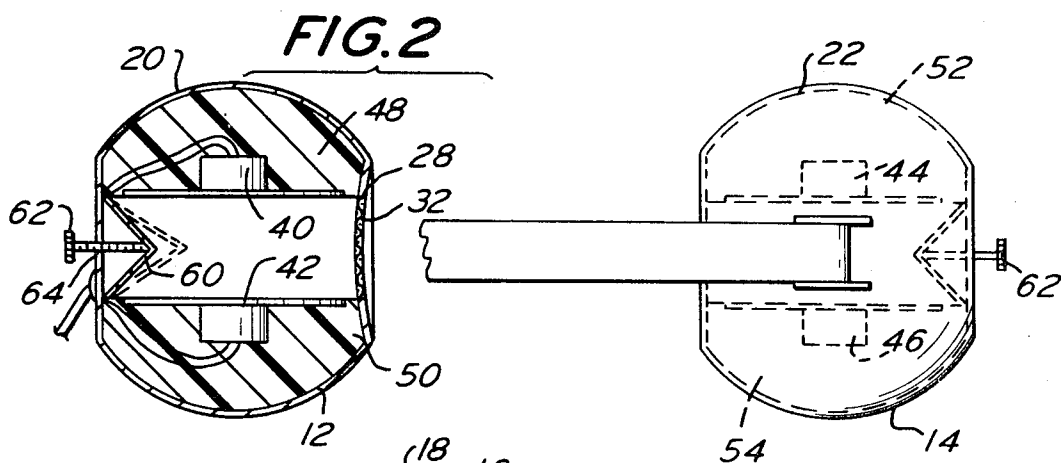
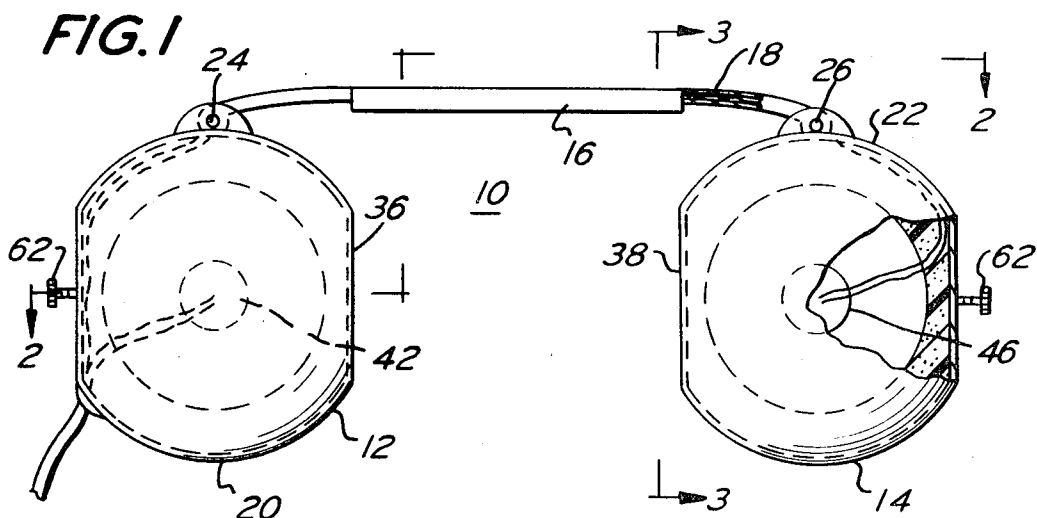
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[54] **STEREOPHONIC HEADPHONES**
 7 Claims, 4 Drawing Figs.
[52] U.S. Cl. 179/1 G,
 179/182 R
[51] Int. Cl. H04r 1/10
[50] Field of Search 179/1 G, 1
 GA, 1 E, 182 R, 156; 181/23

ABSTRACT: Stereophonic headphones mount pairs of audio transducers (speakers) on an opposing front to back axis relative to the head of a listener to create a greater panorama of sound.





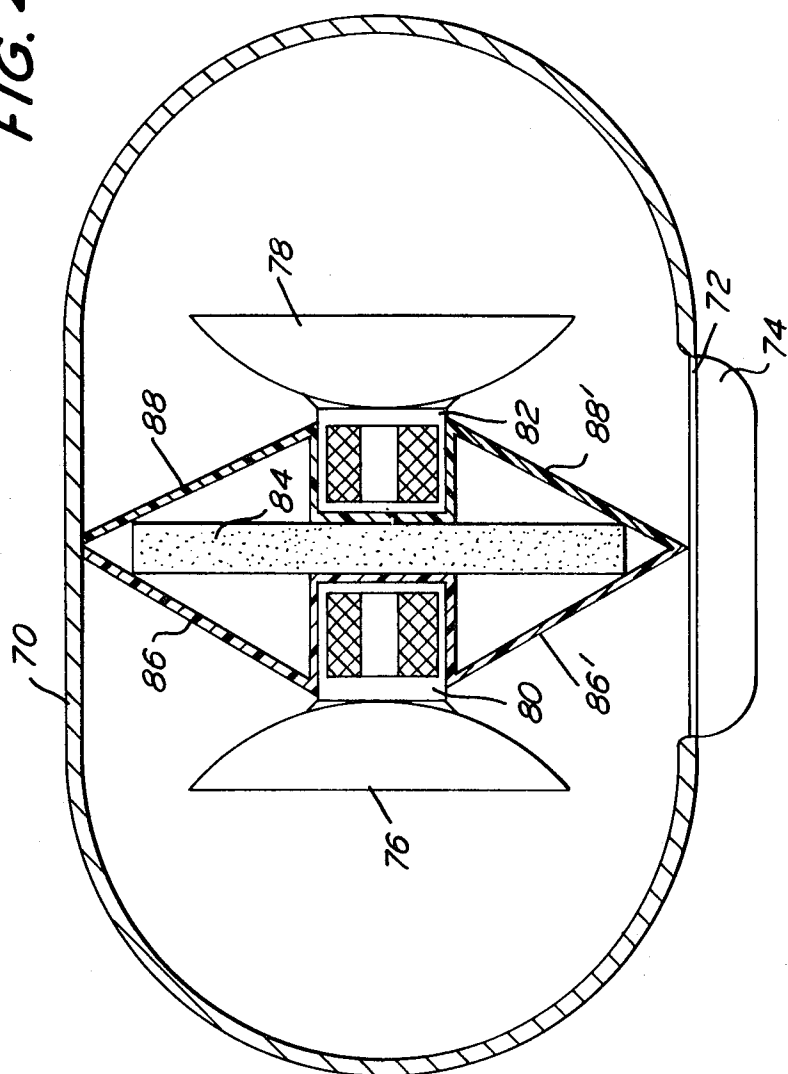
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FIG. 4



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STEREOPHONIC HEADPHONES

This invention relates to stereophonic headphones. More particularly, this invention relates to stereophonic headphones with audio transducers mounted so as to create the effect of a greater panorama of sound.

Stereophonic headphones have been in use for a number of years. Moreover, they have been developed to a high degree of sophistication and are capable of rather faithfully transducing electronic signals into sound. However, all stereophonic headphones suffer from one rather annoying characteristic. That is, the listener perceives the sound as emanating from the center of his head. Thus, while stereophonic headphones do produce differential left-right characteristics, they do not produce a true panorama of sound. It is the purpose of the present invention to provide stereophonic headphones capable of producing the effect of a true panorama of sound.

In accordance with the present invention each of the headphones is provided with at least one pair of audio transducers. These transducers are mounted on an opposing front to back axis within the headphones. The axis itself extends in a front to back relationship with respect to the listener's head. The sound emitting opening adjacent the listener's ear is positioned laterally of this axis. It has been found that this particular positioning of a pair of audio transducers within each headphone produces the effect of a true panorama of sound for the listener to perceive.

It therefore is an object of the present invention to provide a new and improved stereophonic headphone wherein the listener perceives the effect of panoramic sound.

Other objects will appear hereinafter.

For the purpose of illustrating the invention, there are shown in the drawings forms which are presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. 1 is a front view of the headphones constructed in accordance with the present invention.

FIG. 2 is a partial transverse and partial top plan view of the headphones illustrated in FIG. 1 taken along the line 2—2.

FIG. 3 is a transverse sectional view of the headphones illustrated in FIG. 1 taken along the line 3—3.

FIG. 4 is a partial transverse view of a headphone illustrating another embodiment of the present invention.

Referring now to the drawings in detail, wherein like numerals indicate like elements, there is shown in FIG. 1 a pair of stereophonic headphones designated generally as 10.

As shown, the headphones 10 include a first headphone 12 and a second headphone 14 pivotally mounted on a resilient support bracket 16. The bracket 16 may be made of any conventional resilient material and is preferably provided with a closed conduit 18 through which interconnection conductors can be threaded. The bracket 16 is appropriately connected to the housings 20 and 22 for the headphones 12 and 14 by the pins 24 and 26. Of course, other well-known means for connecting headphones to a supporting bracket may be used.

The housings 20 and 22 are preferably made of a tough, molded plastic which completely surrounds and encloses the audio transducers described below. As best shown in FIG. 3, each of the housings 20 and 22 is provided with an opening 28 or 30 in which is positioned a perforated disc 32 or 34, respectively. The purpose of the openings 28, 30 and discs 32, 34 is to provide for the emission of sound directly into the listener's ears. Thus, the openings 28, 30 are provided on inward faces 36 and 38 of the housings 20 and 22 and directly overlie the listener's ears when the headphones 10 are placed on his head. The discs 32 and 34 may be made of any conventional material used for this purpose in the headphones.

Mounted within each headphone 12 and 14 is a pair of audio transducers. Thus, the audio transducers 40 and 42 are mounted within the headphone 12 and the audio transducers 44 and 46 are mounted within the headphone 14. Each audio transducer may take the form of a 1 inch or 1½ inch speaker. Such speakers are available on the market and hence need not be described in detail. Of course, better quality speakers are preferable to obtain a more faithful audio reproduction of the

electronic signal. Each transducer is mounted within its respective housing 20 or 22 by fixing it to a plastic foam backing. Thus, transducer 40 is fixed to the plastic foam backing 48 which fills the entire area behind the transducer. In a like manner, the transducer 44 is fixed to a foam backing 52 and the transducer 46 is fixed to a foam backing 54. The transducers 40—46 may be fixed to the foam backings 48—54 in any conventional manner such as by use of an adhesive fixative or by a heating sealing process.

As best shown in FIG. 2, audio transducer 40 is directly opposite and faces transducer 42. In a like manner, transducer 44 is directly opposite and faces transducer 46. Thus, each headphone 12 and 14 contains a pair of transducers mounted in opposing relation. Moreover, the transducers are on a common axis defined by an imaginary line drawn through their geometric centers. This axis extends in a direction which may be described as front to rear with relation to the head of a listener when the headphones 12 and 14 are each mounted over an ear with the bracket 16 extending across the top of the head. The sound emission openings 28 and 30 are laterally positioned with respect to the aforesaid imaginary axis. The pair of transducers 40 and 42, as shown, are spaced from each other across the diameter of the opening 28. In a like manner, the transducers 44 and 46 are spaced from each other across the opening 30.

As thus positioned within the housings 20 and 22, the transducers 40—42 and 44—46 generate a sound pattern which is a full panorama effect to the listener. In other words, the sound seems to the listener to be directed at him along a continuum extending fully from his left side to his right side.

To further increase the stereo separation between the paired speakers within each enclosure 20, an expandable membrane 60 is fixed to the wall opposite to the opening 28. Membrane 60 is preferably made of a sound reflective material such as elastomeric product coated with plastic. However, any type of stretchable material is suitable. The membrane 60 is preferably dish-shaped and its edges are fixed to the aforesaid wall by any suitable means such as by cementing.

A threaded opening 64 is provided in the wall of enclosure 20. An elongated adjusting member such as the threaded screw 62, having a knurled head thereon, is threaded through the opening 64. The distal end of the member 62 engages the membrane 60 in the center thereof. By adjusting the position of screw 62 within opening 64, the stretchable membrane is caused to take on the shape of a cone and extend a greater or lesser distance into the space between the speakers 40 and 42. This is shown by the dotted lines in FIG. 2. A similar membrane 60 is mounted within the enclosure 22.

The purpose of the membrane is to increase the stereo separation between the speakers 40 and 42. In a like manner, the membrane mounted within enclosure 22 increases the stereo separation between the speakers 44 and 46.

In operation, each transducer is connected to one track of a four track stereophonic system. Such a system may include a four track tape or some other means for generating four distinct electronic signals, each being representative of a particular microphone position recording sound generated over a measurable distance; e.g., an orchestra or a band. As thus positioned within the headphones 10, the transducers generate an effect perceived by the listener as a full panorama of sound emanating toward him in all direction. It is not entirely understood why this positioning of the transducers produces a panorama of sound. It should be sufficient to state that other positions of the transducers relative to the ear of the listener does not produce the panorama effect. Rather, the listener perceives the sound as emanating from the center of this head.

Referring now to FIG. 4, there is shown still another embodiment of the present invention. Only one earphone is shown since, as illustrated in FIGS. 1, 2 and 3, the concepts of the invention are duplicated in each earphone of the complete set. As shown, an enclosure 70 has an opening 72 on which is mounted a conventional earpiece 74 for fitting over the listener's ear. The enclosure 70 is preferably made of plastic

or some other material conventionally used for enclosing headphones.

Mounted within the enclosure 70 are a pair of audio transducers which take the form of speakers 76 and 78. The speaker 76 is provided with a conventional driving coil and magnet 80. In a like, the speaker 78 is provided with a driving coil and magnet 82. Of course, other forms of audio transducers may be provided, if desired. The audio transducers 76 and 78 are mounted in axial alignment within the enclosure 70. They differ from the alignment illustrated in FIG. 2 in that each speaker is turned 180° so that they face in opposite directions. The axis of the alignment of the transducers 76 and 78, however, is spaced laterally from the opening 72 in the same manner as the axis of the paired speakers illustrated in FIG. 2. Moreover, the aforesaid axis is aligned so as to extend from front to back relative to a listener's head when mounted thereon.

A wall 84, preferably made of sound-insulating foam, extends between the transducers 76 and 78 and is positioned intermediate the opening 72. Thus, the wall 84 substantially isolates the sound emanating from the audio transducers 76 and 78. The speakers 76 and 78 are mounted to the wall 84 by any conventional means.

A pair of stretchable membranes 86 and 88 are each formed in the shape of a cone and extend outwardly from the edges of the wall 84 to the speaker electromagnets 80 and 82. The membranes 86 and 88 are preferably made of an elastomeric material such as rubber. Moreover, they may be coated with a plastic or other material, as desired. The purpose of the membranes 86 and 88 is to enhance the stereo separation emanating from the speakers 76 and 78.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

I claim:

1. Stereophonic headphones for a four channel system comprising a support for retaining first and second enclosures in position over the ears of a listener, a first enclosure and a second enclosure, each enclosure having an opening for the emission of sound into the ear of a listener, each said opening being positioned in the enclosure to face one of the ears of a listener, at least two audio transducers in each enclosure for transducing electronic signals into sound, said two audio transducers being mounted on a common sound emitting axis, the axis defined by said transducers in each enclosure being in a front-back direction relative to the head of a listener when the enclosures are mounted over the ears of a listener.
2. Stereophonic headphones for a four channel system in accordance with claim 1 wherein said speakers are mounted in facing sound emitting relation along said axis.
3. Stereophonic headphones for a four channel system in accordance with claim 1 wherein said transducers are mounted to emit sound in opposite directions along said axis.
4. Stereophonic headphones for a four channel system in accordance with claim 1 wherein means are provided within said enclosure to enhance the stereo separation of said audio transducers.
5. Stereophonic headphones for a four channel system in accordance with claim 4 wherein said means for enhancing the stereo separation is adjustable.
6. Stereophonic headphones for a four channel system in accordance with claim 5 wherein said means is a cone-shaped membrane.
7. Stereophonic headphones for a four channel system comprising at least two pairs of audio transducers, one pair of audio transducers in each headphone, each transducer in a pair being mounted in sound-opposing relation, the axis defined by said opposing transducers in each pair being in a front to back direction relative to the head of a listener when the headphones are mounted over the ear of a listener.