

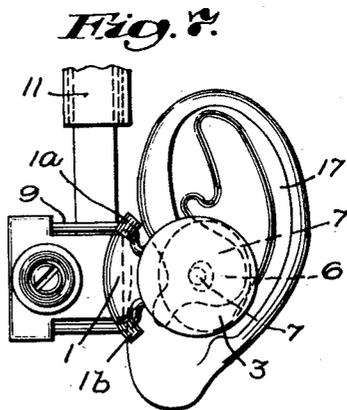
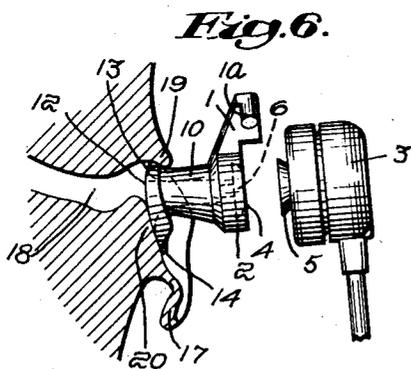
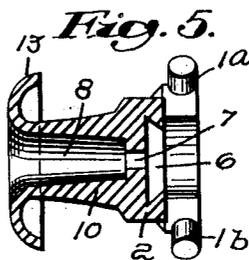
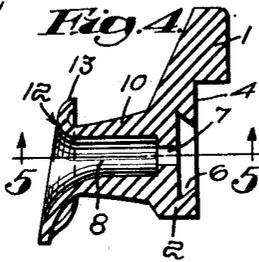
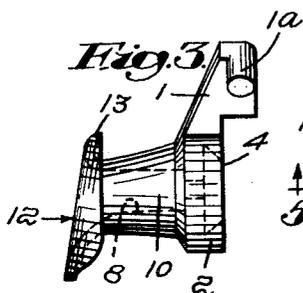
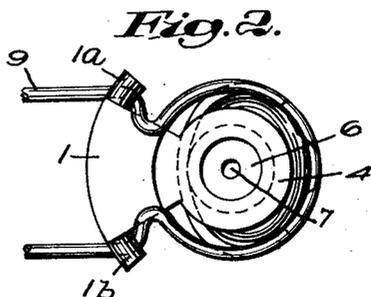
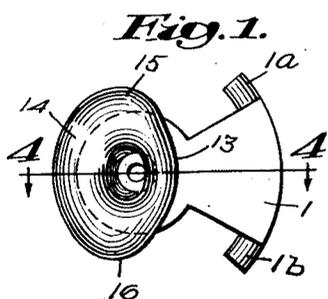
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ACOUSTIC COUPLER FOR EARPHONES

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ACOUSTIC COUPLER FOR EARPHONES

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2 Claims. (Cl. 181—23)

1 This invention relates to an acoustic coupler for earphones and more especially to an acoustic coupler of the type which is adapted to be supported in the outer ear in a position such that it may overlie the ear canal opening, thus providing an orificial seal and excluding ambient noise.

Conventional couplers consisting of an earphone, socket portion and a short tubular body have already been proposed. These devices are not readily located and held in a properly sealed position relative to the ear canal opening, and when increased pressure is exerted to force the coupler into a properly sealed relation, discomfort develops, requiring that the device be removed after a short period of use.

It is an object of the invention, therefore, to devise an improved acoustic coupler which may be quickly and accurately located in the outer ear in sealed relation to the ear canal to exclude ambient noise. Another object is to provide a coupler which may be maintained in sealed relation to the ear canal without the use of excessive pressure, thereby eliminating discomfort and making it possible to keep the coupler in the ear for prolonged periods. It is further an object of the invention to provide a simple, cheap and more efficient acoustic coupler.

The nature of the invention and its objects will be more fully understood from the following description of the drawings, and discussion relating thereto.

In the accompanying drawings:

Fig. 1 is a view in elevation illustrating the inner end of the acoustic coupler of the invention;

Fig. 2 is a view in elevation of the outer end of the coupler;

Fig. 3 is a view in side elevation;

Fig. 4 is a cross section taken on the line 4—4 of Fig. 1;

Fig. 5 is a cross section taken on the line 5—5 of Fig. 4;

Fig. 6 is a diagrammatic view illustrating in plan cross section an ear canal with the coupler of the invention located in apposition thereto; and

Fig. 7 is a side elevational view diagrammatically indicating the coupler mounted in the ear.

The coupler in general includes a base or socket for an earphone, preferably formed of a resilient material such as rubber, plastic or the like. The base extends inwardly to provide a tapered tubular body which presents at its inner extremity a curved lip portion adapted to constitute a means for sealing an ear canal in an improved manner.

2 Referring more in detail to the drawings, numeral 2 indicates a base or socket for an earphone. The base consists of an annular body having at its outer side a flat face 4, against which an earphone 3 (Figure 6) may be supported and secured in some suitable manner as by the tapered head 5 engaged in an undercut opening 6.

Extending outwardly from the peripheral surface of the base 2 is a projection 1 which may, for example, be fan-shaped. At its ends the projection is formed with lug portions 1a and 1b, as illustrated in Figures 1, 2 and 3. The projection 1 serves as a means of attaching the coupler to a wire bracket 9 which passes around the coupler and is in turn secured to a head band 11, fragmentarily illustrated in Fig. 7. As will be noted from an inspection of Fig. 2, the wire bracket 9 is bent in such a manner that it engages against the outer surface of the projection 1 and then passes in back of the lug portions 1a and 1b. This prevents rotation of the coupler with respect to the bracket.

At its inner side the base 2 is formed with a tubular extension 10 which tapers inwardly and is provided with a communication channel 8 connecting with a passageway 7 leading to the opening 6, as illustrated in Figs. 4 and 5. The communication channel 8 is of a somewhat oval-shaped cross section which is most pronounced at the end of the tubular member and which gradually changes in size and shape to conform to and merge with the smaller circular shape of the passageway 7.

The tubular extension 10 terminates in a sealing element consisting of an irregularly shaped lip 12 which extends all the way around the tubular portion. As viewed from the inner side (Fig. 1), it will be seen that the sealing lip consists of a roughly oval-shaped body having a front edge 13 and a rear edge 14. At the ends of its longer axis the oval-shaped body is formed with rounded portions 15 and 16 at the top and bottom respectively. The oval shape referred to, and especially the rounded portions 15 and 16, correspond to a similar shape which generally characterizes the cartilage portions immediately surrounding the entrance to an average ear canal.

Along the front edge 13, the sealing lip is curved over upon itself to provide a rolled edge portion, having an arc of a relatively small radius. Along the rounded portions 15 and 16, the radius of the arc of curvature of the lip gradually increases and at the rear portion 14 the lip flattens out and reaches its greatest width. It should be observed that, as a result of this arrangement, the

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front edge 13 is arranged in close proximity to the axis of the tubular extension 10, while the rear edge 14 is spaced away from the axis of the tubular extension 10 to a much greater extent.

As the lip flattens out along the rear edge 14, it also extends inwardly a greater distance than does the front edge 13 relative to a plane passing through the flat face 4 of the base, and as a result the lip assumes a somewhat offset position with respect to the tubular member.

In general, the coupling provides an improved seal by means of the compliant lip shaped to conform to an ear canal opening and to fill in around the surrounding cartilage portions. The lip, due to its rolled edge construction, develops axial resilience so that it may be firmly held in place with pressure being uniformly distributed.

In Fig. 6 of the drawings, I have illustrated, in plan cross section, an ear 17 and an ear canal 18, with the acoustic coupler of the invention being indicated in an operative position relative thereto.

It will be seen that the sharply curved edge 13 is adapted to engage in back of the tragus 19 (Figure 6), conforming to the sharply curved character of this portion of the tragus. The rear edge 14 of the lip contacts the cartilage portion 20, with the flattened lip portion spreading out over the cartilage portion 20. As is diagrammatically indicated in Fig. 6, the rounded portions 15 and 16, as already noted, fill in around the top and bottom of the ear canal orifice. By this arrangement all portions of the ear surrounding the ear canal opening are completely contacted by the lip and an effective orificial seal is obtained which efficiently excludes sound.

At the same time, the arrangement of the sharply curved front edge 13 in close proximity to the axis of the communication channel 8, permits a substantial part of the communication channel opening 8 to lie directly in apposition to the ear canal 18. The oval shape of channel 8 particularly corresponds to a somewhat similar oval shape found at the orifice of the ear canal, and this further serves to provide for a relatively large portion of the communication channel 8 occurring in apposition to the ear canal opening.

As will be observed in Fig. 6, the tragus 19 extends part way across the opening of the ear canal 18. As a result it is sometimes difficult to obtain a seal against the inner side of this part of the ear. The off-set arrangement of the lip portion, relative to the tubular extension 10, is particularly suited to overcoming this difficulty. The sharply curved forward edge 13 of the lip, by reason of its angular disposition, tends to fall into a position in back of and against the inside of the tragus 19, while the opposite edge 14 of the lip comes into contact with the cartilage portion 20 (Fig. 6) of the outer ear, and is slightly distorted and bent back to conform to the shape of the cartilage portion 20.

The inclination of the lip portion also tends to cause the coupler naturally to assume a position in which an effective seal is obtained, and no difficulty is experienced in quickly and properly locating the lip member in the ear. No excessive pressure is required in order to fit the coupler against the ear portions surrounding the ear canal in an effort to secure a seal, as a light pressure quickly engages the offset lip in a position in which it contacts all portions of the ear with uniform pressure, and with a complete sealing action.

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The extended or flattened rear edge is especially advantageous from the point of view of maintaining the coupler in the ear for prolonged periods. Such pressure as is exerted to hold or support the coupler against the ear is distributed by this flattened rear edge over a much greater area of the sensitive cartilage portions and no localized pressure area is developed, with consequent discomfort.

The fan-shaped projection and lugs constitute a simple and efficient means of securing the coupler to a head band and is especially desirable from the point of view of positively resisting rotation so that a permanent location of the lip member in relation to the ear canal may be maintained.

It should be observed that there occurs appreciable variation in the size and shape of ear canals of different individuals. An average ear canal, and its immediately surrounding cartilage portions, are characterized by an oval shape. The oval shape of the lip of the invention is, therefore, particularly adapted to fit an average ear. The thin irregular lip construction and its oval shape effectively meet most variations which are to be encountered.

The combined effect of a design which is fitted to the shape of the ear canal opening so that a minimum of pressure is required to obtain a seal, and the use of a flattened rear edge for distributing such pressure as is required, is to eliminate discomfort almost entirely, and to produce a coupler which may be used without interruption over long periods. A practical result of this is that telephonic communication can be maintained continuously and dependably between given stations over long periods of time.

While I have shown a preferred embodiment of my invention, it should be understood that various changes and modifications may be resorted to, in keeping with the spirit of the invention as defined by the appended claims.

I claim:

1. An acoustic coupler for earphones comprising a base member having a sound communication channel formed therein, a tubular extension on said base member, sealing means for sealing the opening of an ear canal from sounds other than those emanating from said communication channel, said sealing means being located at the end of said tubular extension to be placed nearest the ear canal, said sealing means comprising an irregularly oval-shaped body of flexible material having a front edge portion at one end of the shorter axis of said oval-shaped body, said front edge of said body having a rolled edge portion curved over upon itself in the direction of said base member forming an arc of relatively small radius adapted to fit within the tragus of an ear, top and bottom edge portions extending from said first edge portion increasing in width rearwardly, a flattened rear edge portion merging into said top and bottom portions whereby said top, bottom and rear portions are adapted to conform to the cartilage sections of an ear, a laterally offset opening in said body lying along the axis of said extension, means positioning said opening in offset relation to a line perpendicular to the axis of said tubular extension, and means positioning said front edge closer to said base member than said rear edge so that sound carried through said extension will enter the canal of the ear.

2. The combination of claim 1 characterized further by an outwardly extending fan-shaped

projection on said base member including two lug portions, a head band, and means for fixedly connecting the said coupler to said head band including a wire bracket connected to said head band and passing about the coupler and bent to engage against the outer surface of said fan-shaped projection and pass behind said lug portions.

JOHN VOLKMANN. 10

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