A sound receiver head set or ear phone includes an ear piece housing of generally semi-spherical shape having an annular padded edge which is adapted to be located against the head of a user around the ear. The housing defines a guide for a transducer system which has an acoustic inlet which may be oriented at a selected location in respect to the auditory meatus of the wearer. The housing carries adjusting means for regulating the position of the transducer and the acoustic outlet so that it is at a desired spacing or gap from the ear. The guide way defined in the housing for the transducer is advantageously oriented at an optimum angle in respect to the ear of the wearer in respect to a tangent to the head of the wearer and in addition the adjustable means permits its inner and outer movement in respect to the ear for the precise definition of the volume of an interreaction gap defined between the acoustic outlet of the transducer and the auditory meatus of the ear.
SOUND RECEIVER HEAD SET OR EAR PHONE

SUMMARY OF THE INVENTION

This invention relates in general to the construction of head sets for sound receiving or listening purposes and, in particular, to a new and useful earphone or headset having a housing with a guide way defined therein which permits the adjustable positioning of a transducer having an acoustic outlet so that the outlet may be mounted at a selected location in respect to the ear.

In recent years, headsets for listening to the reproduction of stereophonic transmissions have come back into vogue. This is due in no small measure to the fact that as compared to a loud speaker reproduction, a stereo effect of the highest fidelity can be achieved to a greater extent with the use of head phones. In addition, the intensity of the sound which is reproduced may be increased to that level which produces the effect of the original volume without disturbing others around the listener. A further advantage is that the wearing of the head phone permits the elimination of surrounding noise or distortion influences. By coupling the sound source directly to the ear of a listener, the head phones produce auditory sensations which have highly individualized qualities and these may vary considerably depending upon the type of head set employed. When these qualities are measured objectively with instruments, for example, an artificial ear, the transmission characteristics exhibited by these various head sets are by no means so disparate. The reproduction by some head sets is regarded as being sharp or as giving a sense of immediacy and accentuating the trebles in particular. Other head sets are considered to have a soft transparent quality or even a diffused or indistinct effect. Moreover, these impressions, which as tests have shown also vary markedly from person to person, might be best compared to the position occupied by a listener in a concert hall. There are head sets which give the impression that one is sitting amongst the orchestra and at the opposite extreme there are those which create the impression that one is listening from the back row. Thus dependent on his taste and views, the listener will favor either the first or the second type of reproduction.

Investigations of a more detailed nature have shown that it is quite impossible to satisfy requirements in respect to all of the qualities of head phone reproduction by simply adjusting their the frequency response, that is, by exerting an electrical influence on the effective transmission factor. It was found that the specific characteristic of a head phone reproduction depends essentially on the size and shape of the interaction gap between the transducer acoustic outlet and the auricular orifice of the ear, and therefore upon the position of the transducer system relative to the orifice of the external auditory meatus. The smaller the volume of the interaction gap and the more direct the emission of sound from the diaphragm to the auditory canal, the more immediate and more clear does the reproduction become. The transducer diaphragm at the acoustic outlet and the ear drum are relatively intermittently interlinked by means of the external auditory meatus and form a common oscillatory system. If, however, the transducer diaphragm is removed from the auricular orifice this does provide an interaction gap of increased volume. A secondary sound field is formed in front of the head phone. This secondary field, to which the auricular orifice is linked less intermittently, primarily determines the quality of the sound which is reproduced. The quality of the reproduction and the transmission characteristics of a head set of this type are described as distant, diffuse, and sometimes also somewhat hollow.

In accordance with the invention, there is provided a head set which permits different sensory impressions to be produced at will, that is in accordance with the requirements and tastes of the listener. This is provided by forming the housing of the head set with a guide way which receives the transducer and which permits the transducer to be shifted toward and away from the ear to vary the interaction gap between the transducer and the ear. In one form of the invention, the guide way is formed as a separate channel which is oriented at the preferred angle in respect to a tangent of the head of the wearer in the normal ear piece operational position, and it includes means, such an adjustable nut or bolt assembly, for displacing the transducer directly or for displacing a portion of the housing with the transducer relatively to the ear.

In accordance with a further modification of the invention, the housing may contain a guide way which itself is pivotal so that the transducer may be shifted about an axis which is substantially vertical and which permits movement of the transducer outlet forwardly or rearwardly for the desired orientation in respect to the ear.

In the preferred form the transducer is mounted in a rubber diaphragm which at least partly limits the volume of the interaction gap and which also forms a resilient element for restoring the transducer to an initial position.

Accordingly, it is an object of the invention to provide an improved head set construction which includes means for holding a transducer with an acoustic outlet at a selected location in respect to the ear of the wearer.

A further object of the invention is to provide a head set which includes a holder for a transducer which is mounted in a head set housing for pivotal movement in forward and rearward directions in respect to the wearer when the headset is mounted in the normal position and which also includes means for adjusting the position of the transducer in respect to its location away from the opening of the ear.

A further object of the invention is to provide a head set which is simple in design, rugged in construction, and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated and described preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is an axial sectional view of an earphone of a head set constructed in accordance with the invention; FIG. 2 is a view similar to FIG. 1 of another embodiment of the invention; and
FIG. 3 is a schematic top plan view indicating the adjustment of two earphones in respect to the wearer's head and showing another embodiment of the invention.

GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings in particular, the embodiment of the invention shown in FIG. 1 comprises a head set, generally designated 10, shown in position around an ear 1 of the user, which ear has an external auditory meatus 2 as schematically indicated.

In accordance with the invention, the head set or earphone includes a casing 3 of semi-spherical configuration having an annular lip or edge which is padded at 6 and which engages against the head of the wearer and around the ear 1. A transducer system 4 is mounted, in accordance with the invention, in a guide way or tubular holder 7 and it includes an acoustic outlet 5 which is oriented toward the ear 1. Means are provided to permit the shifting of the transducer 4 and the associated outlet 5 for the purpose of selecting a desired listening position by regulating the volume of the interreaction gap defined between the ear and the transducer. In the embodiment of FIG. 1, the means for facilitating the shifting of the transducer comprises the guide way 7, itself, and if desired, also an adjusting means in the form of a threaded spindle 8 connected to the transducer and extending outwardly through an opening of the housing 3 and provided with a nut 9 which may be threaded on the spindle or bolt 8 by an amount in accordance with the spacing of the transducer from the ear which is desired.

In the embodiment illustrated in FIG. 2, an earphone 10' includes similar parts which are similarly designated but with a prime in addition. An interior wall 11 of the housing is made of a flexible material and is secured to a cage or guide means 7'a for the transducer 4'. The entire cage 7'a with the wall 11 may be flexed inwardly and outwardly and this inward and outward flexing is advantageously aided by means of a threaded bolt 12 having an engaging head 12a which is located on the exterior of the housing and a spindle portion 12b which is threaded into the outer end of the cage 7a.

In FIG. 3 of the drawings, another embodiment of head set 10'' is provided. In this embodiment a guide way or guide means 7'' for the transducer comprises a tubular member which is pivotally mounted about a pivot 12 of the housing 3''. It includes a handle or tab portion 14 which may be engaged at the exterior of a housing 3'' for the purpose of pivoting the guide means 7'' about the pivot 12 in forward or rearward directions in respect to a person's head 16.

A feature of the inventive construction is that the earphones 10, 10' and 10'' may be oriented to allow for difference in the shape of the human head. In the embodiment of FIG. 3, the earphone 10'' is mounted so that the axis of the acoustic outlet of the transducer 4'' may be shifted either forwardly or rearwardly so that the outlet can be favorably oriented in respect to the auricular orifice of the ear 1. The longitudinal axis of the transducer 4'' is set at an angle $\phi$ relative to the axis connecting the two auricular orifices. This angle should be preferably equal to the angle $\phi$ which is enclosed by two planes one of which is a plane $k$ extending tangentially to the head 16 and which includes the orifice of the external auditory meatus, and the second one forms a plane $e$ which passes through the auricle. In the embodiment of FIG. 3, the transducer systems 4'' can be displaced by the adjusting handles 14 and also by engaging the transducer 4'' and shifting it along its guide means 7'' either manually or by means of adjustment such as indicated in FIGS. 1 and 2. Thus, instead of a single adjustment as indicated in FIGS. 1 and 2, the transducer 4'' in FIG. 3 may be adjusted toward and away from the ear and in a forward and rearward direction in respect to the head of the user. The transducer 4'' in the embodiment of FIG. 3 is advantageously frictionally engaged within the guide means 7'' so that it will remain in its adjusted position. The sliding guide may advantageously comprise a sphere (not shown) which is rotatably mounted in the ear piece and which has a bore therethrough for receiving a slide rod or threaded bolt, the inner end of which supports the transducer system.

The invention makes it possible to adjust the position of transducer so that the listener may himself create a headset which is particularly designed to his listening requirements and tastes. The movement of the guide means 7'' in FIG. 3 will be sufficient if it moves toward and away from the face of the person through an angle which ranges preferably within 15° to 50°.

What is claimed is:

1. An earphone comprising a casing adapted to be positioned over an ear of a listener and having an internal cage therein defining a guideway for a transducer mounted in said guideway, said guideway being movable in directions toward and away from the ear of the wearer, said transducer having an acoustic outlet at the end directed toward said ear which will shift with said transducer when the said guideway is moved to vary the volume of the spacing between the said transducer and the ear of the wearer, and a flexible interior wall in said casing, said guideway being connected to said wall and being displaceable with said wall for varying the position of said transducer.

2. An ear phone, according to claim 1, wherein said wall comprises a rubber diaphragm which at least partly defines the volume of the interreaction gap between said acoustic outlet and the wearer's ear, said diaphragm forming a resilient element for restoring the transducer system to an initial position.

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