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(54) ELECTROACOUSTIC TRANSDUCER

ELEKTROAKUSTISCHER WANDLER

TRANSDUCTEUR ELECTROACOUSTIQUE

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Description

This invention relates to electroacoustic transducers of the type which incorporate a reed armature.

An electric transducer of this general type is described in our British Patent 2095510, and typically includes a pair of spaced permanent magnets, a coil having a tunnel therethrough and a reed armature having a central portion which extends through the coil and a tip portion which lies at least partially between the magnets. The arrangement is such that when the moving part of the reed shifts in one direction or another away from a centralised position between the two poles, the magnetic flux is caused to flow in one direction or the other along the reed and hence through the coil. The reed is attached to a diaphragm and in this way the vibrations of the diaphragm caused by received sound are converted into corresponding currents in the coil or vice versa. It is very easy to damage the reed by over deflection, if the transducer experiences a shock e.g. from being dropped, in addition the tip portion may strike the magnet with considerable force. It will be understood that a similar configuration can be used for a receiver or loudspeaker.

In one transducer the coil tunnel has a restricted central portion which limits the degree of deflection available to the reed and hence reduces the possible damage. However because coils in such transducer are almost always formless, this solution is only available when the coil is set in epoxy having been wound on a flexible removable plastic former. This method of construction is only appropriate for certain types of transducer and has a number of limitations.

The present invention consists in an electroacoustic transducer including a pair of spaced permanent magnets, a coil having a tunnel therethrough and a reed armature having a central portion which extends through the coil and a tip portion which lies at least partially between the magnets, the reed being mounted for deflection towards or away from the respective magnets, wherein the central portion of the reed is provided with a formation on either side thereof.

In a particularly preferred embodiment formations are deformations in the reed. Where the reed is flat and elongate, the formations are preferably formed by pressing out sections of the reed at or adjacent the longitudinal axis of the reed. By pressing, or otherwise deforming, the formation or formations from the reed, the limitation on the movement of the reed can be achieved without adding any mass to the reed, or indeed the transducer as a whole. However by restricting the formation or formations to the area of the central axis of the reed, no additional restriction on the lateral position of the reed within the tunnel is introduced and extra restrictions on its rotational positions are limited. Further such formations can be pressed with considerable accuracy, which is important when the dimensions and tolerances involved are extremely small as is the case where the transducer is for use in a hearing aid.

In this construction the formation or formations may be semi-spherical, ridges or star shapes or a combination thereof.

In another arrangement the formation or formations may be constituted by a body or bodies mounted on the reed. For example the body may be in the form of a sleeve or may be in the form of some settable or deposited material or may simply be a body attached to the reed. These arrangements are somewhat less preferred, because they add weight to the reed and in the latter case the control of dimensions is more difficult. However, in certain cases, there may be advantages where the localised deformation of the reed undesirably affects its flexing properties.

The invention may be performed in various ways and specific embodiments will now be described in reference to the accompanying drawings, in which:

Figure 1 is a cross sectional stylised view through an electroacoustic transducer with the reed in its central position;
Figure 2 shows the reed in its extreme upward position;
Figure 3 shows the reed in its extreme downward position;
Figure 4 is a view from above of the reed of the transducers Figures 1 to 3;
Figure 5 is a cross sectional view of the reed of Figure 4 along the line of IV - IV; and
Figures 6 and 7 are schematic views generally corresponding to Figure 1 showing alternative arrangements.

An electroacoustic transducer 10 is schematically shown in Figures 1 to 3 and comprises a coil 12, magnets 13,14, pole pieces 15,16 and reed armature 17. As can be seen in Figure 1 the coil 12 defines a central tunnel 18 and the magnets 13,14 are spaced apart. The reed armature 17 extends along the tunnel 18 and between the magnets 13,14. A central portion 19 of the reed 17 lies within the tunnel 18 and, adjacent one end of that central portion 19 are formed opposed formations 20,21. As can be best seen in Figures 4 and 5 the formations 20,21 are generally semispherical and are pressed out of the plane of the reed.

As can be seen in Figures 2 and 3 the formations 20,21 respectively engage the coil 12 when the reed is deflected upwardly or downwardly beyond its normal working range. Preferably the formations are sized to prevent the tip 22 of the reed 17 striking the magnets 13,14, but considerable protection can also be provided if they are dimensioned so that they strike the coil 12, before the tip 22 strikes either the magnet 13 or magnet 14.

It has been discovered that a transducer constructed in this manner can be dropped from, typically, twice the height, without incurring damage to the reed, as

compared with an identical transducer without the formations. Put another way this means it can, typically, receive up to 4 times the shock without damage.

It will be appreciated that the formations could have other conventional shapes, but they are confined to the general area of the longitudinal axis of the reed 17 so that their existence introduces as little restriction as possible on the rotational or lateral position of the reed 17 within the tunnel 18. In a construction where this was not a factor, the formations could be at the sides of the reed 17 or extend right across it.

As has been explained above this construction has particular advantages; for example no extra mass is added to the reed 17. However many of the advantages of the invention can be obtained with other arrangements and examples of these are briefly described in connection with Figures 6 and 7.

In Figure 6 the formations 20,21 are formed by blobs of adhesive or other settable material. In Figure 7 the formations 20,21 are formed by a sleeve 23 slid onto the reed 17.

It will be understood that the restriction principles recited in this description are applicable to many other reed mountings and configurations within the scope of the claims.

Claims

1. An electroacoustic transducer (10) including a pair of spaced permanent magnets (13, 14), a coil (12) having a tunnel (18) therethrough and a reed armature (17) having a central portion (19) which extends through the coil and a tip portion which lies at least partially between the magnets, the reed (17) being mounted for deflection towards or away from the respective magnets, wherein the central portion (19) of the reed is provided with a formation (20, 21) on either side thereof.

2. A transducer as claimed in Claim 1, wherein the formations (20, 21) are opposed deformations in the reed (17).

3. A transducer as claimed in Claim 2, wherein the reed (17) is flat and elongate and the formations (20, 21) are formed at or adjacent the longitudinal axis of the reed.

4. A transducer as claimed in Claim 3, wherein the formations (20, 21) are pressed out of the plane of the reed (17).

5. A transducer as claimed in any one of Claims 1 to 4, wherein the formations (20, 21) are semi-spherical, ridges or star shaped or a combination thereof.

6. A transducer as claimed in any one of Claims 1 to 3, wherein the formations (20, 21) are constituted by a body (23) or bodies mounted on the reed.

7. A transducer as claimed in Claim 6, wherein the body (23) is in the form of a sleeve mounted on the reed.

8. A transducer as claimed in Claim 7, wherein the body is in the form of a lump of settable material deposited on the reed (17).

Patentansprüche

1. Elektroakustischer Wandler (10) mit zwei voneinander beabstandeten Permanentmagneten (13, 14), einer Spule (12), welche einen durch diese hindurchgehenden Tunnel (18) aufweist, und einem Federanker (17) mit einem sich durch die Spule erstreckenden Mittelabschnitt (19) und einem vorderen Abschnitt, welcher wenigstens teilweise zwischen den Magneten angeordnet ist, wobei der Federanker (17) derart befestigt ist, daß er zu den jeweiligen Magneten hin oder von diesen weg ablenkbar ist, wobei ferner der Mittelabschnitt (19) des Federankers auf jeder Seite eine Gestaltung (20, 21) aufweist.

2. Wandler nach Anspruch 1, **dadurch gekennzeichnet** , daß die Gestaltungen (20, 21) entgegengesetzte Deformationen des Federankers (17) sind.

3. Wandler nach Anspruch 2, dadurch gekennzeichnet, daß der Federanker (17) flach und langgestreckt ausgebildet ist und die Gestaltungen (20, 21) auf oder benachbart zur Längsachse des Federankers ausgebildet sind.

4. Wandler nach Anspruch 3, dadurch gekennzeichnet, daß die Gestaltungen (20, 21) aus der Ebene des Federankers (17) herausgepreßt sind.

5. Wandler nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die Gestaltungen (20, 21) halbkugelförmig, rippenförmig oder sternförmig oder als Kombination dieser ausgebildet sind.

6. Wandler nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die Gestaltungen (20, 21) aus einem oder mehreren Körpern (23), welche auf dem Federanker befestigt sind, ausgebildet sind.

7. Wandler nach Anspruch 6, dadurch gekennzeichnet, daß der Körper (23) büchsenförmig ausgebildet und auf der Ankerfeder befestigt ist.

8. Wandler nach Anspruch 7, dadurch gekennzeichnet, daß der Körper in Form eines Klumpens eines härtbaren Materials auf dem Federanker (17) abgelagert ist.

Revendications

1. Transducteur électroacoustique (10) comprenant une paire d'aimants permanents espacés (13, 14) un enroulement (12) traversé par un tunnel (18) et une armature en forme de lame (17) ayant une partie centrale (19) qui traverse l'enroulement et dont une extrémité se place au moins partiellement entre les aimants, la lame (17) étant montée de manière à fléchir en s'approchant et en s'éloignant des aimants respectifs, dans lequel la partie centrale (19) de la lame est pourvue d'une formation (20,21) de chaque côté.

2. Transducteur selon la revendication 1, dans lequel les formations (20, 21) sont des déformations opposées de la lame (17).

3. Transducteur selon la revendication 2, dans lequel la lame (17) est plate et allongée et les formations (20, 21) sont formées sur ou adjacentes à l'axe longitudinal de la lame.

4. Transducteur selon la revendication 3, dans lequel les formations (20, 21) sont embouties en s'éloignant du plan de la lame (17).

5. Transducteur selon l'une quelconque des revendications 1 à 4, dans lequel les formations (20, 21) sont hémisphériques, en forme de rebord ou en forme d'étoile ou en une combinaison de ces formes.

6. Transducteur selon l'une quelconque des revendications 1 à 3, dans lequel les formations (20, 21) sont formées par un élément (23) ou plusieurs éléments montés sur la lame.

7. Transducteur selon la revendication 6, dans lequel l'élément (23) a la forme d'un manchon monté sur la lame.

8. Transducteur selon la revendication 7, dans lequel l'élément a la forme d'un morceau de matière durcissable déposé sur la lame (17).

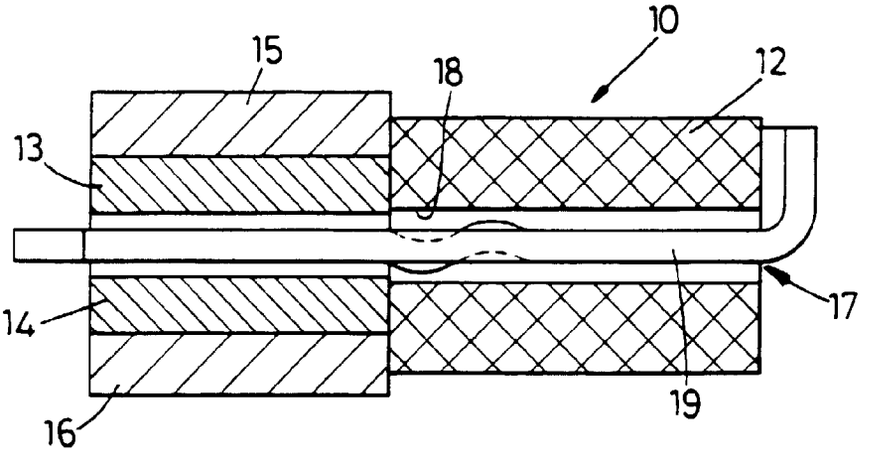

Fig. 1

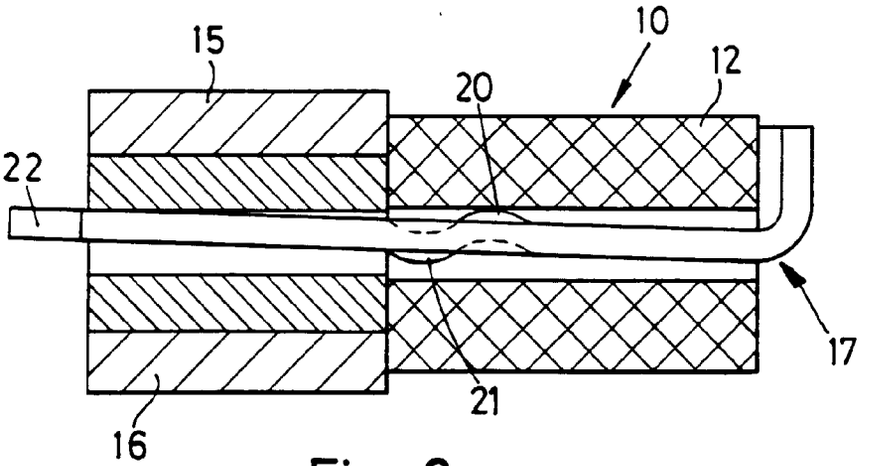

Fig. 2

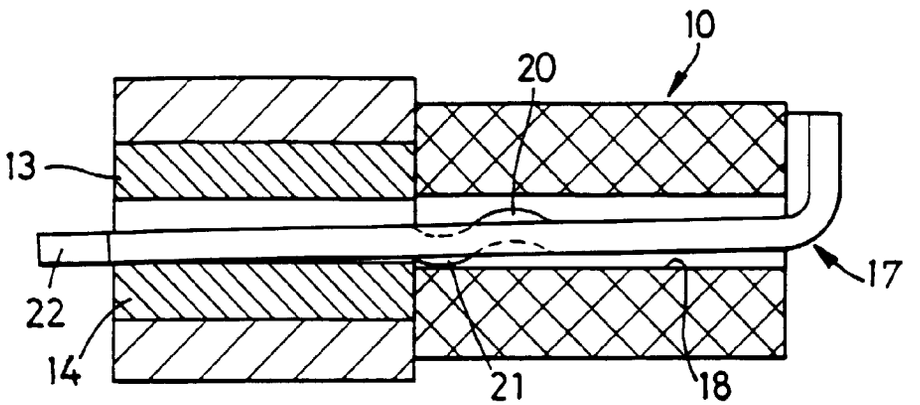

Fig. 3

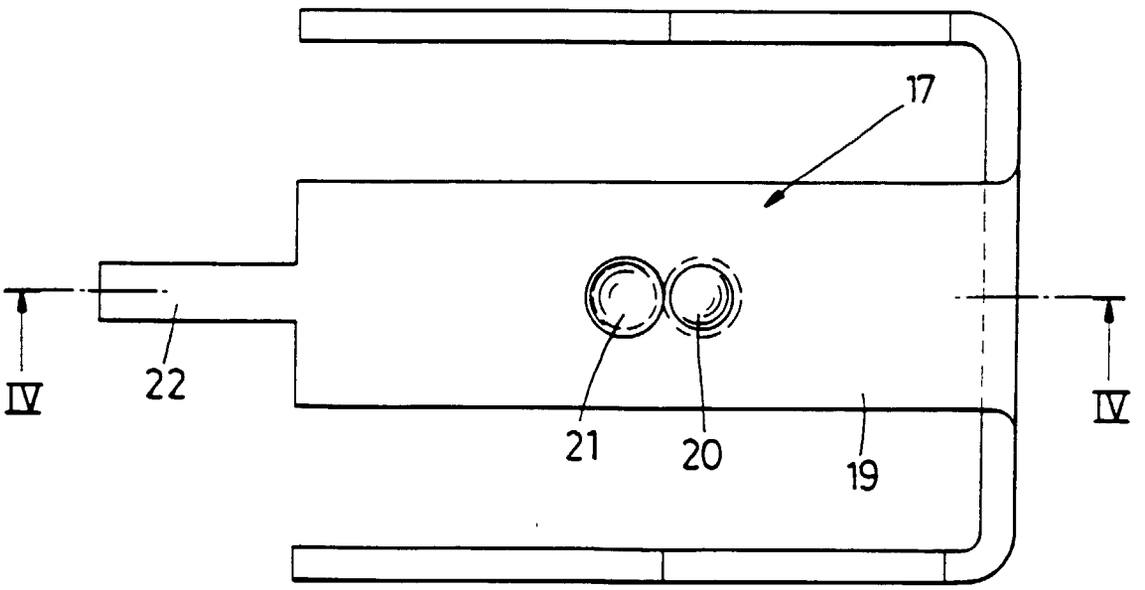

Fig. 4

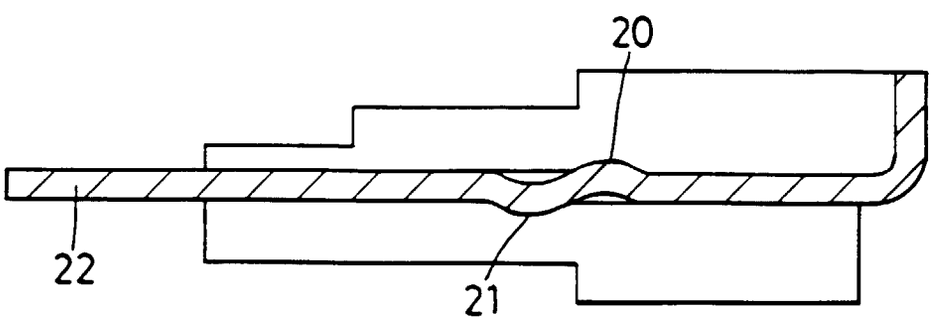

Fig. 5

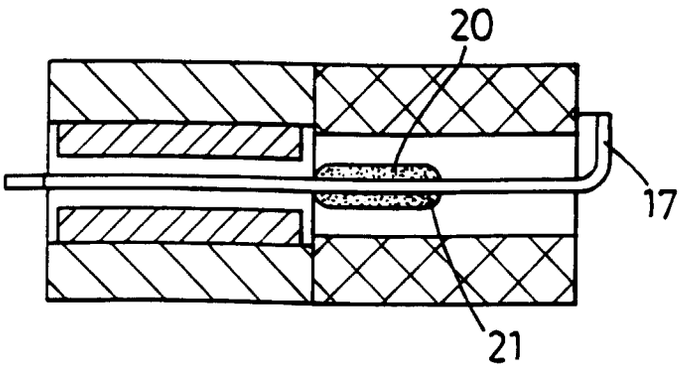

Fig. 6

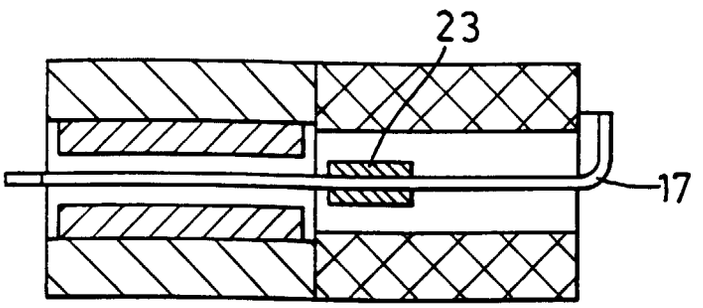

Fig. 7