PATENT SPECIFICATION

688,804

Date of Application and filing Complete Specification: May 31, 1951.

No. 12843/51.

Application made in Germany on May 3, 1949.

Complete Specification Published: March 11, 1953.

Index at acceptance:—**Class 40(iv),** J1f2, J1o(5 : 7 : 8 : 9), J6d, K16a, K24b(1b : 2b).

COMPLETE SPECIFICATION

Improvements in or relating to Transducers for Use in Sound Recording and Reproducing Apparatus

We, TELEFUNKEN GESELLSCHAFT FÜR DRAHTLOSE TELEGRAPHIE, m.b.H., a company organised under the laws of Germany, of Berlin, S.W.61, Mehringdamm 32—34, Western Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to transducers for use in sound recording and reproducing apparatus, and in particular to transducers for use in the production or reproduction of grooved sound records in which either or both the hill-and-dale and lateral-cut types of recording are utilised.

It has already been proposed to utilise both the hill-and-dale and lateral-cut methods of sound recording simultaneously in a grooved sound record, and it is known to provide a single transducer for use in connection with such records, which can be used for recording or reproducing both types of record. For example, such a transducer has been provided with two coils which by means of a switch could be connected either in aiding or opposing relation such that by suitable adjustment of the switch the transducer was capable of use with either one or the other type of recording.

The object of the present invention is to provide an improved transducer capable of the production or reproduction of sound records in which either or both the hill-and-dale and lateral-cut types of recording are utilised.

In accordance with the invention a transducer for use in sound recording and reproducing apparatus comprises three transducer systems arranged such that for one type of recording one of said systems is operative, whilst the other two systems function in opposition to one another so as to be effectively inoperative, and in the other type of recording said one system is inoperative whilst said other two systems function additively.

In order that the invention may be clearly understood and readily carried into effect, a preferred embodiment will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a schematic front elevation, partly in section, of portions of a transducer according to the invention,

Figure 2 is a schematic longitudinal elevation, partly in section, of portions of the transducer illustrated in Figure 1, and

Figures 3 and 4 are, respectively, plan and elevation of an armature suitable for use in the transducer illustrated in Figures 1 and 2.

The transducer illustrated in Figures 1 and 2 includes a magnet system comprising two magnets 1 and 2 provided, respectively, with pole-pieces 3, 4 and 5, 6 to form a four-pole system. A **T**-shaped armature has a main longitudinal portion 9 and two transverse portions 10 and 11. the armature being resiliently supported in operative relation to the pole-pieces 3, 4, 5 and 6 at three points 15, 16 and 17 by means of a suitable material such as rubber. Two coils 7 and 8 are arranged symmetrically around the transverse armature portions 10 and 11, these coils being connected in opposing relation. A further coil 12 is arranged around the longitudinal axis of the main portion 9 of the armature.

The armature illustrated in Figures 3 and 4 is very similar to that shown in Figures 1 and 2 in that it comprises a main portion 9 and transverse portions 10 and 11 but the stylus extends approximately at right-angles to the plane of the armature and, as shown, the stylus may

be secured to the armature by a screw or any other suitable means may be employed for this purpose.

It will be seen that the transducer as described comprises in effect three transducer systems, namely, the coil 7 and one transverse portion 11 of the armature, the coil 8 and the other transverse portion 10 of the armature, and finally the coil 12 and the main longitudinal portion 9 of the armature.

When utilised for the simultaneous reproduction of a grooved disc sound record carrying both hill-and-dale and lateral-cut recordings, the method by which the transducer illustrated in the drawings operates will now be described. The undulations representing the hill-and-dale recording give rise to movements of the stylus in a plane perpendicular to the disc record and by virtue of the corresponding movements imparted to the armature, the transducer system including the longitudinal portion 9 of the armature is operative to produce a voltage in the coil 12 representative of the sound recorded by the hill-and-dale method. These movements of the armature also result in the induction of equal voltages in the coils 7 and 8 included in the other two transducer systems but since these coils are connected in opposing relation the net voltage between the terminals 13 and 14 is zero so that for hill-and-dale movements of the armature the other two transducer systems function in opposition and are effectively inoperative.

The lateral movements of the stylus responsive to the lateral cut recording produce a rotary movement of the armature about its longitudinal axis so that under these conditions the transducer system including the longitudinal portion 9 of the armature is inoperative and no voltage is induced in the coil 12. However, since the rotary movement of the armature also effects a rocking movement of the transverse portions 10 and 11 towards and away from opposite pole pieces 4, 5 and 3, 6, the other two transducer systems are operative and the voltages induced in coils 7 and 8 are additive. Thus, a voltage appears between terminals 13 and 14 representative of the sound recorded by the lateral cut method.

Although the coils 7, 8 and 12 are shown as being in fixed relation with respect to the magnet system, these coils could be mounted for movement with the armature, but the fixed mounting is preferred since by this means the mass of the moving parts can be reduced to a minimum and the use of coils having large numbers of turns is permitted whereby the induced voltages are correspondingly large.

A transducer having a T-shaped armature as described, in conjunction with three separate coils to form three transducer systems is thus capable of simultaneously reproducing both hill-and-dale and lateral-cut sound records, without any substantial mutual interference.

In conjunction with a grooved sound record carrying simultaneously both hill-and-dale and lateral-cut recordings in the same groove, a transducer according to the invention permits of double the playing-time as compared with a conventional sound record, since it is possible firstly to reproduce, say, the hill-and-dale recording and then the lateral-cut recording independently.

A further possibility with the transducer according to the invention is the production and reproduction of two-channel recordings, one channel by the hill-and-dale method and the other by the lateral-cut method. Such a two-channel recording may be utilised in known manner to produce a stereophonic effect.

What we claim is:—

1. A transducer for use in sound recording and reproducing apparatus wherein the transducer is capable of the production or reproduction of sound recordings of both the hill-and-dale and lateral cut types, said transducer comprising three transducer systems arranged such that for one type of recording one of said systems is operative, whilst the other two systems function in opposition to one another so as to be effectively inoperative, and in the other type of recording said one system is inoperative whilst said other two systems function additively.

2. A transducer according to Claim 1, in which a common armature is provided for co-operation with said transducer systems.

3. A transducer in accordance with Claim 2 comprising a four-pole magnet system and a T-shaped armature which is supported for bodily movement in a plane passing through its longitudinal axis, and also rotary movement about said axis, one coil surrounding the longitudinal axis of the armature to produce, or to be responsive to, hill-and-dale movements of said armature, and two further coils arranged symmetrically around the transverse portions of said armature, the said further coils being connected in opposing relation so as to produce, or be responsive to, lateral cut movements of said armature.

4. A transducer substantially as described with reference to Figures 1 to 4 of the accompanying drawings.

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Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1953.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

688,804 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

FIG. 1.

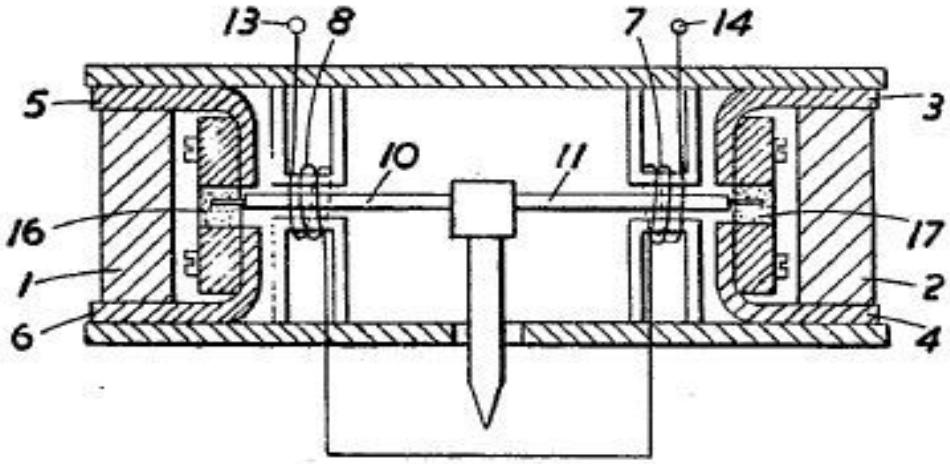

FIG. 2.

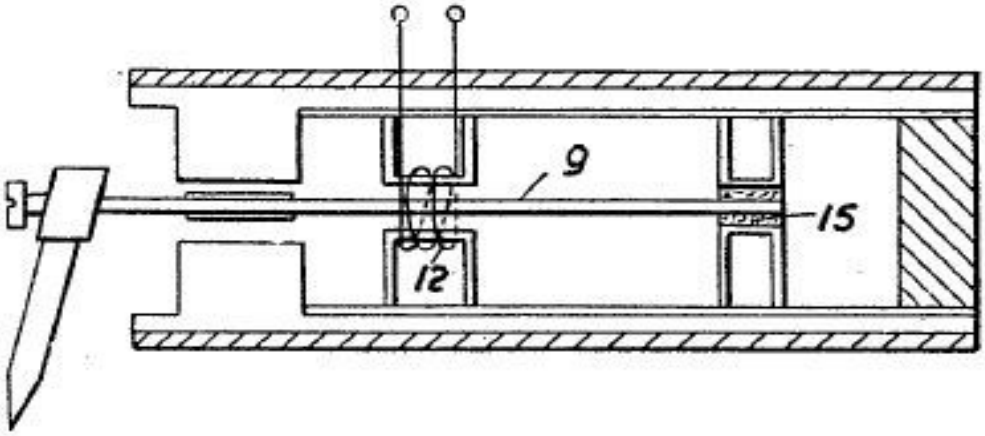

FIG. 3.

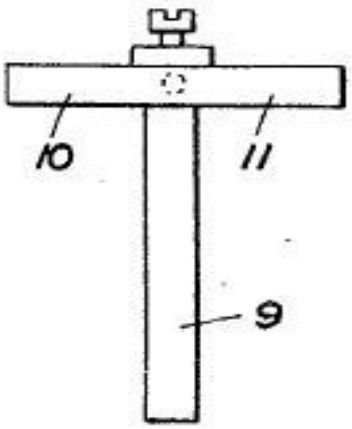

FIG. 4.