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F. ULRICH ET AL
ELECTRODYNAMIC LOUDSPEAKER

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Fig. 1

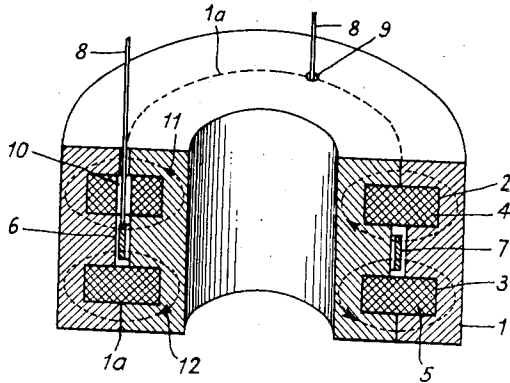


Fig. 1a

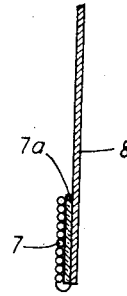


Fig. 2

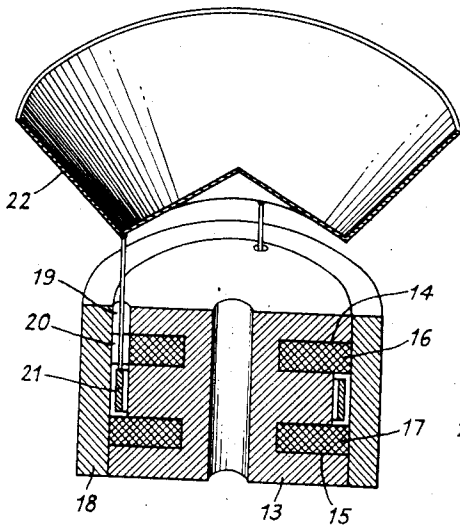
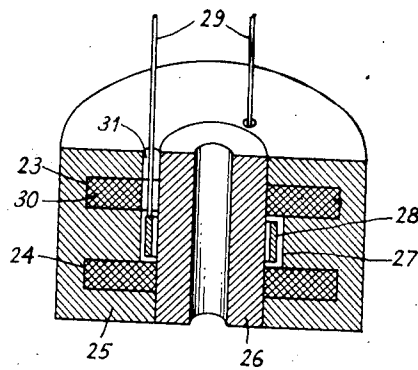


Fig. 3



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ELECTRODYNAMIC LOUDSPEAKER

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4 Claims. (Cl. 179—115.5)

This invention is concerned with loudspeakers of the electro-dynamic or moving coil type, and more particularly to the magnet system of such loudspeakers.

Heretofore it has not been possible, in electro-dynamic loudspeakers, to completely transform the energy used for excitation into magnetic field intensity in the air gap. A considerable portion of the magnetic flux is lost due to straying when the electro-magnets are of cup-shape. Although attempts have been made in reducing the air gap as much as possible, an essential improvement of the degree of efficiency could not be attained.

A considerable advance is made by the present invention according to which in magnet systems for electro-dynamic loud speakers, two exciter or field windings are provided having a common magnetic path and which are arranged at such a distance from each other that a magnetic field of high density is produced therebetween and in which a conductor oscillates. The conductor has passed through it voice currents and is connected to a sound radiator or diaphragm. The magnetic system on the one hand can be so constructed that the two exciter or field windings have the same magnetic axis and excitation is carried out in the same sense so that the air gap containing the conductor passed by voice currents can be arranged laterally to the magnetic axis. On the other hand, the exciter windings having the same magnetic axis, may be excited in the opposite sense so that the resultant flux will be the greatest between the opposite faces of the windings. Consequently in this construction the air gap is placed in this part of the field, i. e., parallel to the magnetic axis. Especially in this construction the magnetic flux produced by the exciter winding is compelled to take its course through the air gap extending between the two exciter windings over the entire length of the annular core. Losses through straying effects are thus avoided in the present arrangement to the greatest extent thus obtaining an essentially higher degree of efficiency than in prior arrangements.

Further particulars of the invention will be explained in connection with the accompanying drawing wherein, by way of example, several embodiments are represented in Figures 1 to 3.

In Figure 1, item 1 designates an annular core of soft iron having channel-like passages 2 and 3 arranged in succession in the direction of the axis and serving for accommodation of the exciter or field windings 4 and 5. Between the two passages an annular slot 6 is provided in which

the winding 7 passed by speech currents is placed. The speech coil which may be mounted on a coil body of small wall thickness has connection strips 8 attached thereto brought outside through openings 9 in the magnet core, and which may be joined to a membrane, such as a conical diaphragm for instance. These strips may at the same time also be utilized as lead-ins for the oscillatory voice coil. As seen from the figure the connection strips also cross the exciter winding 4, for instance at 10.

As already pointed out, the two windings producing the field are excited in the opposite sense as indicated in the figure by the arrows 11 and 12. In this way there is produced between the two coils in the magnet core, a course of the field extending in the same direction and having a high density. Obviously, in the arrangement shown, there is no occasion for the field to form stray field lines so that approximately the entire energy used for excitation will be consumed for the production of a sufficiently high field intensity in the air gap 6 whereby in the present arrangement a high efficiency is obtained.

Figure 2 shows a practical example of an embodiment of the new principle. Obviously in the construction according to Figure 1 difficulties would be encountered in inserting the exciter windings as well as the oscillatory coil in the magnet core. In the construction according to Figure 2, a way is shown by which these difficulties are avoided. The magnet core in this case consists of an annular part 13 of E-shaped cross section whereby two recesses 14 and 15 for placing the exciter windings 16 and 17 are formed. Towards the outside these grooves are closed by means of cylinder 18 of soft iron placed over the core. As indicated in the figure the central rim of the E-shaped cross section is somewhat shorter than the outer rims thereby leaving an annular gap between the center rim and the cylinder for accommodating the voice coil 21. In the core 13 and preferably also in the exciter winding 16 grooves 19 and 20 are provided through which the connections between the voice coil and a conical diaphragm 22 are passed. These connections may at the same time be used as lead-ins for the oscillatory coil. In order to insert the lead-ins for the exciter windings, channels are preferably provided in core 13. Otherwise the functioning of the magnet system completely corresponds to that explained in connection with Figure 1.

Figure 3 finally shows a modification of the embodiment according to Figure 2, in which the

grooves 23 and 24 are formed on the inner surface of the cylindrical core 25 instead of on the outer surface as in Fig. 2. In this case the cylinder 26 which closes the grooves and is composed of magnetic material is inserted in the ring-shaped part 25. Between the central part of the E-shaped cross section and cylinder 26 an annular cap 27 is again left free for accommodating the oscillatory coil 28 which may be connected to the diaphragm by means of connections 29. Also in this case openings 31 are provided for passing the connections through the magnet core 25 and through the exciter winding 30.

What we claim is:

1. An electro-dynamic loudspeaker comprising a cylindrical core of magnetic material, a pair of spaced coaxially disposed field windings arranged within said core, said core having an annular air gap in the space between the field windings, a voice coil arranged within said air gap, a vibratile diaphragm, and connectors joined between the voice coil and the diaphragm, certain of said connectors serving as the lead-in conductors for the voice coil.

2. An electro-dynamic loudspeaker according to claim 1 wherein the field windings and the voice coil are disposed in channels formed on the outer surface of the magnetic core and a soft iron cylinder fitted over the outside of the core.

3. An electro-dynamic loudspeaker according to claim 1 wherein the field windings and the voice coil are disposed in channels formed on the inner surface of the magnetic core and a soft iron cylinder fitted within the core.

4. An electro-dynamic loudspeaker magnetic system, comprising an annular core member, a pair of similarly shaped field windings, spaced apart coaxially and embedded in said core member, and an annular air gap for accommodating a movable voice coil formed in said core member and coaxially positioned between the field windings, the directions of the magnetic fields produced by said windings within the air gap being in the same direction whereby a magnetic field of high density is produced therein.

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