

[54] **ELECTROMAGNETIC MICROPHONE INCLUDING AT LEAST ONE ACOUSTIC RESISTANCE**

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[30] **Foreign Application Priority Data**

Apr. 1, 1971 Netherlands ..... 7105001

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[51] Int. Cl. .... **H04r 1/28**, H04r 9/08

[58] Field of Search. 179/115.5 R, 117, 119 R, 180, 179/121 D, 1 DM; 181/31 R

[56] **References Cited**

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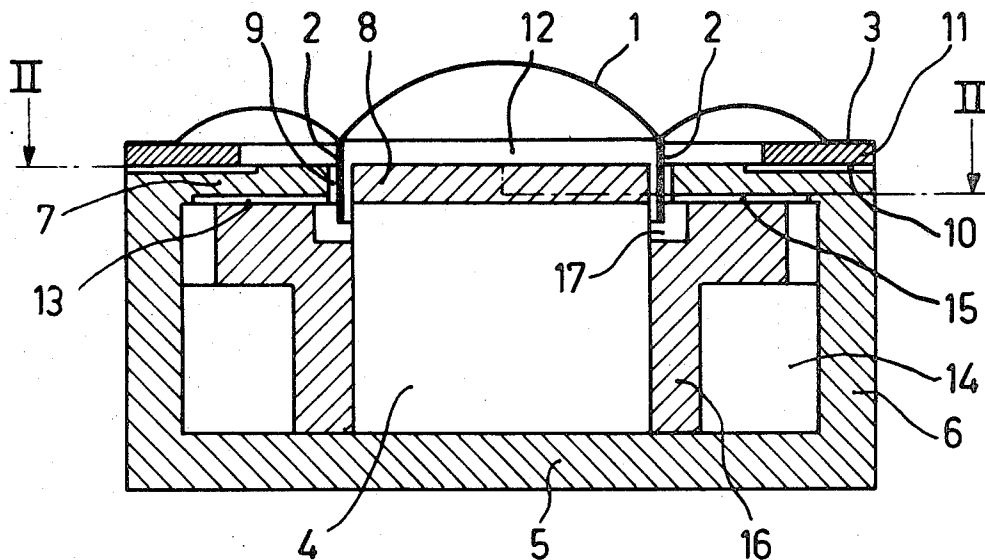
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[57] **ABSTRACT**

Electrodynamic microphone provided with a diaphragm having a moving coil which is disposed in the active air-gap of a magnet system.

The air volume behind the diaphragm is connected to acoustic resistances. Each acoustic resistance comprises a groove which is pressed in a part of the magnet system made of a sintered material and is covered by a cover plate. The advantage is that in manufacture by mass-production methods acoustic resistances having very small tolerances are obtained.

**10 Claims, 2 Drawing Figures**



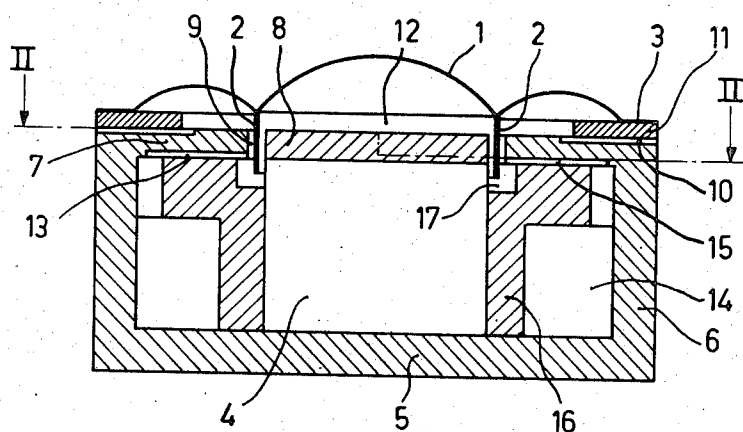


Fig.1

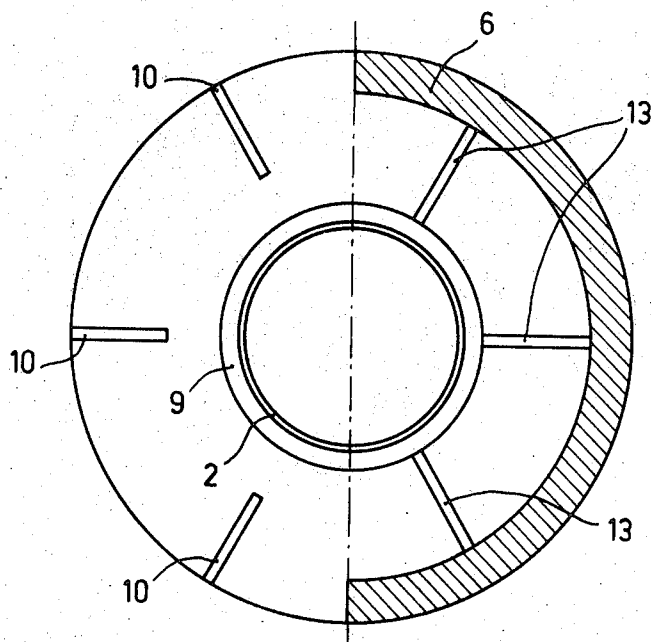


Fig.2

# ELECTROMAGNETIC MICROPHONE INCLUDING AT LEAST ONE ACOUSTIC RESISTANCE

The invention relates to an electrodynamic microphone provided with a diaphragm to which a moving coil is attached which is suspended in the active air-gap of a magnet system, the volume of air behind the diaphragm being connected with at least one acoustic resistance.

Such a microphone is described in U.S. Pat. No. 3,141,070.

In this microphone the acoustic resistances take the form of damping materials disposed in ducts.

The damping materials may be provided in the form of plugs pressed from sintered granules. Alternatively the orifices of the ducts may be closed by pieces of gauge. This method of providing the damping materials is time-consuming and hence expensive to manufacture by mass production methods.

A microphone according to the invention is characterized in that the acoustic resistance comprises a narrow groove which is pressed in a part of the magnet system made of a sintered material and is covered by a cover plate.

Thus the above described disadvantage of the known microphone construction is avoided. The part of the magnet system made of a sintered material is manufactured by pressing. In the press operation the required number of grooves which act as acoustic resistances may simultaneously be formed. The sintered material has the property that the pressed dimensions have very close tolerances.

It is particularly advantageous to form the pressed groove or grooves in the upper plate of the magnet system which together with the centrally arranged core defines the active air-gap.

The groove or grooves may be formed either in the upper surface or in the lower surface of the upper plate.

In the first case a communication path between the air volume behind the diaphragm and the atmosphere is established, which greatly influences the directional effect of a microphone.

In the second case the active air-gap communicates with the air chamber provided in the magnet system between the core and the pot.

Since the core of a magnet system usually is centered with respect to the top plates by a centering member made of a non-magnetic material, the upper part of this member is advantageously given a flat shape so that it can serve as the cover plate for the groove or grooves.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawing, in which:

FIG. 1 is a cross-sectional view of a microphone having an acoustic resistance according to the invention, and

FIG. 2 shows two radial sections of this microphone.

In FIG. 1 the microphone is of the electrodynamic type. A diaphragm 1 provided with a moving coil 2 is movably arranged and secured to the magnet system along its edge 3.

The magnet system comprises a core 4 which is made of a permanent-magnetic material and is axially magnetized.

The core 4 is centrally disposed on a bottom 5 of a pot 6 made of a sintered material. The pot 6 is closed by an upper plate 7 also made of a sintered material. The top plate 7 together with a soft-iron plate 8 disposed on the core 4 defines an active air-gap 9 in which the moving coil 2 is free to move.

The top plate 7 has six radial grooves 10 formed in its upper surface which are covered by a flat brass ring 11. Through the grooves 10 the air volume 12 behind the diaphragm 1 communicates with the outside atmosphere. The edge of the diaphragm 1 is secured to the ring 11.

The lower surface of the top plate 7 also has six radial grooves 13 formed in it which are shifted by an angle of 30° with respect to the grooves 10.

Both the grooves 10 and the grooves 13 are spaced apart at angles of 60° to one another. The grooves have a width of 1 mm and a depth of 150  $\mu$ m.

Through the grooves 13 the air volume 12 communicates via the air-gap 9 with an air chamber 14 defined by the core 4 and the pot 6.

The grooves 13 are closed by a flat upper surface 15 of a centering member 16 by which the core 4 is centered in the pot 6. The centering member 16 is provided with a recess 17 to prevent the moving coil 2 from striking the centering member in the case of large deflections of the diaphragm.

What is claimed is:

1. An electrodynamic microphone comprising, a magnet system including a central core enclosed within a magnetic member having a top plate made of a sintered magnetic material and arranged to define an air gap with said core, a diaphragm having a movably mounted coil secured thereto and positioned so that the coil is disposed within said air gap of the magnet system, said diaphragm being mounted to define an air volume space with the top portion of the magnet system, said top plate having an upper surface and a lower surface with a plurality of narrow grooves formed in at least one surface and dimensioned so as to function as an acoustic resistance and being in communication with said air volume space behind the diaphragm, and a cover plate covering a portion of said grooves.

2. An electrodynamic microphone as claimed in claim 1 wherein said grooves are formed in the upper surface of the top plate so as to form an acoustic communication path between the air volume behind the diaphragm and the external atmosphere, and the cover plate comprises a ring which covers said grooves and is made of a non-magnetic material and to which the diaphragm is secured along its edge.

3. An electrodynamic microphone as claimed in claim 1 wherein the grooves are formed in the lower surface of the top plate, and the cover plate forms a part of a centering member made of a non-magnetic material.

4. An electrodynamic microphone as claimed in claim 1 wherein said grooves are disposed radially about the central core in the upper surface of the top plate so as to form a plurality of acoustic communication paths between said air volume space and the external atmosphere.

5. An electrodynamic microphone as claimed in claim 1 wherein said core and magnetic member are disposed so as to form together an annular air chamber and wherein said grooves are radially disposed about the central core in the lower surface of the top plate so

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as to form a plurality of acoustic communication paths between said air volume space and the air chamber.

6. An electrodynamic microphone as claimed in claim 1 wherein said central core comprises a cylindrical axially magnetized permanent magnet and said magnetic member comprises a sintered pot core.

7. An electrodynamic microphone as claimed in claim 1 wherein said core and magnetic member are disposed so as to form together an annular air chamber and said grooves are radially disposed in both the upper and lower surfaces of the top plate with the grooves in the upper surface angularly offset from the grooves in the lower surface, the grooves in the upper surface forming a plurality of acoustic communication paths between the air volume space and the external atmosphere and the grooves in the lower surface forming a second plurality of acoustic communication paths between the air volume space and said annular air chamber.

8. An electrodynamic microphone as claimed in claim 1 wherein said grooves are symmetrically disposed around the top plate through an angle of 360°, said grooves having a width of approximately 1 millimeter and a depth of approximately 150 micrometers.

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9. An electrodynamic microphone comprising, a magnetic circuit including a cylindrical central magnetic core enclosed by a magnetic pot core having an annular top plate made of a sintered magnetic material and arranged to define an air gap with said central core, at least one element of said magnetic circuit being permanently magnetized to produce a magnetic field in the air gap, a vibratory system including a diaphragm having a movably mounted coil secured thereto and positioned so that the coil is disposed within said air gap, said diaphragm being positioned to define an air volume space with the top part of the magnetic circuit, said top plate including a plurality of narrow grooves dimensioned to function as an acoustic resistance in communication with the air volume space behind the diaphragm, and a cover plate covering a portion of said grooves to form therewith a plurality of tubular ducts.

10. An electrodynamic microphone as claimed in claim 9 wherein said cover plate comprises a non-magnetic ring adjacent the upper surface of the top plate and the grooves are radially disposed in the upper surface of said top plate.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,790,724 Dated February 5, 1974

Inventor(s) GERRIT SCHENKEL

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

TITLE PAGE

below "Foreign Application Priority Data" cancel

"Apr. 1, 1971" and insert -- April 14, 1971 --;

Signed and sealed this 21st day of May 1974.

(SEAL)  
Attest:

EDWARD M. FLETCHER, JR.  
Attesting Officer

C. MARSHALL DANN  
Commissioner of Patents