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H. FISCHER

ELECTRICAL SOUND TRANSMITTING AND RECEIVING APPARATUS

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Fig. 1

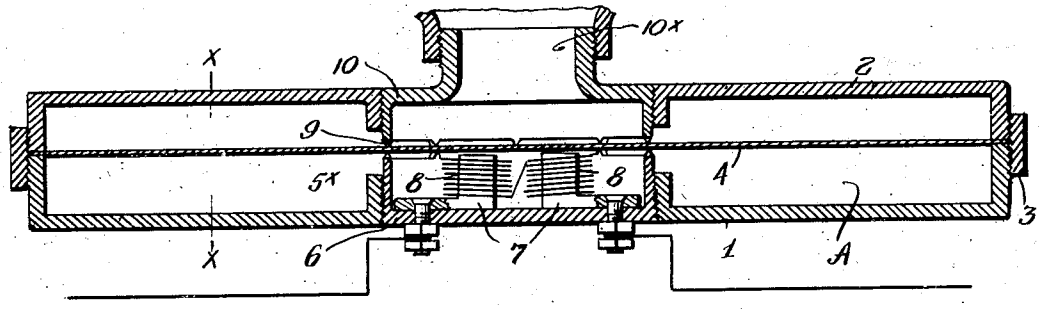



Fig. 2

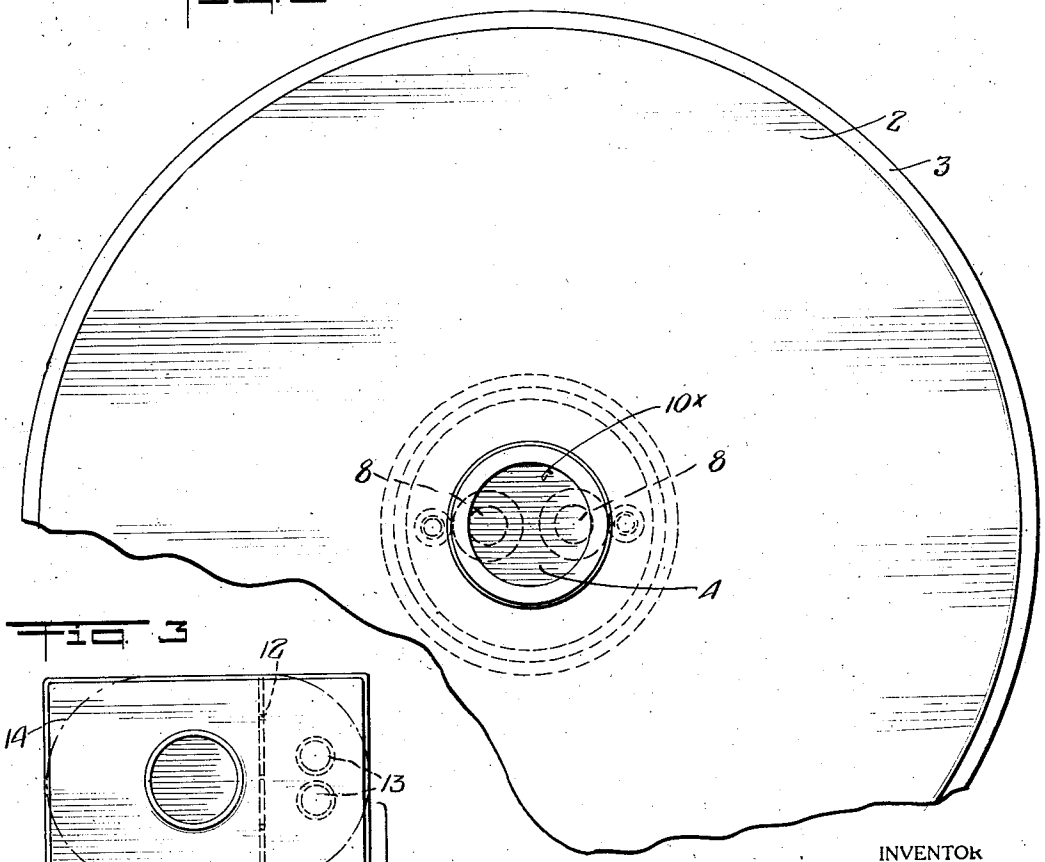



Fig. 3




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# UNITED STATES PATENT OFFICE.

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## ELECTRICAL SOUND TRANSMITTING AND RECEIVING APPARATUS.

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The object of the present invention is to provide a sound receiving or transmitting apparatus employing a diaphragm actuated by electric waves or impulses in conjunction with means for securing reaction of the diaphragm under conditions ideal for both the high tones and the low tones of the scale and for reproduction of said tones without distortion.

The invention will be understood by reference to the following specification in connection with the accompanying drawing, in which—

Figure 1 is a sectional elevation of a sound transmitting apparatus constructed in accordance with the improvement;

Figure 2 is a fragmentary plan view of the apparatus; and

Figure 3 is a diagrammatic view in plan and transverse section illustrating a modified form of apparatus within the invention.

Referring to the drawings, the embodiment illustrated in Figures 1 and 2 comprises a casing A, having a lower annular member 1 and an upper annular member 2, the two at their outer marginal faces being threaded to receive a connecting ring 3. Clamped between members 1 and 2 is a diaphragm 4. Intermediate its length the diaphragm rests upon the annularly arranged points $5^x$ of a cup-shaped member 6 threaded within casing member 1. The cup 6 encloses an electromagnet having the poles 7, the magnet being energized through the wires 8 leading to the means for receiving the sound vibrations, assuming that the apparatus illustrated in the figure is employed as a sound receiving and reproducing instrument, as for example the loud speaker of a radio receiving apparatus.

Opposite the points $5^x$ of cup 6 are like points 9 of an annular member 10 threaded within casing member 2. Points 9 are in contact with the diaphragm 4. Member 10 is provided with an outlet $10^x$ for the sound vibrations, to which outlet may be connected a horn or other amplifying device, if desired.

The diaphragm 4 in the embodiment of the invention illustrated in Figures 1 and 2 of the drawing is so mounted as to have a central portion, bounded by the points $5^x$, 9, of less area than the surrounding portion, and the said central portion is adapted for reproduction of the high notes of the scale represented by rapid vibrations which are relatively strong. That portion of the diaphragm exterior the points $5^x$, 9, provides means for acting upon the low notes of the scale, represented in a receiving device by slow vibrations which are relatively weak. Notes which would be damped or distorted by the fact that the diaphragm line between the pole pieces and the points $5^x$, 9, is too short for their slow vibration and low force, will be ideally reproduced by the relatively wide and flexible area of the diaphragm surrounding the said points. Furthermore, the points $5^x$, 9 act as fulcrums to enable the magnification of vibrations exerted upon the diaphragm at the centre thereof, the vibrations increasing in length from the points to the line $x$—$x$, Figure 1, and then decreasing toward the outer surface of the diaphragm. Not only are over-tones reproduced which in ordinary reproducing devices are entirely damped and lost, but the volume of reproduction is very greatly increased by the invention.

It will be understood that various modifications may be made in the embodiment of the invention illustrated in Figures 1 and 2 of the drawings, without departing from the spirit of the invention. One modification I have illustrated in Figure 3. In that modification a rectangular casing is employed and the diaphragm is rectangular being clamped in a suitable manner along its outer marginal faces. At one side of its centre the diaphragm 11 rests upon a number of points 12, the upper member of the casing being provided with a number of corresponding opposite points $12^x$. To the right of the points $12^x$ are the pole pieces 13. In this embodiment of the device that part of the diaphragm to the right of the points 12, $12^x$ provides means for acting upon the high notes of the scale and that portion of the diaphragm to the left of the points provides means for acting upon the low notes of the scale having less resistance to the action of magnetic waves. The pole pieces act with greater leverage upon the larger area to the left of the points, the points acting as fulcrum members.

The casing may be shaped as desired, as also the diaphragm. For example, the casing and diaphragm may be shaped in an

oval design as indicated by the dotted lines 14, Figure 3.

The annular line of fulcrum points may be substituted by upper and lower rings, each having a somewhat sharp edge contacting with the diaphragm. Also in the construction shown in Figure 3, the points may be substituted by straight sharp-edge fulcrum bars one at the top and one at the bottom of the diaphragm the sharp edges directly engaging the latter.

The centre portion of the diaphragm may be of magnetic material and the surrounding portion of non-magnetic material. For example, the centre portion may be iron, and the outer portion fibre, wood or a composition or some other non-magnetic material, or even of magnetic material differing in vibratory characteristics from the iron and suitably connected to the centre portion. Also, the centre portion may be non-magnetic and connected by a needle or other means with a primary vibratory diaphragm. If desired, the outer edge of the diaphragm may be left free, or the diaphragm may be clamped at spaced points around its periphery.

I claim:

1. An electrical sound transmitting and receiving apparatus, comprising a casing, a diaphragm supported in said casing, an electromagnet, and opposed co-acting fulcrum members for the opposite faces of the diaphragm disposed intermediate the pole piece of the magnet and the outer margin of the diaphragm and dividing the latter into two zones, the lesser zone being intermediate the magnet and the fulcrum members.

2. In electrical sound transmitting and receiving apparatus, a casing, an electromagnet, a diaphragm within the casing, co-acting fulcrum devices for the opposite faces of the diaphragm intermediate a lesser area thereof directly acted upon by the magnet and a greater area reactively actuated through the vibrations of the lesser area.

In testimony whereof, I have signed my name to this specification.

HERMANN FISCHER.