

May 17, 1932.

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1,859,170

ELECTROSTATIC TELEPHONE AND MICROPHONE

Original Filed Dec. 1, 1926

Fig. 1

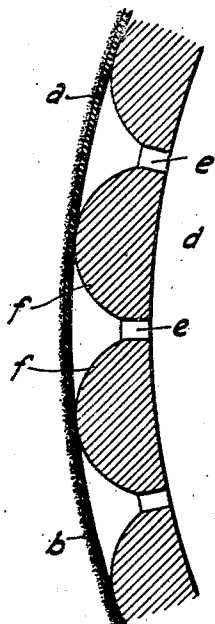
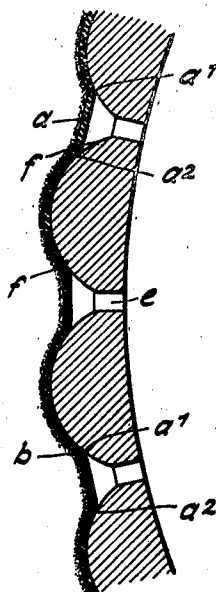


Fig. 2



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ELECTROSTATIC TELEPHONE AND MICROPHONE

Original application filed December 1, 1926, Serial No. 152,026, and in Germany September 30, 1926.
Continued as Serial No. 185,622 filed April 21, 1927. Divided and this application filed October 6, 1927. Serial No. 224,454.

This invention relates to improvements in non-resonant diaphragms for electrostatic sound translating systems.

This application is a continuation of my application Ser. No. 152,026, filed December 1, 1926 for non-resonant diaphragms, embodying the original Fig. 6 of that application, or Fig. 4 of the divisional application Ser. No. 185,622 filed April 21, 1927, and is therefore a division of the latter application.

It is known in such electrostatic sound translating systems, that in the use of a vibratory diaphragm in combination with a rigid perforated condenser element, particularly when the distance between the diaphragm and the rigid element is less at the peripheries thereof than at their centers, that, in the vibration of the diaphragm, distortion occurs which prevents an otherwise high quality and natural reproduction or translation of the tones.

An object of the invention is to provide a diaphragm structure which will overcome this disadvantage in an extremely simple but highly effective manner.

With this and other equally important objects and advantages in view, the invention resides in the certain new and useful combination, construction and arrangement of parts as will be hereinafter more fully described, set forth in the appended claims, and illustrated in the accompanying drawings in which:—

Figure 1 is a fragmentary sectional view of an assembly of the parts forming the device and showing the diaphragm in a state of repose, and,

Figure 2 is a similar view, but showing the diaphragm under vibratory tension.

Referring to the drawings, the invention, as exemplified therein, is generally constituted in a rigid condenser plate which is perforated in a manner that the holes passing therethrough are gradually widened in the outward direction and have their outer wall portions rounded for mergence into the front face of the plate. A suitable diaphragm is laid over the front face of the condenser plate, substantially as shown. Now if a proper voltage, necessary for the working of the

diaphragm, is impressed on the condenser plate, the parts of the diaphragm at the said openings will vibrate and move inwardly thereof and touch the inner rounded walls of the same in a greater distance from the centerline of the holes than in the state of rest of the diaphragm. Thus, for reproducing sounds, not the whole diaphragm will vibrate, but only circular parts thereof at the outer ends of the holes of the rigid condenser plate.

The diaphragm *a* consists of a very flexible elastic skin or member, such as unstressed or only lightly stressed rubber of about 0.1 mm. of thickness, to the outside of which finely reduced conducting material *b*, such as carbon granules of various degrees of coarseness are applied, by means of an adhesive medium, such as a rubber solution. This layer of conducting material should be so thin, that the elasticity of the diaphragm is not impaired in any case.

The holes *e* in the condenser plate *d*, on which the rubber skin *a* rests, are outwardly widened and have their outer wall portions rounded off as before stated and as indicated at *f*.

If now for reproducing sounds the necessary voltage is impressed on the condenser, the diaphragm *a* will be attracted against the plate *d*, so that portions thereof will be partly drawn into the holes *e*, substantially as shown in Fig. 2 and will touch the inner walls of the holes *e* in different distance from the center line of the holes, according to the impressed voltage. If the diaphragm *a* is set into vibration for reproducing sounds, only circular parts of the diaphragm, closing the outer flared ends of the holes, as indicated at *a'* *a''* in Fig. 2, will vibrate. Each part of the diaphragm moves therefore independently of the other, and distortion, otherwise preventing high quality reproduction of the tones, cannot occur.

I claim:

1. A non-resonant diaphragm for an electrostatic sound translating system in combination with a flexible elastic diaphragm coated on the outside with a thin layer of finely reduced conducting material, this layer con-

stituting one element or an electrostatic condenser, the other element being constituted by a rigid perforated curved metallic plate supporting the diaphragm, the holes of the plate being widened towards the outside.

2. A non-resonant diaphragm for an electrostatic sound translating system in combination with a flexible elastic diaphragm, coated on the outside with a thin layer of conducting material, constituting one element of an electrostatic condenser, the other element of the same being constituted by a rigid perforated curved metallic plate, supporting the diaphragm, the holes of the plate being widened towards the outside and rounded, so that the diaphragm with varying impressed voltage of the condenser will touch the walls of the holes in different distance from the center line of the holes and will vibrate not as a whole, but only in circular parts of the diaphragm, surrounding the holes of the plate.

3. An acoustic device comprising a foraminated rigid plate, a di-electric diaphragm stretched over the plate and maintained in intimate contact therewith, and a flexible conducting material covering the opposite side of diaphragm from its side of intimate contact with the plate.

4. A sound reproducer comprising a foraminated metallic plate, said plate presenting a spherical surface, a flexible di-electric diaphragm uniformly stretched over the spherical surface of the plate and held in intimate contact therewith, and flexible conducting material disposed in intimate contact with the opposite side of the di-electric diaphragm.

5. A sound reproducer comprising a perforated rigid plate presenting a spherical surface, a diaphragm supported by said plate and maintained in intimate contact and tensioned therewith, said diaphragm being constructed of a material which is dielectric and sound deadening, and a flexible conducting coating maintained in intimate contact with the diaphragm on the side opposite the rigid spherical plate.

6. A sound reproducer comprising a pair of co-operating electrodes separated by an interposed solid dielectric, one of said electrodes being a relatively stationary vented member, and the other forming a portion of a freely flexible, substantially non-resonant diaphragm, said diaphragm and said stationary member being maintained in contact at a multiplicity of portions distributed over their cooperating surfaces and spaced apart at portions adjacent said contacting portions to define a multiplicity of diaphragm sections, the spacing between said diaphragm sections and said stationary member progressing gradually from zero to maximum in said diaphragm sections.

7. A sound reproducer comprising a pair

of co-operating electrodes separated by an interposed solid dielectric, one of said electrodes forming a portion of a freely flexible, substantially non-resonant diaphragm, and the other being a relatively stationary vented member having a multiplicity of projections distributed over its area, said diaphragm and said stationary member being maintained in contact at said projections and being spaced apart at other portions adjacent said projections to define a multiplicity of diaphragm sections, the spacing between said diaphragm and said stationary member progressing smoothly and gradually from minimum to maximum in said diaphragm sections.

8. A sound reproducer comprising a pair of co-operating electrodes separated by an interposed solid dielectric, one of said electrodes forming a portion of a freely flexible, substantially non-resonant diaphragm, and the other being a relatively stationary member having a multiplicity of openings distributed over its area and having a multiplicity of projections interspersed between said openings, said diaphragm and said stationary member being maintained in contact at said projections and being spaced apart at other portions adjacent said projections, the space separations between said diaphragm and said stationary member increasing gradually from minimum, at said projections, to maximum at said adjacent spaced portions.

9. A sound reproducer comprising a pair of co-operating electrodes, separated by an interposed solid dielectric, one of said electrodes forming a portion of a freely flexible, substantially non-resonant diaphragm, and the other being a relatively stationary member having a multiplicity of openings distributed over its surface, said diaphragm and said stationary member being maintained in contact at a multiplicity of portions distributed over their cooperating surfaces and spaced apart at other portions adjacent said contacting portions, the space separation progressing gradually and recurrently from minimum to maximum.

10. A sound reproducer comprising a pair of cooperating electrodes separated by an interposed solid dielectric, one of said electrodes being a relatively stationary foraminated member, and the other forming a portion of a soft, substantially non-resonant diaphragm, said diaphragm and said foraminated member having a multiplicity of portions distributed over their cooperating surfaces, maintained in contact, and a multiplicity of portions adjacent said contacting portions spaced from each other when not in operation but arranged to contact during vibration of said diaphragm, whereby the area of said diaphragm in contact with said foraminated member varies in operation.

11. A sound reproducer comprising a pair of co-operating electrodes separated by an

interposed solid dielectric, one of said electrodes being a relatively stationary foraminated member provided with projections distributed over its area, and the other forming a portion of a soft and substantially non-resonant diaphragm, said diaphragm being maintained in contact with said foraminated member at said projections and being spaced therefrom at a multiplicity of portions adjacent said projections when not in operation, and so constructed and arranged that during vibration of said diaphragm the area of said diaphragm in contact with said foraminated member varies in operation.

12. A sound reproducer comprising a pair of co-operating electrodes separated by an interposed solid dielectric, one of said electrodes being a relatively stationary foraminated member provided with a multiplicity of projections distributed over its area, and the other forming a portion of a soft and substantially non-resonant diaphragm, said diaphragm being maintained in contact with said foraminated member at said projections and being spaced therefrom at a multiplicity of portions adjacent said projections, the distance of said spacing varying gradually from minimum to maximum in said spaced portions, whereby the area of said diaphragm in contact with said foraminated member varies as the potential between said electrodes is varied.

13. A sound reproducer comprising a pair of co-operating electrodes separated by an interposed solid dielectric, one of said electrodes being a relatively stationary foraminated member provided with projections distributed over its area, and the other forming a portion of a soft and substantially non-resonant diaphragm, said diaphragm being maintained in contact with said foraminated member at said projections and being normally spaced therefrom at a multiplicity of portions adjacent said projections when not in operation, the separation between said diaphragm and said foraminated member varying recurrently and gradually from minimum to maximum, whereby when the potential between said electrodes is varied, the area of said diaphragm in contact with said stationary member varies by expansion or contraction at the boundaries of said spaced portions.

14. A sound reproducer comprising a pair of co-operating electrodes separated by an interposed solid dielectric, one of said electrodes forming a portion of a soft and substantially non-resonant diaphragm, and the other being a relatively stationary foraminated member, said foraminated member having a multiplicity of projections distributed over its surface and having valleys interspersed between said projections, said projections and valleys being connected by gradually sloping portions, and said diaphragm being normally

maintained in contact with said foraminated member only at said projections, whereby, when the potential between said electrodes is changed, the boundaries of said contacting portions change.

15. A sound reproducer comprising a pair of co-operating electrodes separated by an interposed solid dielectric, one of said electrodes forming a portion of a soft and substantially non-resonant diaphragm, and the other being a relatively stationary member having a multiplicity of openings distributed over its area, said diaphragm being supported at a multiplicity of portions distributed over said stationary member to form a multiplicity of diaphragm sections, the spacing between said diaphragm and said stationary member in each diaphragm section varying gradually from minimum to maximum.

16. A sound reproducer comprising a pair of electrodes and an interposed dielectric, one of the electrodes being relatively stationary and having an uneven surface provided with vents, the other of said electrodes and said dielectric being portions of a flexible non-resonant diaphragm contacting at spaced loci on said surface, said diaphragm being spaced inter-loci from said surface, the inter-loci spaces varying gradually from zero to maximum.

17. A sound reproducer comprising a pair of co-operating electrodes separated by an interposed dielectric, one of said electrodes forming a portion of a substantially non-resonant diaphragm and the other being a relatively stationary member having a multiplicity of openings distributed over its area, the spacing between said diaphragm and said stationary member being such that in a section taken across said reproducer, said diaphragm and said stationary member are in contact at a multiplicity of loci spaced apart, and out of contact intermediate said loci, the spacing varying gradually from zero at said loci to maximum intermediate said loci.

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

EUGEN REISZ.