June 23, 1931. C. O. TAYLER 1,811,482

ELECTROSTATIC ACOUSTIC AMPLIFYING DEVICE

Filed April 9, 1930

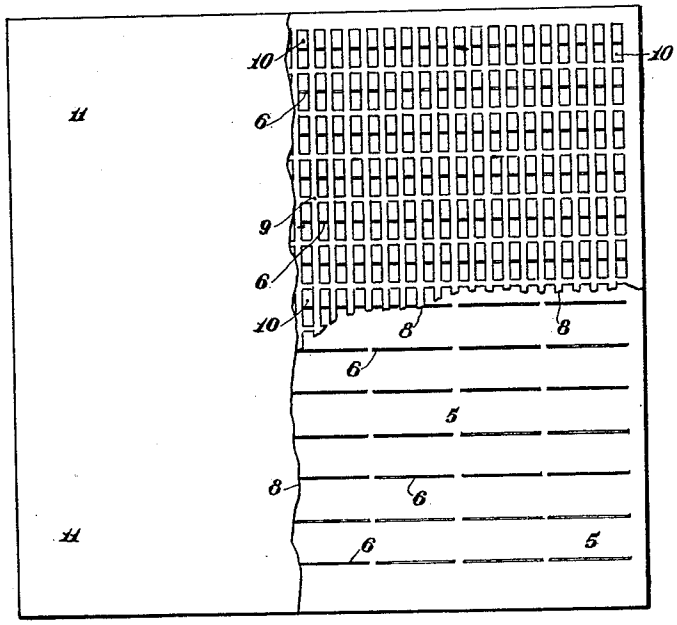


Fig.1

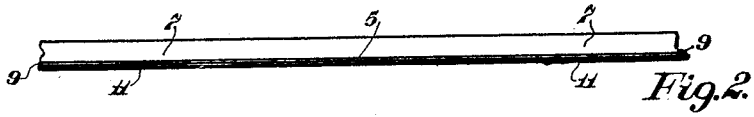


Fig.2.

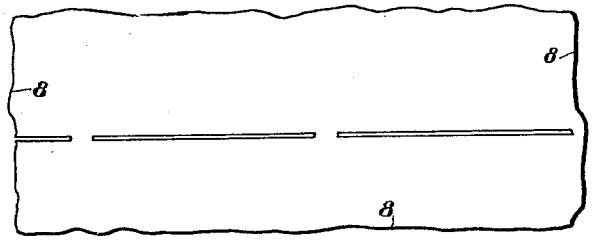


Fig.3.

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UNITED STATES PATENT OFFICE

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ELECTROSTATIC ACOUSTIC AMPLIFYING DEVICE

Application filed April 9, 1930. Serial No. 442,907.

This invention relates to electrostatic loud speakers, for radios, phonographic recordings for theatres, and other like acoustic amplification purposes.

Its object is the production of devices of this character which are both simpler and of more robust construction and therefore have less liability to derangement than those of the type hitherto constructed, the parts of which are frequently so delicate both in form and substance as to give rise to defects and difficulties when least expected and which are traceable to these peculiarities of structure.

With some apparatus of this type it has been necessary to use a metal baseplate of cellular formation, where the plate member consists of numerous small apertures in regular and spaced apart relation, and so proportioned that the intervening space separating adjacent apertures is relatively narrow and consequently weak.

In other apparatus the baseplate has somewhat the same general character but the individual cells take the form of receptacles which have punctured incisions, and to the effect of which certain objections may in my opinion be taken.

My invention aims to eliminate this inherent weakness of the base member, and to impart to the apparatus as a whole a more definite mechanical structure which lends itself to mass production methods, besides having more inherent efficiency with direct adaptability to adjustment for acoustic reasons.

My device has three essential elements.

A substantial metallic baseplate having a series of relatively narrow slits in parallelism.

An insulating member comprising a sheet of thin hard rubber or other like effective insulator, this sheet being effectively cemented to the surface of the base member and itself providing the resonant cavities of the device. These latter consist of clean edged apertures at spaced apart intervals which provide an intervening strip of insulation of the order of half the width of the aperture. This seried arrangement of apertures covers the entire effective area of the sheet. It will thus be seen that these apertures in combination with adjacent members—each of which is effectively cemented to one surface of the insulating sheet—form shallow cavities held in comparative rigidity, each of which becomes a resonant unit of the device. It should here be noted that each of these cavities obtains an atmospheric outlet through one of the aforesaid slits in the base member, which slit crosses the cavity substantially at its centre, and provides by the adjustment of its width a delicate and effective means for readily varying the resonant qualities of the cavity according to requirements. This feature I regard as highly important and it may be classed as a salient point in the device.

The third element consists of a sheet of metal leaf, such as tin foil or its equivalent, and having an effective area equal to that of each of the other members. This third element may probably with advantage be coated with a film of fine insulating varnish on the surface which opposes the cellular insulating sheet before the two surfaces are finally cemented together.

The operative area of each of the three members is the same, and the inner surface of each of the metallic members is preferably coated with a thin film of high grade insulating varnish before the three members are cemented firmly together. This insulating film is a necessary precaution against the possibility of sparking between the members, due to the comparatively high voltage employed.

When the members are thus compacted together a comparatively rigid compound structure is produced, and the base member being of relatively substantial form may readily be provided with means for uniting adjacent units in multiple, so that they may be con-

nected to obtain any desired value of sound amplification. Should it be deemed necessary to introduce a slight tensional strain upon the vibrating member, means for providing this to the utmost degree of refinement are available by cambering the surface in two directions—one right angular to the other—and providing means for measuring and regulating the camber as desired.

However as the tensioning of the foil induces a higher frequency the ready means of obtaining it is only indicated as a remote possibility, as it would not be required to any appreciable extent—the frequency calibration of my device being obtained by a modification of the width of the slits in the base member.

The invention is more clearly described by the aid of the drawings accompanying and forming a part of this application, and in which

Fig. 1 is a surface view of one unit of my device, showing portions of the two members broken away so as to expose the member underneath.

Fig. 2 is an end view—exaggerated to diagrammatic form so as to show the relative positions of the various members, and

Fig. 3 is a fragmentary view of the base member to an enlarged scale.

In these drawings the numeral 5 indicates the inner surface of the metallic base member, 6 are narrow incisions or slits therein, 7 is one of the rightangularly turned edges which are available for securing adjacent units on any one or more of the four sides, 8 indicates the broken edge of the part shown. The cellular insulating member is shown at 9 and in the example indicated is of the nature of hard rubber with clean edged apertures of rectangular form 10. The members 5 and 9 are so positioned that the narrow incisions 6 are transverse and central of the apertures 10 in the respective members, the sound waves from the cavities formed or bounded by the rectangles 10 find egress through the incisions 6 and these are available for calibration purposes by slightly altering their width and thus effecting a corresponding alteration in the frequency of the vibrating member. This latter is indicated at 11 and consists of a sheet corresponding in size with that of the two other members 5 and 9 but of metal foil such as tin foil or its equivalent in some form of metallized film. The inner surface of this foil is preferably coated with a thin film of high grade insulating varnish, the inner surface of the base member 5 being similarly treated, and the three members effectively cemented together.

In operation, suitable terminals are affixed to the two metallic members, and the base member 5 is provided with a positive bias charge varying between the limits of 200 to 500 volts, the instrument being connected in the usual way and arranged with the base member inwards.

The unit or any number of them may thus be readily mounted in suitable framework, and may form the panel of a cabinet or on a wall of an auditorium.

Having now fully described the nature of my said invention, what I claim and desire to secure by Letters Patent, is:

1. In an electric static acoustic amplifying device the combination comprising, a base member consisting of a sheet of metal rectangular in form and having a series of parallel lines of narrow slots formed therein, said slots being in spaced apart relation in said lines and positioned transversely of said sheet, said member being coated with insulating varnish on its operative edges and surface, a sheet of insulating fabric of corresponding rectangular form and size and having a series of clean edged rectangular apertures in spaced apart relation and positioned side by side and end towards end and in such spaced relation that the width of insulation between adjacent apertures is less than half the width of the said aperture, the relative positions of the two said sheet members being such that the narrow slots in the one span the apertures in the other at a point intermediate of their ends, a third sheet member corresponding in form and size with the other said members and comprising a film of super-thin metal, said metal film having a coating of insulating varnish on one surface, the varnished surfaces of the two metallic members aforesaid being firmly cemented to the respective surfaces of the said insulating member, whereby when an electric wave impulse of suitable frequency is passed through the two said metallic members a sound vibration will be set up by the said super-thin member within the said apertures and emitted through the said narrow slots in addition to the sound propagated by the outward face of the vibrating member.

2. In an electro-static acoustic amplifying device the combination comprising three sheet members of substantially similar contour and surface area, the said three members being arranged in series surface to surface, the inner one of the said members being of high grade insulating fabric and having a series of clean-edged apertures in closely spaced relation occupying the entire operative area of the said sheet members, one of the outer of the said three members being adapted to form the base member of the device and being of sheet metal and having a series of narrow incisions so positioned that when the last said member is in operative position with regard to the said insulating member the apertures in the latter are traversed by some portion of the said narrow incisions in the base member, the other outer member of the three said members being of super-thin metal, the

three said members being effectively cemented together, whereby the cavities formed by the apertures in the said insulating member in combination with the two other said members become resonant under the vibration set up by the said super-thin member when an electric wave impulse of suitable frequency is passed through the two said metallic members.

In testimony whereof I have hereunto affixed my signature.

CLIVE OSBORNE TAYLER.