Nov. 18, 1941. G. LAKHOVSKY 2,263,408

MEANS FOR IMPROVING THE SOUND EMITTED BY MICROPHONES, LOUD-SPEAKERS, AND THE LIKE

Filed Aug. 21, 1936 2 Sheets-Sheet 1

Fig. 1.

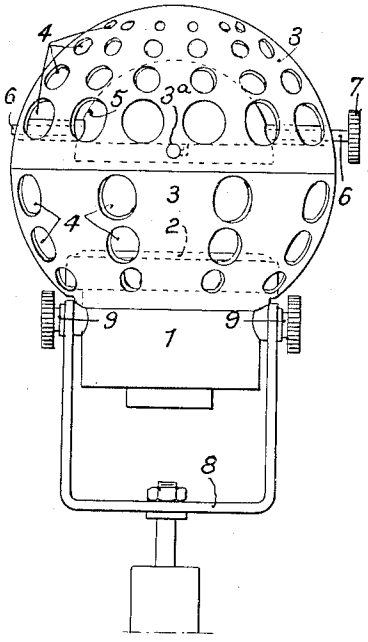

Fig. 2.

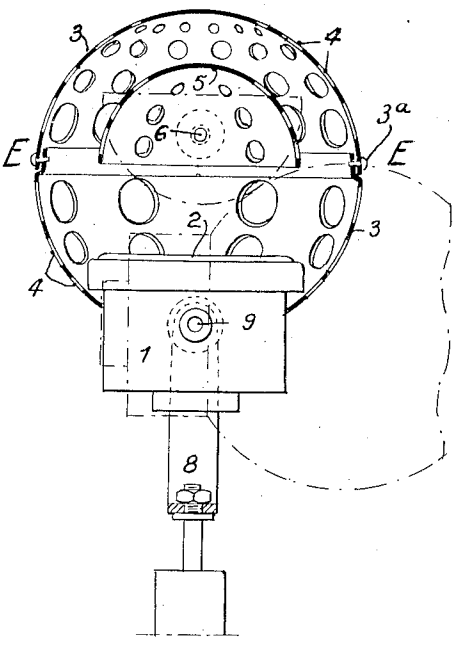

Fig. 3.

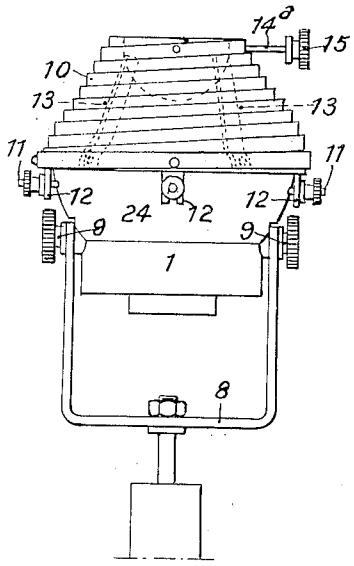

Fig. 4

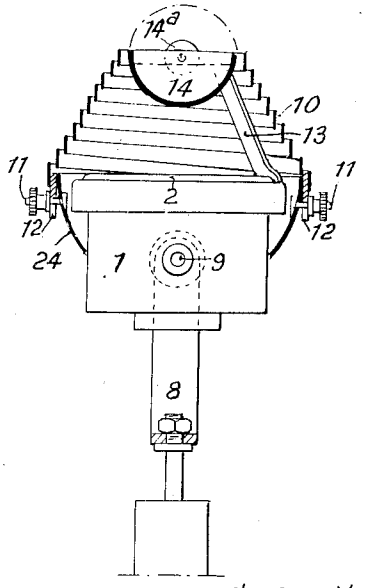

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Fig. 5.

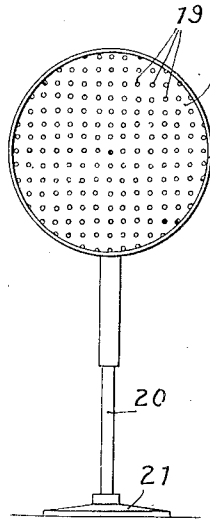


Fig. 6.

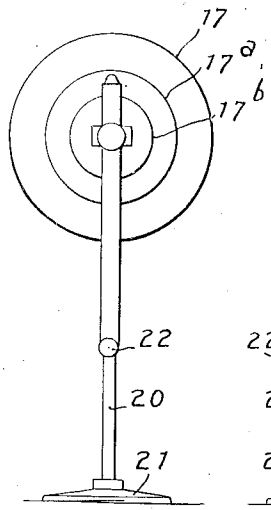


Fig. 7.

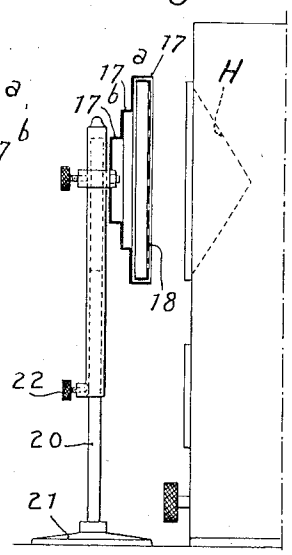


Fig. 10

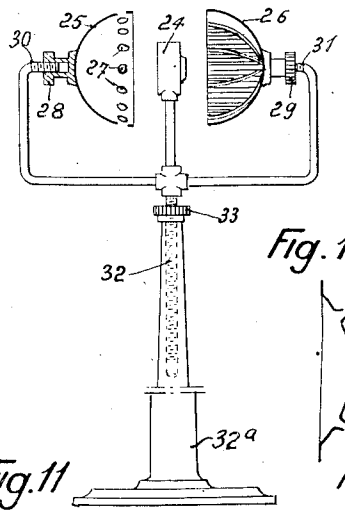


Fig. 8.

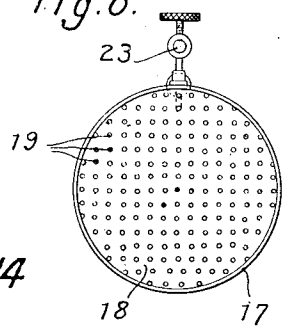


Fig. 9.

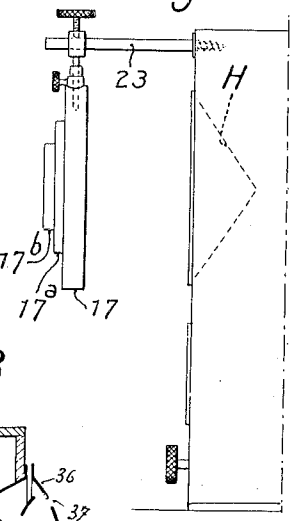


Fig. 14

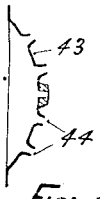


Fig. 13

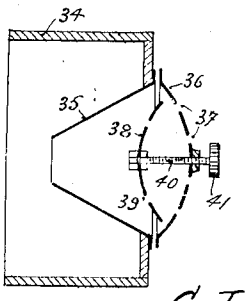


Fig. 11

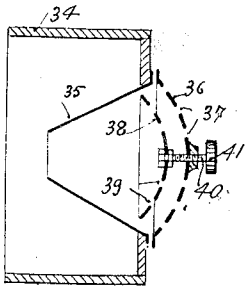
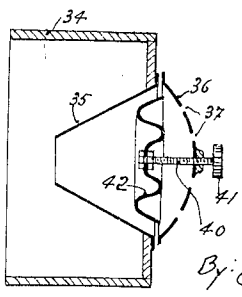


Fig. 12



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Patented Nov. 18, 1941

2,263,408

UNITED STATES PATENT OFFICE

2,263,408

MEANS FOR IMPROVING THE SOUND EMITTED BY MICROPHONES, LOUDSPEAKERS, AND THE LIKE

Georges Lakhovsky, Paris, France

Application August 21, 1936, Serial No. 97,255
In France April 11, 1936

1 Claim. (Cl. 181—34)

The present invention has for its object means for improving the sound emitted by microphones, loudspeakers and the like, by creating, around or in the vicinity of the vibrating part, a field of stable neutral air.

It is known that microphones, even in the most improved present constructions, do not collect always sounds with the fidelity to which the ear is accustomed when hearing directly, because the sounds emitted in a hall or in the open air, strike against all the surrounding objects, for example, the chairs, the musical instruments, such as a piano, violoncello, and other objects which are in the studios in which they are being used and even the walls. All these obstacles, by sending back to the microphone the reflected vibrations, produce interference with the initial sounds and their harmonics, which results in a deformation of the voice end of the music. On the other hand, when a musical instrument is played in a hall or in the open air, the quality of the music varies and that which is head varies and, except in special conditions, is generally better in the first case than in the second case. The air enclosed in the hall, below a limited volume, vibrates in better conditions, whilst in the open the vibrations are rapidly lost, due to the unlimited space which is presented to them.

The means forming the subject of the present invention limit, to some extent, the vibrations in a volume of more stable air, so that this air, vibrating under better conditions, renders audible all the higher harmonics. The sounds emitted acquire thus greater relief and more purity.

The accompanying drawings represent, by way of example, various constructions in accordance with the invention.

Figs. 1 and 2 are two views, respectively a plan and a diametrical horizontal section, of one arrangement adapted to improve the working of a microphone.

Figs. 3 and 4 represent, the first an elevation, the second a view partly in section of a modified construction of the arrangements described with respect to Figs. 1 and 2.

Figs. 5 and 6 are respectively front and rear views of a same arrangement, of which Fig. 7 shows partly in section, the application of a loudspeaker.

Figs. 8 and 9 show modifications.

Fig. 10 shows partly in section and partly in elevation another arrangement for improving microphones.

Figs. 11 to 14 show sectional views of other methods of carrying the invention into effect in its application to loundspeakers.

Referring to Figs. 1 and 2:

Upon the casing 1 of a microphone 2 is mounted a sphere consisting, for example, of the assembly of two hemispherical shells 3—3 connected to one another by any appropriate means, for example a set of bayonet catches 3^a. This sphere which may be made of any suitable material, for example sheet metal is pierced with holes 4 the diameters of which may be decreasing from the equator E—E to the poles of the sphere. The microphone 2 is enclosed in the sphere and it is thus under the influence of a stable field of air.

If desired, there may be arranged in the interior of the sphere, a third hemispherical shell 5, of smaller dimension, which, carried by an axle 6, can when moved by a driving button 7 be rotated variably between two extreme positions for which the shell 5 turns either its concavity or its convexity towards the microphone 2.

The whole apparatus is supported, for example by means of a stirrup 8, with respect to which it may be more or less inclined by turning around an axle 9.

In the arrangements shown in Figs. 3 and 4 the microphone 2 is placed in the middle of a vibration chamber, at the back of the microphone, by a shell 24 and in front, by a spiral 10 capable of being inscribed in a cone or in a hemisphere. This spiral is fixed at its base, by any suitable means, upon the shell 24, in the example shown in the drawings by means of screws 11 which fix the carriers 12 of the spiral. The spiral might likewise be movable with respect to the microphone and be regulated, for example, by means of a central screw co-operating with two small bars. The successive coils of the spiral press upon arms 13 rigid with the base. Upon the upper coil there may be mounted a shell 14, for example hemispherical, capable of pivoting upon an axle 14^a controlled by a knurled button 15. The spiral may be made preferably by a metal strip having a certain amount of elasticity.

Figs. 5 to 9 represent devices for the improvement of the tone of loudspeakers.

The reflecting device comprises essentially a plate 17 of any appropriate contour.

This plate, for example made of sheet iron, in plastic or other suitable material, may be placed at the desired height in front of the cone of the diffuser or loudspeaker H, by moving it along a column 20 having a base 21 and set screw 22.

On the other hand, it is easy, by simply moving the plate **17**, to put it at the best distance from the diffuser or loudspeaker.

Without it being necessary to form holes in the plate, the two movements provide means to regulate the volume of stable air necessary for the maximum of purity in the sounds diffused by the apparatus.

It may be supposed, from this point of view, that the air located between the reflector and the diffuser, vibrates with such intensity that it restrains the reflected waves.

In the example shown, the plate **17** is made in such a manner as to form, in addition, a vibrating air chamber, the opening of which is closed by a wall **18**, pierced with holes **19**.

The back of this chamber may have several stages such as **17a**—**17b**.

In the example shown in Figs. 8 and 9 an analogous reflector is supported, with its face to the diffuser H, by a rod **23**, fixed to the diffuser, and along which it may be moved easily with a view to the determination of the best distance.

The devices shown in Figs. 5 to 9 offer, in addition, the advantage of being capable of being combined with all existing receiving apparatuses without necessitating any modification of them.

Finally it is known that, in a loudspeaker, diffuser or the like, the sonorousness is specially the result of the quality of the resonant case of the apparatus and of the volume of air which is between this case and rear part of the vibrating element.

In order to annihilate or reduce to a great extent the action of these factors, which may be detrimental, it is proposed, according to the invention, to enclose the vibrating part of the loudspeaker in an appropriate surrounding, for example not sonorous, the walls of which are at a convenient distance from the vibrating part. This wall is constituted in such a manner that the vibrating air escapes at the same time from the front part and from the rear part of the diffuser, by suitable openings.

Thus, the troublesome effect is suppressed which introduces, in known apparatus, the particular quality of sound which results from various causes, variable in one apparatus from another, namely: nature of the wood, volume of air in the sounding case, relative distance of the parts of the case and of the vibrating part, and other causes.

Fig. 10 shows a modification of the devices for improving microphones.

24 designates the microphone, **25** and **26** the air chambers of hemispherical form. The chamber **25** is formed with holes **27**. Knurled buttons **28** and **29** fitted on screw threaded rods **30** and **31** permit these chambers to be relatively adjustable. A screw **32** fitted in a base **32a** and a nut **33**, enables the height of the whole device to be regulated.

Figs. 11 to 14 show the application of the invention to apparatus such as loudspeakers, diffusers, talking machines and the like.

In Fig. 11, **34** represents the casing of the receiver, **35** the vibrating cone of the loudspeaker, **36** a reflector screen pierced with holes **37**. A second screen **38** is pierced with holes **39** arranged so as not to coincide with respect to the holes **37**. A screw threaded rod **40** with a controlling button **41** enables the relative position of the screens to be varied.

In Fig. 12 the parts described with respect to the preceding figure are marked with the same reference numerals. In this modification, the screen **36** is combined with a corrugated screen **42**, which may or may not be pierced with holes.

Fig. 13 corresponds with Fig. 11, but the screen **38** turns its concavity towards that of the screen **36**.

Fig. 14 represents in section a type of screen **43** according to the invention, and in which the openings **44** having outwardly presented edges which arrest, on the return, the laterally reflected vibrations, which allows the use of a second screen to be dispensed with.

I claim:

An apparatus for improving the sonorous effect of an acoustic device comprising two hollow substantially hemispherical parts having their concave surfaces facing each other arranged on opposite sides of the acoustic device, and an additional substantially hemispherical member disposed in the interior of one of said parts and mounted therein for pivoting movement.

GEORGES LAKHOVSKY.