July 13, 1926. 1,592,059

D. H. WIGGINS

TRANSMITTER FOR TELEPHONES AND THE LIKE

Original Filed March 16, 1923

FIG. 1

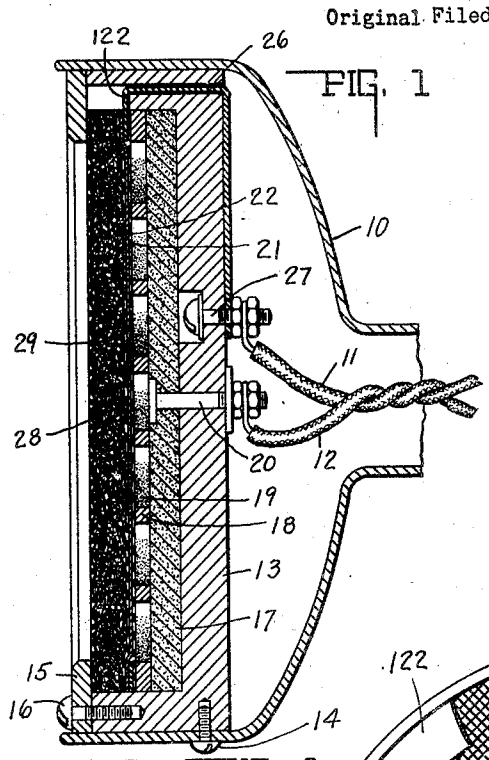


FIG. 2

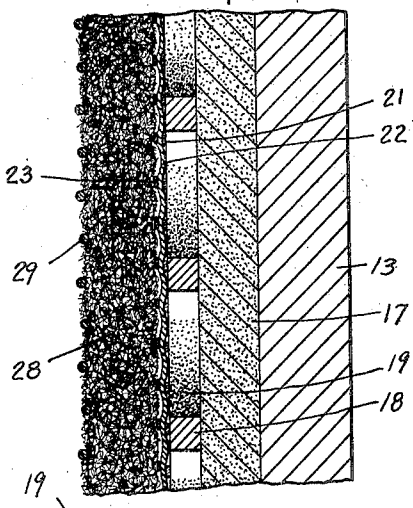


FIG. 3

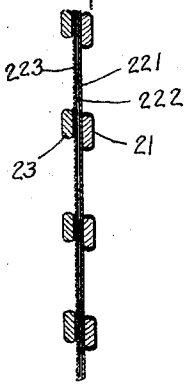


FIG. 4

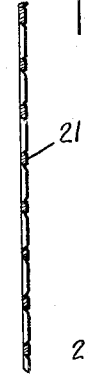
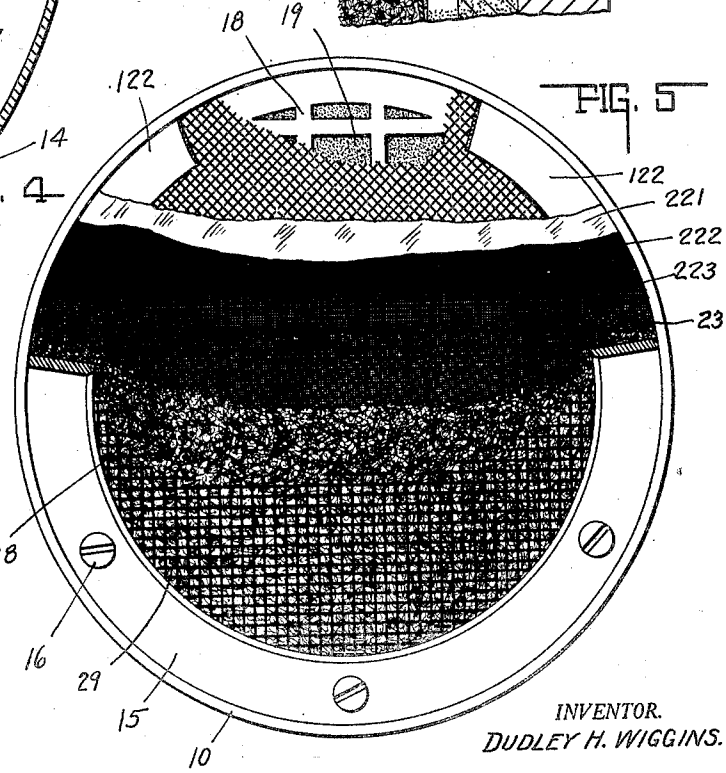


FIG. 5



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Patented July 13, 1926. 1,592,059

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TRANSMITTER FOR TELEPHONES AND THE LIKE.

Application filed March 16, 1923, Serial No. 625,437. Renewed April 5, 1926.

The object of this invention is to improve the transmitters for telephones and the like described and shown in my former application for Letters Patent on transmitter for telephones and the like, Serial No. 597,834, filed October 30, 1922. In the former transmitter the diaphragm member was a relatively thin pliable metal sheet, preferably gold foil, held in position between two wire screens or frames immediately in front of granular carbon in sectional holders, and the parts were held together under tension by a layer of steel wool. Said construction is operative and superior to any previously known transmitter, but I have improved said construction, particularly so far as the diaphragm is concerned. The principle of construction and mode of operation of this improved transmitter is the same as that in my former application, but instead of the gold foil diaphragm, I have provided a diaphragm which so far as at present advised is several times more efficient and satisfactory.

In my present improvement the diaphragm is formed by securing thin gold leaf to thin silk fabric so that they are practically one sheet. A diaphragm used as a medium to convert sound vibrations into undulatory electric current should be as nearly inelastic as possible, and be as thin and pliable as possible. My improved diaphragm has the advantage over the former in both of these particulars, and is reduced to a minimum of weight and for these reasons affords a minimum of resistance to sound waves, whereby it is sensitively vibratory under their influence.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

In the drawings, Figure 1 is a diametrical section through said new transmitter. Fig. 2 is a portion of the same section with parts shown on an enlarged scale and with the diaphragm in exaggerated condition when vibrated by sound waves. Fig. 3 is a section through the new diaphragm and adjacent parts on a scale a great many times enlarged. Fig. 4 is a section of the rear wire frame. Fig. 5 is a plan view of the transmitter with parts broken away for clearness.

There is shown in the drawings herein, for the purpose of illustrating the nature of the invention, a transmitter suitable for an ordinary telephone and adapted to be mounted on an ordinary telephone stand or otherwise. It is shown herein, however, somewhat enlarged for the sake of clearness, and it should be preferably a little larger than the ordinary telephone transmitter, and of the same shape, as it appears in Fig. 1.

A circular metal casing 10, of the same shape as found in the ordinary telephone transmitter may here be employed and through its rear central portion the usual telephone wires or conductors 11 and 12 extend. Within said circular casing 10 there is a thick fiber disk 13 mounted by the screws 14. It is cup-shaped with the central front portion recessed to receive the members or parts of the device which will hereafter be enumerated and these parts are held in the casing 10 by a retaining ring 15, made preferably of hard rubber, and secured to the fiber disk 13 by screws 16.

Within the cup-shaped disk 13 there is a carbon plate 17 and in front of it a reticulated or perforated hard rubber frame 18 in the recesses of which granular carbon 19 is placed. The carbon plate constitutes the rear electrode and is connected to the conductor 12 by a binding post 20.

In front of the carbon-holding frame 18, there is an insulated wire netting or reticulated frame 21, made of metal extending over the entire area of said frame 18. It may be formed of cross wires woven about twelve to the inch each way for ordinary telephone use.

This frame 21 if made of wire is preferably flattened by being run between a pair of compressing rollers, and in this new construction I insulate the side of said frame facing the carbon electrode 17 and frame 18 by japanning or coating it with lacquer or other insulating material, but elsewhere said wire frame 21 is an electrical conductor.

Against the conducting side of said reticulated frame 21 I place a thin annular copper plate or ring 122 which engages merely the margin of said frame 21 and said plate has an extenion 26 through the thick fiber disk 13 and connected with the binding post 27 and wire conductor 11 at the rear, as shown in Fig. 1.

Against said reticulated wire frame 21,

the diaphragm is placed or secured. In this present invention said diaphragm is of special character. Instead of being what is known as metal foil or gold foil, that is, a homogeneous sheet of metal, it is a compound sheet, consisting of very thin gold leaf 221 secured by very thin adhesive material 222 to a very thin, strong, fine silk fabric 223. This fabric may be either cloth or paper, as desired. The compound diaphragm thus formed is as thin and flexible as the gold foil mentioned in the prior application, but it is superior to the gold foil on account of its greater thinness and pliability, less elasticity and greater sensibility to sound waves, whereby the minor tones are clearly transmitted.

In operation, the current passes from the rear electrode through the carbon to the diaphragm sections and wire frame 21 and out through the ring 122. This distributes the current over the diaphragm so as not to be concentrated.

The diaphragm is held in place against the conducting ring 122 and the wire frame 21 by a wire or reticulated frame 23 which is placed against the aforesaid members so that the diaphragm will be held tightly in place.

In front of what may be called the diaphragm construction, made of the diaphragm and its holding means, such as the frames 21 and 23 and the ring 122, there is placed a relatively thick mat or layer 28 of wool-like material. The wool-like material 28 is preferably composed of steel wool, but it may be made of other wool or wool-like material. However, it is preferable and believed to be necessary to the successful operation of the device that this wool-like material be substantially resilient, elastic and so that it will retain its position normally and be penetrated by the sound waves and yet not respond to them. It should be of such character as not to mass against the sheet of gold foil and prevent its freedom of vibration as would be the case if it were composed of cotton or the like. The mat of steel wool is held preferably out of direct engagement with the gold foil by the intervening wire frame 23, substantially as indicated in Figs. 4 and 5.

The sound waves pass through the metal wool and beat against the diaphragm 22 and each section of the diaphragm lying between the four wires of a small square net wire frame 21 thus becomes an independent and separate diaphragm.

The foregoing description and the associated drawings explain substantially the general features and construction of this invention, although it is not limited to many of the particular details therein set forth. It is evident from what has been said that the diaphragm will not vibrate as a whole and is so mounted and held that it is divided into a large number of relatively small diaphragm sections. Each of these sectional portions of the diaphragm is capable of vibration under the influence of the sound waves, and independently of the other sections of the diaphragm.

By providing the transmitter with such similar and sensitive diaphragm sections, it is enabled to be influenced by relatively slight sound waves and to transmit and reproduce the same, and since there is a large number of sectional diaphragms and they are substantially the same in size and character, their effect in reproducing the sound is cumulative. That is, they act in the same way and at the same time and being distributed over a relatively considerable area, they more accurately reproduce the tones, especially those of the human voice and give to the reproduced tones the same timbre and quality as those of the human voice; and since the minor tones are all reproduced, the major tones are thereby relatively subordinated so that they are not so greatly emphasized as to cause a mere noise. In fact, it is the minor tones that enable different tones or sounds to be distinguished and the loud major tones that cause the confusion of sound in the ordinary telephone and which render it difficult to distinguish the tones or sounds. Therefore, one of the important results of this transmitter is the purity of tone it causes to be reproduced.

One result, it is believed, of the large number of very small sectional diaphragms of similar character and action is the amplification by them of the very minor tones, whereby in the reproduced tones or sounds, they have the same relative strength or character that the major and stronger minor tones have in the original tones or sound. This amplification not only results from the multiplicity of the sectional diaphragms, but from the free and sensitive movement of each small diaphragm because of the character of the diaphragm material. This result is impossible where the diaphragm is made of a sheet of material that must be vibrated wholly or almost wholly and where there is much inertia and lag. This sensitiveness prevents lag in the minor tones so that in the reproduced tones or sounds, the minor tones have the original position relative to the major tones in point of time as well as in strength.

The nature and construction of this instrument enables it to be made of any size that may be required and desired for any use or situation. The ordinary transmitter cannot be made large because the diaphragm would become too heavy and the inertia thereof too great to be vibrated by the ordinary sound waves. Since, however, in this instrument the diaphragm is in small

sections, they are substantially alike and the diaphragm as a whole does not vibrate, the action is the same whether there would be a small or large number of diaphragm sections. Hence, the instrument can be three feet in diameter as well as three inches. The effect of enlargement is to increase the power of the instrument and adapt it for use in conventions and for reproducing distant and delicate tones and particularly in connection with radio telephoning and the like.

Another characteristic is that a very great energizing current may be used in connection with the instrument without the hissing and sizzling noise heretofore associated with the use of large currents. This is not only of value in ordinary local telephoning, but particularly in long distance work and in radio telephoning and the like.

The advantages of the improved construction of transmitter over that described in my former application are first that the flexibility of the diaphragm is enormously increased, and there seems to be a total absence of elasticity with no decrease of the necessary electric conductivity.

This diaphragm is relatively much thinner than the the gold foil set forth in my former application and also much more pliable and light of weight so that its resistance to sound waves is greatly reduced as compared with the gold foil, whereby it is rendered much more sensitive to the sound waves. It is readily understood that a very thin silk fabric is much lighter of weight and much more pliable than a body of gold, as in gold foil or any other metal foil, and the extremely thin and fragile character of gold leaf as compared with gold or metal foil is a matter of common knowledge. The advantage of using a diaphragm of silk as a basis is to enable the use of gold in its thinnest possible form and the relative thinness and lightness of gold leaf compared with gold foil is to some extent indicated by the cost of the two, the cost of the gold leaf being about two percent of the cost of the gold foil. The gold foil diaphragm is relatively solid metal and heavy and resisting, as compared with the silk and gold leaf diaphragm, although the gold foil diaphragm is better than any rigid diaphragm in the combination set forth herein.

The invention claimed is:

1. In a transmitter for telephonic instruments and the like, the combination of a diaphragm member formed of a fabric and metal leaf adhering throughout to and covering one side thereof, so that the diaphragm is conductive and a stationary backing for the same, substantially as set forth.

2. In a transmitter for telephonic instruments and the like, the combination of a diaphragm member consisting of silk fabric and gold leaf adhering to and covering one side thereof, and a stationary backing for the same, substantially as set forth.

3. In a transmitter for telephonic instruments and the like, the combination of a diaphragm member having a plurality of similar diaphragm sections, each formed of relatively thin fabric and relatively thin metal leaf adhering to and covering one side thereof, and a stationary backing for the same, substantially as set forth.

4. In a transmitter for telephones and the like, the combination of a diaphragm member formed of relatively thin fabric and relatively thin metal leaf secured to and covering one side thereof, and means for holding the diaphragm member so as to sectionalize it into a plurality of independently vibratory diaphragm sections.

5. In a transmitter for telephones and the like, the combination of a diaphragm member formed of relatively thin silk fabric and relatively thin gold leaf secured thereto and covering one side thereof, and means for holding said diaphragm member so as to sectionalize it into a plurality of independently vibratory diaphragm sections.

6. In a transmitter for telephones and the like, the combination of a thin pliable sheet as a diaphragm member thereof, said sheet having a metal surface, and a reticulated frame against which the diaphragm member is held so as to sectionalize it into a plurality of independently vibratory diaphragm members.

7. In a transmitter for telephonic instruments and the like, the combination of a carbon electrode, a stationary and reticulated metal frame in front of said carbon electrode, said frame being insulated on the side thereof facing the carbon electrode and the other portions thereof being conductive, a diaphragm member adjacent the front side of said frame, granular carbon between the carbon electrode and said frame and diaphragm, and means for holding the diaphragm member against said frame so that the sections of the diaphragm member covering the openings in said frame will be independently vibratory, substantially as set forth.

8. In a transmitter for telephonic instruments and the like, the combination of a carbon electrode, a stationary and reticulated metal frame in front of said carbon electrode and the other portions thereof being conductive, said frame being insulated on the side thereof facing the carbon electrode, a diaphragm member adjacent the front side of said frame, granular carbon between the carbon electrode and said frame and diaphragm, and a conducting ring for holding the margin of said diaphragm member tightly against said frame.

9. In a transmitter for telephonic instru-

ments and the like, the combination of a carbon electrode, a stationary and reticulated metal frame in front of said carbon electrode and the other portions thereof being conductive, said frame being insulated on the side thereof facing the carbon electrode, a diaphragm member adjacent the front side of said frame, granular carbon between the carbon electrode and said frame and diaphragm, a conducting ring for holding the margin of said diaphragm member tightly against said frame, another reticulated frame in front of said diaphragm member and marginal conducting ring, and means for securing said elements together at their margin, substantially as shown.

10. In a transmitter for telephonic instruments and the like, the combination of a carbon electrode, a stationary and reticulated metal frame in front of said carbon electrode and the other portions thereof being conductive, said frame being insulated on the side thereof facing the carbon electrode, a diaphragm member adjacent the front side of said frame, granular carbon between the carbon electrode and said frame and diaphragm, a conducting ring for holding the margin of said diaphragm member tightly against said frame, and yielding means in front of the diaphragm for yieldingly holding it against said metal frame and permitting the sections thereof covering the opening in said frame to be independently vibratory.

11. In a transmitter for telephonic instruments and the like, the combination of a carbon electrode, a stationary and reticulated metal frame in front of said carbon electrode and the other portions thereof being conductive, said frame being insulated on the side thereof facing the carbon electrode, a diaphragm member adjacent the front side of said frame, granular carbon between the carbon electrode and said frame and diaphragm, a conducting ring for holding the margin of said diaphragm member tightly against said frame, another reticulated frame in front of said diaphragm member and marginal conducting ring, metal wool in front of said front metal frame and engaging it and the diaphragm member, and means for securing all of said elements tightly together at their margin.

In witness whereof, I have hereunto affixed my signature.

DUDLEY HOWARD WIGGINS.