Dec. 11, 1934. E. C. GUEDON 1,983,937

TRANSLATING DEVICE

Filed Dec. 5, 1931

Fig. 1.

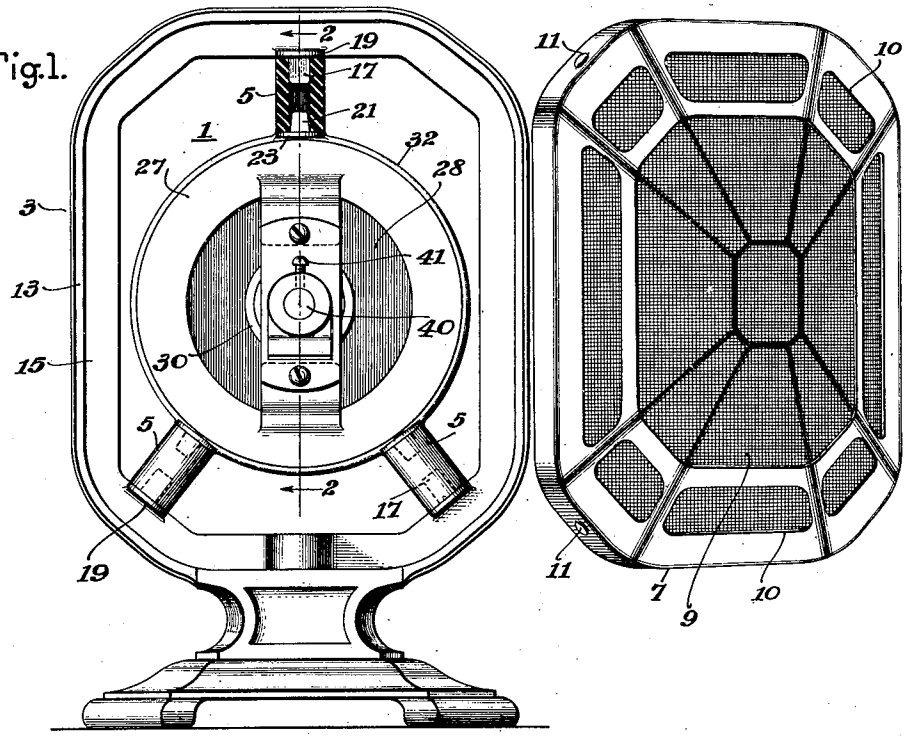


Fig. 2.

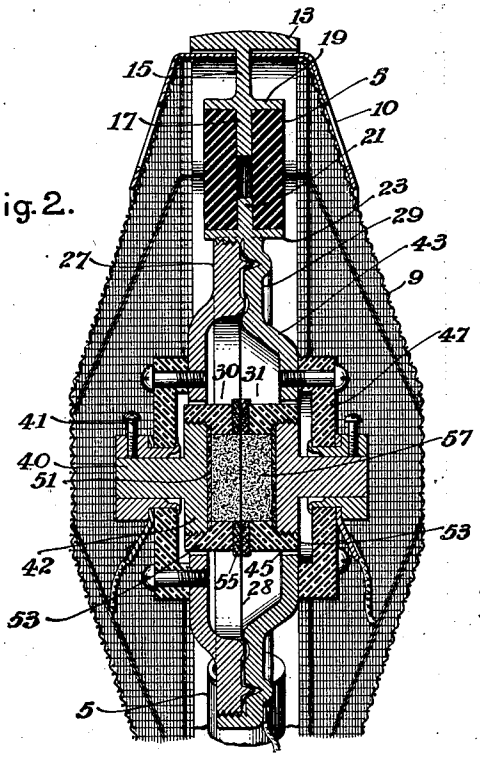
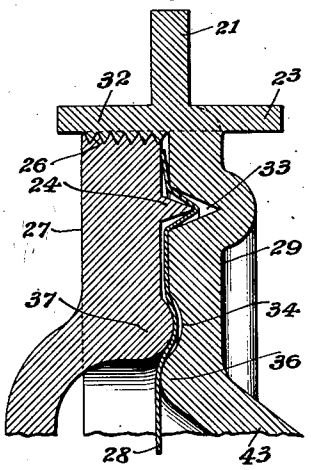


Fig. 3.



INVENTOR.
Emile C. Guedon,
BY J. R. Goldsborough
HIS ATTORNEY.

Patented Dec. 11, 1934

1,983,937

UNITED STATES PATENT OFFICE

1,983,937

TRANSLATING DEVICE

Emile C. Guedon, Camden, N. J., assignor to Radio Corporation of America, a corporation of Delaware

Application December 5, 1931, Serial No. 579,235

6 Claims. (Cl. 179—122)

My invention relates to translating devices and, more particularly, to devices of the type employed in the recording or reproduction of speech and music.

Heretofore, in microphones employed in radio apparatus and telephony requiring a relatively high degree of fidelity of reproduction, it has been necessary to prevent the occurrence of resonant peaks of substantial magnitude within the range of frequencies employed. For this purpose, it has been customary to stretch or tune the diaphragm used in the transmitter in such manner that its natural period occurs above the useful range of frequencies. In radio apparatus including means for the so-called "home-recording" of speech and programs, however, considerable difficulty has been encountered in the design and production of an efficient, high quality, and low priced microphone.

All prior microphones embodying the above mentioned diaphragm tuning feature, with which I am familiar, have included an annular clamping device for rigidly securing the periphery of the diaphragm, and a separate and independently adjustable member adapted to engage the diaphragm circumferentially within the limits of the clamping means for the purpose of applying pressure to effect a radial stress in the diaphragm. In such an arrangement, where the periphery has been rigidly clamped, the stresses have not been uniform at similar points of the area under tension. The structures heretofore employed have been somewhat complicated, expensive, difficult to assemble, and have not, in other respects, been adapted to large quantity production. For example, it has been customary to use an unnecessarily large number of component parts for a microphone button. Furthermore, it has been common practice to resiliently mount the microphone unit by means of a plurality of coil springs. This has added unnecessarily to the number of parts used, and there has been an undesirable tendency to local vibration of the springs.

Accordingly, it is an object of my invention to provide a high quality microphone having a simplified and inexpensive structure for clamping and stretching the diaphragm in a uniform manner.

Another object of my invention is to provide a simplified and improved button structure for a microphone of the carbon granule type.

A still further object of my invention is to provide simplified and improved means, having damping characteristics, for resiliently mounting a microphone unit.

In order to more clearly describe the invention, reference will be had to the accompanying drawing, in which:

Fig. 1 is a front view in elevation of an improved transmitter embodying my invention, with the cover removed to show the interior thereof, and with one of the elements therein being shown in section;

Fig. 2 is an enlarged sectional view taken on a line corresponding to the line 2—2 of Fig. 1; and

Fig. 3 is an enlarged sectional view of a portion of the structure shown in Fig. 2.

Referring to the drawing, similar numerals denote corresponding parts in all the figures.

According to my invention, a microphone unit 1 of the carbon granule type is resiliently mounted in suspended relation in an enclosing casing 3 by means of blocks or tubes 5 of soft resilient material, preferably rubber. These blocks provide flexible damping supports for the microphone and serve to substantially prevent transmission of shocks or vibrations from the casing to the microphone unit.

The casing 3 includes an annular rim 13 having an inwardly directed web 15 on which is formed a plurality of inward extensions or fingers 17 adapted to hold the rubber blocks 5. Each of the fingers, preferably, is provided with a transverse abutment 19 against which the corresponding blocks 5 rest.

The outer edge of the microphone button unit 1 is provided with similarly disposed outwardly extending projections 21 and abutments 23 for engaging the inner ends of the rubber blocks. These projections 17 and 21 fit into a bore or slit in the block of rubber 5. Non-integral abutments or washers may obviously be used, if desired, in place of the abutments 19 and 23.

A cover for the microphone casing comprises a stamped metallic structure 7 having the usual sound openings 10 covered by wire gauze 9, secured thereto by welding or by solder. This cover is provided with a plurality of projections 11 adapted to frictionally cooperate with the inner surface of the framework 3 for firmly securing the cover in place on the framework while, at the same time, permitting ready assembly and removal of the covers.

My novel microphone unit comprises simplified unitary means for simultaneously securing and tensioning the diaphragm, as well as an improved cooperative carbon button construction having, among other features, a reduced number of parts. Accordingly, a pair of metallic diaphragm support

members 27 and 29, preferably circular, are provided for mounting the diaphragm 28, preferably a thin metallic disc, therebetween, and for supporting the microphone buttons 30 and 31, respectively, on either side of the diaphragm in operative relation therewith.

Specifically, the member 27, preferably in the form of a flat ring, has a central opening to permit ready access of sound waves to the side of the diaphragm facing the opening. The outer edge of the ring member 27 preferably threadedly engages the inner wall of an outer cylindrical flange 32 on the edge of a ring portion of the member 29, which is preferably dish-shape, by means of the screw threads 26 provided for adjustably securing the support members together, whereby the diaphragm is secured and tensioned as hereinafter described.

For the purpose of securely clamping the outer portion of the diaphragm, one of the members, preferably 27, is provided, on its face adjacent the other member, with a concentrically disposed ridge or wedge 24 having a relatively sharp edge, or a small radius of curvature. Preferably, the cross-section of the ridge defines an acute angle, and the ridge is adapted to advance into a complementary concentrically disposed socket, shown as a V-shaped groove, formed in the adjacent face of the ring portion of the other member 29. This construction is shown more clearly in Fig. 3.

As the inner clamping faces of the support members are advanced together, the edge of the ridge 24 crimps the adjacent portion of the diaphragm into the groove 33, taking up all slack and imparting an appreciable radial stress to the diaphragm. As will be seen from the drawing, the crimped diaphragm section is forced into several angular positions, thus providing resistance to slippage. As the wedge advances into the groove, carrying the adjacent portion of the diaphragm with it, both the outer and inner areas of the diaphragm, on either side of the wedge and groove, supply diaphragm material for the crimping. When the inner area reaches a certain range of tension, however, more material is drawn from the area outside the crimped portion as the wedge is advanced further in, the material of the crimped portion apparently sliding inwardly around the working edge of the wedge under increasing resistance as the angle of the crimped section becomes sharper. This slipping action against resistance effects an unusually uniform tension throughout the diaphragm area under stress.

While the above described diaphragm clamping means might provide the required tension in the diaphragm for some cases, or could be so designed to do so, for the purpose of accelerating the tensioning of the diaphragm and for giving it the final desired high resonance frequency of vibration, additional complementary means have been provided on the support members in the form of a concentric inner ridge 37 whose cross section has a relatively large radius of curvature, and a relatively shallow inner groove 34 similarly disposed, in the faces of the members 27 and 29 respectively. The groove 34, preferably, is formed in the face of the ring portion of member 29 adjacent to the inmost support shoulder 36 that determines the position of the plane of the diaphragm. By this means and in this manner, after the diaphragm has been tensioned a certain amount by means of the outer ridge and groove, a further relative rotation inwardly of the ring members effects a deformation of the diaphragm in the region between the inner ridge 37 and groove 34. Although this deformation is ordinarily relatively small, it is quite effective in producing a high degree of tension or radial stress.

The microphone buttons 30 and 31 are supported in the central openings, respectively, of the support members 27 and 29, and are adjustable in a direction normal to the plane of the diaphragm. The button 30 is supported by means of a pair of inwardly extending bridge elements, preferably integral with the ring member 27 and bent inwardly from the plane thereof. The ends of the bridge elements are, in turn, bridged by a piece of insulating supporting material that carries a metallic bushing secured thereto as by an upsetting operation. This bushing has a central bore for receiving a stem or shank 40 of the button structure 30 and is provided with a set screw 41 for securing the button in a desired operating position adjacent the diaphragm. The bridge members are preferably narrow to afford minimum obstruction to the entrance of sound waves for the diaphragm. The button 31 on the other side of the diaphragm is similarly supported, but in this case the support member 29 forms a continuous dished portion 43 around a small central opening 45, the latter being covered by an insulating bridging member 47 to seal the back of the diaphragm against the entrance of sound waves. Electrical terminals are secured to the metallic bushings, as shown, and a good, continuous electrical connection is thereby provided from the terminals to the microphone buttons.

In regard to the novel construction of the microphone buttons which are identical in form, it will be seen, referring to the button at the left in Fig. 2, that it comprises a metallic electrode having a stem 40 and an enlarged flat circular head portion 42, the working face of which is ground to a plane surface and the outer edge of which is threaded. A carbon disc 51, preferably copper plated on one of its faces, is clamped to the working face of the electrode, with the copper plated surface of the disc in contact with said electrode face, by means of a cap 53 preferably of molded bakelite. The cap is in the form of a ring having a portion of its inner wall threaded for engagement with the electrode and having a reduced inner wall surface forming a thread for clamping the outer edge of the carbon disc. A felt washer 55 is provided between the end of the cap and the diaphragm to prevent dislodgment of the carbon granules 57 and to introduce a desired amount of damping for the diaphragm. The working face of the electrode 42 is preferably ground to a smooth plane surface in order to prevent fracture of the carbon disc when tightly clamped by means of the cap, and to effect good electrical connection between the disc and the electrode. With this arrangement it is found unnecessary to solder the carbon disc to the electrode face as has heretofore been common practice.

In the foregoing constructions, various changes may obviously be made by those skilled in the art, without departing from the spirit of the invention. For example, while I have shown, as my preferred embodiment, the two ridges for securing and stretching the diaphragm as being formed on the same ring member, it would obviously be possible to interchange elements, as for example to form the outer ridge 24 on the ring member 29 and form the groove 33 in the ring member 27. While I have preferred to use annular screw threads for adjustably securing the ring support

members together, it is obviously possible to use a plurality of bolts or machine screws for accomplishing the desired result, particularly in case the diaphragm securing and tensioning means is other than circular, although, of course, such an arrangement is more complicated and therefore less desirable.

It will be seen that the construction of the transmitter above described is such as to have durability, fidelity of reproduction, simplicity of construction, and to be particularly adaptable to quantity production at a low cost. The number of component parts has been appreciably reduced without any sacrifice of desirable features, and in fact, a considerable improvement has been effected by this simplification.

While I have disclosed my invention in connection with a carbon microphone, it will be obvious that it will have utility in connection with a condenser type of microphone where means are usually provided for stretching the diaphragm.

Although I have shown and described a particular embodiment of my invention, many modifications thereof will be apparent to those skilled in the art to which it pertains. My invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

I claim as my invention:

1. In a sound translating device, a supporting casing, a microphone unit, means for supporting said unit comprising a plurality of blocks of resilient damping material, and pairs of cooperating radial projections on said casing and said unit, respectively, with which said blocks engage, each of said cooperating projections respectively being substantially radially in line.

2. In a microphone, a plurality of annular elements, means for holding said elements in contact with each other, one of said elements being provided with a plurality of concentric annular ridges, and the other of said elements being provided with a plurality of cooperating concentric annular grooves, the outermost ridge extending axially of the supporting element more than the innermost ridge whereby, when a planar diaphragm is interposed between said elements and they are brought into approximation through action of the holding means, the diaphragm is first initially stretched by the outermost ridge and groove and thereafter additionally tensioned by the innermost ridge and groove.

3. In a microphone, a plurality of annular elements, the periphery of one of said elements being provided with an axially extending portion interiorly threaded, the periphery of the other element being exteriorly threaded to cooperate with the threads on the first mentioned element, one of said elements being provided with a plurality of concentric annular ridges, and the other of said elements being provided with a plurality of cooperating concentric annular grooves, the outermost ridge extending axially of the supporting element more than the innermost ridge whereby, when a planar diaphragm is interposed between said elements and they are brought into approximation through interaction of the complementary screw-threaded portions, the diaphragm is first initially stretched by the outermost ridge and groove and thereafter additionally tensioned by the innermost ridge and groove.

4. The invention set forth in claim 3 wherein the outermost ridge and groove are V-shape in cross-section.

5. The invention set forth in claim 3 wherein the innermost ridge and groove are semi-circular in cross-section.

6. In a sound translating device, a supporting frame provided with a plurality of inwardly extending lugs, a microphone unit provided with a plurality of peripheral outwardly extending lugs equal in number to the lugs carried by the frame, and a plurality of cylindrical rubber elements into opposite ends of which corresponding lugs on the microphone unit and the frame extend, the material of the cylindrical elements having damping characteristics, whereby the microphone unit is insulated against extraneous vibrations picked up by the frame.

EMILE C. GUEDON.