July 8, 1924.

1,500,331

R. H. MARRIOTT

TELEPHONIC RECEIVER

Filed July 20, 1922

3 Sheets-Sheet 1

Fig. 1

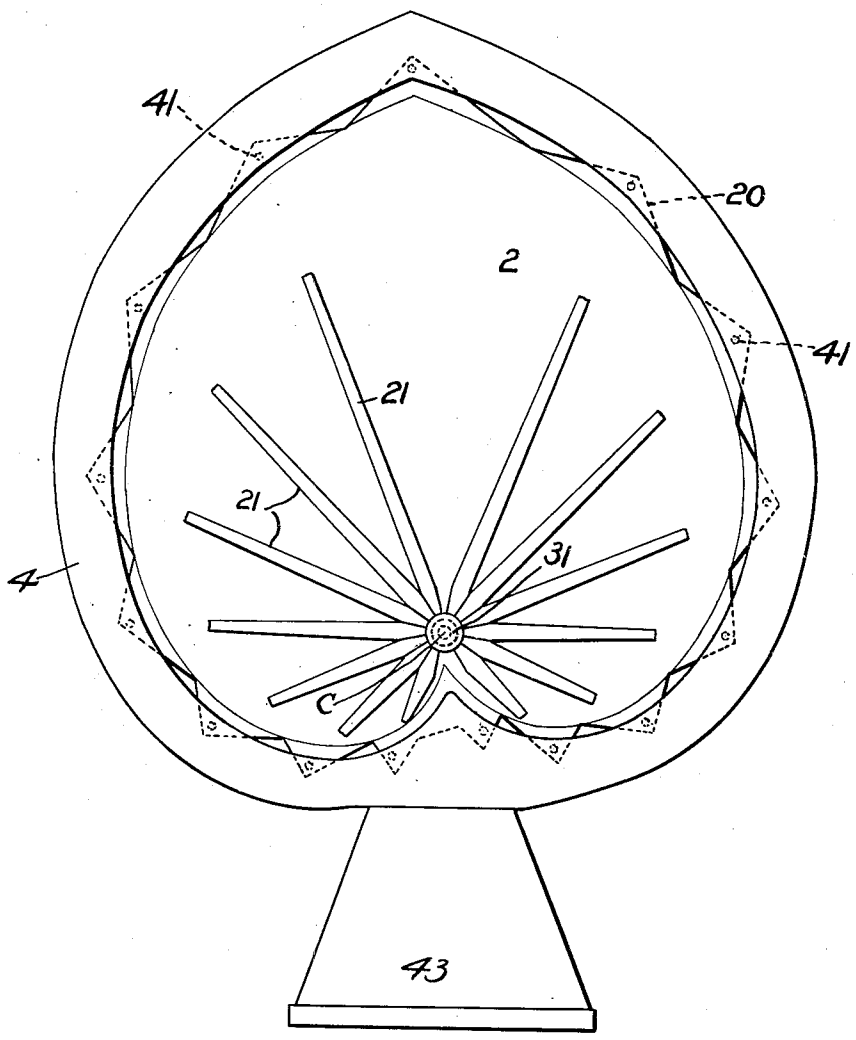

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Fig. 2

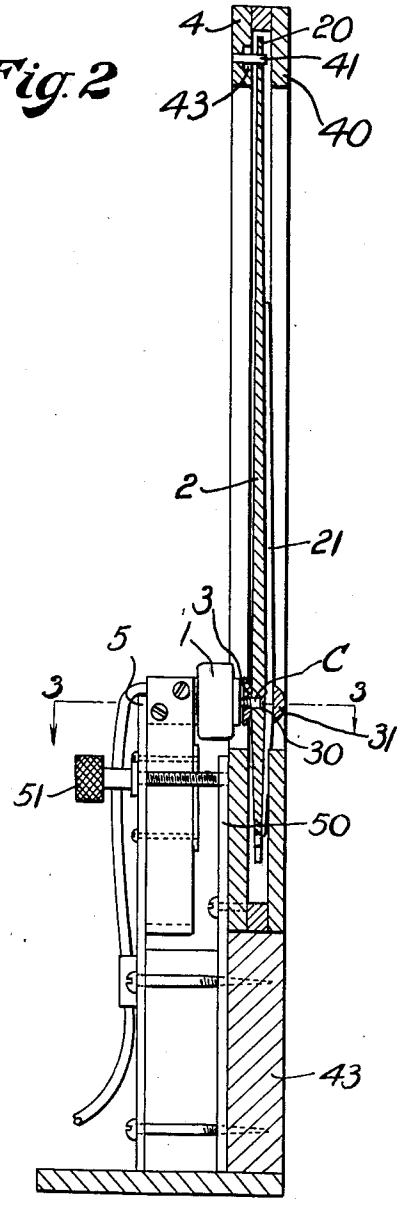

Fig. 3

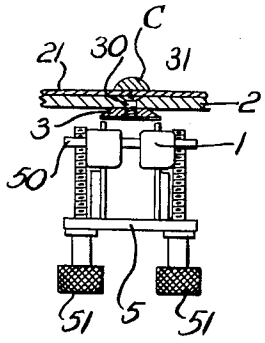

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Fig. 5

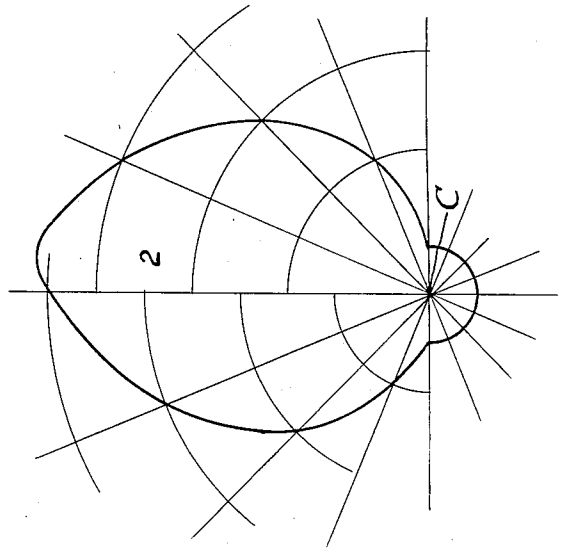
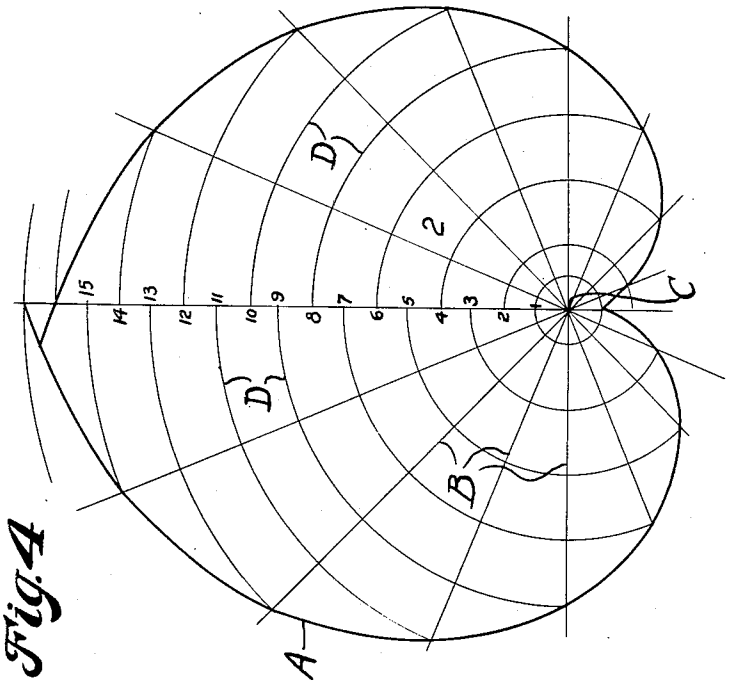


Fig. 4



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Patented July 8, 1924. 1,500,331

UNITED STATES PATENT OFFICE.

ROBERT H. MARRIOTT, OF BREMERTON, WASHINGTON.

TELEPHONIC RECEIVER.

Application filed July 20, 1922. Serial No. 576,313.

(FILED UNDER THE ACT OF MARCH 3, 1883, 22 STAT. L., 625.)

To all whom it may concern:

Be it known that I, ROBERT H. MARRIOTT, a citizen of the United States of America, and resident of the city of Bremerton, in the county of Kitsap and State of Washington, have invented certain new and useful Improvements in Telephonic Receivers, of which the following is a specification.

My invention consists of a telephone receiving device of a type capable of better tone reproduction than those of the usual type and also having a capacity in volume sufficient to give satisfactory results without the use of horns or like sound concentrating or modifying device.

My invention consists largely in a diaphragm of a new type of construction and design and of a material which I believe has not been used before. The same is believed to involve the use of principles not before employed in the design of similar apparatus.

In the accompanying drawings I have illustrated a type of construction which includes the principles and the essential features of my invention. The novel features of my invention upon which I desire to secure a patent will be particularly defined in the claim which terminates this specification.

Figure 1 shows a front or face view of my device.

Figure 2 is a central vertical section taken transversely of the device.

Figure 3 is a cross section taken on the line 3—3 of figure 2.

Figures 4 and 5 are diagrams illustrating two different manners of laying out and determining the outline of the diaphragm.

In designing the diaphragm herein described it has been my purpose to produce a diaphragm of a material having in a high degree good tonal qualities and of a design which will be resonant through a wide range of tone so that it will be capable of correctly reproducing tones throughout the usual register of a musical instrument.

It has also been my desire to produce a diaphragm which will give out a sufficient volume of sound to permit the elimination of all horns and like sound concentrators when the device is used in medium sized spaces.

Because of its proved excellent qualities as a sounding board, I chose spruce wood as the material from which to make the diaphragm of my experimental devices. It is, however, to be understood that I contemplate using any other material which is available and possesses the proper qualities to adapt it to this use.

The device illustrated in the accompanying drawings is given as an example of a type of construction which is adapted to secure the desired results under the principles of my invention.

At 1 is shown an electromagnet of essentially the same type as are used in telephone receivers of the class which are especially adapted for radio work. This is connected with other radio receiving apparatus in the same way as are such telephone receivers. The diaphragm upon which this acts is, however, of radically different construction.

The diaphragm 2 is made of wood or other material having the proper vibrant and tonal qualities. Such material may include metals and alloys. It is made quite large and the point thereon at which the vibrating action of the magnet is applied, is not central but very much eccentric. The shape of these diaphragms is not circular, but approximately heart shaped. The shapes which I now prefer are shown in Figures 4 and 5 by diagrams which serve to illustrate the underlying principles of these designs.

In the design shown in Figure 4 the point C is the point of application of the vibrations produced by the magnet of the receiver. From this point radiate lines B which in the example shown are 22½° apart. Circular lines D are drawn from the center C, these being at successively different distances from the center, these varying in uniform manner. For the circular segments lying at one side of the central diameter, these may be assumed to be say an inch apart, but are so placed as to bisect the spaces between the circular segments of the first side. That is, the first one is one and a half inches from the center C, the succeeding one being then spaced an inch apart. The unit used in spacing these segments may be any other unit than an inch which is suitable and desired.

Through the points of intersection of each radial line B with its particular circular segment D is drawn the curved outline A. This defines the theoretical margin of the

diaphragm. The shape is lop sided conventional heart shape, the tip of the heart being somewhat to one side of the central axis.

It will be observed that the point C has a different relative position for each diameter B. If C be a weight, as an armature or point of pressure of an armature, and the line is resilient, then each line, considered separately, would have a period of vibration different from all others, because the weight is in a different place. This, apparently, is an aid in reducing undesirable diaphragm periodicity by providing a band of periods which are not detrimental. This might be a light aluminum diaphragm clamped or held about periphery and carrying an iron armature at C.

When so constructed, by reason of the eccentric position of the armature connection with the diaphragm, a very small movement of the diaphragm will cause a very considerable portion of the diaphragm to move a much greater distance. This tends toward a much greater movement over most of the surface than is secured by the central position of the armature connection with the usual diaphragms. For this reason a much smaller air gap for the armature is required to get the same total surface movement of the diaphragm.

In carrying out my invention the theoretical shape above defined may be departed from in certain ways as may be dictated by practical structural considerations. For instance, the diaphragm as shown in Figure 1 has lobes 20 about its periphery, these being connected by supporting pins or pegs 41 with the ring 4. The object sought is to hold the diaphragm as a whole in definite position while leaving it free to vibrate under the action of the armature. It will be noted that the diaphragm is supported from ring 4 only and not directly from the companion ring 40. The pins are made small and as long as feasible for a limited width of frame, as by countersinking the frame about the frame, as shown at 43.

The diaphragm is made stiffer and less subject to bending near the point C of action of the magnet and more springy towards its outer part. This is simply done by varying the thickness. For a diaphragm of from eight to ten inches in diameter made of spruce wood, I have used thicknesses ranging from approximately three thirty-seconds of an inch at C to one thirty-second of an inch at its edge.

This varying of the resiliency and strength to resist bending, causes a greater percentage of the movement to occur towards the outer part of the diaphragm, thereby producing a greater disturbance in the air over a larger area for a definite movement of the armature.

The armature is shown as secured to the diaphragm by a screw or bolt 30 and this is covered by a knob, 31, of wood or other suitable material.

To further stiffen and reinforce the diaphragm, and especially in directions transverse of the grain when made of wood, I contemplate employing ribs 21 which extend from the point of attachment of the armature outwardly. These ribs may be of wood and be glued to the surface of the diaphragm. In the diaphragm illustrated in Figure 1 the grain of the wood is supposed to extend vertically; there is, therefore, no vertical rib. The length of these ribs are approximately three-fourths of the distance from the center C (knob 31) to the edge.

Rings 4 and 40 form an encircling frame from which the diaphragm is supported. This may be supported in any suitable manner, as from a stand 43. The magnet 1 is mounted in such manner as to be adjustable toward and from the armature 3 to thereby vary the air gap. As illustrated this is secured by mounting the magnet upon an arm 5 which is unsupported for a distance sufficient to permit bending enough to secure the needed adjustment. An arm 50 is positioned to be connected to arm 5 by a pair of adjusting screws 51, located at opposite sides of the center line. The arm 50 is so associated with the support for the diaphragm that there is no material relative movement between them. By turning up the screws 51 the arm 5 and the magnet carried thereby may be brought nearer to the armature, thereby adjusting the air gap. By varying the adjustment between the two screws adjustment of the relative amount of gap at the two poles may be made.

By adjusting one of the screws so as to maintain contact of one end of the armature with its pole while the other side is separated from its pole, the air gap for the latter pole is reduced very low. The device then acts as a polarized relay.

A diaphragm designed according to the diagram shown in Figure 4 has all lines radiating from the focal center namely point C of substantially the same length, each line being understood to run from one edge to the opposite. The magnet acts at a different relative point in each line.

The diagram of Figure 5 has each of its lines passing through the like center of different lengths with the magnet acting thereon at different relative points for each line. One object sought is to provide a diaphragm which shall not have a marked periodicity, but one which will respond to vibrations of all periodicity. Each periodicity has a particular part of the diaphragm which is responsive to this period.

I have found that a diaphragm of the type described forms an excellent telephone which has volume capacity sufficient to be easily

heard anywhere in a room of considerable size. Its action may be increased by the use of well known devices employed for amplifying electrical impulses, so as to make of it a loud speaking telephone, capable of being heard clearly in large spaces. It is capable with such amplifying means of being used for announcing in halls and out doors. A series of these distributed about an industrial plant, ship or the like may be operated from a central point to call any person to a designated spot.

For the reproduction of music or speech as transmitted, if taken by the transmitter direct from the singer or speaker or from an instrument or instruments being played, will be reproduced without the scratching which accompanies phonographic reproduction and in the clear distinct tones of the original production.

What I claim as my invention is:

A sound reproducing diaphragm having a cardioid outline in which the halves at opposite sides of its major axis are unequal.

Signed at Seattle, King County, Washington, this 12th day of July, 1922.

ROBERT H. MARRIOTT.