

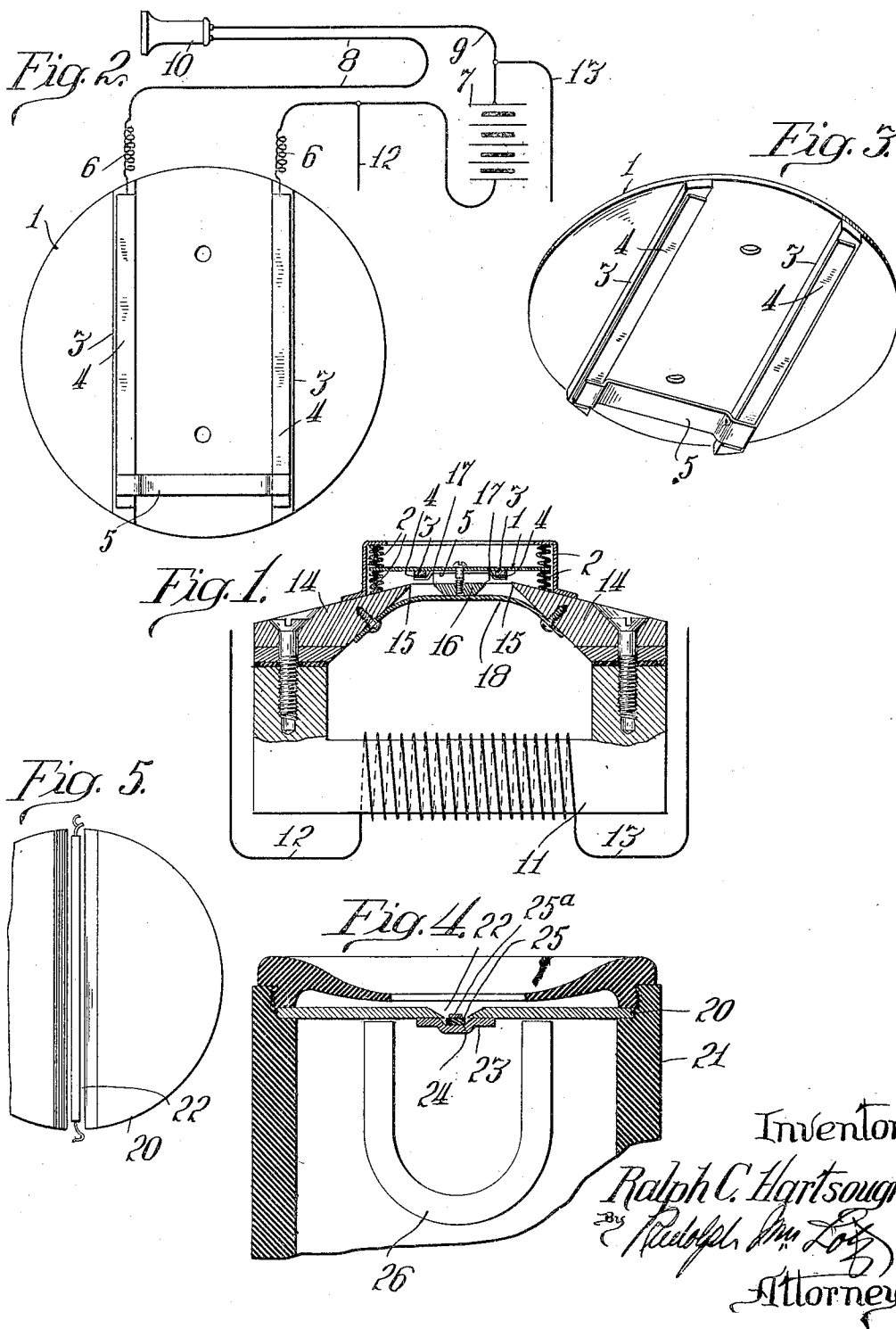
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TELEPHONE TRANSMITTER

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TELEPHONE TRANSMITTER

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This invention relates to improvements in the art of telephony and particularly in sound transmitters of the electrical type and has for its main object to provide very simple and efficient means for effecting sound-transmission far more efficiently and accurately than is accomplished by existing transmission means.

A further object of the invention is to provide sound-transmission means which are not affected by variations in atmospheric conditions and which are far more delicate and flexible than existing means to thereby more efficiently transmit sound at less cost of current than existing means.

An essential object of the invention is to provide a transmitter wherein or whereby the tone modulations are transmitted continuously and accurately without sharp breaks as in existing types of transmitters.

In the accompanying drawings illustrating more or less diagrammatically the preferred embodiments of the invention:

Fig. 1 is a view, partly in section, of a sound transmitter constructed in accordance with the invention.

Fig. 2 is a bottom plan view of the vibratory disk of the transmitter and the manner of associating the same with a conventional electrical telephone circuit.

Fig. 3 is a perspective view of the transmitter disk.

Fig. 4 is a central longitudinal section of a modified form of transmitter constructed in accordance with the invention.

Fig. 5 is a fragmentary plan view of the diaphragm shown in Fig. 4.

The present invention is concerned mainly with the use of bismuth in association with an electro-magnetic field. It is very well-known that the resistance of bismuth to the conduction of electric current increases as the magnetic field increases in strength. That is to say that if a bismuth conductor through which electric current is flowing is moved into and out of a magnetic field the flow of current through the bismuth will vary proportionately to the strength of the magnetic flow through the same.

If, for example, a magnetic field be as-

sumed wherein the magnetic flow is confined to substantially a plane between the poles, then, as the bismuth in the form of a fine wire or thin ribbon is thrown into this plane, its resistance to flow of current is increased to the maximum whereas when it is very closely adjacent to said plane so that there is very little or no flow of magnetism through the bismuth, the resistance to flow of current through the latter is lessened proportionately and; for the purposes of this specification, may be defined in terms applied to magnets and armatures, viz.: as increasing and decreasing as the square of the distance of the bismuth from the strongest part of the magnetic field.

While I refer to bismuth as the particular method or substance contemplated, this is due to the fact that I know of no other metal or substance having this property but I desire it to be understood that the invention contemplates the use of any metal or material possessing the above mentioned properties of bismuth.

In reducing the invention to practice either of two embodiments may be selected. In one of the same, illustrated in Figs. 1 to 3, inclusive, I employ an inflexible disk 1 which may be made of any suitable material. This disk is mounted between suitable flexible bellows elements 2 so that it may be said to float therebetween and will vibrate responsively to sound waves. The bellows elements 2 will be suitably confined between opposite faces of the disk 1 and annular shoulders opposed to the circumferential edge portions of the disk 1 as is common in the telephone art.

Mounted on the inner face of the disk 1 is a pair of parallel strips 3 of glass or other suitable insulating material, glass being preferred. On the outer face of each strip 3 there is mounted or applied a very thin layer or ribbon 4 of bismuth. The two layers or ribbons 4 are connected or bridged at one end by a ribbon 5 of electrically conductive material such as gold foil. Ribbons 6 of this or similar material associates the other ends of the elements 4 with an electrical circuit comprising a source of current 7 and the lines or wires 8 and 9 which connect, as ordinarily

with the coils of the electro-magnet of the conventional type of receiver 10. A shunt circuit from the wires 8 and 9 passes through the energizing coil of an electromagnet 11, this shunt circuit being indicated by the wires 12 and 13.

Mounted upon the poles of the magnet 11 are shoes 14 having opposed parallel sharp or knife edges 15. Mounted between said edges 15 is an armature 16 of soft iron or other efficient magnetically conductive material, said armature consisting of a plate having beveled or knife edges 17 parallel with, spaced from and opposed to the edges 15 of the shoes 14. This armature may be mounted on non-magnetic metal strips 18 secured to the magnet poles.

The disk 1 is normally so positioned with respect to the edges 15 and 17 that the bismuth layers or ribbons 4 are disposed out of the common plane of the several edges 15 and 17 and thus in a weak portion of the magnetic field. Obviously the magnetic flow will be very sharp or intense between each pair of edges 15 and 17 and will be very weak a very short distance from said plane. As the ribbons 4, under the influence of sound waves impinging upon the disk or diaphragm, enter the strongest portion of the magnetic field, the flow of magnetism therethrough will be greatest and, consequently, the resistance of flow of electric current through the bismuth will be also at its maximum. As vibration causes a reaction of the disk or diaphragm in the reverse direction from that in which impingement of a sound wave moves the same will be substantially equal to its initial movement, the bismuth ribbons will reciprocate through the normal plane in which they lie from a strong to a still weaker portion of the magnetic field so that the flow of current will be varied without being interrupted. This variation in flow will obviously have the same effect at the receiver as has the current of the present telephone except in so far as the latter is interrupted.

In other words, upon vibration of the disk 1 responsively to sound waves, the ribbons 4 will be moved out of its normal position and into a stronger portion of the field, the distance being increased as the intensity of the sound wave is increased. Thus, if a person speaking into the transmitter talks in a low tone the ribbons 4 will vibrate through a zone or field which maintains the ribbons 4 within a fairly weak magnetic field influence, but if the voice be loud, then the movement of the disk 1 increases and the ribbons 4 become disposed farther into the zone or sphere of greatest influence of the magnetic field and reactively into the weakest portion of such field. The flow of current through the ribbons 4 thus becomes more widely varied as the vibratory reciprocation of said ribbons increase in stroke and is subjected to a more widely

varied zone or sphere of influence of the magnetic field with the result that the electro-magnet of the receiver will be proportionately energized and consonantly vibrate the iron disk of said receiver, the voice modulations or sound wave modulations being thus very accurately reproduced by the receiver 10.

Obviously the cross-sectional dimensions of the ribbons 4 must be properly proportioned to the electrical current and magnetic field influences to which it is subjected in order to attain the best results, these being matters of mathematical determination.

The invention may be also embodied in a transmitter of the electro-magnetic type such as is shown in Fig. 4 wherein a flexible metallic disk 20 is firmly secured along its circumferential edge in the mouth of the shell 21 of a transmitter. This disk may consist of two substantially semi-circular pieces of iron or other magnetic material which are spaced from each other to provide a gap 22 therebetween which is bridged by a strip or disk 23 of a non-magnetic material sweated or otherwise rigidly secured to the semi-circular elements. This bridge piece may be formed to provide a suitable offset or groove 24 registering with the gap 22 and upon this offset there is mounted a thin strip 25 of a suitable insulating material carrying a layer or ribbon 25^a of bismuth which is interposed by means, preferably, of gold foil, in one side of an electric circuit.

The edges of the semi-circular elements which border the gap are sharply beveled and the ribbon 25 is so mounted as to lie in the plane of the sharp edges of said elements and is only slightly spaced therefrom.

Within the shell 21 there is mounted a permanent magnet or a continuously uniformly energized electro-magnet 26, the poles of which are disposed on opposite sides of the gap 22 and are equally spaced from the respective semi-circular elements so that the magnetic flow will be from one pole of said magnet through one of said elements, then across the gap 22 through the other element to the other pole, the ribbon 25 being thus disposed in whatever portion of the magnetic field may be selected when the disk structure is in its normal position. This normal position is preferably at some distance from the poles of the magnet 26 so that as said disk is flexed responsively to sound waves to more closely approach the magnet poles, the magnetic field over the gap 22 and through the bismuth ribbon becomes more intense with resulting increase in resistance to flow of electric current through the bismuth ribbon so that voice or tone modulations will be transmitted by means of said varying current in ratio to the variations in resistance consonantly with the zone of vibration as above described with respect to the structure of Figs. 1 to 3, inclusive.

The advantage of this invention over the use of the carbon-granule capsule of the modern transmitter lies to a very appreciable extent in the fact that variations in atmospheric humidity and temperatures have no influence on bismuth so that the intensity of electric current to neutralize varying atmospheric conditions is not required and, furthermore, tone modulations are far more accurately transmitted over a greater range because of the fact that there are not as great limitations to variations in resistance as is true of the carbon-granule capsule. A further distinct and very appreciable advantage of the use of bismuth in place of carbon granules lies in the total elimination of electric arcs common to the granules and causing the disagreeable cracking or grinding noises incident to modern telephony.

I claim as my invention:

1. A telephone transmitter including a pair of opposed magnets having substantially knife-edged parallel opposed edges, there being a magnetic field between said edges of maximum intensity in the plane thereof, a diaphragm disposed parallel with the said plane of said edges, and a strip of bismuth carried by said diaphragm and interposed in the telephone circuit and extending parallel with and disposed between said edges for vibration into and out of the portion of greatest intensity of said field.

2. A telephone transmitter including a diaphragm, a magnetic field of maximum intensity in a plane parallel with said diaphragm, and a strip of bismuth carried by said diaphragm and normally interposed in the portion of maximum intensity of said field and moving from the latter into portions of less intensity of said field responsively to vibration of said diaphragm, said strip of bismuth being interposed in the telephone circuit.

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