April 17, 1928.

1,666,309

J. N. RAY

MAGNOMETER

Filed Nov. 26, 1924

2 Sheets-Sheet 1

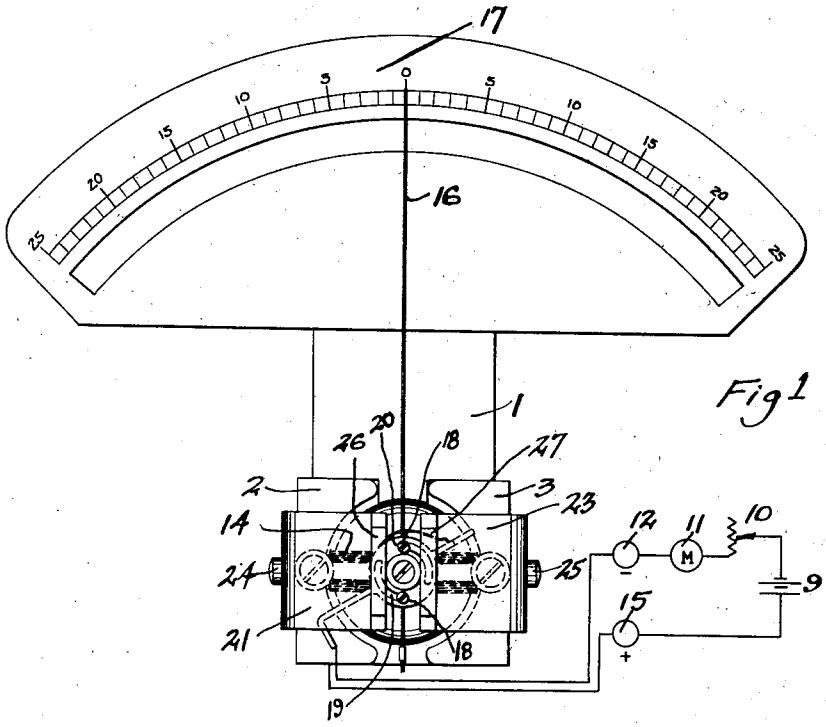


Fig 1

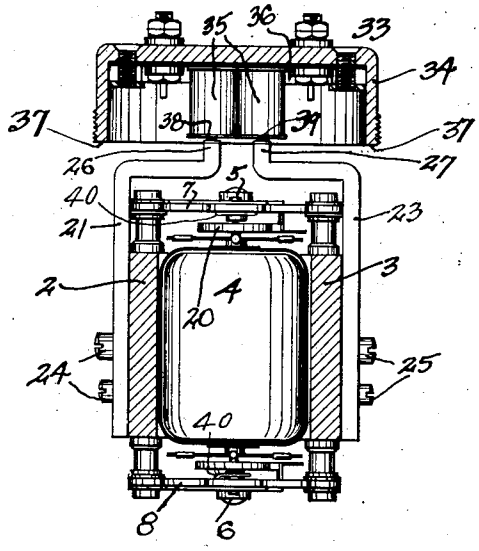


Fig 2

JOHN N RAY INVENTOR.

BY John B. Brady

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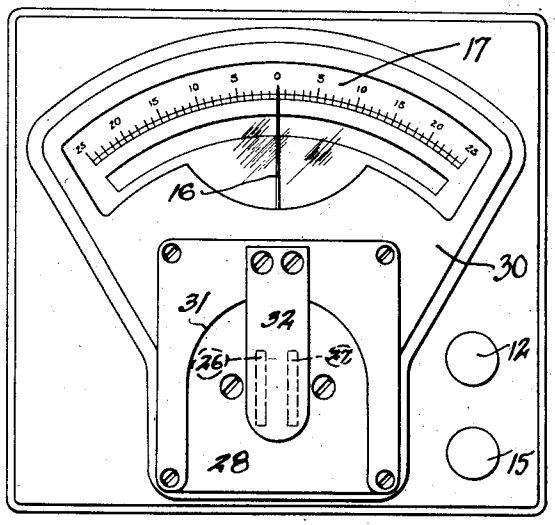


Fig 3

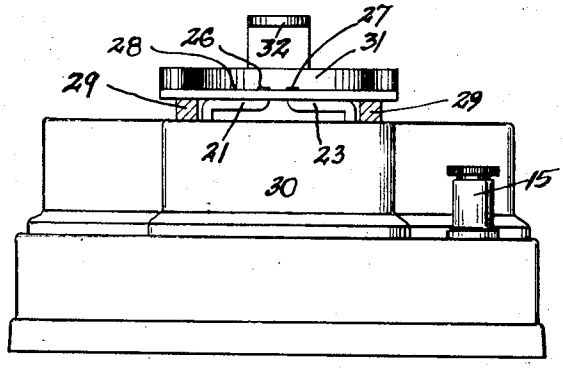


Fig 4

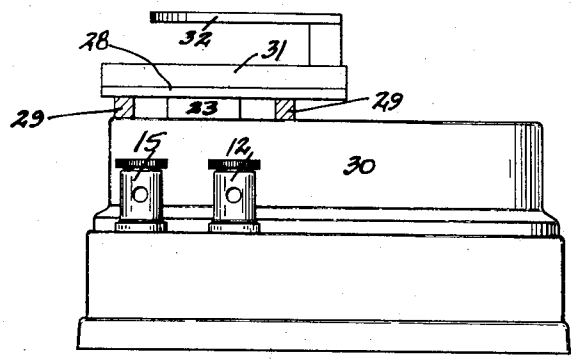


Fig 5

JOHN N RAY INVENTOR.

BY John B. Brady

ATTORNEY.

Patented Apr. 17, 1928. 1,666,309

UNITED STATES PATENT OFFICE.

JOHN N. RAY, OF NEWARK, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO BRANDES LABORATORIES, INC., OF NEWARK, NEW JERSEY, A CORPORATION OF NEW JERSEY.

MAGNOMETER.

Application filed November 26, 1924. Serial No. 752,431.

My invention relates broadly to electrical apparatus and more particularly to an apparatus for testing the magnetism of electromagnetic sound reproducing devices.

One of the objects of my invention is to provide means for rapidly testing the magnetism of electromagnetic sound reproducing devices in such manner that those devices possessing the desired degree of magnetism may be passed, while those devices falling below a particular degree of magnetism may be held for examination and correction.

Another object of my invention is to provide a simple construction of apparatus by which the magnetic qualities of telephone receivers may be readily observed so that in a production program of many thousands the individual telephone receivers may be rapidly inspected and those having the desired degree of magnetism passed for further operations, while those falling below the desired degree of magnetism may be rejected to be held for further examination.

Still another object of my invention is to provide a testing apparatus for observing the magnetic qualities of telephone receivers by the sense of sight, the test consisting of an operation in which the telephone receiver to be tested is placed adjacent magnetic members positioned on opposite sides of a rotatable armature in such manner that variable degrees of magnetism in the telephone receivers on test may be employed to actuate the rotatable armature and move an indicator secured to the armature.

A further object of my invention is to provide a simplified construction of meter arranged to register the magnetic strength of the electromagnetic sound reproducing device to be tested and at the same time show either the correct or incorrect direction of magnetism in the receiver to enable receivers which are correctly magnetized with the desired degree of magnetism to be rapidly selected out of numerous receivers passing through the production program.

My invention has particular application to the testing of electromagnetic sound reproducing mechanisms which are employed in loud speaking telephone devices and in telephone receivers and headsets employed in radio broadcast reception. In the manufacture of devices of this character many thousand electromagnetic sound reproducers are carried forward in the production program simultaneously. Without a positive means of determining the magnetic properties of each of the units it is difficult and practically impossible to maintain a uniform magnetic characteristic for each of the devices throughout the production program.

My invention enables an operator on the inspection floor to rapidly determine the magnetic qualities of each device as it passes to his position from an assembly position. The operator by observing the movement of an indicator may determine by the direction and amplitude of deflection of the indicator whether or not the device is magnetized in the correct direction and also whether or not the device has the proper magnitude of magnetism.

My invention will be more clearly understood from the following specification by reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic view showing the arrangement of parts of the testing apparatus and the scale which is employed in reading the direct or reverse magnetism characteristic of the receiver; Fig. 2 is a side elevation partially in cross section of the magnometer and the electromagnetic sound reproducing device in test position relative thereto; Fig. 3 is a plan view of the magnometer completely assembled; Fig. 4 is a front view of the magnometer illustrating the attachment which I provide for readily receiving the electromagnetic sound reproducing device in position for testing the magnetic properties thereof; and Fig. 5 is a side view of the apparatus showing the electromagnetic sound reproducing receiving device in more detail.

Referring more particularly to the drawings, reference character 1 designates a supporting member on which pole pieces 2 and 3 are mounted and between which an armature 4 is mounted for rotation. The armature 4 is journaled in bearings 5 and 6 at each end thereof positioned in members 7 and 8 supported from pole pieces 2 and 3. The winding on armature 4 is normally energized from an external source indicated at 9 controlled by rheostat 10, the value of which is determined by meter 11. The supply circuit is connected through negative terminal 12 with the armature winding 14 carried by rotatable armature 4, the circuit being completed through positive terminal 15 back to

the external source 9. A condition of balance is obtained by which the armature 4 is normally maintained by spiral spring devices 40 in position where an indicator 16 registers with the central zero position of scale 17. The indicator 16 is carried by the armature 4 by means of screws 18 cooperating with arcuate slots 19 in disk 20 fixed upon the armature shaft. The scale 17 is graduated in opposite directions on either side of the central zero position as represented. Extended pole members 21 and 23 are fixed to the pole pieces 2 and 3 by means of screws 24 and 25 and terminate in parallel pole pieces 26 and 27. The pole members 21 and 23 are bent substantially at right angles and directed toward each other. The pole members are again bent at right angles and extend parallel with each other along a line parallel to the axis of the armature 4 finally terminating substantially flush with the upper surface of the test board 28. The test board 28 is mounted upon members 29 which are supported by the casing 30 of the magnometer. The casing 30 encloses the operating parts of the magnometer heretofore described. The test board for the electromagnetic sound reproducing device is provided with a substantially semi-circular guide 31 and an extended guide member 32 supported thereover to secure the electromagnetic sound reproducer casing in position during the testing operation.

Fig. 2 illustrates the arrangement of the telephone receiver 33 in test position with reference to the magnometer. The casing of the receiver is represented at 34 housing the magnets 35 and the permanent ring magnet system 36. The circular peripheral edge 37 of the casing 34 is guided by the semi-circular guide member 31 on the test board in such manner that by abutting the telephone receiver casing against the side walls of the semi-circular guide member 31 and beneath the laterally extending member 32, the pole pieces 38 and 39 of the telephone receiver will be aligned with the pole pieces 26 and 27 of the magnometer. Both of the magnometer pole pieces are thoroughly annealed in such manner that both are of uniform magnetic quality. The magnetism of the permanent magnetic system 36 of the pole pieces 38 and 39 of magnets 35 in the telephone receiver 33 seeks a path through the magnetic system of the magnometer and across the pole pieces 2 and 3. The lines of force set up when the telephone receiver is positioned upon the test board cause magnetic displacement of the normal magnetic field between pole pieces 2 and 3 in which the additional magnetic field derived from the telephone receivers on test tends to add to or oppose the normal field existing in the magnometer. The armature winding 14 will oppose the normal field whereby rotatable movement is imparted to the armature 4 displacing the indicator 16 over scale 17 in accordance with the direction of magnetism of the telephone receiver 33.

I have determined that acceptable telephone receivers show a deflection to the right over scale 17 with at least a reading of 20. Telephone receivers should fall within limits of 20 to 22 and those falling below 20 are rejected as having insufficient magnetism. When the telephone receiver has been incorrectly magnetized and has a reverse magnetism the deflection of the indicator 16 will be towards the left on scale 17. Any reading toward the left is sufficient to require the rejection of the receiver on test. It will be observed that I provide means for actually employing the magnetic strength of the telephone receiver per se for directly operating a meter. In this way the magnetic qualities of the receiver may be instantly shown and checked. Several thousand telephone receivers passing through a production program may thereby be rapidly inspected and the rejects removed from receivers of good quality.

It will be understood that while I have particularly described my invention with reference to telephone receivers that my invention is equally applicable to electromagnetic sound reproducing mechanisms in general. I may employ the testing apparatus for observing the magnetic qualities of loud speaker units passing through a production program in a manner similar to the operations described in connection with tests conducted on telephone receivers per se. I may also combine with the magnetic test described herein, a mechanical test to determine the grinding depth of the devices. This may be readily done by so locating the pole pieces 26 and 27 with reference to the upper surface of the test board 28 that they normally project above the test board for a distance equal to the grinding depths. By the grinding depth I means the dimensional difference between a plane passing through the tips of the pole pieces 38 and 39 of magnets 35 and a plane passing through the peripheral edge 37 of the casing 34. With the proper projection of the pole pieces 26 and 27 above the surface of the test board 28 the peripheral edge 37 should abut firmly against the test board surface. I may employ a direct reading meter mechanically actuated by contact of the terminal faces of the pole pieces 26 and 27 to give an indication of the height of the pole pieces.

It will be understood that other modifications may be made and that the invention may be embodied in various constructions and that I intend no limitations upon the invention other than those imposed by the scope of the appended claims.

What I claim and desire to secure by Let-

ters Patent of the United States is as follows:—

1. An apparatus for determining the magnetic properties of electromagnetic sound reproducing devices comprising a substantially horizontal test board, a guide for positioning an electromagnetic sound reproducing device with respect to said test board, a pair of pole pieces projecting upwardly into said test board and extending below said test board on opposite sides of a rotatable armature, an indicator carried by said armature and arranged to swing over a graduated scale, and means whereby an electromagnetic sound reproducing device when positioned on said test board in said guide may be caused to furnish magnetic flux for moving said armature and driving said indicator over said scale through distances proportional to the magnetic strength of said electromagnetic sound reproducing device.

2. An apparatus for determining the magnetic properties of electromagnetic sound reproducing devices comprising a substantially horizontal test board, a guide for positioning an electromagnetic sound reproducing device upon said test board, a pair of pole pieces projecting upwardly into said test board and extending below said test board on opposite sides of a rotatable armature, an indicator arranged to swing over a graduated scale, said pole pieces being spaced one from another and parallel throughout the length thereof corresponding to the distance between pole pieces of the electromagnetic sound reproducing device to be tested, whereby electromagnetic sound reproducing devices on test may be positioned in said guide on said test board with the magnetic poles thereof adjacent said pole pieces, said pole pieces projecting from said test board for providing a continuous path for the lines of magnetic force from said electromagnetic sound reproducing device through said armature for rotating said indicator to a position proportional to the magnetic strength of the electromagnetic sound reproducing device on test.

In testimony whereof I affix my signature.

JOHN N. RAY.