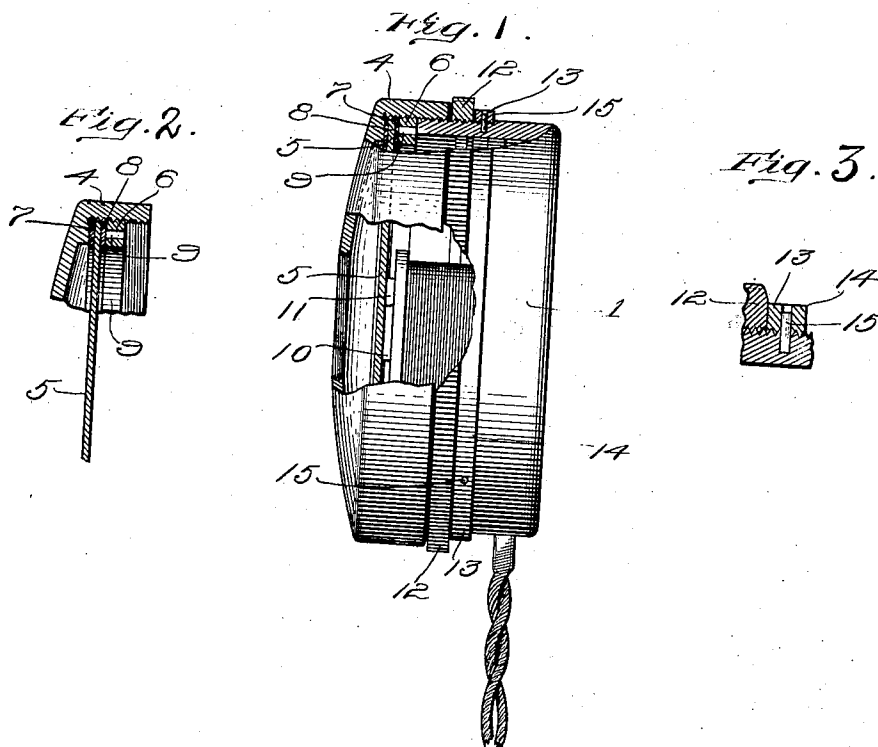


R. J. BARBER.
 ADJUSTING MEANS FOR THE REGULATION OF THE INTENSITY OF SOUND FOR EAR PHONE RECEIVERS
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Patented Aug. 23, 1910.



Witnesses.
 M. J. Spalding
 Edward Macwell

Inventor:
 Raymond J. Barber,
 by Geo. H. Maxwell
 Atty

UNITED STATES PATENT OFFICE.

RAYMOND J. BARBER, OF BELMONT, MASSACHUSETTS, ASSIGNOR TO GLOBE EAR-PHONE COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

ADJUSTING MEANS FOR THE REGULATION OF THE INTENSITY OF SOUND FOR EAR-PHONE RECEIVERS.

968,231.

Specification of Letters Patent.

Patented Aug. 23, 1910.

Application filed October 26, 1909. Serial No. 524,606.

To all whom it may concern:

Be it known that I, RAYMOND J. BARBER, a citizen of the United States, residing at Belmont, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Adjusting Means for the Regulation of the Intensity of Sound for Ear-Phone Receivers, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

One of the most important and at the same time difficult features in connection with ear-phone receivers is the regulation of the intensity of sound, and accordingly my invention resides in providing means for accomplishing this regulation without the possibility of derangement of the mechanism due to careless or unskilled handling. The greatest intensity is secured when the diaphragm is approximately but not quite in contact with the poles of the electromagnet. The adjustment necessary for securing the desired intensity is so exceedingly fine that even the skilled and careful expert in the factory has heretofore found it necessary to give special care and attention to this adjustment, and when the instrument has reached the hands of the inexperienced and often careless user, experience has proved that the instrument has been very liable to be condemned and thrown aside simply because this adjustment has been varied. Accordingly I have provided means rendering it impossible for the user to screw the diaphragm down too far or otherwise lose the original fine accurate adjustment. The diaphragm is mounted as usual in the cap or cover and is held permanently in fixed position therein. On the threaded rim of the body of the instrument, which receives the cap or cover with its contained diaphragm, I mount a knurled threaded ring and just back of this ring a small smooth ring or stop which is likewise threaded in position and is adapted to be secured immovably in exactly the right adjustment by being pinned to the casing, the result being that the user cannot possibly screw the diaphragm too close to the electromagnet so as to lose the greatest sound intensity and yet he has it within his power, by adjusting the knurled ring outward, to decrease said intensity ac-

cording to the peculiarities of his individual requirements.

In the drawings, I have shown a preferred embodiment of the invention, Figure 1 showing in side elevation, partly broken away, an ear-phone receiver provided with my invention; and Figs. 2 and 3 showing, in fragmentary cross section, details of the removable parts.

The general construction of the receiver may be of any usual or preferred kind, and hence I have omitted showing and describing the details of the internal construction.

The case 1 is externally threaded to receive the correspondingly threaded portion of a cap or cover 4. In the latter the diaphragm 5 of the receiver is clamped by a threaded ring 6 between paper washers 7, 8, holes 9 for a spanner wrench being provided in ring 6. As previously explained, the greatest intensity of sound is secured when the diaphragm 5 is almost but not quite in contact with the poles 10, 11, of the electromagnet of the receiver, but the efficiency of the receiver is entirely killed if the diaphragm actually touches said poles. Hence it is desirable that it shall be impossible for the unskilled to move the diaphragm against the electromagnet and yet it is equally desirable that the user shall be able to get the greatest intensity of sound if the condition of his hearing shall require it. On the other hand, different people require different intensities of sound in order that the receiver shall be in accord or tuned to the requirements of their hearing, and hence there must be provision to enable the user to decrease said intensity from the maximum, and this is accomplished by moving the diaphragm away from the electromagnet. Accordingly I provide a separate knurled ring 12 screwed onto the threaded portion of the case 1 in front of the cap to limit the adjustment of the cap when the latter is screwed onto the case. By this means the user is enabled to obtain such adjustment, within proper range, as he may desire, and, while keeping said adjustment, may screw off the cap and diaphragm in case he wishes to inspect the magnet, clean the same, or the like. Having inspected the magnet, he simply screws back the cap until it strikes against the ring 12 which was left in the particular adjustment which he has found

by experience is suited to his hearing. Just back of the ring 12 I mount an adjustable stop in the form of a second threaded ring 13, preferably thin and of less external diameter than the ring 12 and having a smooth periphery 14 so that there is no tendency to grasp said ring inasmuch as the thicker ring 12 is knurled or milled and projects above the ring 13. This ring is provided at desired points throughout its periphery with radial pin holes 15. In adjusting the ring 13, the cap 4 is turned onto the case 1 until the diaphragm 5 just touches the poles of the magnet. Thereupon the rings 12 and 13 are turned until they tighten against the edge of the cap. A mark 16 is then made or noted opposite one of the pin holes 15 of the ring 13, the cap 4 and ring 12 are removed or turned backward slightly and the ring 13 is then moved a short distance, as for instance to the point 17, whereupon the pins are inserted in the pin holes 15 and into the case, permanently pinning the ring 13 immovably in said adjustment. When now the ring 12 is tightly screwed against the ring 13 and the cap screwed tightly in place, the diaphragm will be as near the magnet poles as possible without touching them, which is the point of greatest intensity of sound. The instrument is sent out in this adjustment and it will be evident that thereafter the user, whether careless or careful, may freely vary the intensity of sound by adjusting the diaphragm by means of the ring 12 with relation to the magnet poles but cannot prevent the proper working of the diaphragm by adjusting it against the poles. All the adjustment is secured by means of metal (as distinguished from the non-dependable paper washers, for instance) and externally of the cap. The maximum adjustment toward the magnet is positive, so that screwing the diaphragm down too far is absolutely prevented. It is no longer necessary to leave a margin of safety in adjusting the apparatus but it can be set as fine as desired as the adjusting means is fixed and accurate.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is,

1. In an ear-phone receiver, the combination with the case, its fixed magnet, and the cap and its diaphragm secured therein, said cap having threaded engagement with the case for adjusting said diaphragm toward and from said magnet, of an adjusting ring for limiting the adjustment of said cap on the case, a stop capable of adjustment on said case in a direction toward and from the cap to vary the normal position of said adjusting ring and thereby vary the extent to which the cap can be screwed onto the case, and means securing said stop fast on the case in its said adjustment in position to

limit the distance of possible approach of said diaphragm to said magnet.

2. In an apparatus of the kind described, a case, a removable cap, one externally threaded and the other internally threaded for adjustment thereon, a diaphragm secured in fixed position in one, a magnet secured in fixed position in the other for operating said diaphragm, and adjusting means for limiting the adjustment of said diaphragm and its carrying part with relation to said magnet to the position of maximum intensity of sound, including a threaded stop adapted to travel on the threads of the case and means securing said stop in fixed position in the path of movement of said diaphragm-carrying part with relation to the magnet-carrying part to prevent the actual touching of the magnet by the diaphragm, while permitting the two to be brought almost together.

3. In an apparatus of the kind described, a case, a removable cap, one externally threaded and the other internally threaded for adjustment thereon, a diaphragm secured in fixed position in one, a magnet secured in fixed position in the other for operating said diaphragm, and adjusting means for limiting the adjustment of said diaphragm and its carrying part with relation to said magnet, including a freely movable threaded ring mounted upon the externally threaded member in the path of movement of said internally threaded member, and a stop ring back of said movable ring fixed in position to stop the movable ring and internally threaded member when the diaphragm has reached the position of desired nearest approach to the magnet.

4. In an apparatus of the kind described, a case, a removable cap, one externally threaded and the other internally threaded for adjustment thereon, a diaphragm secured in fixed position in one, a magnet secured in fixed position in the other for operating said diaphragm, and adjusting means for limiting the adjustment of said diaphragm and its carrying part with relation to said magnet, including a freely movable threaded ring mounted upon the externally threaded member in the path of movement of said internally threaded member, and a stop ring back of said movable ring fixed in position to stop the movable ring and internally threaded member when the diaphragm has reached the position of desired nearest approach to the magnet, said movable ring having a greater peripheral diameter than the stop ring.

5. In an apparatus of the kind described, a case, a removable cap, one externally threaded and the other internally threaded for adjustment thereon, a diaphragm secured in fixed position in one, a magnet secured in fixed position in the other for

operating said diaphragm, and adjusting
means for limiting the adjustment of said
diaphragm and its carrying part with rela-
tion to said magnet, including a freely mov-
5 able threaded ring mounted upon the ex-
ternally threaded member in the path of
movement of said externally threaded mem-
ber, and a stop ring back of said movable
ring fixed in position to stop the movable
10 ring and internally threaded member when
the diaphragm has reached the position of
desired nearest approach to the magnet, said

movable ring being peripherally knurled
and having a greater peripheral diameter
than the stop ring and the latter having a 15
smooth periphery.

In testimony whereof, I have signed my
name to this specification, in the presence of
two subscribing witnesses.

RAYMOND J. BARBER.

Witnesses:

M. J. SPALDING,
EDWARD MAXWELL.