

UNITED STATES PATENT OFFICE.

EUGENE WILLIAM SCHNEIDER, OF NEW YORK, N. Y., ASSIGNOR TO THE MEARS EAR PHONE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

MESSAGE APPARATUS FOR IMPROVING THE HEARING.

No. 801,745.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EUGENE WILLIAM SCHNEIDER, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Massage Apparatus for Improving the Hearing, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

My invention relates to apparatus for treating certain affections of the ear by means of massage, and has for its chief object to provide a device which shall cause the ear to be affected by sharp and frequently-recurring sounds and also by the mechanical effect of alternately compressing and rarefying the body of air in contact with the ear-drum. Instruments for massaging the ear have been known heretofore; but, so far as I am aware, no device prior to my present invention has combined both pneumatic and sound massage for the purpose intended. Moreover, in the prior devices of the pneumatic type the electromagnets commonly employed for actuating the diaphragm, which by its vibration caused the alternate compression and rarefaction of the body of air within the outer ear, did not act directly upon the diaphragm, and in the previous devices for sound-massage it was impossible to exert the full force of the magnets upon the sound-producing diaphragm, as some of this force at least was expended in actuating the make-and-break armature. My apparatus, however, is so designed that the entire force of the current is expended on the diaphragm, the making and breaking of the circuit being accomplished by means actuated by the diaphragm itself. I also obtain in my apparatus a very large amplitude of vibration of the diaphragm, so that a pronounced suction is produced when the diaphragm moves outward away from the ear and a very appreciable compression of the air adjacent to the diaphragm when it moves forward toward the ear. The result is that I am able to obtain a more powerful massage effect due to the alternate compression and rarefaction of the air which is in contact with the ear-drum. At the same time the sharp and rapid sounds produced by the diaphragm are transmitted by the ear-drum to the inner parts of the ear,

thereby adding a further effect to that produced by the pneumatic massage.

The preferred embodiment of my invention is shown in the accompanying drawings, in which—

Figure 1 is a front elevation of the casing for the apparatus, showing the batteries in position and the massage device proper in the compartment designed to receive the same when not in use. Fig. 2 is a vertical section on line *a b* of Fig. 1. Fig. 3 is a section on line *c d* of Fig. 1. Fig. 4 is a perspective view of the massage device proper, showing the scale and index for use in determining the proper adjustment of the apparatus. Fig. 5 is a longitudinal section of the massage device proper, and Fig. 6 is a section on the line *e f* of Fig. 5.

The device is inclosed within any suitable casing—as, for example, that indicated by 1, which is provided with a cap 2, having a centrally-located aperture 3. Carried by the cap is a diaphragm 4 of any approved construction, preferably of mica. The diaphragm carries at its center a disk of metal 5, constituting, in effect, the armature, which is acted upon by suitable electromagnets to cause the diaphragm to vibrate.

6 6 indicate electromagnets having their pole-pieces extending in proximity to the armature 5, the other ends of the cores 7 being secured to a yoke 8, which latter may be fastened in any convenient manner to the bottom of the casing 1.

Pivoted to a standard 9 is a spring-supported vibrator or arm 10, preferably of brass or other non-magnetic metal, extending between the pole-pieces of the magnet and carrying a stud or pin 11, adapted to be engaged by the disk 5, carried by the diaphragm. The arm 10 also carries a spring contact member 12, extending toward the bottom of the casing, where it makes contact with a screw 13.

From the foregoing the operation of the massage device proper will be readily understood. The device being properly connected with a source of current, as more fully explained hereinafter, the electromagnet will be energized and the armature 5 drawn down, carrying with it the diaphragm 4. As the diaphragm is flexed it bears upon the stud 11 and carries the arm 10 backward on its pivot,

the contact-spring 12 sliding over the end of the screw 13 until finally it is carried out of contact therewith and the circuit is broken. The resiliency of the diaphragm immediately
 5 causes it to be reflexed with considerable force, which may be sufficient to carry the same even beyond its original position before the remaking of the circuit causes the magnets to develop enough force to start the diaphragm
 10 on its return. By a proper adjustment of the screw 13 and the contact-spring 12 the two may be kept in contact with each other for a considerable movement of the latter.

The cap 2, which carries the diaphragm, is
 15 screw-threaded to the casing 1, so that by rotating the cap the diaphragm may be carried toward or from the pole-pieces of the electromagnet. By this means the amplitude of vibration of the diaphragm may be regulated
 20 with great accuracy, since, as will be readily seen, the magnets will continue to act upon the armature 5 as long as the contact-spring 12 is in engagement with the screw 11. If the cap is adjusted so as to hold the diaphragm
 25 a considerable distance from the magnet-poles, it will require a considerable movement of the arm 10 before the spring 12 is disengaged from its contact, during which period, as before stated, the magnet will continue to
 30 draw the armature and diaphragm inward. For the purpose of determining the adjustment of the cap and diaphragm, the former may be provided with a scale over which projects an index 14, secured to the casing by
 35 means of a nut 15 on the screw 13, which nut serves also to lock the said screw in its adjusted position.

The wiring and connections of the device are as follows: Assuming the current to enter
 40 from the conductor 16, it flows through the plate 17 to the screw 13, thence to the spring-contact 12, vibrator or reed arm 10, standard 9, through magnets 6, and out again through conductor 18.

45 In order to prevent sparking at the contacts of the spring 12 and screw 13 and consequent injury thereto, I provide a condenser 19 in the form of a long strip bent into circular shape to fit the inside of the case 1. One terminal of the condenser is connected to the
 50 plate 17 and the other to the yoke 8.

For the sake of convenience and portability I provide a case 20 for the batteries, with a compartment to receive the message device proper
 55 when the same is not in use. The batteries (indicated by 21 22 23) are connected in series, the end cells being provided with contact-strips of spring metal adapted to bear against plates 24 25, secured to the back of the case
 60 and electrically connected with the sockets 26 27, respectively. Into the latter may be inserted the plugs 28 29, to which are connected the conductors 30, leading to the message device, as indicated in Figs. 3 and 4. The
 65 battery may be inclosed in a receptacle 31,

having separate compartments for the several cells. The case is provided with a hinged cover 32 to permit ready removal and insertion of the battery-box 31. The compartment for the message device is also provided
 70 with a hinged closure, as 33.

As before stated, when the instrument is in use the diaphragm is attracted by the magnets, and being in contact with the stud on the reed-arm it carries the same backward,
 75 and thus breaks the circuit at the point of contact between the spring 12 and screw 13. However, the circuit is maintained for a considerable period, comparatively speaking, by reason of the tension of the spring 12. The
 80 latter drags over the end of the screw 13, and thus keeps the circuit complete, enabling the magnets to draw the diaphragm over the full distance for which the instrument has been adjusted. Finally, the tension of the spring
 85 having been fully expanded it leaves the contact-screw, and the circuit is thereby broken. This construction and operation is radically different from all other devices with which I
 90 am familiar, as in the usual form of instrument the make and break of the circuit are each of substantially the same duration. The adjustment referred to is, as already explained, obtained by screwing the cover or
 95 cap 2 to right or left, thus varying the distance of the diaphragm from the magnet-poles. In this way the tone produced is sharp, as in the case of great amplitude of the diaphragm vibrations, or of lesser intensity, as in the
 100 case of shorter amplitude. At the same time the suction produced by the diaphragm is correspondingly modified, being stronger and slower when the amplitude of vibration is larger than when the amplitude is small.

It will be noted that the make and break of
 105 the circuit is effected by the mechanical engagement of the reed-arm by the diaphragm and not by a separate armature actuated directly by the magnet, as is usual in devices for the same purpose. Hence in my construction
 110 the force of the magnets is expended on the diaphragm, and the make-and-break mechanism is actuated independently of the former in so far as any direct action by the magnets is concerned.
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It is to be understood that the instrument herein shown and described is merely one specific embodiment of my invention, which may be embodied in a variety of forms without departure from its proper scope.
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What I claim is—

1. In a device of the kind described, the combination of an electromagnet, a circuit therefor, a diaphragm adapted to be actuated by the electromagnet, a reed-arm in the said circuit and arranged to be vibrated by the diaphragm, and means connected with said reed-arm for making and breaking the circuit, as set forth.
 125

2. In a device of the kind described, the com- 130

5 combination of an electromagnet, a circuit there-
for, a diaphragm adapted to be actuated by
the electromagnet, relatively stationary con-
tact in the circuit, and a vibrating contact in
the circuit coöperating with the stationary
contact and actuated by the diaphragm, as set
forth.

10 3. In a device of the kind described, the com-
bination of an electromagnet, a circuit there-
for, a diaphragm adapted to be actuated by
the electromagnet, a relatively stationary con-
tact in the circuit, a reed-arm arranged to be
vibrated by the diaphragm, and a resilient con-
tact member in the circuit, carried by the reed-
arm and coöperating with the stationary con-
tact, as set forth.

20 4. In a device of the kind described, the com-
bination of an electromagnet, a circuit there-
for, a diaphragm adapted to be actuated there-
by, make-and-break mechanism for the cir-
cuit, actuated by the diaphragm, and means
for varying the amplitude of vibration of the
diaphragm, as set forth.

25 5. In a device of the kind described, the com-
bination of an electromagnet, a circuit there-
for, a diaphragm adjacent to the electromag-
net and actuated thereby, make-and-break
mechanism for the circuit, including a vibrat-
ing reed-arm in contact with the diaphragm
so as to be vibrated thereby, and means for
adjusting the diaphragm relative to the elec-
tromagnet and the reed-arm, whereby the
amplitude of vibration of the diaphragm may
be regulated, as set forth.

35 6. In a device of the kind described, the com-

bination of a case, an electromagnet therein,
a circuit for the electromagnet, an adjustable
cap for the case, a diaphragm carried by the
cap in position to be actuated by the electro-
magnet, and make-and-break mechanism for
the circuit, actuated by the diaphragm, as set
forth.

7. In a device of the kind described, the com-
bination of an electromagnet, a circuit there-
for, a mica diaphragm having an armature se-
cured thereto, and make-and-break mechan-
ism for the circuit, actuated by the diaphragm,
as set forth.

8. In a device of the kind described, the com-
bination of an electromagnet, a circuit there-
for, a diaphragm adapted to be actuated by
the electromagnet, make-and-break mechan-
ism for the circuit, actuated by the diaphragm
and constructed to give a relatively long pe-
riod of contact, and a condenser connected
with said circuit, as set forth.

9. In an apparatus of the kind described, the
combination of a carrying-case having a com-
partment to receive an electromagnet massage
device, and a compartment for containing a
battery, one or more cells in the battery-com-
partment, a pair of contact-sockets in the wall
of the case electrically connected with oppo-
site poles of the battery, and a pair of remov-
able plugs for the sockets, electrically con-
nected with the massage device, as set forth.

EUGENE WILLIAM SCHNEIDER.

Witnesses:

M. LAWSON DYER,
S. S. DUNHAM.