Oct. 20, 1936. G. W. BURCHETT 2,058,212

ARTIFICIAL LARYNX

Filed Dec. 5, 1934 2 Sheets-Sheet 1

FIG. 1

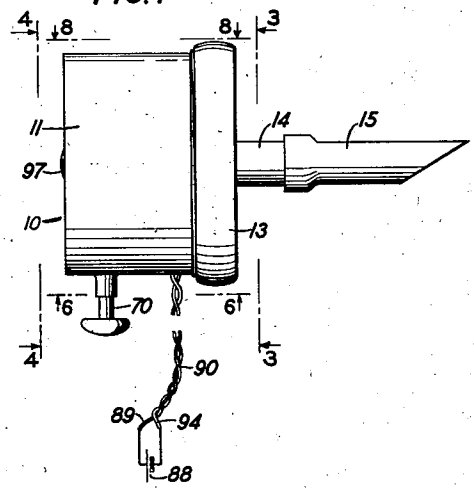

FIG. 2

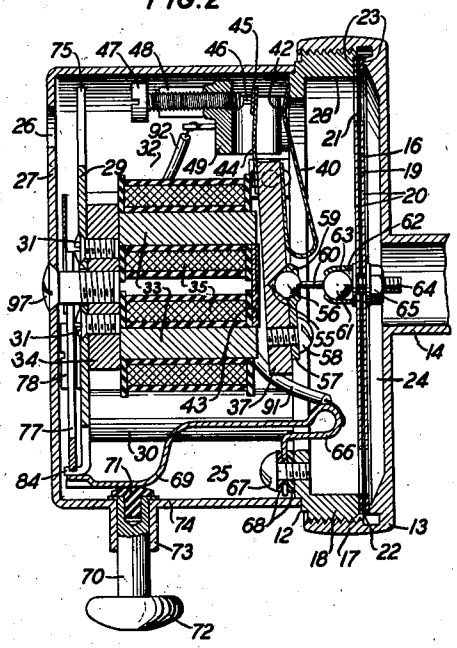

FIG. 3

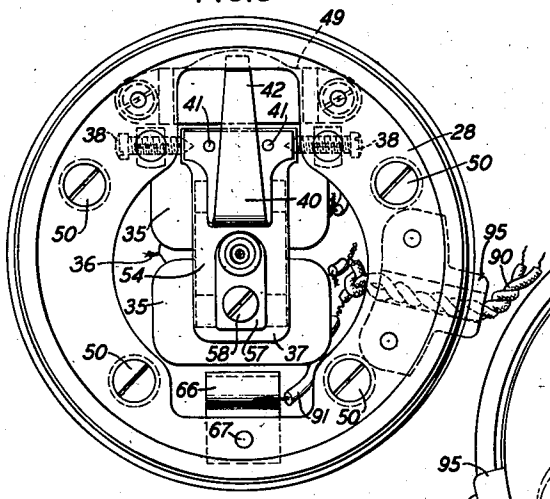

FIG. 4

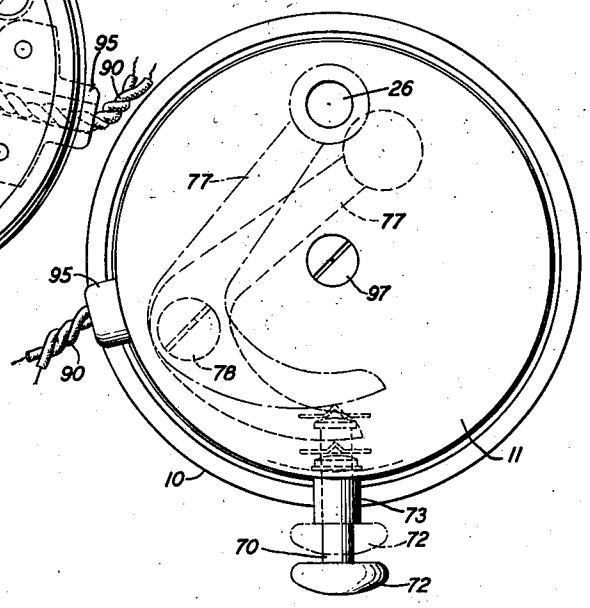

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FIG. 5

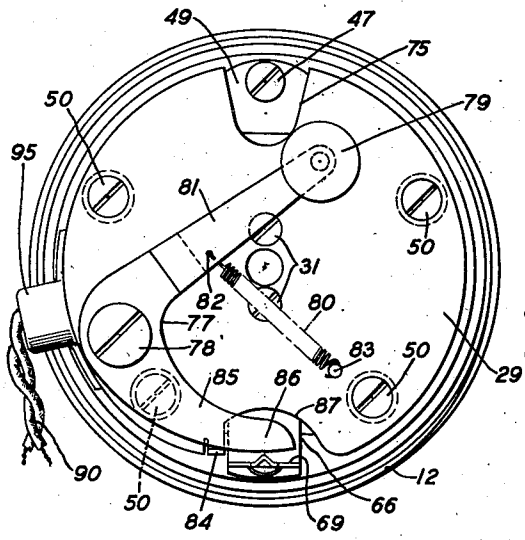


FIG. 6

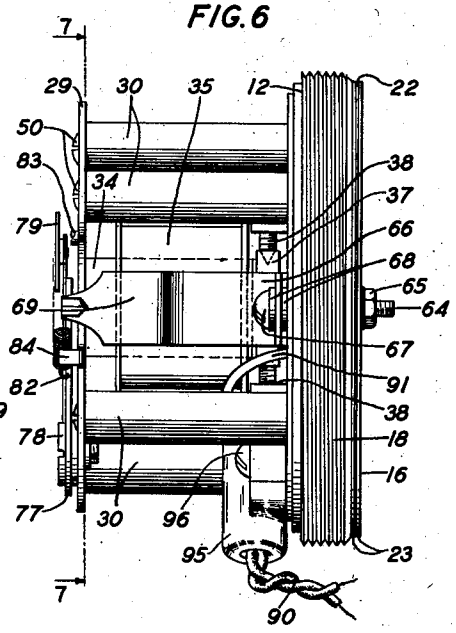


FIG. 7

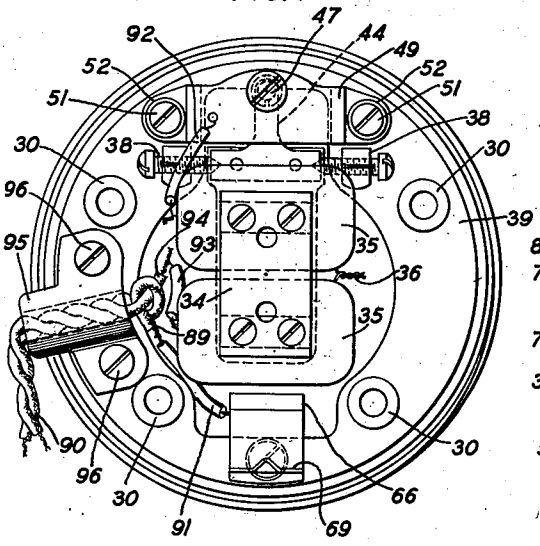
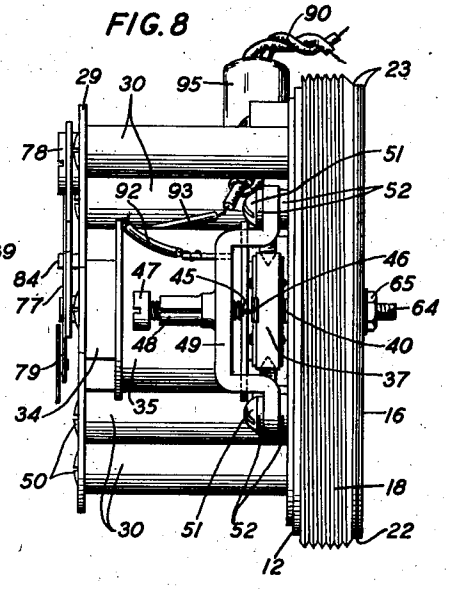


FIG. 8



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UNITED STATES PATENT OFFICE

2,058,212

ARTIFICIAL LARYNX

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Application December 5, 1934, Serial No. 756,047

5 Claims. (Cl. 3—1)

This invention relates to an artificial larynx, and, more particularly, to artificial larynx of the electrical type.

An object of this invention is to simplify and improve the structure of an artificial larynx.

A further object is to improve the operating characteristics of an artificial larynx.

A feature of this invention comprises providing a chamber on one side of the larynx tone generating means with a variable size outlet or opening whereby the pitch of the larynx tone may be varied.

Another feature comprises manually operable means for varying the area of the opening from the chamber.

Still another feature comprises manually operable means for varying the area of the opening from the chamber, which controls, also, the current circuit of electrical means for actuating a vibratable larynx tone-producing member.

A further feature comprises a piston type diaphragm for an artificial larynx having a planar member, preferably of water-proof, air-proof, flexible material reinforced over a portion of its area and supported so that the reinforced portion moves like a piston when vibrated.

Yet another feature comprises connecting an artificial larynx diaphragm and an armature of electrical means for actuating the diaphragm, through means obviating the need for accurate positioning of the diaphragm with reference to the electrical means or for fastening the diaphragm and armature rigidly together.

Still other features will be evident from the detailed description which appears hereinafter.

A preferred embodiment of this invention comprises a casing having an open end supporting a diaphragm, and a chamber containing electrical means for actuating the diaphragm. The casing contains an aperture or outlet for the chamber, variable in size by a manually operable closure member, regulated in position by a finger member or button which also controls the current circuit of the electrical actuating means. The diaphragm comprises, preferably, a planar member of water-proof, air-proof, flexible material, for instance, a fabric, having a portion of its area reinforced, preferably by a pair of discs of light, corrosion resistant metal, for instance, aluminum or an aluminum alloy, the non-reinforced portion providing a flexible surround for the reinforced portion whereby the latter is free to move as a piston when vibrated. The electrical means comprises, preferably, an armature member coupled to the diaphragm through toggle-like means obviating the need for accurate positioning of the diaphragm or rigid connection thereof to the armature.

A more complete understanding of this invention will be derived from the detailed description which follows, taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a side elevational view of an artificial larynx embodying this invention, approximately normal size;

Fig. 2 is an enlarged cross-sectional view of the device of Fig. 1;

Fig. 3 is an enlarged view of the device of Fig. 1 along the line 3—3 thereof, with the front cover or cap removed;

Fig. 4 is an enlarged view of the device of Fig. 1 along the line 4—4 thereof;

Fig. 5 is an enlarged view of the device of Fig. 1 along the line 4—4 thereof, with the case or housing removed;

Fig. 6 is an enlarged view of the device of Fig. 1 taken along the line 6—6 thereof and with the front cover and case removed;

Fig. 7 is a sectional view of the device of Fig. 1 taken along the line 7—7 of Fig. 6; and

Fig. 8 is an enlarged view of the device of Fig. 1 taken along the line 8—8 thereof and with the front cover and case removed.

This invention is embodied in an electrical artificial larynx, designated generally as 10, comprising a case or housing 11, a metal frame member 12, and a front cover or cap member 13 having a central cylindrical tubular extension 14 engaged by a soft rubber tubular member 15, adapted for insertion in the mouth of a user of the larynx.

A larynx-tone-producing member or diaphragm 16 is supported at its peripheral portion against the frame member by the front cover which is provided with an internally threaded, outer flange portion 17 engaging with the externally threaded portion 18 of the frame member. The diaphragm comprises, preferably, a circular, planar, fabric member 19, air-proof and water-proof, for instance, of oiled silk. It is reinforced over the greater portion of its central area, preferably, by a pair of discs 20 of light-weight, corrosion-resistant material, such as aluminum or duralumin, the non-reinforced portion 21 providing a flexible surround, whereby the reinforced portion is free to move as a piston when vibrated. The peripheral portion 22 of the diaphragm is mounted between a pair of phenol fiber washers 23, which, like the discs 20, are secured to the member 19 in any suitable man-

ner, for instance, by cement. The diaphragm divides the volume defined by the case, frame and front cover into two air chambers, a front and shallow chamber 24 between the diaphragm and cover having an outlet through the extension 14, and a rear and deep chamber 25 communicating with the atmosphere outside of the case through the opening or aperture 26 in the bottom wall 27 of the case.

The frame member comprises a substantially annular portion 28, a plate or disc member 29, and a plurality of spacers or separators 30, the portion, member and spacers being fastened together by screws 50. Intermediate the annular portion and the plate member and secured to the latter by screws 31 is an electro-magnet structure 32. This structure comprises a pair of cores 33, a magnetic plate 34 connecting one end of each core, and an energizing winding in the form of a coil 35 on each core, the coils being connected together at 36. An armature 37, of magnetic iron, is pivotally supported at one end on screw-adjustable trunnions 38, carried on the undersurface 39 of the portion 28. A reversely bent metal spring 40 is secured at one end to the armature by rivets 41, and engages at its other and free end 42 with the surface 39. The spring 40 holds the armature in spaced relation to the pole-pieces and acts to return the armature to its original position after it has been attracted to the pole-pieces upon the flow of current through the coils 35. A sheet 43 of compressible material, such as cork, is supported on the coils and serves to limit the movement of the armature toward the pole-pieces to prevent its freezing to them. On the underside of the supported end of the armature, a metal spring or contact member 44 is secured, for instance, by the rivets 41, its free end 45 normally being in contact with the extremity 46 of an adjustable screw or member 47. The member 47 threads through a threaded sleeve portion 48 on a U-shaped, metallic carrier or support 49 fastened to the surface 39 by screws 51, but insulated therefrom by the insulating washers 52. When the armature is attracted to the pole-pieces, the contact between the spring 44 and the member 48 is broken, but upon the armature's returning to its normal position, the contact is again closed.

The armature and diaphragm are coupled together by toggle-like means. The armature's upper surface 54 is provided with a recess 55 to receive a small, spherical member 56 which is held in the recess by a plate member 57 secured to the armature, for instance, by the screw 58, and provided with a recess 59 to receive a portion of the member 57. A short rod 60 is connected at one end to the member 57 and at its other end to a similarly shaped spherical member 61 held in a recess 62 defined by a hollow member 63, having a threaded extension 64 projecting through the center of the diaphragm and secured thereto by the clamping nut 65. The spherical members are adapted to move freely or to swivel in their recesses and, with the connecting rod 60, constitute an effective, although loose, connection between the armature and diaphragm that permits mounting the diaphragm on the frame member without the necessity of accurately positioning it with reference to the armature.

An elongated metal spring member 66 is secured to the surface 39, for instance, by the screw 67, and insulated from it by the insulating washers 68. The member 66 extends downwardly toward the wall portion 27 of the case, an outwardly curved portion 69 being adapted to be engaged by an inwardly movable member 70 terminating at one end in an insulating member 71 and at the other end in a button-shaped member 72 adapted to be engaged by a finger of the user of the larynx. The member 70 is guided in its movement by the sleeve or extension 73 in the side wall portion 74 of the case.

Supported on the disc member 29, is a crank member 77, pivotally mounted on the disc by a screw member 78, and normally occupying the position in which it is shown in Fig. 5 and as indicated by the dotted line of Fig. 4. The member 77 is provided with an enlarged end portion 79. While shown as circular, the portion 79 may, like the aperture 26, be of any other desired shape. The member 77 is retained in its normal position by a helical spring 80, at one end engaging the arm 81 of the crank at 82, and at its other end being secured to the pin or rivet 83 attached to the disc member. A stop or lug 84 projects from the disc member and is engaged by the arm 85 of the crank. The crank is caused to turn on its pivotal support when the finger actuatable member 70 is pushed inwardly, the insulating member 71 bearing against the spring member 66, and forcing it against the end portion 86 of the crank arm 85 to cause the crank arm 81 to move to the left and to occupy as its extreme position that indicated by the broken line of Fig. 4. In the broken line position, the aperture 26 is entirely closed. Of course, by adjusting the extent to which the member 70 is pushed inwardly, the extent to which the effective area or size of the aperture 26 is varied may be controlled. It has been found that, by varying the effective size of the opening connecting the chamber 25 and the atmosphere outside of the case, the pitch of the larynx tone may be effectively varied. The disc member is recessed at 87 to permit inward movement of the curved portion 69 of the member 66, and at 75 so that the member 47 may be adjusted with a tool inserted through the aperture 26. In its initial position, the portion 69 is separated from and is out of contact with the crank arm 85. When, however, the member 70 is pressed inwardly sufficiently for it to force the portion 69 into contact with the crank member, the electrical circuit for the larynx is completed. This circuit is from the battery 88, which may be carried concealed on the person of the user, conductor 89 of the cord 90, conductor or lead 91 electrically connected to the member 66, the member 66, member 77, frame member 12, spring member 40, armature 37, spring member 44, member 47, support 49, conductor or lead 92 to one of the coils 35, coils connection 36 to the other coil 35, conductor or lead 93 to the other conductor 94 of the cord, to the battery. When this circuit is completed, the armature will be attracted toward the pole-pieces, the contact between the members 44, 47 will be broken, thereby causing the energizing current to cease, and the armature, under the influence of the spring 40, to return to its original position. These operations will continue as long as the contact is maintained between the members 66 and 77, the armature movements causing vibration of the diaphragm and the production of a larynx tone, the pitch of which may be varied by varying the effective area of the opening 26 by forcing the member 70 farther inwardly against the member 66. When the pressure is removed from the member 70, the resiliency of the spring member 66 returns it to its original position.

The cord **90** is brought into the larynx through the bushing **95** of insulating material secured to the frame **12** by screws **96**, and the case **11** is held in place on the frame by another screw **97**.

In use, the larynx **10** is held in the hand of the user with one finger in engagement with the member **70**, the mouth tube **15** being inserted in the user's mouth. As described hereinabove in detail, actuation of the member **70** closes the electrical circuit for the device and causes the production of a tone by the diaphragm, which tone is introduced into the user's mouth through the tube and whose pitch may be varied by adjustment of the effective area of the opening **26** in the case. Upon introduction of the tone into his mouth cavity, the user positions his lips, teeth and tongue and shapes the mouth cavity as he would if he were able to speak naturally, and, thereby, modulates the tone to produce articulate sounds or speech.

While this invention has been disclosed with reference to a specific embodiment thereof, it will be understood that it may be embodied in various forms without departing from the scope of the invention, which is to be considered as limited, therefore, by the appended claims only.

What is claimed is:

1. An artificial larynx comprising a case, a frame, a front cover having a larynx tone passage, a diaphragm mounted between said frame and said cover, said case, frame, cover and diaphragm defining air chambers on opposite sides of the diaphragm, said case having an opening therein connecting one chamber with the atmosphere outside the larynx, and means supported on said frame within said case and adjacent said opening for varying the effective size thereof.

2. An artificial larynx comprising a case, larynx tone-producing means in said case secured against movement at and around its entire periphery, said case forming a chamber on one side of the tone generating means and having an opening leading to the atmosphere, and means within said case and adjustable from outside said case for varying the effective size of said opening whereby the pitch of the larynx tone may be varied.

3. An artificial larynx comprising a case, larynx tone-producing means including a diaphragm and electrical means for actuating said diaphragm, said case forming a chamber on one side of said tone means and having an opening connecting the chamber with the atmosphere, and finger-actuatable means for varying the effective size of said opening whereby the pitch of said tone may be varied, said finger-actuatable means controlling the current circuit for said electrical means.

4. An artificial larynx comprising a case, larynx tone-producing means in said case, said case forming a chamber on one side of the tone generating means and having an opening leading to the atmosphere, and means for varying the effective size of said opening whereby the pitch of the larynx tone may be varied, said means comprising a crank member, one arm of which is adapted for movement relative to and across the opening to vary the effective size thereof, and the other arm of which is operated upon by a finger-actuatable member whose position is controlled by the user from outside the case.

5. An artificial larynx comprising a case, larynx tone-producing means including a diaphragm and electrical means for actuating the diaphragm, said case forming an air chamber on one side of said tone means and having an opening connecting the chamber with the atmosphere, and finger-actuatable means for varying the size of said opening whereby the pitch of the tone may be varied, an initial movement of said finger-actuatable means under finger pressure closing the current circuit for said electrical means and further movement varying the size of said opening.

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