Dec. 17, 1935. R. R. RIESZ 2,024,601

ARTIFICIAL LARYNX

Filed March 3, 1933 2 Sheets-Sheet 1

FIG. 4

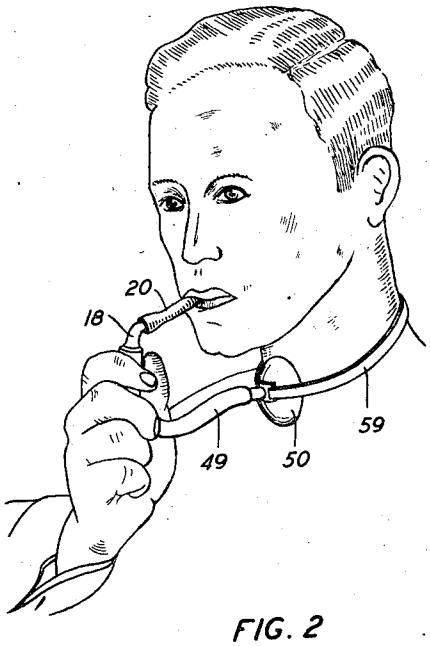


FIG. 1

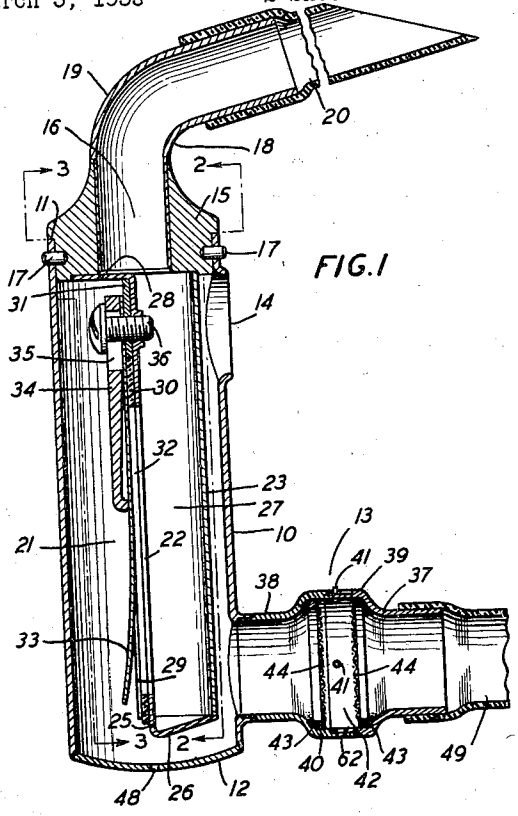


FIG. 2

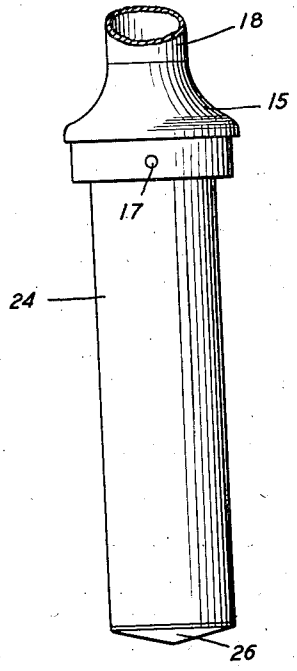
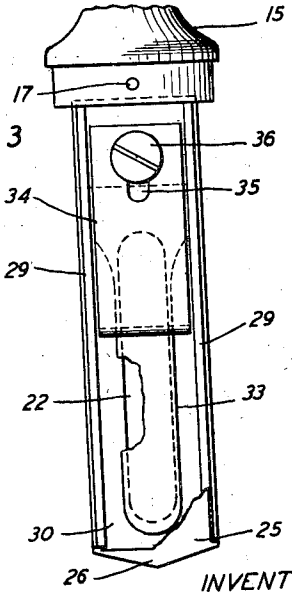


FIG. 3



INVENTOR
R. R. RIESZ
BY
Walter C. Kiesel
ATTORNEY

Dec. 17, 1935. R. R. RIESZ 2,024,601

ARTIFICIAL LARYNX

Filed March 3, 1933 2 Sheets-Sheet 2

FIG. 5

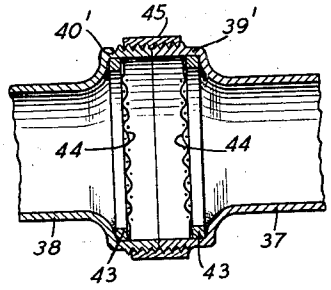


FIG. 6

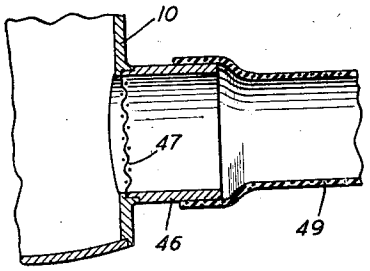


FIG. 7

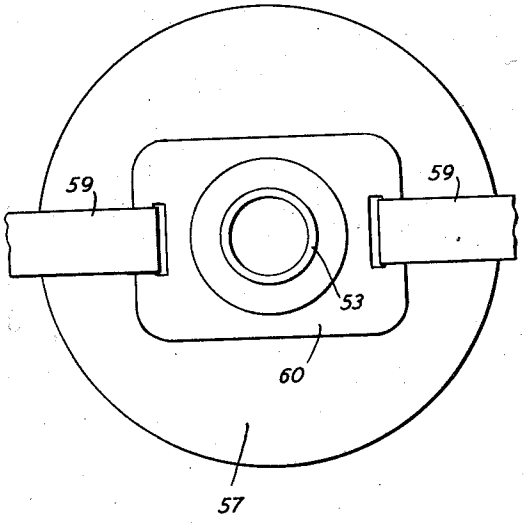
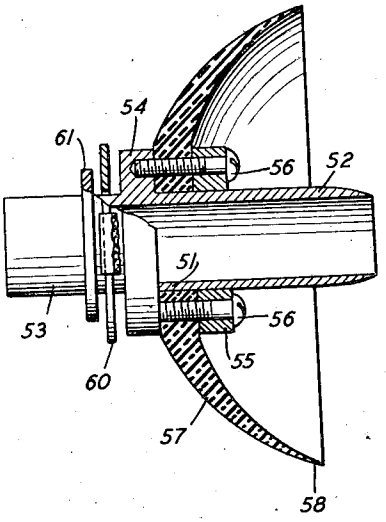


FIG. 8



INVENTOR
R. R. RIESZ
BY
Walter C. Kiesel
ATTORNEY

Patented Dec. 17, 1935

2,024,601

UNITED STATES PATENT OFFICE

2,024,601

ARTIFICIAL LARYNX

Robert R. Riesz, Mount Vernon, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application March 3, 1933, Serial No. 659,452

3 Claims. (Cl. 3—1)

This invention relates to an artificial larynx which is intended to enable a person, who has had the natural larynx removed, to simulate speech.

More particularly, the invention relates to an artificial larynx of the vibrating reed type which is operated by an air stream from the user's lungs.

Difficulty has been experienced in the operation of a larynx of this type because the air stream from the user's lungs is moisture laden, and this moisture content deposits in large part on the reed of the larynx causing the reed to become wet and stick to associated portions of the larynx to render the latter inoperative.

An object of this invention, therefore, is to remove substantially all of the moisture from the air stream from a user's lungs before it reaches the reed member of the larynx.

Another difficulty experienced has been to maintain a substantially leak-proof seal at the tracheotomy opening in the user's throat. There are many people who can not or will not wear a tracheotomy tube, for instance, such as is shown in G. W. Burchett Patent 1,835,757, issued December 8, 1931. Because of the irregularities of the front of the neck about the tracheotomy opening, a larynx can not be coupled to the trachea aperture without a large leak which results in greater effort being required to operate the larynx than would be necessary if such leak were not present.

A feature of this invention comprises positioning the sounding mechanism or vibratory member of the larynx such that the air stream must reverse in direction before acting thereon.

Another feature of this invention comprises the insertion in the inlet tube to the larynx of means to remove moisture from the air stream.

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

Fig. 1 is a side elevation in section of an artificial larynx embodying features of this invention;

Fig. 2 is a view of the device of Fig. 1 along the line 2—2 with its outermost member or casing removed;

Fig. 3 is a view of the device of Fig. 1 along the line 3—3 with its outermost member removed;

Fig. 4 illustrates the artificial larynx of Fig. 1 and the tracheotomy coupling member in position for use;

Fig. 5 shows a structural modification of a feature of the larynx shown in Fig. 1;

Fig. 6 shows another modification of the same feature;

Fig. 7 is a front elevation of the tracheotomy coupling member shown in Fig. 4; and

Fig. 8 is a side elevation partly broken away and partly in section of the coupling member of Fig. 7.

An artificial larynx embodying features of this invention is shown in Figs. 1 to 4. It comprises an outer cylindrical housing or casing 10 having an open end 11, a closed end 12, an air stream inlet 13 and a breath port or vent 14. An insert member 15 having a central bore 16 is positioned in the open end of the casing being held therein by bayonet connections 17, 17. Tightly fitted into the bore 16 is one extremity of a larynx tone and air outlet 18 comprising a hollow elbow connection or member 19 and a mouth tube 20. The mouth tube is preferably of soft rubber and is adapted to be inserted in the mouth of the user of the larynx.

The sounding or tone producing mechanism 21 of the larynx comprises an enclosure or hollow member 23. The member 23 may be made from a half section 24 of a longitudinally split tube, a flat plate 25 being soldered across the open side of the half section and having a turned-down end portion 26 soldered to and closing one end of the sound chamber 27 and a turned-up end portion 28 which is secured, as by solder, to the inner surface of the insert member 15. The end portion 26 is pryamidal in shape for a purpose to be pointed out hereinafter. The plate 25 contains a substantially centrally located elongated aperture 22 and has its longitudinal edge portions turned over to form cooperative channels 29, 29 to receive a rectangular semi-soft rubber strip 30 and a small plate 31 of rigid material. The rubber strip 30 is slid over the plate 25, is held at its edges in the channels 29, 29, and is provided with an elongated aperture 32 in alignment with the aperture 22 in the plate 25.

A metallic reed 33 is supported on the member 23. It is fastened at its upper end against the plate 31 and its lower outwardly curved end extends over the aligned apertures in the strip 30 and plate 25. The effective vibrating length of the reed may be regulated by adjusting the position of the plate 34, the slot 35 enabling the vertical adjustment thereof. The reed and vibration length controlling plate are secured to the member 23 by any suitable fastening device, such as the screw 36 which threads through the plate 31 into the plate 25. The member 23 is positioned so that the air stream entering the casing 10 from the inlet 13 strikes first against the semi-cylindrical portion 24. In order to operate the

reed and to pass through the apertures 22 and 32, the sound chamber 27, and the outlet 18, the air stream must reverse its initial direction of flow through 180°. The purpose of this arrangement is pointed out in detail hereinafter.

The air stream inlet 13 comprises tubular members 37, 38 having enlarged portions 39, 40 secured together by bayonet connections 41, 41 to form an annular enlargement 42. Within the portion 39 is secured, as by solder, a ring member 43 to which is fastened at its peripheral portion an air-perforate screen 44 of fabric or wire gauze. A similar ring member and screen is secured, as by solder, within the portion 40. When these portions are connected as shown the screens are in spaced relation. Aligned apertures in the portions 39 and 40 provide a vent 62 to the atmosphere.

A modification of the air inlet is shown in Fig. 5 in which the enlarged portions 39', 40' of the tubular members 37 and 38 are externally threaded and are secured together by a union coupling 45. The spaced screen arrangement is the same, however, as shown in Fig. 1.

In Fig. 6, the air inlet is shown as comprising merely a tubular member 46, the end of which engages with the casing 10 maintaining a screen 47 of fabric or of wire gauze in the air inlet opening in the casing.

Difficulty has been experienced in the operation of artificial larynges of the reed type by an air stream from the lungs of a user. The moisture in the air from the lungs has been found, because of temperature difference between the air from the lungs and the parts of the larynx, to deposit on the reed and larynx parts adjacent thereto causing the reed to become wet and to stick to the adjacent parts of the larynx and to render the latter inoperative. By positioning the reed carrying member 23 so that the air stream does not act directly on the reed when it enters the larynx casing, but upon the extensive surface provided by the semi-cylindrical portion of the member 23, a large portion of the moisture in the air stream is caused to be deposited thereon before the air stream reaches the reed. The lower end 26 of the member 23 is pyramidal or pointed, as shown in Fig. 3, so that moisture deposited on the member 23 may readily drip off to the closed end 12 of the casing having egress through the vent or aperture 48 therein. To keep to a minimum the moisture content of the air before it enters the larynx casing, the spaced screens 44, 44 shown in Figs. 1 and 5 or the single screen 47 of Fig. 6 is provided. These screens are of such mesh that they do not impede the flow of air, but do remove substantially all moisture from the air passing therethrough.

The air stream from the lungs is supplied to the larynx through the conduit or tube 49 which is connected to the tracheotomy coupling member 50. This member, shown more clearly in Figs. 7 and 8, comprises a tracheotomy tube 51. The end portion 52 of this tube is adapted to be inserted in the tracheotomy opening in the user's throat and to center the coupling member with reference to the opening. To the other end portion 53 is attached one end of the tube 49. Surrounding the extremity 52 and secured thereto between the flange portion 54 and the annulus 55 by suitable fastening members, such as the screws 56, is a hemispherical, concave, dished or cup-shaped member 57 of flexible material, such as soft rubber, having a thin, tapering edge portion 58. This cup member is adapted to be pressed against the flesh of the user's throat about the tracheotomy opening, the thin tapering edge conforming to the irregularities thereof to make a substantially air-tight seal. The cup member is held in position by the strap or ribbon 59 which encircles the user's neck being connected to opposite sides of the plate member 60 which is supported by the tube 51 between flanged portions 54 and 61 thereon.

While the features of this invention have been disclosed in various specific structures, it is of course understood that various modifications may be made in the details of construction without departing from the scope of the invention as defined in the appended claims.

What is claimed is:

1. An artificial larynx comprising a casing, a vibratory member in said casing, a larynx tone outlet from said casing, an air stream inlet to said casing, and means for removing substantially all the moisture from an air stream supplied to said larynx before the air stream reaches the vibratory member, said means being positioned in the air stream inlet and comprising an air perforate member providing a moisture-collecting surface.

2. An artificial larynx comprising a casing, sounding mechanism in said casing, a larynx tone outlet from said casing, and an air stream inlet to said casing, said sounding mechanism comprising a reed member and a supporting member for said reed, said supporting member being positioned between the air stream inlet and the reed so that the air stream must pass around said supporting member and reverse its direction after entering said casing in order to set the reed in vibration.

3. An artificial larynx comprising a casing, sounding mechanism in said casing, a larynx tone outlet from said casing, and an air stream inlet to said casing, said sounding mechanism comprising a reed member and a supporting member for said reed, said supporting member being positioned between the air stream inlet and the reed so that the air stream must pass around said supporting member and reverse in direction after entering said casing in order to set the reed in vibration, said supporting member being hollow and having a pointed end portion adjacent the air stream inlet.

ROBERT R. RIESZ.