Dec. 18, 1934. G. W. BURCHETT 1,985,013

ARTIFICIAL LARYNX

Filed Oct. 20, 1932 3 Sheets-Sheet 1

FIG. 1

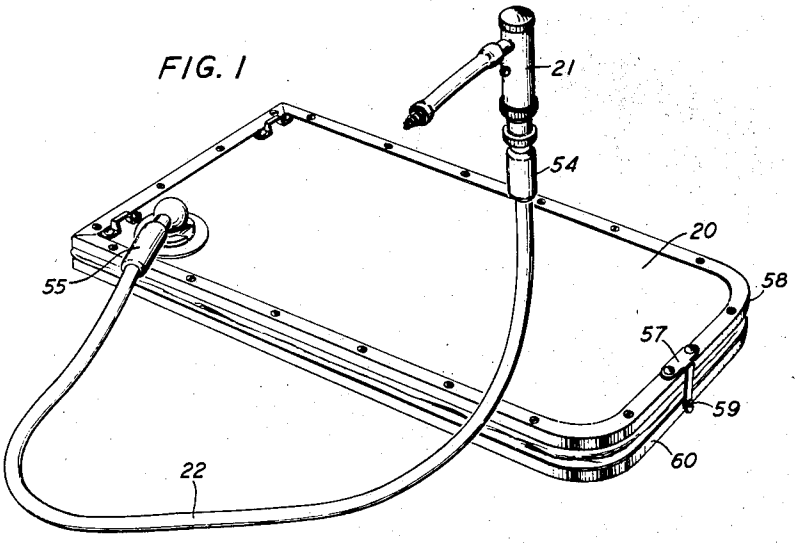

FIG. 2

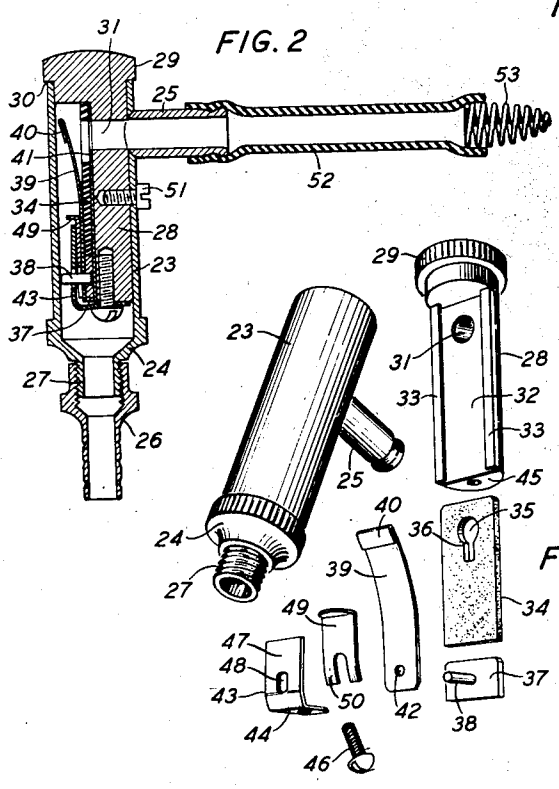

FIG. 4

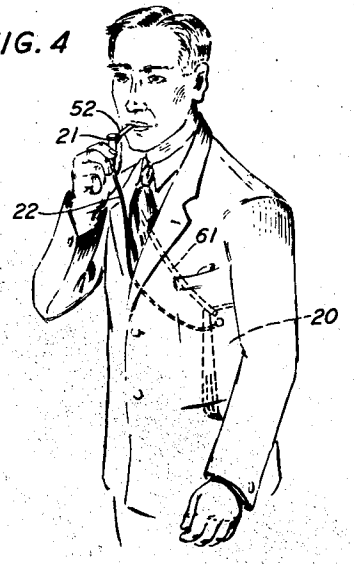

FIG. 3

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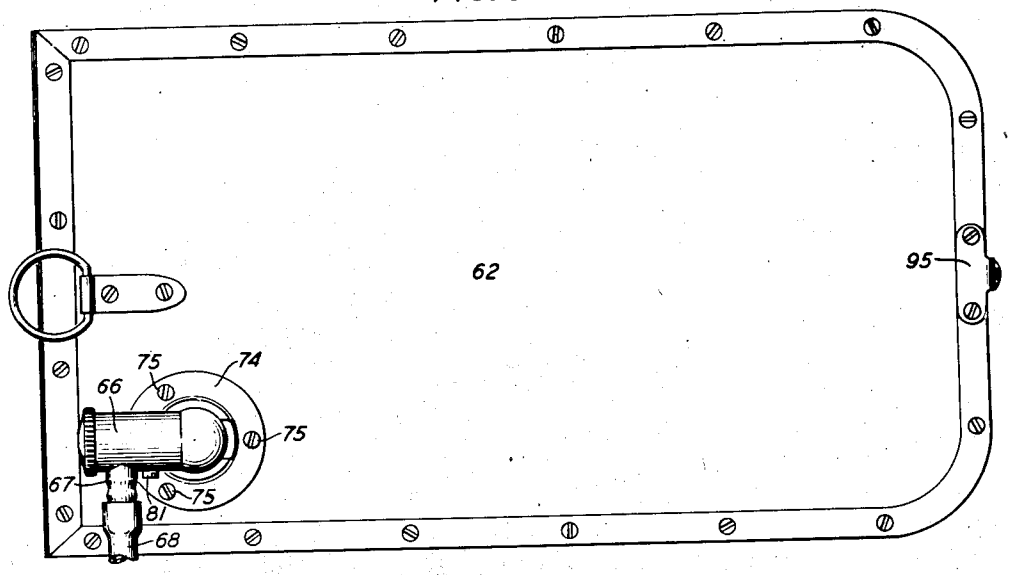
FIG. 5



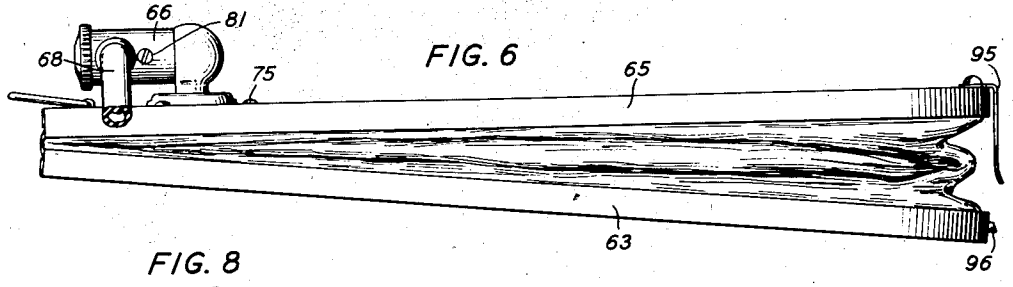


FIG. 6

FIG. 8

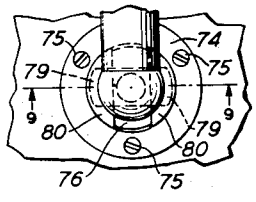


FIG. 9

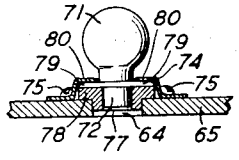


FIG. 7

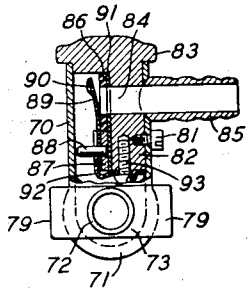


FIG. 10

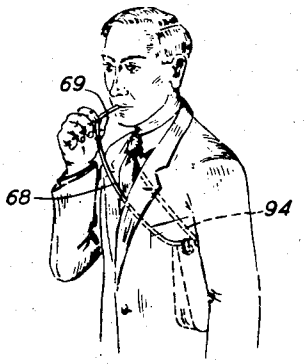


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FIG. 11

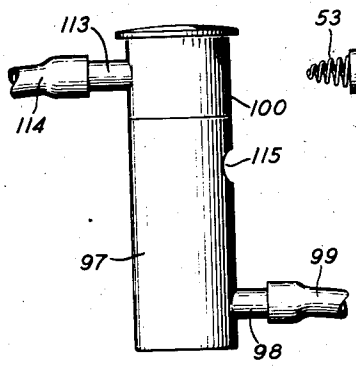


FIG. 12

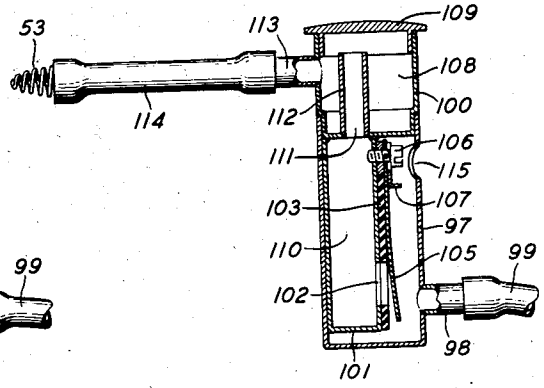


FIG. 13

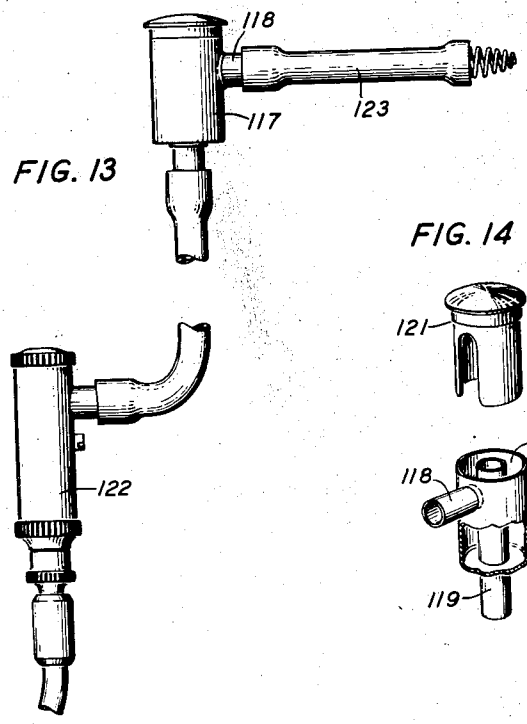
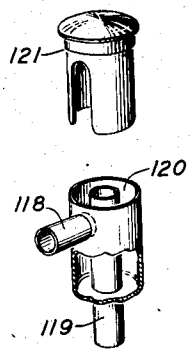


FIG. 14



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Patented Dec. 18, 1934

1,985,013

UNITED STATES PATENT OFFICE

1,985,013

ARTIFICIAL LARYNX

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Application October 20, 1932, Serial No. 638,687

11 Claims. (Cl. 3—1)

This invention relates to an artificial larynx which is intended to restore the power of speech to a person who has had the natural larynx removed, or to others having afflictions which impair the usefulness of the natural larynx.

An object of this invention is to simplify the structure of artificial larynges of the reed type.

Another object of this invention is to prevent saliva from the mouth of a user of an artificial larynx entering the larynx and, if operated by an air stream from the lungs of the user, the user's trachea.

Still another object of this invention is to prevent interference with the proper introduction of the larynx tone into the mouth of a user.

A further object of this invention is to effectively operate an artificial larynx by an air stream from a bellows and to provide a larynx-bellows combination that may be concealed under the clothes of a user or in a small bag, the only evidence of the larynx being a larynx tone tube extending between a user's mouth and the nearest portion of his clothing or of the bag.

A feature of this invention comprises an artificial larynx of the reed type having a shell or case member provided with an air inlet and an air outlet and enclosing a solid member or bar supporting a vibratile reed, the bar containing a drilling in alignment with the air outlet and the free and weighted end of the reed.

Another feature of this invention comprises an artificial larynx having associated or integral therewith means for collecting saliva that may pass from a user's mouth into the mouth tube so that it cannot pass to the larynx or to the user's trachea.

A further feature of this invention comprises an artificial larynx having a tone tube or mouth tube for insertion in the user's mouth provided with a guard member preventing the tongue or cheek flesh from blocking the open end of the tube.

Still another feature of this invention comprises the combination of an artificial larynx and a bellows in which the artificial larynx is mounted on and secured to one wall of a bellows in alignment with the air outlet vent thereof, a tone tube or conduit leading from the larynx to the user's mouth.

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

Fig. 1 is a perspective view of an assembly comprising a bellows-operated artificial larynx embodying features of this invention;

Fig. 2 is a sectional view of the artificial larynx of Fig. 1;

Fig. 3 shows the artificial larynx of Figs. 1 and 2 in perspective and exploded;

Fig. 4 illustrates the manner in which the larynx of Fig. 1 is used and how the bellows may be carried on the person of a user;

Fig. 5 is a plan view of a device comprising a bellows and an artificial larynx, the larynx being mounted on one wall of the bellows and having its air inlet in alignment with the outlet vent thereof;

Fig. 6 is a side view of the device of Fig. 5, the bellows being partially expanded;

Fig. 7 is an elevational view partially in section and slightly enlarged of the artificial larynx of Figs. 5 and 6;

Figs. 8 and 9 show in detail the means for coupling the artificial larynx of the device of Fig. 5 to the bellows wall;

Fig. 10 illustrates the manner in which the device of Fig. 5 is used and how it may be carried on the person of a user;

Fig. 11 is a side elevational view of an artificial larynx embodying the saliva trap comprising a feature of this invention;

Fig. 12 is a sectional view of the device of Fig. 11 showing in detail the internal structure thereof;

Fig. 13 shows another embodiment of the saliva trap of this invention; and

Fig. 14 is an exploded view of the saliva trap of Fig. 13.

Referring to Figs. 1 to 4 of the drawings, there is disclosed a bellows 20 of the usual type having an inlet valve in one wall and an outlet vent in the other, an artificial larynx 21, and an air tube or conduit 22 operatively connecting the bellows and larynx.

The larynx comprises a shell or case 23, preferably cylindrical and open at each end, having an air inlet portion 24 at one extremity and an air and larynx tone outlet portion 25 near its other extremity and extending laterally outward. A hollow coupling member 26 threadedly engages the threaded end 27 of the air inlet portion. Removably inserted within the shell through one open end thereof is a semi-circular solid member 28 preferably of bar metal and having a circular knurled cap portion 29 engaging the upper edge 30 of the case. The member 28 contains a bore or drilling 31 near its cap and preferably in axial alignment with the outlet 25 and providing a

short air column forming a portion of the passage through the larynx for an air stream. The flat or plane surface 32 of the member 28 is provided with turned-over lateral edge portions 33 which hold a strip 34 of sound-absorbing or deadening material, preferably soft rubber, against the surface 32 so that the circular portion 35 of the key-hole shaped opening 36 in the strip 34 is in alignment with the drilling 31. The rubber strip functions, when the larynx is in operation, to keep metallic sounds in the larynx tone at a minimum. A small plate 37 having an extension or pin 38 projecting therefrom is held at the lower end of the member 28 by the lateral edge portions 33 and prevents the rubber strip from altering its position. A curved reed 39, preferably metallic, having a weighted end 40 adjacent the inner end 41 of the drilling 31 has an aperture 42 at its lower end into which the pin 38 is adapted to fit. The reed is held in place by an approximately L-shaped clamping member 43. The leg 44 of the clamping member is secured against the end 45 of the member 28 by the screw 46, and the other leg 47 extends along and against the reed. By making the aperture 48 in the clamping member elongated and by having the L form an angle of slightly less than 90°, a small adjustment of the vibrating length and, consequently, of the pitch of the reed is obtainable. A greater range of pitch is obtainable, however, by the provision of a finger adjustable plate 49 which has a bifurcated portion 50 for guidance by the pin 38 and is inserted between the clamping member and the reed. Varying the position of the plate 49 results in a change in the effective vibrating length of the reed and, consequently, of its pitch. The member 28 is fastened within the case by the screw 51 which extends from outside of and through the case into a tapped drilling in the member 28. When the screw 51 is removed, the member 28 and the details mounted thereon may be removed as a unit for cleansing, adjusting and replacement of parts. A mouth or tone tube 52, of hard or soft rubber, or of metal, is secured over one end of the outlet 25 and is adapted for insertion in the mouth of the user of the larynx for the introduction of the larynx tone therein. To prevent interference by the tongue or cheek flesh with the proper introduction of the larynx tone, a perforate-to-air member 53 comprising, preferably, a conoidal wire coil of spaced turns is inserted in the end of the tube actually in the mouth when the larynx is in use. It will be noted that there is substantially a straight line path for the air stream between the free end of the reed and the user's mouth. The air stream to be modulated by the vibrating reed is furnished by the bellows 20 through the preferably flexible tube or conduit 22, one end 54 of which is drawn over the coupling member 26 and the other end 55 of which is drawn over the hollow coupling member 56 one portion of which is held in alignment with the outlet vent (not shown) of the bellows. The bellows is shown in collapsed condition in Fig. 1, the rigid wall members and flexible sides being held closely adjacent by the fastening clip 57 attached to the upper wall 58 and engaging a pin 59 projecting from the lower wall 60. The bellows is carried, preferably, under the user's jacket, or other outer clothing, if the user is a man, being supported by a ribbon or strap 61 and operated from the outside by the arm or hand of the user. The larynx is shown held between the fingers, but may be concealed within the palm of the user's hand, the only other visible parts being the conduit 22 and the tone tube 52. When not in use, the larynx may be placed, of course, in an inside pocket. If a woman is the user of the larynx, the bellows can be conveniently carried in her handbag and operated from outside the bag by her hand.

Referring now to Figs. 5 to 10, there is disclosed a bellows 62 having an inlet valve (not shown) in one wall 63 and an outlet vent 64 in its other wall 65. Coupled to the outlet vent is an artificial larynx 66 to whose air and larynx tone outlet 67 is secured one end of a preferably flexible tube or conduit 68, the other end 69 being adapted to be inserted in the mouth of a user as shown in Fig. 10. The larynx comprises a shell or case 70 having a hollow globular portion 71 provided with an air inlet 72 and a coupling wing portion 73 for engagement with the sheet metal frame member 74 fastened to the bellows wall 63 about the outlet vent 64 by the screws 75. The wing portion 73 of the larynx is inserted in the slot 76 of the frame member 74, the air inlet 72 projecting into the central opening 77 of the washer 78 in alignment with the bellows outlet 64. The larynx is then turned through approximately 90°, the tips 79 of the wing portion 73 slide under the projecting portions 80 of the frame member 74 and the larynx is held tightly in position. Removably secured within the shell by screw 81 is a unitary assembly comprising a semi-circular solid member 82 having a circular cap portion 83 for engagement with the edge of the shell. The member 82 has a drilling or bore 84 in axial alignment preferably with the air and larynx tone outlet 85 of the shell. The flat surface of the member 82 supports a strip 86 of sound-absorbing or deadening material, for instance soft rubber, and the plate 87 has a pin 88 projecting therefrom. The strip 86 and the plate 87 are held in place by the same arrangement as that employed in the larynx of Fig. 1. A curved reed 89, preferably of metal having a free and weighted end 90 adjacent one end 91 of the drilling 84, has an aperture at its other end through which the pin 88 extends and is held fixed at the apertured end by an L-shaped clamping plate 92, one leg of which is secured against the end of the member 82 by the screw 93 and the other leg of which presses against the reed holding it securely.

Fig. 10 shows how the bellows with larynx attached may be carried and concealed under the user's jacket, in the case of a man, and supported by a ribbon or strap 94. The tone conduit 68 and a portion only thereof is all that is exposed to view. When the bellows is not being used, it is held preferably in collapsed condition by the spring catch 95 and pin 96 on the walls 65 and 63, respectively, of the bellows. If the user is a woman, the larynx and bellows can be carried in a small handbag, the only visible part of the equipment, when in use, being the tone tube or conduit, the bellows being operated from outside the bag by the user's hand.

Figs. 11 and 12 disclose an artificial larynx of the reed type intended primarily for operation by an air stream from the lungs of a user. Users of larynges designed to be so operated frequently experience difficulty and discomfort in their use because saliva tends to work its way into the artificial larynx and from there into the tube attached to the tracheotomy opening and into the trachea of the user causing convulsive

coughing. The larynx of Figs. 11 and 12 overcomes this difficulty and comprises a tubular case or shell 97 adapted to be held in the hand of a user and having an air inlet 98 to which is attached one end of a tube or conduit 99 that may be coupled at its other end (not shown) to the trachea of a user in a manner well known and consequently not illustrated. Inserted in the open end of the case, forming a part thereof, and making a tight sliding fit therewith is a hollow member 100 having a tubular extension 101. The wall of this extension contains an aperture 102 and supports an apertured strip 103 of sound-deadening material, such as soft rubber, and a curved vibratory reed 105, the free end of which extends over and is adjacent the aperture 102. The stationary end of the reed is secured by the screw 106 which maintains in position, also, a small metal plate 107 adjustable in position to vary the effective vibrating length and, consequently, pitch of the reed and larynx tone. The member 100 defines a chamber 108 which is closed at one end by a removable cover member 109 and communicates with the chamber 110 of the extension 101 through a tubular vent 111 provided by the tube or pipe 112. The chamber 108 has an outlet 113 to which is attached a tube 114 for insertion in the mouth of the user of the larynx. This tube is provided preferably with the guard 53 described above with reference to Figs. 1 to 5. When the larynx is in use, the tone generated by the vibratory reed in modulating the air stream passing through the larynx is introduced into the mouth of a user through the tube 114. The breathing vent 115 will be closed, of course, by the finger of the user. Saliva that trickles down the tube 114 to the larynx will be collected in the chamber 108, which is out of the direct line of air flow through the larynx to the mouth, and cannot pass to the trachea although the modulated air stream has a free passage through the tube 112 and out through the outlet 113. The collected saliva may be removed as desired, the removable cover 109 to the chamber 108 permitting facile cleansing.

Figs. 13 and 14 illustrate another form the saliva trap of this invention may take. It is there disclosed separate from an artificial larynx of the type shown in Fig. 1. Although the possibility of saliva getting into the user's trachea is not present when a bellows-operated artificial larynx is used, such a larynx will require less attention and cleansing if saliva is prevented from entering it. The saliva trap to be described may be used, also, with larynges of the type disclosed in R. R. Riesz Patent 1,836,816, issued December 15, 1931. The trap comprises a shell or case 117 having an air and larynx tone outlet 118 and, with a central cylindrical tube or pipe 119, defining an annular cavity or chamber 120 out of the direct line of air flow from larynx to user's mouth. A removable cover member 121 fits slidably into the open end of the shell. The trap is inserted between the artificial larynx 122 and the mouth tube 123 and collects in its cavity 120 the saliva that tends to pass through the mouth tube in the direction of the larynx without interfering with the air flow from the larynx to the mouth of the user.

While the features of this invention have been disclosed in various specific structures, it is understood, of course, 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 case having an air inlet and an air outlet, said air outlet being located intermediate the ends of said case, a member supported within said case and having a bore therein providing an air column in alignment with the air outlet, said member supporting a vibratile reed secured at one extremity and free at its other extremity, the free extremity of the reed being adjacent one end of the bore, and means for connecting the mouth cavity of a user of the larynx and said case, said connecting means, said outlet and said bore providing a substantially straight line path for the air stream between the free end of the reed and the user's mouth.

2. An artificial larynx comprising a hollow case having an air inlet and an air outlet, a solid member supported within said case and having near one end a bore in axial alignment with the air outlet, a reed secured at one extremity to said solid member and having a free and weighted extremity adjacent said bore, a source of air, means to connect said air inlet to said air source, and means for connecting said air outlet with the vocal cavities of a user of the larynx.

3. An artificial larynx comprising a hollow case open at each end and having an opening in its wall intermediate said ends, a solid member removably inserted in said case through one open end and closing the same, the other open end of said case providing an inlet for an air stream, said solid member having a bore therein in alignment with said intermediate opening and carrying a reed, the free end of said reed being adjacent one end of said bore and adapted to vibrate on the passage of an air stream through said larynx, and means connected to said intermediate opening for insertion in the mouth of a user of the larynx.

4. An artificial larynx comprising a case open at each end and having an opening intermediate its ends, a solid member insertable in said case through one open end and closing said end, said solid member having a bore in alignment with the intermediate opening and supporting a reed having its free end adjacent and overlapping one end of said bore, and means for maintaining the other end of said reed stationary, said means comprising an approximately L-shaped clamping member.

5. An artificial larynx comprising a case having an inlet, a passage and an outlet for an air stream, a reed within said case to be set in vibration by and to modulate the air stream, said reed being free to move at one extremity and being stationary at its other extremity, and means to maintain said one end stationary, said means being adjustable to vary the vibrating length of said reed and comprising an L-shaped clamping member, the legs of which form an angle less than 90°, one of said legs engaging the stationary end portion of said reed, and means engaging the other of said legs to vary the angle between said legs to vary the position of said first mentioned leg along the length of said reed.

6. An artificial larynx comprising a case having an inlet, a passage, and an outlet for an air stream, a reed within said case to be set in vibration by and to modulate the air stream, said reed being free to move at one extremity and

stationary at its other extremity, means to maintain said one end stationary, and means intermediate said first means and said reed and movable along the length of said reed for varying the pitch of the reed, said intermediate means consisting of a finger adjustable plate.

7. An artificial larynx comprising a case having an inlet, a passage, and an outlet for an air stream. means within said case to be vibrated by and to modulate the air stream, means supporting said first means on a substantially plane surface, said second mentioned means containing a bore extending substantially at right angles to said surface and providing an air column in line with the air outlet and forming part of the air passage, said vibratable means comprising a reed whose free end is adjacent and overlaps one end of said bore, and hollow means connected to the air outlet for conducting the modulated air stream into the user's mouth, said hollow means, said air outlet and said air column constituting a substantially straight line path for the modulated air stream between the free end of the reed and the user's mouth.

8. In combination, a bellows comprising rigid wall members and flexible sides, one of said wall members having an air outlet, an artificial larynx mounted on and secured to said wall, said larynx having an air inlet in axial alignment with the bellows air outlet, said larynx having an air outlet, and means connected to the larynx air outlet for conducting into the vocal cavities of a user the tone generated by the larynx when an air stream produced by said bellows passes therethrough.

9. In combination, an artificial larynx and a bellows for producing an air stream for the operation of said larynx, said bellows comprising rigid wall members and flexible sides, one end of said wall members having an air outlet, said larynx being mounted on said wall and having an air inlet providing a continuation of said bellows air outlet, said larynx having a larynx tone outlet, and hollow means connected to said tone outlet for conducting the larynx tone into the mouth of a user, said hollow means being the only necessarily visible element of the combination when in use.

10. In combination, an artificial larynx and a bellows producing an air stream for the operation of said larynx, said bellows comprising a plurality of walls, one of which contains an air outlet, said larynx having an air inlet in alignment with said outlet and having an air and larynx tone outlet, and hollow means connected to said tone outlet for conducting the larynx tone into the mouth of a user.

11. In combination, an artificial larynx having an air inlet and an air and larynx tone outlet, a bellows having rigid wall members and flexible sides, one of said wall members having an air outlet, said larynx being secured to said wall member so that air passing out the bellows outlet works into the larynx through the larynx air inlet, and elongated hollow means connected at one end to the larynx air and tone outlet and having its other end adapted for insertion in the mouth of a user, said hollow means being the only necessarily visible portion of the combination when the latter is in use.

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