Sept. 21, 1937. W. F. KELLOTAT 2,093,453

ARTIFICIAL LARYNX

Filed Aug. 1, 1935 2 Sheets-Sheet 1

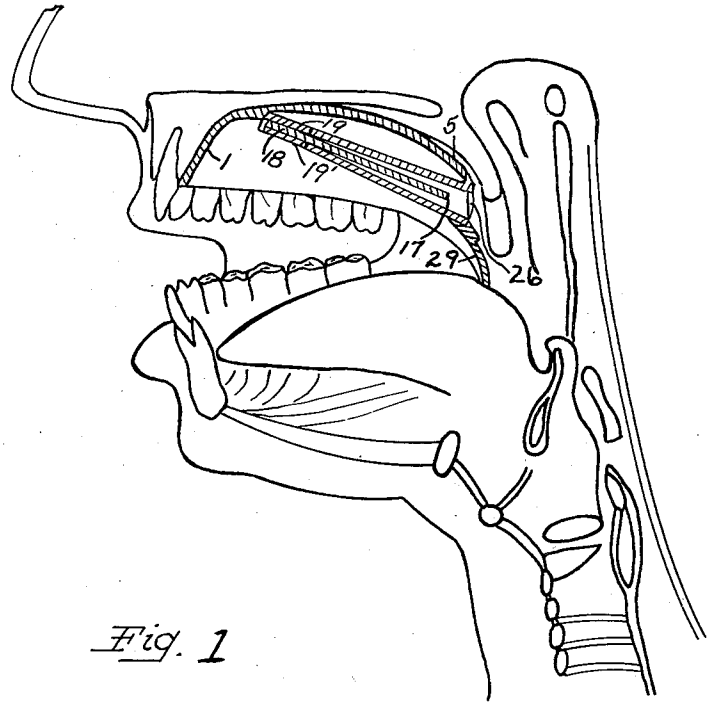


Fig. 1

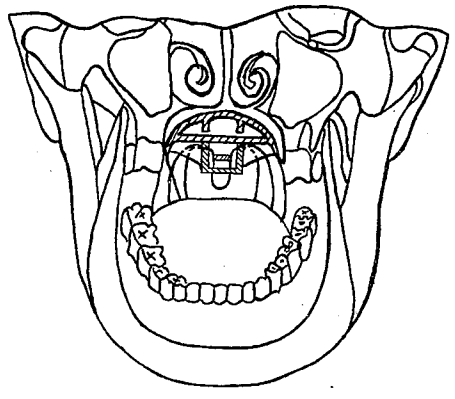


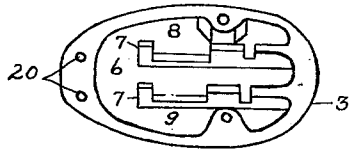
Fig. 2

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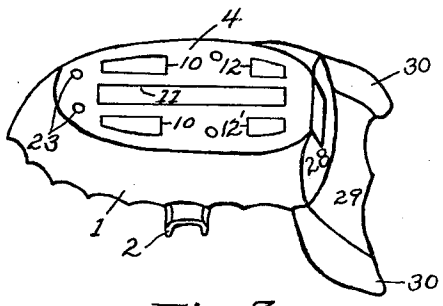


Fig 3

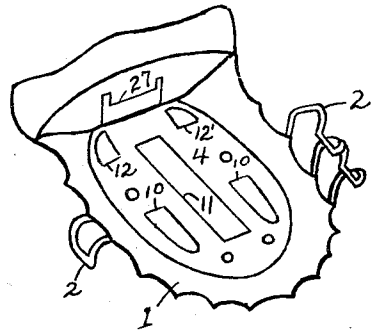


Fig 4

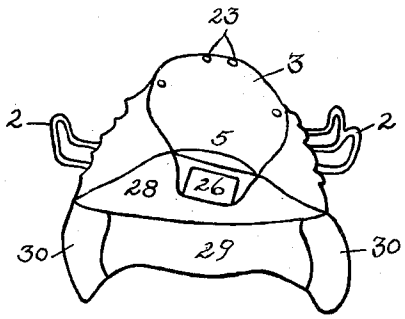


Fig 6

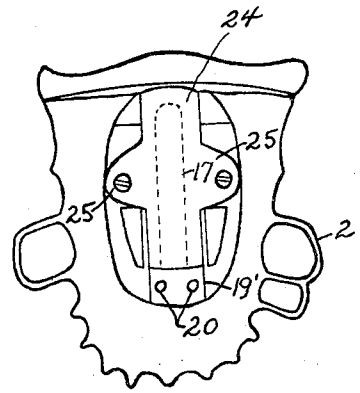


Fig 5

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UNITED STATES PATENT OFFICE

2,093,453

ARTIFICIAL LARYNX

William F. Kellotat, Fort Jay, N. Y.

Application August 1, 1935, Serial No. 34,204

7 Claims. (Cl. 3—1)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention generically considered relates to prosthesis or the replacement of an absent part by an artificial one; more particularly it is directed to an improved artificial larynx adapted to restore the power of speech to those, who, as a result of paralysis of the larynx, removal of the vocal cords or other impairment of these organs have been rendered incapable of producing articulate speech.

The fundamental purpose of this invention is to provide an artificial larynx in the form of a tone producing instrument, which is adapted to be wholly contained within the mouth and operatively supported through the medium of an artificial denture fitted to the oral cavity in accordance with the prevailing practice in prosthetic dentistry.

Another object of this invention is to produce a denture-supported tone-producing instrument having a membrane like extension which divides the back part of the mouth from the base of the pharynx and serves as a valve, which during inhalation opens to admit air to the trachea, and on exhalation closes to direct the air from the trachea to the tone-producing instrument.

Another object of this invention is to provide an individually fitted denture combined with a tone-producing instrument operable by the air of exhalation and supported contiguous to the roof of the mouth so that the vibrations from the tone-producing instrument are directed into the mouth and nasal cavities for modulation into articulate speech.

With these and other objects in view this invention consists of certain novel details of construction, combination and arrangement of parts to be more particularly hereinafter described and claimed.

Briefly stated, this invention comprises a denture formed in accordance with the prevailing dental practice and adapted to be suitably fitted to the mouth of the user, a tone-producing instrument mounted in the roof of the denture, and having a single air inlet and a plurality of appropriately arranged sound and air outlets, and a flexible apron detachably connected to the distal portion of the denture and extending downwardly and outwardly, the apron being adapted to function as a valve which during inhalation opens to admit air to the trachea and on exhalation closes to direct the air into the inlet of the tone-producing instrument, to generate the required tone which after passage through the outlets enters the mouth and nasal cavities where it may be modulated into speech.

Referring more particularly to the accompanying drawings in which corresponding parts are indicated by similar reference characters:

Fig. 1 is a vertical section of the artificial larynx operatively positioned in the mouth of the user, anatomical sections of parts of the head, mouth and throat being shown;

Fig. 2 is a transverse vertical section through the rear of the artificial larynx when operatively positioned in the mouth of the user, illustrating the location and arrangement of the flexible apron, anatomical sections or parts of the head and back of the mouth being shown;

Fig. 3 is a perspective partially disassembled view of the artificial larynx illustrating the interior arrangement of the roof of the denture and construction of the intermediate plate upon which the roof is normally disposed;

Fig. 4 is a perspective view with parts omitted, illustrating the under-surface of the artificial larynx;

Fig. 5 is a bottom plan of the assembled artificial larynx; and

Fig. 6 is a perspective view of the assembled artificial larynx illustrating the rear construction thereof.

Mechanical substitutes for the natural larynx have to a large extent been predicated upon the fundamental concept of an externally located sound producing instrument, having inlet and outlet openings connected by means of tubular extensions with the trachea, and the mouth, whereby the vibrations set up by the air of exhalation are conducted into the mouth and nasal cavities for modulation into speech. This type of construction while serviceable leaves much to be desired in those cases not requiring a tracheotomy; it is inconvenient and renders the afflicted person conspicuous.

It is therefore the aim and purpose of this invention to provide an artificial larynx which being confined in its entirety to the oral cavity, permits a person who has lost the use of the natural larynx to produce articulate speech, at no greater discomfort, inconvenience or embarrassment, than would be imposed by the use of an artificial plate.

In the illustrated embodiment characterizing this invention (1) indicates a denture formed in the usual manner, and adapted to be suitably anchored to one or more of the teeth by clamps (2),

In the present instance the denture has been given the form required for a person having a complete set of teeth, however, it is to be understood that it may be constructed for either a partial or a complete restoration of the oral cavity as the exigency of the situation may demand.

The roof (3) of the denture rests upon and is detachably connected to an intermediate or supporting plate (4), which may be flat as shown or slightly curved with the concave side toward the roof. Exteriorly the surface of roof (3) conforms to the contour of the roof of the mouth, falling away however at its rearward or distal part (5) to avoid contact with the soft palate.

The underside of roof (3) is hollowed out to form an elliptical shaped cavity (6) within which are positioned vertically disposed partitions (7), the upper surfaces of which terminate flush with that of roof (3). Petitions (7) extend in parallel and laterally spaced relation from one end of the elliptical shaped cavity (6) to a point spaced from its opposite end, as clearly shown in Fig. 3. When roof (3) is in its normal position on supporting plate (4) partitions (7) in connection with the upper surface of the plate will form intercommunicating sound passages (8) and (9), for a purpose hereinafter to appear.

The intermediate or supporting plate (4) is centrally formed with a longitudinally extending slot (11), which opens into sound chambers (8) and (9) and is adapted to be covered by the vibratory reed hereinafter to be mentioned. In addition to slot (11), plate (4) is also provided with a series of outlets (12) and (12') opening into sound chambers (8) and (9) respectively. If desirable a suitably formed cushioning strip of rubber or other similar material may be attached to the undersurface of plate (4). This strip prevents the reed, hereinafter to be mentioned, from striking the plate (4) and producing metallic sounds.

Extending longitudinally of the undersurface of plate (4) and over the slot (11), is a flat reed member (17), of spring material. Reed (17) is provided with an enlarged portion (18), which is adapted to seat upon a similarly shaped piece (19), having therein apertures aligning with those in the enclosed portion (18). An attaching plate (19') overlies the enlarged end (18) of the reed and is formed with internally threaded openings (20), to receive the threaded ends of suitable fastening elements extending through the opening (23) in the roof of the denture, as clearly shown in Fig. 6 of the drawings. The material of the reed, its shape and the manner of mounting may be varied in accordance with developments in this art as will be understood without further discussion. The important feature in so far as this invention is concerned, being the provision of a reed which will produce a tone closely resembling the natural, vocal tone of the individual, using the artificial larynx. In this connection it is to be understood that the design and balance of the reed must be such as to render it irresponsive to ordinary breathing pressures, so as to avoid the undesirable sounds which otherwise would be produced by constant vibration of the reed.

A tapering reed housing is affixed to the undersurface of plate (4), by means of laterally extending wings (25) which are apertured for the passage of suitable fastening elements. The distal end of housing (24) is formed with a rectangular opening (26) adapted to register with the similarly shaped opening in the rear of the denture. When housing (24) is operatively positioned its open end engages the flange (27) projecting from the upper wall of opening (26) in the rear of the denture. Housing (24) is further held in place by the edge of attaching plate (19'), as clearly shown in Fig. 5 of the drawings.

Secured to the rear portion of the denture, by means of a detachable anchoring plate (28) is a membrane like apron (29) formed of suitably flexible material. Apron (29) extends downwardly and outwardly from the denture and when the latter has been positioned in the mouth, has its lower edge resting on the tongue near the root as clearly shown in Fig. 1 of the drawings.

The lateral edges of the apron (29) may abut against the sides of the throat following the line of the glossopalatine arches, but it has been found that the artificial larynx can be worn with greater comfort by taking impressions of the sides of the throat which would be touched by the edges of the apron and forming continuations of the sides of the denture as at (30) in accordance with such impressions so that the edges of the apron instead of contacting the throat, work against the inner surfaces of said continuations as clearly shown in Fig. 3 of the drawings.

In operation, the denture is placed in the mouth as shown in Fig. 1, with the apron extending across the isthmus of the fauces and in contact with the tongue as shown in Fig. 1 of the drawings. When arranged in this manner, inhalation lifts the apron and admits air for breathing purposes. On exhalation however, the apron is pressed down against the tongue, thus directing the air into the open end of the reed housing, to cause vibrations of the reed. The sound waves set up by the movement of the reed pass through the outlet openings and into the mouth where they are modulated into speech as will be readily understood without further discussion.

In conclusion, this invention provides an artificial larynx which is comparatively inexpensive, simple in construction, easily disassembled for cleaning, requires no adjustment or attention by the user, except periodic change of rubber parts and cleaning and is entirely concealed from view.

Although in the foregoing certain elements have been described as best adapted to perform the functions allotted to them, nevertheless it is to be understood that certain changes may be resorted to without departing from the scope and spirit of this invention.

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

1. An artificial larynx assembly comprising a denture adapted to be fitted to the mouth, and means in connection with the denture for producing a voice tone, said means including means carried by the denture and adapted to seal the back of the mouth to direct the air of exhalation to the first mentioned means, the entire assembly adapted to be contained within the oral cavity.

2. An artificial larynx assembly comprising a denture adapted to be fitted to the mouth, and means in connection with the denture for producing a voice tone, said means including a tone generator and a flexible member extending from the denture and adapted to seal the back of the mouth to direct the air of exhalation to the tone generator, the entire assembly adapted to be contained within the oral cavity.

3. An artificial larynx assembly comprising a denture adapted to be fitted to the mouth, and

means in connection with the denture for producing a voice tone, said means including a tone generator having an air inlet located in the back of the mouth and a flexible apron extending from the denture and functioning to seal the back of the mouth and direct the air of exhalation into said inlet, the entire assembly adapted to be contained within the oral cavity.

4. An artificial larynx assembly comprising a denture adapted to be fitted to the mouth, and means in connection with the denture for producing a voice tone, said means including a tone generator having inlet and outlet openings, and a flexible apron extending downwardly and outwardly from the denture across the isthmus of the fauces and coacting with the tongue to direct the air of exhalation into the inlet opening of the tone generator, the entire assembly adapted to be contained within the oral cavity.

5. An artificial larynx assembly comprising a denture adapted to be fitted to the mouth, and means in connection with the denture for producing a voice tone, said means including a sound chamber having an outlet, a reed chamber associated with the sound chamber and having an air inlet, a vibratory member mounted within the reed chamber, and a flexible apron extending from the denture to seal the back of the mouth and direct the air of exhalation into the inlet opening of the tone generator, the entire assembly adapted to be contained within the oral cavity.

6. An artificial larynx assembly comprising a denture adapted to be fitted to the mouth, and means in connection with the denture for producing a voice tone, said means including a plurality of adjacently located intercommunicating sound chambers having outlet openings, a reed chamber associated with the sound chambers and having an air inlet, a vibrating reed within the chamber and a flexible apron extending from the rear of the denture and adapted to seal the back of the mouth to direct the air of exhalation into the inlet opening of the reed chamber, the entire assembly adapted to be contained within the oral cavity.

7. An artificial larynx assembly comprising a denture adapted to be fitted to the mouth, and means in connection with the denture for producing a voice tone, said means including a sound chamber having outlets, a reed chamber having an inlet, the reed chamber being operatively associated with the sound chamber, a vibrating reed within the reed chamber, side extensions carried by the denture and conforming to the contour of the side of the mouth, a flexible apron disposed between the side extensions and functioning in connection therewith to seal the back of the throat and direct the air of exhalation into the inlet of the reed chamber, the entire assembly adapted to be wholly contained within the oral cavity.

WILLIAM F. KELLOTAT.