Dec. 2, 1958 H. K. COOPER 2,862,209

SPEECH AID

Filed June 24, 1957

FIG. 1.

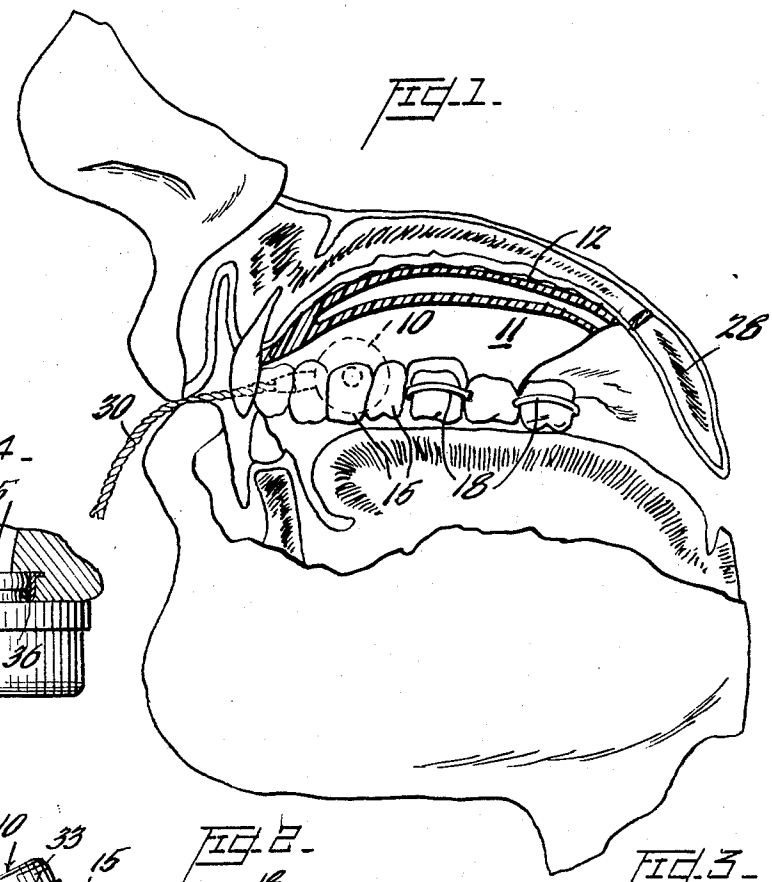


FIG. 4.

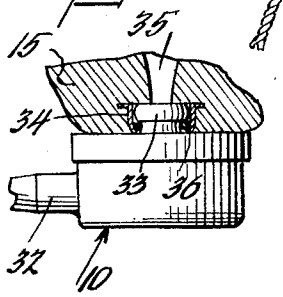


FIG. 2.

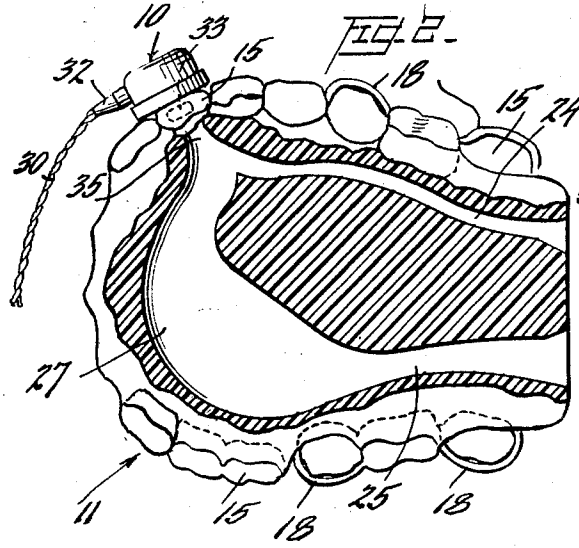
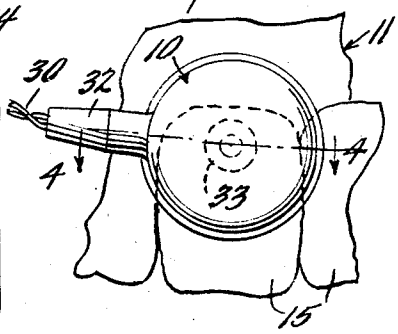


FIG. 3.



INVENTOR

Herbert K. Cooper,

BY Watson, Cole, Grindle & Watson

ATTORNEYS

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SPEECH AID

Herbert Kurtz Cooper, Lancaster, Pa.

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6 Claims. (Cl. 3—1.3)

This invention relates to speech aids for applying an audible signal to the mouth cavity of persons having impaired vocal emission. The primary object of the invention is to provide for such persons a convenient, practical, and reasonably efficient substitute for the vocal chords in the production of articulate sounds.

In recent years an increasing number of persons have been deprived of the power of speech by surgical removal of the larynx. The larynx contains the vocal chords, which are set in vibration by expiration of air from the lungs to produce an audible sound of controllable frequency in the vocal cavities. This sound is then modulated by appropriate positioning and movement of the vocal organs, principally the tongue, lips, and soft palate, to form the voice sounds of human speech. It has long been known that if sound of audible frequency is supplied to the oral cavity of a person whose vocal chords are absent, or not functioning, intelligible sounds can be produced by manipulating the vocal organs in the normal manner. Devices heretofore used for supplying the sound have been, however, inadequate, defective, and awkward and uncomfortable in use. It is, therefore, an object of the invention to overcome these difficulties and to provide sound generating equipment which is efficient for the intended purpose and which subjects the user to a minimum of discomfort and inconvenience.

More specifically, it is proposed as part of the invention to mount an electrically energized sound emitter in a denture, the arrangement preferably being such that the sound issuing from the emitter is delivered at the rear of the mouth cavity, whereby more effective use can be made of the vocal organs to modulate the sound for the production of intelligible speech.

In the preferred embodiment of the invention, the emitter is positioned rigidly in or on the denture near the forward portion of the mouth cavity, the sound being conveyed to the rear portion of the mouth cavity through one or more passages formed in the bridging plastic portion of the denture. It is a feature of the invention that the emitter may be readily removed from the denture for repair or replacement.

It is not essential that the electrical signals applied to the emitter be generated within the mouth cavity, it being reasonably convenient to connect the emitter with an external signal source through conductors extending out of one side of the mouth, the arrangement being somewhat similar to that employed in hearing aids. However, the invention contemplates alternatively the mounting of the entire device, including both the signal source and the emitter, within or on a denture.

Further objects and features of the invention will be apparent from the following description of the accompanying drawing, in which

Figure 1 is a partial vertical section of the mouth cavity with a denture embodying the invention and positioned therein;

Figure 2 is a section through the denture shown in Figure 1, taken on a warped plane to show the passages through which the sound is conveyed;

Figure 3 is an enlarged fragmentary view of a portion of the structure shown in Figure 2; and

Figure 4 is a sectional view on the line 4—4 of Figure 3.

In order to promote an understanding of the invention, specific language is used in describing the preferred embodiment thereof illustrated in the drawing. Nevertheless, it will be appreciated that no limitation of the invention is thereby intended, such further alterations and modifications being contemplated as fall within the spirit and scope of the invention as defined in the appended claims.

Referring first to Figures 1 and 2 of the drawing, it will be seen that the emitter **10** is mounted in an upper denture indicated generally at **11**, the denture having a plastic portion **12** extending across the roof of the mouth, or hard palate, and a tooth portion comprising artificial teeth **15** molded in position in the plastic. Conventional acrylic resin may be employed in the plastic portion, although the material used is not significant. The denture is shown as provided with bands **18** embracing natural teeth for the purpose of retaining the denture firmly in position in the roof of the mouth.

The emitter **10** is preferably mounted either in the plastic portion of the denture immediately above the teeth or on a tooth or teeth, and in either event near the forward portion of the denture. Sound is discharged from the emitter **10** into passages **24** and **25** formed in the denture, passage **25** being the larger and being formed to provide a resonant chamber **27** of substantial width. The depth of each passage is, of course, limited to the thickness of the plastic roof of the denture, which should not be so thick as to cause discomfort or inconvenience to the user. It will be appreciated that with such an arrangement, affording two sound paths of different volumetric capacity, resonating at different frequencies, higher frequencies will tend to follow the narrower path and lower frequencies the wider path. In this manner a more natural sound is obtained than by the use of a single passage. Whether one or several sound passages are formed in the plastic portion of the denture, the sound is conveyed toward and discharged into the rear of the mouth cavity, for example at a point adjacent the soft palate **28**, this being important in order that the articulation may be affected by movement of the palate, as is customary in speaking, and in order that the positioning of the tongue may have the maximum effect in modulating the sound.

The details of the emitter form no part of the instant invention, and may be modified widely. Its function is to convert wave-form energy supplied to it into sound waves of a frequency within the usual vocal range, and for this purpose a small diaphragm type of emitter is suitable.

As hereinbefore indicated, the devices for generating the signal energy supplied to the emitter **10** may also be mounted in the denture **11**, in which event provision is made for removal and repair. It is preferred, however, to locate these generating devices externally of the mouth cavity, and they may be carried on the person of the user, for instance in a pocket as in the case of conventional hearing aids. With such an arrangement, the signal energy is conducted from the generating devices to the emitter **10** through conductors **30** which extend through the side of the mouth of the user. In order that the conductors may be removed readily when the emitter is not in use, connection to the emitter may be made through a conventional two-conductor coupling, conductors **30** being connected to the male member **32** of the coupling which is received in an opening at one side of the emitter **10**.

The details of the generating devices form no part of the instant invention, and may vary widely. For instance, an electronic circuit including an oscillator and amplifier delivering a signal of audible frequency, may be used. Alternatively, an electro-mechanical oscillator may be used.

While satisfactory results may be achieved by embedding the emitter in the plastic portion of the denture, it is eminently desirable that the emitter be removable, so that replacement can be made without altering or discarding the denture. In accordance with this invention, removability is simply and effectively achieved by providing at one side of the emitter **10** a hollow stud **33**, communicating with the usual central sound opening in the emitter, for reception in a slightly larger sleeve **34**. The sleeve is secured rigidly in the denture, for instance by being molded in the plastic thereof, in communication with the entrance **35** to passages **24** and **25**. Stud **33** and sleeve **34** are formed to provide coacting annular grooves as shown in Figure 4, and a resilient locking ring **36**, positioned in the groove in the sleeve **34**, engages the groove in stud **33** when the latter is thrust into the sleeve **34** to retain the emitter in position against the denture.

This arrangement is especially convenient in enabling the testing of different types of emitter in order to select a type having frequency and volume characteristics best suited to the individual user, different emitters being readily inserted and removed without removal of the denture. It will be noted that since the emitter is inserted at the outside of the denture, adequate room for manipulation is available between the denture and the cheek of the user, while no obstruction is offered within the denture to normal manipulation of the tongue in speaking or eating.

In the unlikely event that the emitter cannot conveniently be accommodated in the preferred location by a particular user, it may be located outside the mouth and connected with the denture by a flexible tube extending into the mouth and affording communication between sleeve **34** and stud **33**. In most cases, however, this arrangement is inferior to the disposition of the emitter as shown in the drawing.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a speech aid, the combination with a sound emitter of a denture formed to receive and support said emitter, and generating devices supplying to said emitter a wave-form electrical signal at audible frequency within the normal vocal range of frequencies, said denture being formed to provide at least two sound passages affording resonant chambers of different size, said passages communicating at one end with said emitter and opening at their other ends into the rear portion of the mouth cavity.

2. In a speech aid, the combination with a sound emitter, of a denture having a forward portion formed to receive and support said emitter, and generating devices supplying to said emitter a wave-form electrical signal at audible frequency within the normal vocal range of frequencies, said denture being formed to provide a sound passage affording a resonant chamber separate from the mouth cavity, said passage communicating at one end with said emitter and at the other end with the rear portion of the mouth cavity.

3. In a speech aid, the combination with a sound emitter, of a denture formed to receive and support said emitter, and generating devices supplying to said emitter a wave-form electrical signal at audible frequency within the normal vocal range of frequencies, said generating devices being positioned externally of the mouth cavity, conductors connecting said devices and said emitter and extending into the mouth cavity, and a separable coupling having a part carried by the emitter for connecting said conductors to said emitter.

4. In a speech aid, the combination with a sound emitter, of a denture formed to receive and support said emitter, and generating devices supplying to said emitter a wave-form electrical signal at audible frequency within the normal vocal range of frequencies, said emitter having a stud projecting therefrom, and said denture being apertured to receive said stud to mount said emitter removably on said denture.

5. In a speech aid, the combination with a sound emitter, of a denture formed to receive and support said emitter, and generating devices supplying to said emitter a wave-form electrical signal at audible frequency within the normal vocal range of frequencies, said denture being formed to provide a sound passage communicating at one end with said emitter and at the other end with the rear portion of the mouth cavity, said emitter having a hollow stud projecting outwardly from the sound discharge opening therein, said denture being provided with a recess receiving said stud and communicating with said sound passage.

6. In a speech aid, the combination with a sound emitter, of devices generating a wave-form signal at audible frequency within the normal vocal range of frequencies, said devices being electrically connected to said emitter to energize the latter, a dental appliance for reception in the mouth, and means releasably supporting said emitter on said dental appliance, said means comprising a resilient locking element acting between said denture and said emitter.

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