Oct. 30, 1956 A. L. DI MATTIA 2,769,040

MICROPHONE HOUSING

Filed March 15, 1951

FIG. 3.

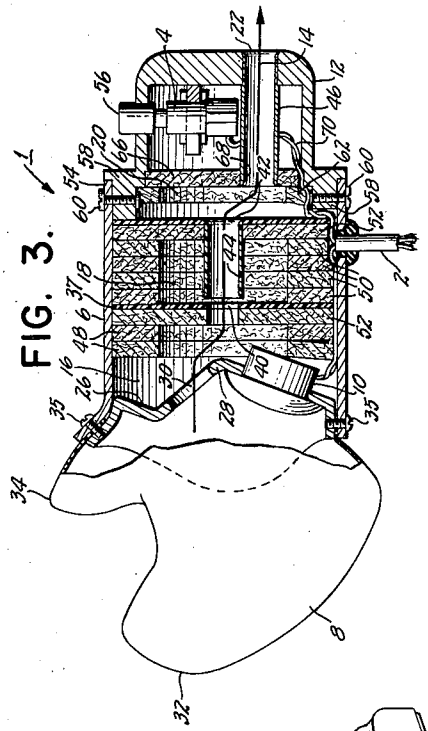


FIG. 2.

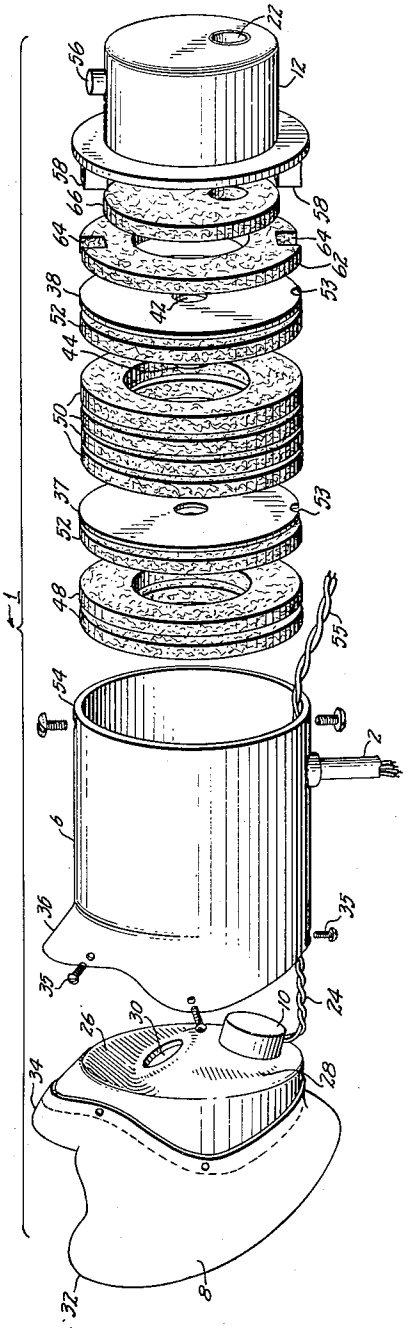
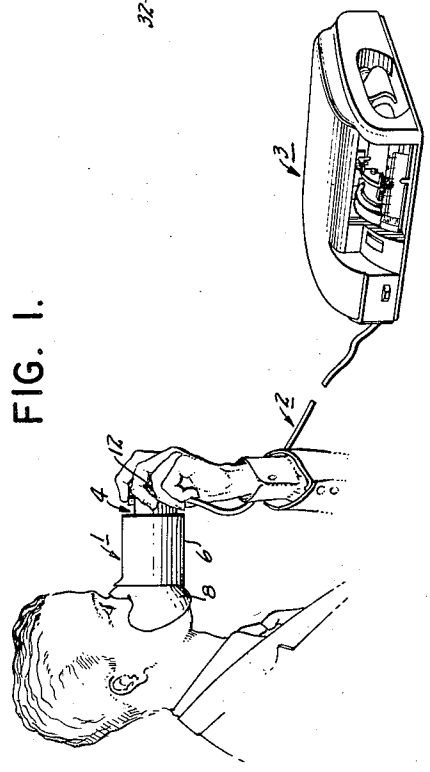


FIG. 1.



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MICROPHONE HOUSING

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This invention relates to microphone housing apparatus adapted for use when it is necessary for a person to speak into a microphone and desirable that the sound of his voice be inaudible to persons nearby. It also relates to such apparatus wherein it is desirable that no sounds other than the speaker's voice be received by the microphone.

More particularly this invention relates to a microphone housing apparatus wherein part of the housing is flexible and adapted to conform to and enclose the portion of the speaker's face including his mouth and nose so that the sound of his voice is substantially confined within the housing and sounds external to the housing are substantially excluded from the microphone, and wherein provision is made in the apparatus to allow the speaker to breathe while using the microphone.

Frequently persons using microphones associated with public address systems, broadcasting facilities, motion picture or sound recording equipment, or the like, must do so without interfering with the activities of persons nearby as, for example, in courtroom proceedings, conferences, legislative proceedings, cueing in broadcasting and television, wedding ceremonies, billiard matches, golf-putting contest, etc. Under other circumstances noises in the neighborhood of the microphone may interfere with its proper use as, for example, operation in an aircraft, battle reporting, and the like.

The advantages of the present invention may be well illustrated in connection with the reporting of courtroom activities. In court reporting it would be advantageous to use microphones connected to sound recording equipment to make a permanent record of the precise language and actions which take place during the proceedings. Although this can be partially accomplished by suitably positioning a number of microphones to record the words of the principal participants, i. e. the judge, witnesses, attorneys, etc., additionally, it is desirable to have a reporter to describe the actions accompanying the spoken words. In accordance with the present invention, it is possible to provide the court reporter with a microphone which can be used in any courtroom for recording such a description without interfering with the proceedings. This description can be recorded simultaneously with the words spoken by the participants, either at a separate place on the recording or on a separate auxiliary record "keyed in" to the principal record. Thus a full understanding of the proceedings can be had merely by listening back to such recordings.

Prior to the present invention attempts have been made to use a microphone in a face mask to permit a court reporter to continuously describe the actions and report the discussion and conversation taking place. One of the difficulties with such previous arrangements was that they did not allow the speaker to breathe while holding the microphone mask to his face. Hence, the speaker had to remove the mask from his face every thirty seconds or so to allow him to breathe. This was disconcerting and tiring to the speaker, and tended to distract participants in the activity being reported. Furthermore, in such

previous arrangements the microphone picked up the sound of the reporter's breathing when the mask was removed from his face, and other undesirable external sounds were also recorded at that time.

Although this problem of interference between the speaker using a microphone and his surroundings may be solved in some cases by the provision of sound-proof booths such as are usually used in radio and television studios, such booths are bulky, expensive, and impractical for many purposes. For example, it usually would be difficult to provide sound-proof booths in courtrooms.

It is an object of this invention, therefore, to provide simple and practical micorphone housing apparatus adapted to prevent interference between a speaker and his surroundings by confining his voice within the microphone housing apparatus so that he can talk without disturbing others while, at the same time, permitting him to breathe.

It is the further object of this invention to provide such a microphone housing apparatus having an air conduit from the interior of the housing provided with a sound absorbing and filtering arrangement therein whereby the user can breathe while speaking into the microphone without the sound of the user's voice escaping from the housing or external sounds entering the housing.

These and other apparent objects and advantages of the invention will be in part obvious and in part pointed out hereinafter.

The invention, accordingly, consists of the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of which will be indicated in the following claims.

One of the various possible embodiments of the present invention is shown in the accompanying drawings, in which:

Figure 1 is a perspective view of a microphone housing arrangement embodying the invention, shown in use in conjunction with a dictating machine;

Figure 2 is a perspective exploded view of the microphone housing apparatus shown in Figure 1; and

Figure 3 is a cross-sectional view of the microphone housing arrangement of Figure 1.

Referring in greater detail to the drawings, in Figure 1, there is shown in use a microphone housing apparatus, generally indicated at **1**, connected by an electric cable **2** to a dictating machine, indicated generally at **3**. The microphone apparatus is adapted to be held by grasping the end remote from the user's face and a switch **4** is conveniently located at the end of the housing so that the operation of the recording machine **3** may be remotely controlled by the same hand that holds the microphone apparatus.

The microphone housing apparatus **1** is shown in greater detail in the exploded view of Figure 2 and in the longitudinal cross-sectional view of Figure 3, which will be described together for purposes of convenience. In general, there is shown a cylindrical container **6**, having at one end a flexible face mask or sound seal **8** for enclosing portions of the user's face including his mouth and nose to confine within the mask **8** the sounds of the user's voice, a microphone **10**, positioned within the mask **8** to catch this sound, and a cap **12** closing the other end of the container **6**. In order for the user to breathe without removing the apparatus from his face, a passageway, generally indicated by the arrow **14** in Figure 3, is provided extending from within the face mask **8**, through a series of sound-absorbing chambers **16**, **18** and **20**, to an air vent **22** in the cap **12**. The control switch **4** is conveniently located within the top of the cap **12**.

The microphone **10** is connected to cable **2** through

connections 24 and is supported by a partition 26 closing one side of the face mask 8, to be disposed before the speaker's mouth when the apparatus is in use. A concave depression 28 in the partition 26 maintains the microphone 10 in proper orientation with respect to his mouth and lips, and a breathing port 30 allows passage of his breath. The face of the microphone 10 is covered by a layer of Vistanex impregnated silk cloth, which is desirable to protect it from the moisture in the user's breath and to prevent it from receiving whistling sounds caused by the passage of the speaker's breath over the face of the microphone and through port 30. The face mask 8 is made of flexible material, such as rubber or plastic impregnated cloth, and is formed with curved cheek portions 32 and a nose portion 34 to conform to the contours of the user's head so as to provide a tight sound seal around the periphery of the mask.

Machine screws 35 secure the partition 26 to a flared end portion 36 of the container 6, and the face mask 8 is clamped in place therebetween.

In order ot prevent substantially all of the sound from the speaker's voice from passing along passageway 14 and out through vent 22 into the air, the interior of the container 6 is divided into the three compartments 16, 18 and 20 which are of particular configurations and dimensions to filter and absorb sound. Accordingly, discs 37 and 38 of rigid material and containing breathing ports 40 and 42, respectively, are placed within the container 6; a tube 44 is mounted in the hole 42 and extends into chamber 18; and a tube 46 is mounted in the air vent 22 so as to extend through cap 12 to the chamber 20. To increase the sound-absorbency effectiveness of each of these chambers 16, 18 and 20, they are appropriately lined with sound-absorbent material. Two annular sound absorbent washers 48 are placed in chamber 16, and four similar washers 50 in chamber 18. Two additional washers 52 are placed in chambers 16 and 18 adjacent discs 37 and 38 to damp any tendency for these discs to vibrate under the influence of the speaker's voice. The discs 37 and 38 are notched at 53 to provide clearance for connections 24 and for connections 55 extending between cable 2 and switch 4.

Inserted into the end 54 of the container 6 is the cap 12 which houses the control switch 4 and entirely closes this end 54 except for the breathing vent 22 and a hole through which projects the push button 56 of switch 4. A pair of projecting lugs 58 on the cap 12 are spaced so that they snugly fit into the end 54, and the cap 12 is secured in place by machine screws 60. A sound absorbent washer 62, having a pair of notches 64 therein to provide clearance for the lugs 58, is placed in chamber 20. And a disc 66 of sound absorbent material is fitted into the cap 12 to provide additional sound damping. In order to accommodate the end of tube 46 and to damp any tendency for tube 46 to vibrate, the disc 66 has a hole 68 therein fitting around the end of the tube 46.

In order to reduce to a minimum any noise which might be occasioned by the passage of breath into and out of the face mask 8 along passageway 14, the bores of tubes 44 and 46 should be smooth, and also their ends should be rounded off on the inside as well as the edges of ports 30 and 40.

From the above description, it can be seen that as the sounds from a user's voice pass from within the face mask 8 along the breathing passageway 14 through chambers 16, 18 and 20, energy is filtered and absorbed from the sound in each chamber by virtue of the configuration thereof and of the sound-absorbent material located therein. The result is that very little, or in fact, practically none of the sound energy from the speaker's voice is radiated from the air vent 22. Not only does the housing apparatus 1 prevent sounds from escaping, but conversely it also prevents the microphone 10 from picking up any external sounds which might otherwise interfere with its use. Thus, any external sounds which might enter the air vent 22 lose substantially all of their energy in chambers 20, 18 and 16 before reaching the microphone 10.

Applicant has built a successful microphone housing apparatus having the desired acoustic properties with the following dimensions. The cylindrical container 6 had an internal diameter of 3½ inches and was approximately 4 inches long. The discs 37 and 38 and the sound-absorbent washers 48, 50, 52 and 64 had an external diameter of approximately 3½ inches to fit snugly within container 6. These washers were of felt ¼ inch thick and having a texture S. A. E. F–10. The washers 48 and 50 had an internal diameter of 2 inches, and washers 52 had a ½ inch hole therein. Disc 37 was 1/32 of an inch thick with a ½ inch hole therein, and the disc 52 was 1/16 of an inch thick having a 0.546 inch hole to accommodate the turned-down end of the tube 56 which was 1 11/32 inches long overall with a ½ inch bore and an outside diameter of 19/32 inch. The free end of tube 44 was spaced 3/32 inch from disc 37. These dimensions leave some clearance between the washers, for the spacing of discs 37 and 38 was approximately 1⅜ inches. Tube 46 has the same diameters as tube 44 and was 2⅛ inches long overall, with the turned down portion being 17/32 inch long and of a diameter to fit snugly in the air vent 22, which was 0.546 inch in diameter. The washer 66 had an outside diameter of only 2 inches and contained an eccentrically located hole ½ inch in diameter to fit over the end of tube 46. With these dimensions, the effect of breathing while holding the microphone housing apparatus 1 firmly in place against the face as shown in Figure 1, was about the same as breathing through a smooth tube 6 inches long and having an internal diameter of ½ inch. As can be seen from this comparison, a user can readily breathe while using this apparatus.

Although only one embodiment of the present invention has been shown and exemplary dimensions set forth, it is apparent that many possible embodiments can be made of this invention without departing from the scope thereof, and, therefore, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative only and not in a limiting sense.

I claim:

1. A microphone housing apparatus adapted for use where it is desirable for a user to address a microphone and undesirable for other persons to hear the sounds from the user's voice, said housing apparatus comprising: a microphone, a substantially cylindrical container having first and second open ends and forming a portion of said housing apparatus, a flexible material extending from the first container end and adapted to conform to and to enclose portions of the user's face including mouth and nose, said material forming a channel for conducting to said first container end sound waves uttered by the user and forming a sound seal for preventing the radiation of sound waves from his voice out into the air surrounding the housing apparatus, a microphone-supporting partition mounted within the first container end and partially closing same, said partition being secured to the microphone to hold it within said container in a position to receive sound waves uttered by the speaker, said partition having an opening therein for permitting the passage of the user's breath into and out of the container to and from him, a closure for said second container end having a tubular inlet and outlet breathing vent therethrough, the length of said breathing vent being at least four times its effective diameter and a plurality of discs each having an orifice therein, said discs snugly fitting within said container and dividing it into a series of three chambers, the orifices in said discs interconnecting adjacent pairs of chambers and being approximately centered with respect thereto, a plurality of annular washers of sound absorbent material snugly fitting within said container, said chambers and orifices forming an unobstructed passageway between said opening and said vent to permit the passage

of the user's breath therebetween, and said chambers and orifices serving to absorb energy from sound waves in said passageay, whereby the user is permitted to breathe while addressing the microphone continuously and whereby the sound of his voice is substantially confined within the said housing apparatus and prevented from escaping out of the vent.

2. A microphone housing apparatus adapted to permit the user to breathe while addressing a microphone over long periods of time without the sound of his voice being heard or outside ambient sounds reaching the microphone, comprising a microphone, a microphone-supporting baffle secured to said microphone and to the wall of said housing, a flexible sound seal extending from said housing adjacent said partition with its extremities formed to conform to portions of a person's face including his mouth, said seal and baffle defining portions of a microphone chamber in which the user's lips are positioned near to said microphone when said apparatus is held to his face in use, said baffle having an opening therein, an inlet and outlet breathing port passing through the wall of said housing and opening directly into the outside air, said breathing port comprising a straight smooth-walled passage having an effective diameter of at least about half an inch and a length at least about four times its effective diameter, at least one large open sound-dissipating chamber in said housing and having communication between said opening, said sound-dissipating chamber, and said port to form a breathing passageway from said microphone chamber through said sound-dissipating chamber and said port to the outside air, and a tubular member projecting into said chamber from a wall of said chamber and having an effective diameter of a least about half an inch and a length at least twice its effective inside diameter, the interior of said tube forming a portion of said passageway, said tube being approximately centered with respect to said chamber.

3. A microphone housing apparatus adapted for use when it is desirable for a user continuously to address a microphone and undesirable for other persons to hear the sounds from his voice and which permits the user to breathe continuously without taking the housing from his face, said housing apparatus comprising: a microphone, a microphone supporting structure secured to the microphone, a thin wall container enveloping the microphone and the microphone supporting structure, a member of flexible material extending from the container and adapted to enclose portions of the user's face including his mouth and nose, said member forming a direct channel from the user's lips to said microphone to conduct to the microphone sounds uttered by him and forming a sound seal to obstruct the passage of sounds from his voice out into the air surrounding the housing apparatus, a breathing vent through a wall in said container opening into the outside air, said breathing vent being beyond said microphone and spaced therefrom and including a first tube-like member, and a partition within the container forming in conjunction with the walls thereof a centrally positioned hollow sound absorbing chamber of relatively large size with respect to the outside dimensions of the housing apparatus, said partition having an opening therein, and a second tube-like member projecting from said partition opening centrally into said hollow chamber for a substantial distance therein, each of said tube-like members having an effective cross sectional area comparable to the cross sectional area of the main breathing passages in a human being but much smaller than the effective area of said hollow sound absorbing chamber, said chamber and said tube-like members serving to connect the said breathing vent to the channel adjacent said microphone through a path of a length comparable to the distance between said microphone and said vent, to allow the passage of breath between said channel and said vent and to absorb energy from sounds passing therebetween, whereby the sounds from the user's voice impinge directly on said microphone and thereafter sound absorption in said chamber and said tube-like members occurs beyond said microphone so that the user may breathe while addressing the microphone continuously and the sound of his voice is substantially confined within said housing apparatus and ambient noises entering said breathing vent are absorbed before reaching said microphone.

4. A microphone housing adapted for use when it is desirable for a user continuously to address a microphone and undesirable for other persons to hear the sounds from his voice and which permits the user to breathe continuously without taking the housing from his face, said housing comprising a relatively thin walled box-like container enclosing a hollow space, the walls of said container being substantially impervious to sound waves; a flexible face mask attached to one end of said container and adapted to conform to the face of a user of said housing to enclose his mouth and in conjunction with a portion of the wall of said container forming a large enclosed volume into which the user can speak; means for mounting a microphone in said large volume; a plurality of partitions positioned within said container and spaced apart from each other for dividing said hollow space into a plurality of large successive volumes; means defining an air vent in the wall of said container between said large enclosed volume and the first one of said successive volumes; means defining an air vent in each of said partitions, each vent communicating between adjacent volumes; and means defining an air vent in the wall of said container communicating with the last of said successive volumes and the outside air, said air vents being approximately centered with respect to said large volumes and placed with respect to each other so that the effective path of air conduction through said housing has a length substantially no longer than the length of said housing.

5. The combination of elements as in claim 4 in which each of said air vents has an effective diameter with respect to conduction of air approximately equal to the effective diameter of an average user's windpipe, the effective diameter of each of said large volumes is much larger than the effective diameter of said vents, the lengths of at least two of said vents are respectively greater than the effective diameters of said vents, and the volume of each of said vents is substantially smaller than one of said large volumes, whereby said housing is divided into a plurality of large and small volumes through which air expelled by a user can pass along a substantially direct path on its way to the outside air.

6. The combination of elements as in claim 5 in which each of said air-vents whose length is greater than its effective diameter is formed by a thin-walled tube-like member whose inside wall is substantially smooth and non-porous and in further combination with sound absorbing material lining most of the walls of at least two of said large volumes, whereby sound carrying air expelled by a user passes through at least two small smooth walled volumes and through at least two large sound absorbing volumes so that before reaching the outside air the sound waves have been substantially entirely attenuated.

7. A microphone housing adapted for use when it is desirable for a user continuously to address a microphone and undesirable for other persons to hear the sounds from his voice and which permits the user to breathe continuously without taking the housing from his face, said housing enclosing a central volume and comprising a hollow box-like container and having sound impervious walls and an open end, a flexible face mask surrounding the open end of said container and adapted to conform to the face of a user and to enclose his mouth and nose and forming in conjunction therewith a large space within said central volume, a microphone supporting structure adapted to hold a microphone immediately in front of the mouth of a user within said large space in said housing, said housing characterized by having the interior

thereof divided by at least one partition into a plurality of large spaces within said central volume and which are interconnected with each other and the outside air by a plurality of air vents much smaller in effective air conducting diameter than the corresponding diameter of each of said large spaces but approximately equal to the effective air conducting diameter of the average user's windpipe, each of at least two of said air vents including a thin walled tube whose length is greater than its inside diameter, at least one of said tubes being carried by said partition around a generally centrally positioned opening therein and projecting substantially into one of said large spaces, another of said tubes passing through a wall of said container and opening into the outside air.

8. The structure as in claim 7 in which each of at least two of said tubes is approximately centered relative to its respective large space, are spaced from each other and are placed with respect to each other so that air expelled by a user is able to pass along a relatively short but not exactly straight path through said housing to the outside air whereby sound waves carried by this air are substantially entirely attenuated before leaving said housing by the sound absorbing action of each of said large spaces and said air vents.

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