

March 14, 1961

A. V. MOTSINGER

2,974,665

GAS MASK SPEECH TRANSMISSION

Filed Feb. 12, 1954

3 Sheets-Sheet 1

Fig. 1.

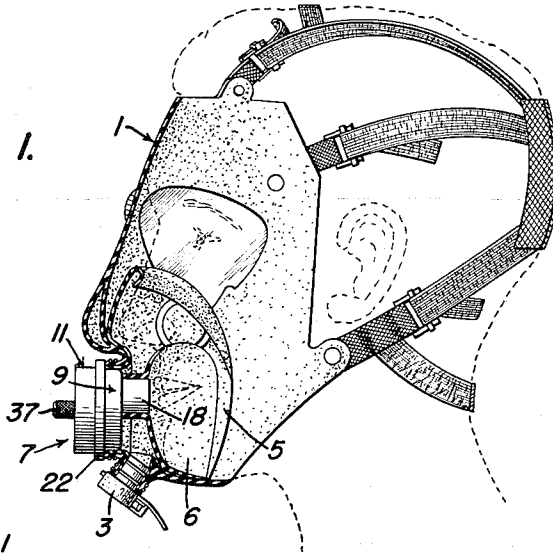


Fig. 4.

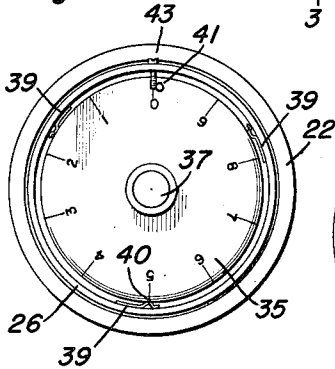


Fig. 3.

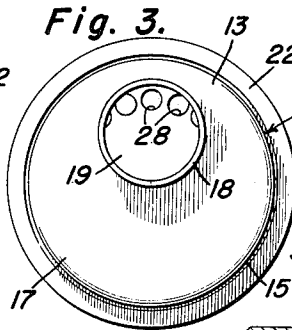


Fig. 2.

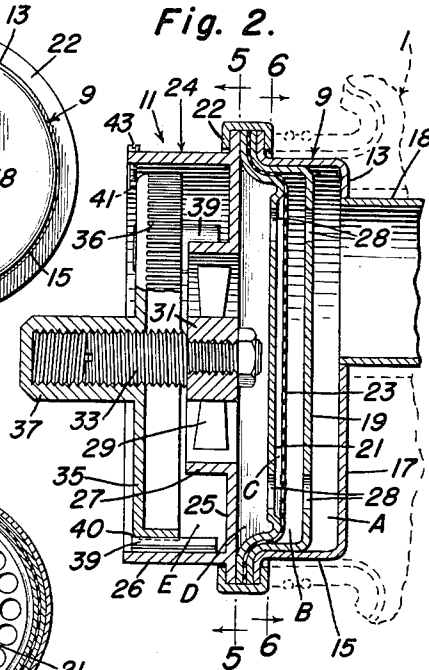


Fig. 5.

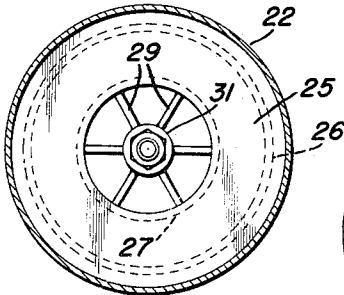
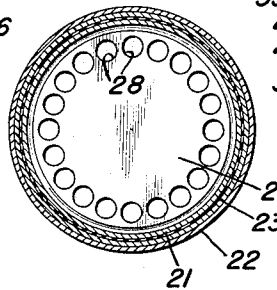


Fig. 6.



INVENTOR.  
Armard V. Motsinger  
BY  
George Penckan  
ATTORNEY

March 14, 1961

A. V. MOTSINGER

2,974,665

GAS MASK SPEECH TRANSMISSION

Filed Feb. 12, 1954

3 Sheets-Sheet 2

Fig. 7.

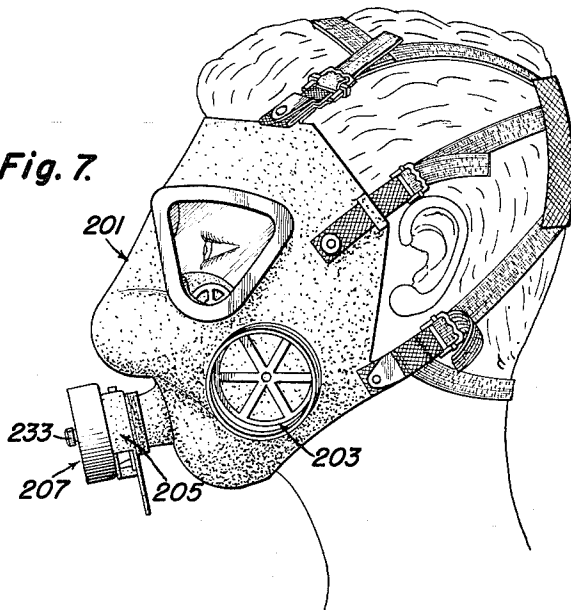


Fig. 9.

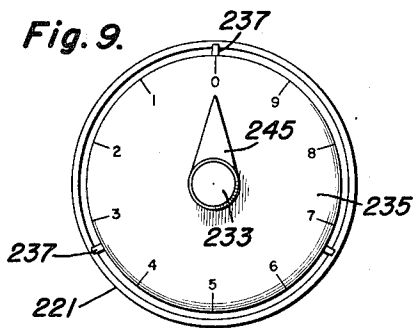


Fig. 10

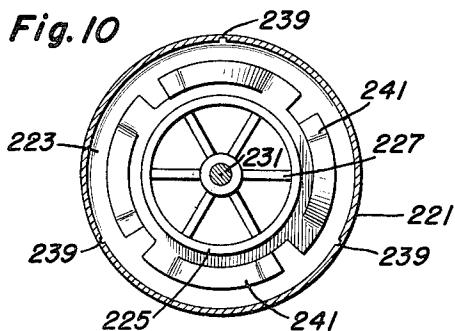
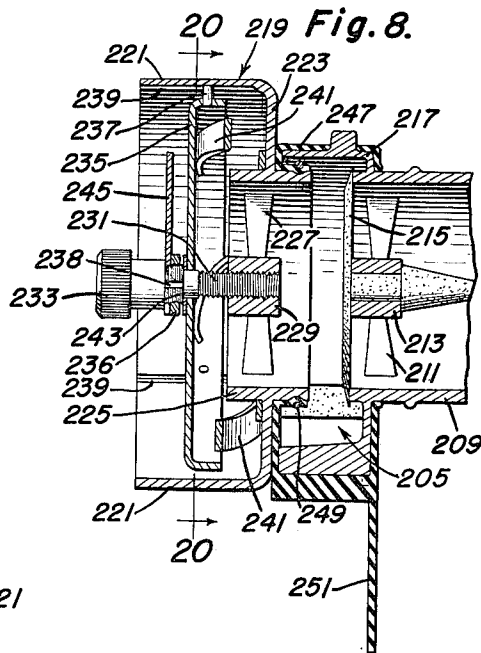


Fig. 8.



INVENTOR.

Armard V. Motsinger

BY

George Penahan

ATTORNEY

March 14, 1961

A. V. MOTSINGER

2,974,665

GAS MASK SPEECH TRANSMISSION

Filed Feb. 12, 1954

3 Sheets-Sheet 3

Fig. 11.

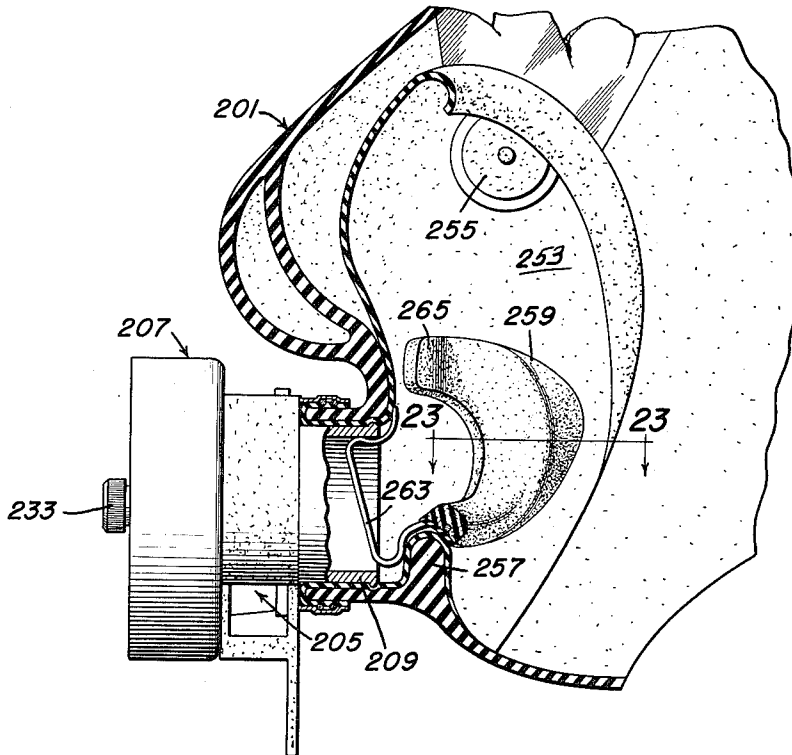


Fig. 12.

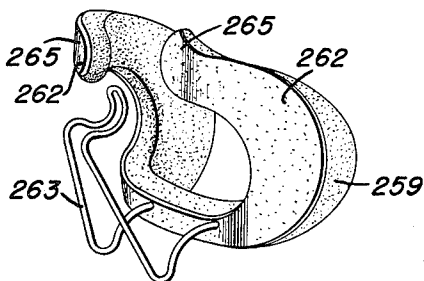
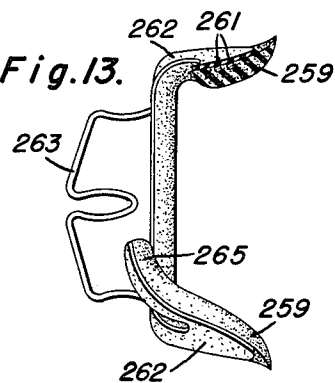


Fig. 13.



INVENTOR.  
Armad V. Motsinger  
BY *George R. Penahan*  
ATTORNEY

1

2,974,665

## GAS MASK SPEECH TRANSMISSION

Armard V. Motsinger, Rte. 2, Aberdeen, Md.

Filed Feb. 12, 1954, Ser. No. 410,056

14 Claims. (Cl. 128—141)

(Granted under Title 35, U.S. Code (1952), sec. 266)

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

This invention relates to a voice transmitting means for gas masks.

In my Patent No. 2,410,454, November 5, 1946, I have shown a voice-transmitting gas mask which includes a vibratable diaphragm of thin sheet material, such as cellulose film, and a resonating chamber between the diaphragm and the mouth of wearer.

An object of this invention is to improve the basic structure shown in my patent.

A further object of my invention is to provide a voice-transmitting means for a gas mask in which the diaphragm is protected against unctures or other injury.

A further object of my invention is to provide an improved resonator structure.

A further object of certain embodiments of my invention is to provide a sound-transmitting gas mask in which the air-outlet valve acts as a diaphragm to transmit speech.

In the accompanying drawings, Figure 1 is a view, partially in section, of a gas mask incorporating a voice-transmitting means according to my invention. Figure 2 is a longitudinal section of one modification of a voice-transmitting means according to my invention. Figure 3 is a right end elevation of the device shown in Figure 2, on a reduced scale. Figure 4 is a left end elevation of the device shown in Figure 2, on a reduced scale. Figure 5 is a section, on a reduced scale, on line 5—5 of Figure 2. Figure 6 is a section on a reduced scale, on line 6—6 of Figure 2.

Figure 7 is a diagrammatic view showing another modification of my voice-transmitting means which utilizes the air outlet valve disk, mounted in a gas mask. Figure 8 is a longitudinal section of the voice-transmitting means shown in Figure 7. Figure 9 is a left end elevation, on a reduced scale, of the device shown in Figure 8. Figure 10 is a section, on a reduced scale, taken on line 20—20 of Figure 8. Figure 11 is a view, partially in section, of the lower portion of the modification of Figure 7. Figure 12 is a perspective view of the mouthpiece of Figure 11. Figure 13 is a plan view of the mouthpiece including a portion in section on the line 23—23 of Figure 11.

The basic principles of the voice-transmitting gas mask shown in my Patent No. 2,410,454 have proved quite successful. The present invention embodies various improvements which render the device more rugged, efficient, and capable of better adjustment. One of the modifications, moreover, utilizes the air outlet valve disk as a speech-transmitting diaphragm and permits a reduction in the number of fixtures attached to the face-piece of the gas mask.

In the mask shown in my Patent No. 2,410,454, a resonating chamber was provided inside the face-piece, between the diaphragm and the mouth of the wearer. In

2

all the modifications of the present invention, a resonating chamber is provided on the exterior side of the diaphragm and is constructed in such a manner that there is no direct opening from the outside to the diaphragm.

The diaphragm is thus protected against punctures.

The modification of Figures 1 to 6 will now be described in detail.

In Figure 1, I have shown the gas mask comprising a face piece 1 and including the usual cannister for the intake of air (not shown) and an air outlet 3. Inside the face piece is a nose cup 5 formed of a sheet of flexible rubber and a mouthpiece 6 of similar material. My invention involves the use of speech transmitter 7 which will now be described in more detail.

Referring to Figure 2, the transmitter includes a diaphragm chamber 9 and a resonator 11. The diaphragm chamber is formed by a first cup-shaped housing 13 which has a cylindrical wall 15 and a base 17. A voice tube 18 communicates with an opening eccentrically positioned in the base 17. Within the housing 13, are plates 19 and 21. Between these plates is a diaphragm 23 formed of several, for instance four, sheets of thin material. While cellulose acetate or the other materials mentioned in my patent may be used, I have found that superior results are secured by the use of thin sheets of polyvinylidene chloride such as is sold under the name of "Saran." Plates 19 and 21 are perforated near their peripheries by holes 28 which permit the passage of sound waves. The housing 13 and the plates 19 and 21 are preferably formed of a plastic or hardboard, for example those that are sold under the name "Panelyte" by the St. Regis Paper Company, New York, New York. The diaphragm chamber and the resonator are held together by a crimped ring 22, preferably of aluminum.

The resonator, which will now be described in detail, is preferably formed of a light metal such as magnesium alloy. The resonator includes a second cup-shaped housing 24, having a cylindrical wall 26, and a base 25. An inner wall 27 located centrally of the base defines a central opening in which is mounted a spider 29 which carries a central support 31. The central support is shown as tapped to receive a stud 33. It will be understood however, that the stud may be mounted in the support in other manners, for example, by pressing. The outer end of the stud is threaded and carries a movable plate 35 which is provided with a knurled knob 37 internally threaded to receive the stud. The outer face of plate 35 carries a numbered scale as shown in Figure 4. A series of friction springs 39 are fastened to the inner surface of wall 26 and are in frictional engagement with the periphery of plate 35. As a further aid to indexing the plate, its periphery is provided with a hundred evenly spaced notches 36. One of the springs 39 has a sharp V-shaped portion 40 which enters these notches giving audible clicks as the plate is rotated. A post 41 on the outer surface of plate 35, and a stop screw 43 mounted in the cylindrical wall 26 serve to limit the movement of the plate.

The operation of this modification is as follows:

When the wearer speaks, mouthpiece 6 directs the sound waves into tube 18. Base 17 of the first housing, plates 19 and 21, base 25 of the second housing, and movable plate 35, together with the cylindrical walls form a series of resonating chambers A, B, C, D, and E. The diaphragm 23 transmits the sound waves while preventing passage of gas in the same manner as described in my prior patent. By turning knob 37, plate 35 can be adjusted, thus varying the size of the chamber E to secure the best transmission of the voice of a given individual. By use of the numbered scale, the plate may be reset at its optimum position. Since rotation of the plate gives audible clicks, it may be adjusted by trial without remov-

ing the gas mask and retained in the position found best.

In Figures 7 to 13, I have shown a modification in which the thin diaphragm used in the other models is dispensed with and its functions are performed by the air outlet valve disk of the gas mask. Referring to Figures 7 and 11, I have shown a gas mask having the usual face piece 201 and air inlet connection 203. The air outlet is at 205. Mounted over the air outlet is resonator 207. Referring now to Figures 8, 9 and 10, the air outlet comprises a metal outlet tube 209 in which is mounted a spider 211 carrying a valve disk support 213. The air outlet valve disk, shown at 215, is formed of flexible resilient rubber. The outlet tube also carries an outlet connection 217. The resonator comprises a cup-shaped housing 219 having a cylindrical or frusto-conical wall 221 and a base 223. Extending through the central part of the base is a cylinder 225 which carries a spider 227. The spider in turn carries a central support 229 in which is threaded a stud 231 having a knurled knob 233. A plate 235 is carried by stud 231 which is rotatable relative thereto. The plate carries at its periphery pins 237 which seat in slots 239 in wall 221. The plate is thus held against rotation but is permitted axial movement. A series of springs 241 urges the plate outwardly against a shoulder 243 on stud 231. As shown in Figure 19, a numbered scale is provided on the peripheral portion of plate 235. The stud 231 carries a pointer 245 which is held in position by lock nut 236. Rotation of the pointer relative to stud 231 is prevented by slot 238 which engages a key formed on the pointer.

The resonator is secured to the air outlet tube by a rubber sleeve 247 which is secured to cylinder sleeve 225 by clamping ring 249. The sleeve passes over the air outlet connection 217 and holds the resonator in place thereon. For ease of operation, the rubber sleeve is provided with a tab 251.

Referring to Figures 11, 12 and 13 the mask includes a conventional nose cup 253 provided with air intake valves, one of which is shown at 255. In the lower portion of the face piece is a chin-fitting ridge 257 which defines the lower edge of the outlet opening. In order to secure proper sound transmission, I employ a sponge rubber mouthpiece 259. This mouthpiece is reinforced by a spring wire 261 which is held in place by sheet rubber 262. The external portion of the wire is formed into a spring clip 263 which holds the mouthpiece in place. It will be noted that the upper ends 265 of the mouthpiece are spaced apart to provide an opening for the transmission of nasal sounds. In use, the mouthpiece fits rather snugly around the mouth of the wearer with ends 265 positioned near the lower edges of the nose.

The manner of use of this modification is as follows:

The facepiece outlet tube, valve disk, and outlet tube connection are the same as for prior models of gas masks. The usual rubber cover of the outlet valve can simply be removed and replaced by my resonator and the mouthpiece clipped in place. When the resonator is installed, the outlet valve disk vibrates sufficiently to permit the passage of sound waves, which are amplified by the resonator chamber formed by housing 219 and plate 235. By turning knob 233, the plate 235 can be adjusted toward and away from base 223 to give the best results for an individual voice. By use of the scale and pointer, the plate can later be reset to the desired position.

It will be apparent that the devices of Figs. 1 to 6 and Figs. 7-13 are closely related and can readily be modified. Thus the non-rotary plate 235, its stud 231 and associated adjusting means of Figs. 7-13 may replace plate 35 and stud 33 of Figs. 1-6, or vice versa.

While I have described specific embodiments in detail, the invention is obviously susceptible to variations. I do not, therefore, desire to be limited except by the scope of the appended claims.

I claim:

1. A resonating chamber for a voice-transmitting means for gas masks comprising a cup-shaped housing having a central opening in the base thereof, a spider in said opening, a central support carried by said spider, a plate within said housing substantially parallel to and spaced from the base thereof, and having its periphery spaced from the cylindrical wall of said housing, means connecting the said central support with the central portion of said plate and thereby supporting said plate.
2. A device according to claim 1 including means to selectively move said plate toward and away from the base of said housing.
3. A device according to claim 1 comprising an axial support member connected to said central support and said plate being rotatably mounted on said axial support member and having a threaded connection therewith, and manually actuatable means for turning said plate on said axial supporting member to thereby selectively move said plate toward or away from said base.
4. A device according to claim 3 further comprising at least one spring detent mounted on the inner surface of the cylindrical wall and engaging the periphery of said plate member and a series of notches in said periphery receiving said detent, whereby said plate member may be held in definite positions and whereby when said plate is turned a series of audible clicks will be produced.
5. A device according to claim 1 comprising an axial support member connected to said central support and rotatably engaging the central portion of the plate, means preventing rotation of said plate but permitting movement thereof toward and away from the base, said axial support member being in threaded engagement with said central support, at least one shoulder on said axial support member engaging said plate, and manually actuatable means for rotating said axial support member to thereby selectively move said plate toward and away from said base.
6. In a device according to claim 5, spring means engaging said base and said plate and urging said plate away from said base, a scale extending around the peripheral portion of said plate and a pointer mounted on said axial support member, whereby said plate may be set at a definite distance from said base.
7. In a gas mask comprising a face piece, an air outlet tube, and an outlet valve, said valve comprising a disk of flexible, resilient material secured at its central portion and having its peripheral portion in contact with the outer end of said outlet tube; the combination therewith of a resonating chamber mounted on the discharge side of said outlet valve, said resonating chamber including a peripheral wall member and at least two plates substantially perpendicular to the axis of said peripheral wall member, said plates being spaced from one another and from said outlet valve, and air passages so located as to permit sound waves to pass from said outlet valve through said resonating chamber to the exterior.
8. A device according to claim 7, wherein at least one of said plates is selectively movable toward and away from the other.
9. In a gas mask comprising a face piece, an air outlet tube, and an outlet valve, said valve comprising a disk of flexible, resilient material secured at its central portion and having its peripheral portion in contact with the outer end of said outlet tube; the combination therewith of a resonating chamber mounted on the discharge side of said outlet valve, said resonating chamber comprising a cup-shaped housing having a central opening in the base thereof, a spider in said opening, a central support carried by said spider, a plate within said housing substantially parallel to and spaced from the base thereof, and having its periphery spaced from the cylindrical wall of said housing and means connecting the said central support with the central portion of said plate and thereby supporting said plate, and an outlet connection, forming

5

an open passage from the exterior of said outlet valve to said opening for conducting sound waves from said outlet valve to said resonating chamber.

10. A device according to claim 9 including means to selectively move said plate toward and away from the base of said housing.

11. In a gas mask comprising a face piece, an air outlet tube, and an outlet valve, said valve comprising a disk of flexible, resilient material secured at its central portion and having its peripheral portion in contact with the outer end of said outlet tube; the combination therewith of a resonating chamber mounted on the discharge side of said outlet valve said resonating chamber comprising a cup-shaped housing having a central opening in the base thereof, a spider in said opening, a central support carried by said spider, a plate within said housing substantially parallel to and spaced from the base thereof, and having its periphery spaced from the cylindrical wall of said housing, means connecting the said central support with the central portion of said plate and thereby supporting said plate, said means comprising an axial support member connected to said central support and rotatably engaging the central portion of the plate, means preventing rotation of said plate but permitting movement thereof toward and away from the base, said axial support member being in threaded engagement with said central support, at least one shoulder on said axial support member engaging said plate, and manually actuable means for rotating said axial support member to thereby selectively move said plate toward and away from said base.

6

12. In a device according to claim 11, spring means engaging said housing and said plate and urging said plate away from said base, a scale extending around the peripheral portion of said plate and a pointer mounted on said axial support member, whereby said plate may be set at a definite distance from said base.

13. The combination as defined in claim 9 and further comprising a sponge rubber mouthpiece removably secured to said facepiece, said mouthpiece being so formed and positioned as to substantially surround the mouth of the wearer and direct sound waves into said outlet tube.

14. The combination as defined in claim 13, said mouthpiece being open at the top to thereby transmit nasal sounds.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

|           |           |               |
|-----------|-----------|---------------|
| 1,757,459 | Harrison  | May 6, 1930   |
| 1,991,002 | Stanley   | Feb. 12, 1935 |
| 2,038,267 | Bullard   | Apr. 21, 1936 |
| 2,325,688 | Landis    | Aug. 3, 1943  |
| 2,410,454 | Motsinger | Nov. 5, 1946  |
| 2,645,301 | De Vries  | July 14, 1953 |

##### FOREIGN PATENTS

|         |               |               |
|---------|---------------|---------------|
| 464,458 | Great Britain | Apr. 19, 1937 |
| 826,056 | France        | Dec. 27, 1937 |
| 833,096 | France        | July 11, 1938 |
| 572,888 | Great Britain | Oct. 29, 1945 |