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MICROPHONE ASSEMBLY

Original Filed March 22, 1943

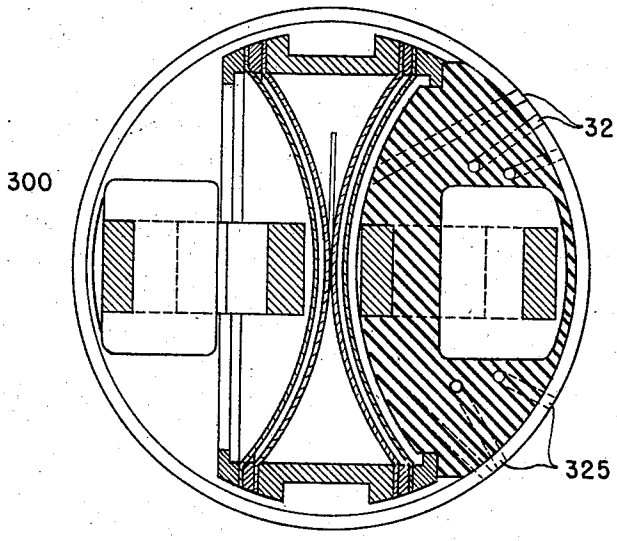


FIG. 1

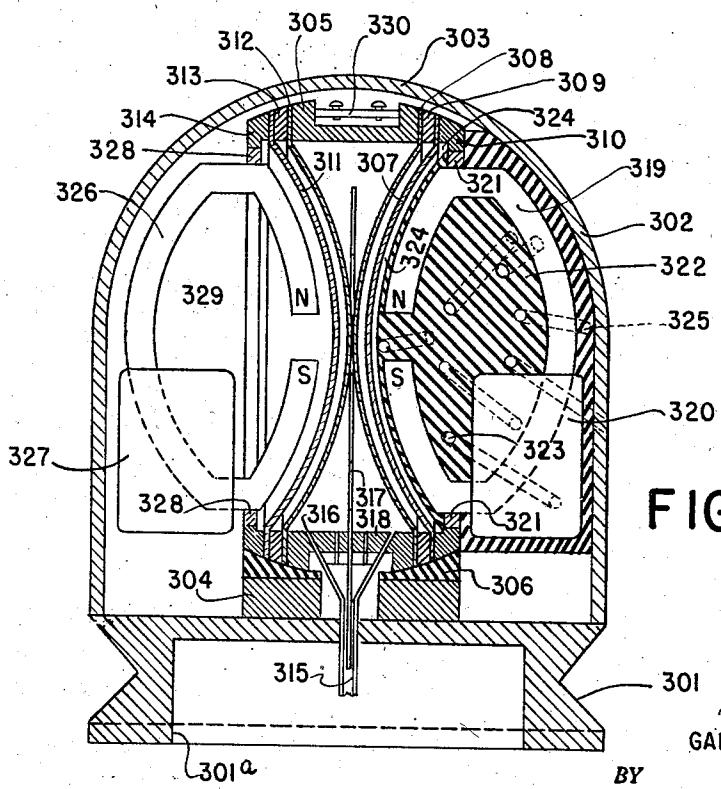


FIG. 2

INVENTOR.
GABRIEL M. GIANNINI

BY
Davis, Lindsey, Smith & Shonts

ATTORNEYS

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MICROPHONE ASSEMBLY

Gabriel M. Giannini, West Los Angeles, Calif., assignor, by mesne assignments, to Automatic Electric Laboratories, Inc., Chicago, Ill., a corporation of Delaware

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5 Claims. (Cl. 179—116)

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The present invention relates to microphone assemblies and more particularly to such microphone assemblies adapted for use in sound direction finders of the electro-acoustic or microphone type. This application is a division of the copending application of Gabriel M. Giannini, Serial No. 480,028, filed March 22, 1943, now Patent No. 2,417,927, granted March 25, 1947.

It is an object of the present invention to provide a microphone assembly which is of compact and economical construction and arrangement and which is highly efficient in operation.

A further object of the invention is to provide a microphone assembly which is of improved construction and arrangement lending the microphone assembly particularly suitable for use upon a submarine or other submersible device.

Further features of the invention pertain to the particular construction and arrangement of the mechanical and electrical elements of the microphone assembly, whereby the above-outlined and additional operating advantages are attained.

The invention both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawing, in which Figure 1 is a plan sectional view of a microphone assembly particularly adapted for use in a sound direction finder; and Fig. 2 is a longitudinal sectional view of the microphone assembly shown in Fig. 1.

Referring now more particularly to Figs. 1 and 2 of the drawing, the microphone assembly 300 there illustrated is particularly adapted for use in a sound direction finder which is arranged to be supported by the periscope of a submarine or other submersible craft or by a diving bell or the like. The microphone assembly 300 comprises a base 301 which is adapted to be directly secured to the periscope or other rotatable part and a substantially bell-shaped casing 302 hermetically sealed to the base 301, the casing 302 including a removable dome 303 hermetically sealed thereto. The interior of the casing 302 is hollow and carries a substantially centrally disposed supporting ring 304 upon which is mounted an upstanding annular frame 305, the frame 305 being mounted upon the supporting ring 304 by means of a mounting ring 306 formed of rubber or the like, whereby the frame 305 is resiliently supported by the supporting ring 304. One end of the frame 305 is hermetically sealed by an arrangement comprising a substantially semi-

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spherical and inwardly directed diaphragm 307, a substantially semi-spherical and inwardly directed reticulated screen 308, an intervening spacing ring 309, and a clamping ring 310, the reticulated screen 308 directly engaging the adjacent end of the frame 305, the spacing ring 309 being disposed between the peripheral portions of the reticulated screen 308 and the diaphragm 307 and the clamping ring 310 directly engaging the adjacent peripheral portion of the diaphragm 307. The elements named are retained in assembled relation by screws or the like, not shown, whereby the adjacent end mentioned of the frame 305 is hermetically sealed. Similarly, the other end of the frame 305 is hermetically sealed by an arrangement comprising a substantially semispherical and inwardly directed diaphragm 311, a substantially semispherical and inwardly directed reticulated screen 312, an intervening spacing ring 313, and a clamping ring 314, the reticulated screen 312 directly engaging the adjacent end of the frame 305, the spacing ring 313 being disposed between the peripheral portions of the reticulated screen 312 and the diaphragm 311 and the clamping ring 314 directly engaging the adjacent peripheral portion of the diaphragm 311. The elements named are retained in assembled relation by screws or the like, not shown, whereby the adjacent end mentioned of the frame 305 is hermetically sealed.

Accordingly, the two inwardly directed reticulated screens 308 and 312 are respectively spaced with respect to the associated diaphragms 307 and 311 to protect the diaphragms mentioned and are disposed substantially in contact with each other adjacent the centers thereof at the approximate center of the frame 305. Also a substantially centrally disposed conduit 315 is arranged within a recess 301*a* formed in the base 301 and projects through an opening provided in the top wall of the base 301, the upper end of the conduit 315 being flared outwardly to provide a substantially cone-shaped throat 316 secured in a cooperating conical opening provided in the bottom of the frame 305, whereby the interior of the compartment defined between the frame 305 and the cooperating diaphragms 307 and 311 communicates through the conduit 315 with the exterior. Also a breather tube 317 is arranged within the conduit 315 and extends toward the top of the compartment mentioned defined between the frame 305 and the diaphragms 307 and 311, the breather tube 317 having an offset central portion disposed out of contact with respect to the reticulated screens 308 and 312,

whereby the interior of the compartment mentioned may be vented through the breather tube 317. The breather tube 317 is suitably supported in the throat 316 of the conduit 315 by an associated plug 318, the breather tube 317 extending through an opening formed in the plug 318 and the plug 318 having other openings therein directly connecting the interior of the compartment formed between the frame 305 and the diaphragms 307 and 311 and the interior of the throat 316 of the conduit 315.

The diaphragm 307 forms a part of a first microphone which also includes a substantially C-shaped field structure 319 carrying a winding or coil 320, the field structure 319 being suitably secured to the clamping ring 310 by a number of blocks or wedges 321 illustrated. The diaphragm 307 is formed of magnetic material while the field structure 319 comprises a permanent magnet arranged in spaced relation with respect thereto, whereby a magnetic field is normally set up between the north and south poles of the permanent magnet 319 which includes the adjacent section of the diaphragm 307. Also the blocks 321 disposed between the permanent magnet 319 and the clamping ring 310 are formed of nonmagnetic material, thereby to prevent flux leakage between the top and bottom portions of the permanent magnet 319 and the adjacent peripheral portion of the diaphragm 307. The first microphone, comprising the permanent magnet 319 and the coil 320, is embedded in a molded block 322 formed of rubber or the like and filling a portion of the interior of the casing 302 disposed between the clamping ring 310 and the adjacent inner side wall of the casing 302. The block 322 has a number of openings 323 formed therein out of contact with the permanent magnet 319 and the coil 320 and communicating between a chamber 324 defined between the block 322 and the adjacent surface of the diaphragm 307, the openings 323 also communicating through openings 325 formed in the casing 302. Accordingly, the chamber 324 defined between the diaphragm 307 and the block 322 communicates with the exterior through the openings 323 formed in the block 322 and the openings 325 formed in the casing 302.

Similarly, the diaphragm 311 forms a part of a second microphone which also includes a substantially C-shaped field structure 326 carrying a winding or coil 327, the field structure 326 being suitably secured to the clamping ring 314 by a number of blocks or wedges 328 illustrated. The diaphragm 311 is formed of magnetic material while the field structure 326 comprises a permanent magnet arranged in spaced relation with respect thereto, whereby a magnetic field is normally set up between the north and south poles of the permanent magnet 326 which includes the adjacent section of the diaphragm 311. Also the blocks 328 disposed between the permanent magnet 326 and the clamping ring 314 are formed of the nonmagnetic material, thereby to prevent flux leakage between the top and bottom portion of the permanent magnet 326 and the adjacent peripheral portion of the diaphragm 311. The second microphone, comprising the permanent magnet 326 and the coil 327, is arranged within an air filled cavity 329 formed in the casing 302 adjacent the diaphragm 311. Finally a terminal block 330 is provided which is supported in a recess formed in the frame 305; which terminal block terminates the coils 320 and 327. Finally it is noted that the terminal block 330 may

be electrically connected through the compartment formed between the frame 305 and the diaphragms 307 and 311, the plug 318 and the conduit 315 to the exterior. Preferably, the two microphones are wired in opposition to each other, whereby the microphone assembly 300 is of the balance type.

Considering now the operation of the microphone assembly 300 after the supporting craft or the like has reached the surface, the periscope or other support upon which the sound direction finder 300 is mounted is projected into the air and is rotated by any suitable means. At this point it is noted that any water entering the chamber 324 defined between the diaphragm 307 and the block 322 through the openings 323 is drained therefrom after the microphone assembly 300 is positioned in the associated atmosphere; and that such water has no deleterious effect upon the second microphone due to the water impervious nature of the material of which the block 322 embedding the elements of the second microphone is formed. At this time the chamber 324 formed adjacent the diaphragm 307 and the block 322 is directly connected via the openings 323 to the atmosphere; while the cavity 329 disposed adjacent the diaphragm 311 of the second microphone is shielded by the side wall of the casing 302. Hence, the first microphone will produce a greater output than the second microphone, assuming that the same intensity of sound is reaching the diametrically disposed surfaces of the casing 302, as will be readily appreciated. At this time the base 301 and consequently the casing 302 are rotated until a maximum output is obtained from the two balanced connected microphones. At this time the first microphone comprising the permanent magnet 319 and the coil 320 is directed toward the source of sound, whereby the associated apparatus, through which microphone assembly 300 carried by the sound direction finder is revolved, is operative to indicate the direction of the source of sound in ordinary compass values, in the manner previously explained.

While the preferred embodiments of the invention have been disclosed, it will be understood that various modifications may be made therein which are within the true spirit and scope of the invention.

What is claimed is:

1. A microphone assembly comprising a casing, a frame disposed in said casing, a first diaphragm supported by one side of said frame, a second diaphragm supported by the other side of said frame, first magnetic structure disposed between said first diaphragm and one side wall of said casing and cooperating with said first diaphragm, a first winding coupled to said first magnetic structure, second magnetic structure disposed between said second diaphragm and the other side wall of said casing and cooperating with said second diaphragm, a second winding coupled to said second magnetic structure, and a block of water impervious material sealing said one side of said frame to said one side wall of said casing and embedding said first magnetic structure and said first winding, said block being spaced from said first diaphragm to define a chamber therebetween and having sound passages formed therein out of contact with said first magnetic structure and said first winding and communicating between said chamber and the exterior through connecting openings provided in said one side wall of said casing, whereby said first diaphragm com-

municates directly with sound from the exterior, said other side wall of said casing partially shielding said second diaphragm from sound from the exterior.

2. A microphone assembly comprising a casing, a frame disposed in said casing, a first diaphragm sealed to one side of said frame, a second diaphragm sealed to the other side of said frame, said frame and said first and second diaphragms defining a compartment within said casing, a breather conduit extending through an aperture provided in said casing and communicating between said compartment and the exterior, first magnetic structure disposed between said first diaphragm and one side wall of said casing and cooperating with said first diaphragm, a first winding coupled to said first magnetic structure, second magnetic structure disposed between said second diaphragm and the other side wall of said casing and cooperating with said second diaphragm, a second winding coupled to said second magnetic structure, and a block of water impervious material sealing said one side of said frame to said one side wall of said casing and embedding said first magnetic structure and said first winding, said block being spaced from said first diaphragm to define a chamber therebetween and having sound passages formed therein out of contact with said first magnetic structure and said first winding and communicating between said chamber and the exterior through connecting openings provided in said one side wall of said casing, whereby said first diaphragm communicates directly with sound from the exterior, said other side wall of said casing partially shielding said second diaphragm from sound from the exterior.

3. A microphone assembly comprising a casing, a frame disposed in said casing, a diaphragm supported by said frame, magnetic structure disposed between said diaphragm and one wall of said casing and cooperating with said diaphragm, a winding coupled to said magnetic structure, and a block of water impervious material sealing said frame to said one wall of said casing and embedding said magnetic structure and said winding, said block being spaced from said diaphragm to define a chamber therebetween and having sound passages formed therein out of contact with said magnetic structure and said winding

and communicating between said chamber and the exterior through connecting openings provided in said one wall of said casing.

4. A microphone assembly comprising a casing, a frame disposed in said casing, a diaphragm supported by said frame, magnetic structure disposed between said diaphragm and one wall of said casing and cooperating with said diaphragm, a winding coupled to said magnetic structure, and a block of rubber molded into direct contact with said frame and said one wall of said casing and into embedding relation with said magnetic structure and said winding, whereby a water impervious seal is provided between said frame and said one wall of said casing, said block being spaced from said diaphragm to define a chamber therebetween and having sound passages formed therein out of contact with said magnetic structure and said winding and communicating between said chamber and the exterior through connecting openings provided in said one wall of said casing.

5. A microphone assembly comprising a casing, a frame disposed in said casing and resiliently supported thereby, a diaphragm supported by said frame, magnetic structure disposed between said diaphragm and one wall of said casing and supported by said frame and cooperating with said diaphragm, a winding supported by said magnetic structure and coupled thereto, and a block of water impervious material sealing said frame to said one wall of said casing and embedding said magnetic structure and said winding, said block being spaced from said diaphragm to define a chamber therebetween and having sound passages formed therein out of contact with said magnetic structure and said winding and communicating between said chamber and the exterior through connecting openings provided in said one wall of said casing.

GABRIEL M. GIANNINI.

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