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L. J. ANDERSON

2,352,305

MICROPHONE

Filed Jan. 2, 1941

FIG. 1.

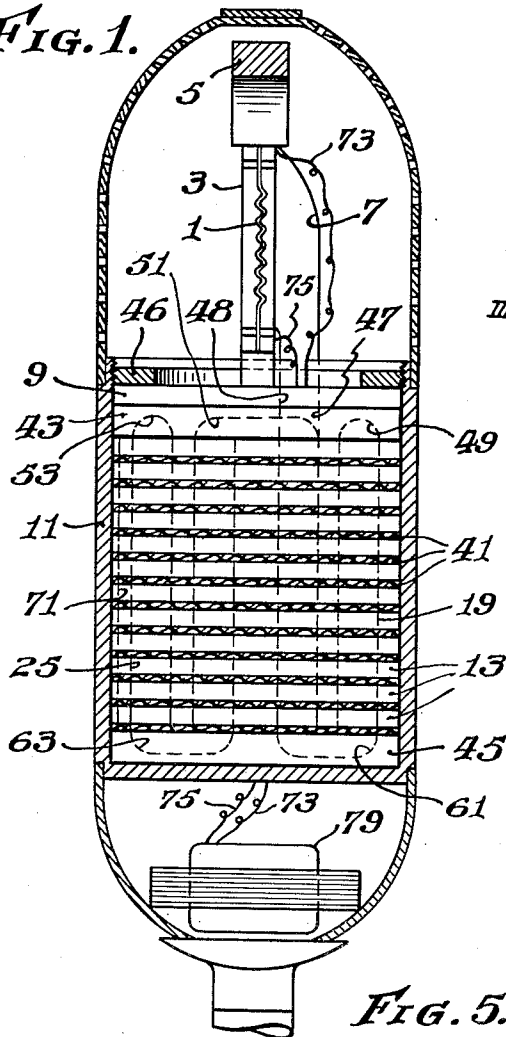


FIG. 2.

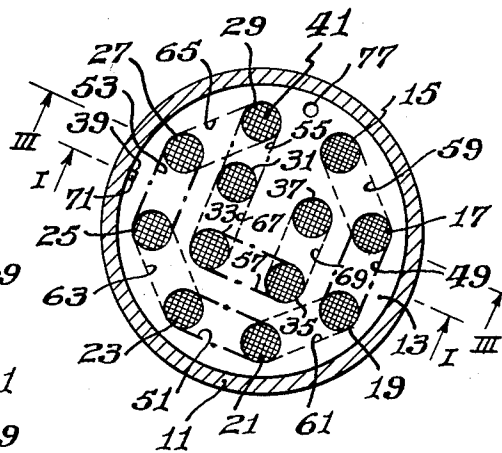


FIG. 4.

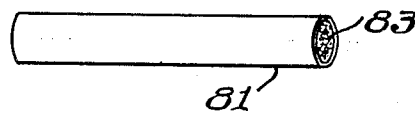


FIG. 3.

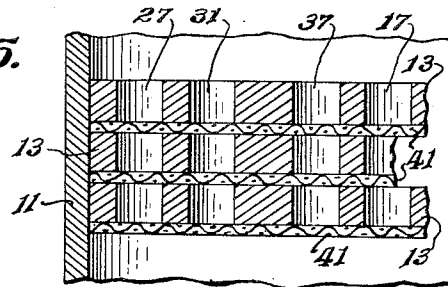


FIG. 6.

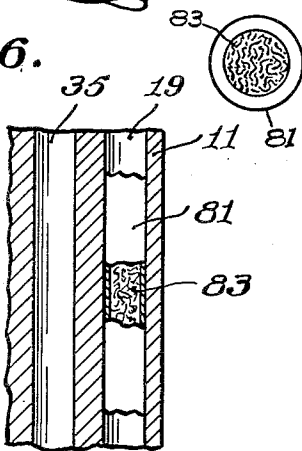
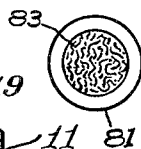


FIG. 5.



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UNITED STATES PATENT OFFICE

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MICROPHONE

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Application January 2, 1941, Serial No. 372,753

7 Claims. (Cl. 181—33)

This invention relates to microphones of the dynamic type, and more particularly to the acoustic labyrinth employed in connection with pressure responsive microphones, the present invention being an improvement over that disclosed and claimed in the copending application of Harry F. Olson, Serial No. 270,801, filed April 29, 1939 and assigned to the Radio Corporation of America.

In the said copending application there is disclosed a microphone having a pressure responsive element and a pressure gradient responsive element, the former terminating in an acoustic labyrinth constituted by a solid member having a plurality of longitudinally extending bores there- 10 through which are serially connected to provide a long, continuous passage. This labyrinth is filled with suitable damping material, such as loosely packed hair felt, or the like, in order to simulate the effect of a loading pipe of infinite 20 length.

In assembling the structure shown in the aforementioned copending application, care must be exercised to uniformly distribute the damping material throughout the labyrinth. Furthermore, 25 while the arrangement disclosed in said application is highly satisfactory in use, it does not lend itself to the greatest economy.

The primary object of my present invention is to provide an improved labyrinth structure 30 which will not be subject to the aforementioned objections.

More particularly, it is an object of my present invention to provide an improved labyrinth for pressure responsive microphones which is in- 35 expensive in cost, easy to manufacture, substantially free from leakage and highly efficient in use.

Another object of my present invention is to provide an improved labyrinth as aforesaid in 40 which the loading material is uniformly distributed throughout the labyrinth.

Another object of my present invention is to provide an improved labyrinth as aforesaid which readily lends itself to quantity manufacture in 45 great economy, and which can readily be assembled with precision even by one unskilled in the art.

According to one form of my invention, I form the acoustic line or labyrinth by a plurality of 50 thin slabs or disc-like members, each provided with an equal number of openings, and assemble them alternately with layers of silk. The openings in each of the slabs or discs are arranged in axially aligned relation to provide a 55

plurality of parallel, axially displaced, discrete passages, these passages being serially connected to provide a continuous, long passage. The silk layers in between each of the discs or slabs constitute the acoustic resistance evenly distributed throughout the continuous passage.

In another form of my invention, I omit the silk layers in between the discs and insert into each of the passages a tubular member of paper or the like which has been rolled up with uniformly distributed hair felt or similar material to simulate the well known cigarette. After the discs are assembled, these individual tubes can be quickly inserted, one into each of the discrete passages, after which suitable end members are applied to the assembly to serially connect the several passages. Of course, if desired, the labyrinth may be made of a single solid member, as disclosed in the aforementioned Olson applica- 20 tion, and the tubular members constituting this phase of my invention may be inserted into the discrete bores thereof.

The novel features that I consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, as well as additional ob- 25 jects and advantages thereof, will best be understood from the following description of several embodiments thereof, when read in connection with the accompanying drawing, in which:

Figure 1 is a view, partly in elevation and partly in section taken along the line I—I of Fig. 2, of a microphone including a labyrinth constructed according to one form of my invention, the micro- 35 phone casing being shown in section and the labyrinth being shown in elevation.

Figure 2 is a top plan view of this form of labyrinth with the top end section removed.

Figure 3 is an enlarged, detail, sectional view taken on the line III—III of Figure 1,

Figure 4 is a perspective view of one of the tubular members filled with damping material and made in accordance with the second form of my invention,

Figure 5 is an end view thereof, and

Figure 6 is a fragmentary sectional view of an acoustic labyrinth formed of solid material and including the damping material according to the second form of my invention.

Referring more particularly to the drawing, wherein similar reference characters indicate corresponding parts throughout, there is shown, in Fig. 1, a conductive, vibratile member 1, such as a crimped aluminum ribbon, arranged to vibrate

in an air gap between a pair of pole pieces 3 (only one of which is shown) to which flux is supplied by a magnet 5. Behind the ribbon 1 is a pipe 7 which leads to and communicates with an acoustic labyrinth according to the first form of my invention, the structure thus far described being supported on a plate 9.

The acoustic labyrinth of this form of my invention is constituted by a plurality of disc-like members or slabs 13 each of which is provided with a plurality of axially-spaced openings 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35 and 37, and also with a peripheral notch 39. To one surface of each of the discs 13 is secured a layer of foraminous material 41, such as silk, as by means of a suitable adhesive, the material 41 in each layer covering the openings in the disc 13 to which it is secured. The labyrinth also includes top and bottom end members 43 and 45, the former being provided with an opening 47 by means of which communication is established between the pipe 7 and the labyrinth, as well as a plurality of recesses 49, 51, 53, 55 and 57. The bottom end member 45 is similarly provided with a plurality of recesses 59, 61, 63, 65, 67 and 69.

In assembling the labyrinth, the bottom end section 45 is first inserted into the casing 11, after which a suitable number of members 13 with attached silk layers 41 are also inserted into the member 11, and finally the top end member 43 is placed on the uppermost disc 13, face down, after which the plate 9 is placed on the end member 45. A ring member 46, which is threadedly received in the casing 11, is then screwed down tight against the top end member 43 to hold the assembly in place. A keyway 71 on the cylindrical member 11 cooperates with the peripheral slots 31 in the members 13, 43 and 45 to insure their being aligned in such a manner that the respective openings of the discs 13 are in axially aligned relation to thereby provide continuous, parallel, axially-spaced, discrete bores or passages. When so assembled, the pipe 7 communicates with the top of the passage constituted by the aligned openings 15 through the opening 47 in the top end member and a superposed, aligned, opening 48 in the supporting plate 9. At the bottom of the passage constituted by the openings 15, the recess 59 in the end plate 45 serves to connect that passage with the next following passage constituted by the aligned openings 17. Thereafter, the recess 49 in the end member 43 connects the tops of the passages constituted by the respective openings 17 and 19. The bottom of the passage constituted by the openings 19 is connected by the recess 61 with the bottom of the passage constituted by the aligned openings 21, and so on serially through all the openings until, finally, the labyrinth is terminated at the top end of the opening 37. The leads 73 and 75 from the ends of the ribbon 1 may be brought down through a series of aligned openings 77, also formed in the discs 13 and in the end members 43 and 45, and through the bottom of the cylindrical member 11 to an output transformer 79.

In Figs. 3, 4 and 5, I have shown a somewhat different form of my invention wherein the acoustic resistance is constituted by a tubular member 81 of thin paper or the like which is rolled up to enclose uniformly distributed hair felt or like material 83, similarly to the conventional cigarette. The labyrinth may be made up of a number of discs and end members, as in Fig. 1, with the silk layers 41 omitted, or it may be

made in one, integral, solid piece, as disclosed in the aforementioned Olson application. In any case, a tube 81 with the enclosed damping material 83 is inserted in each of the discrete, longitudinal passages of the labyrinth to substantially fill each of said passages. It is obvious that the damping material 83 can be much more uniformly distributed in the paper sheet 81 prior to rolling thereof than when inserted by hand into the longitudinal passages of the labyrinth, as is now customary. Moreover, after fabrication, the tubes 81 can be very easily slipped into each of the longitudinal passages of the labyrinth.

Although I have shown and described two embodiments of my invention, it will be apparent to those skilled in the art that other modifications, as well as changes in those described above, are also possible. Furthermore, the precise method of assembling the labyrinth need not be as described above. For example, if desired, the end members 43 and 45 and the intermediate discs 13 with the alternated silk layers 41 may be first assembled by applying a suitable cement to both surfaces of the discs 13 and bonded together under heat and pressure, if necessary, into a solid unitary mass prior to insertion into the casing 11. This method may be followed advantageously where, for example, the members 13, 43 and 45 are made of a thermoplastic material instead of out of cardboard, fibre, or similar material. I therefore desire that my invention shall not be limited except insofar as is made necessary by the prior art and by the spirit of the appended claims.

I claim:

1. An acoustic labyrinth for a pressure responsive microphone comprising a plurality of disc-like members each having a plurality of openings extending therethrough, said members being assembled in superposed relation into a unitary structure with their respective openings in axially aligned relation.

2. An acoustic labyrinth for a pressure responsive microphone comprising a plurality of disc-like members each having a plurality of axially-spaced openings extending therethrough, said members being assembled in superposed relation into a unitary structure with their respective openings in axially aligned relation whereby to provide a plurality of axially-spaced, discrete passages, and means serially connecting said passages into one continuous passage.

3. An acoustic labyrinth for a pressure responsive microphone comprising a plurality of disc-like members each having a plurality of axially-spaced openings extending therethrough, said members being assembled in superposed relation into a unitary structure with their respective openings in axially aligned relation whereby to provide a plurality of axially-spaced, discrete passages extending longitudinally through said structure, means serially connecting said passages into one continuous passage, and means associated with said discrete passages affording an acoustical resistance therefor.

4. The invention set forth in claim 3 characterized in that said last named means is constituted by layers of foraminous material extending across said discrete passages.

5. The invention set forth in claim 3 characterized in that said last named means is constituted by layers of foraminous sheet material interposed between and alternated with said disc-like members.

6. The invention set forth in claim 3 character-

ized in that said last named means is constituted by a plurality of tubular members filled with acoustic damping material, one each of said tubes being inserted in one each of said discrete passages and substantially filling said passages.

7. An acoustic labyrinth for a pressure responsive microphone comprising a member having a

plurality of discrete passages extending longitudinally therethrough, means serially connecting said passages into one continuous passage, and a tubular member filled with substantially evenly distributed acoustic damping material in each of said discrete passages.

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