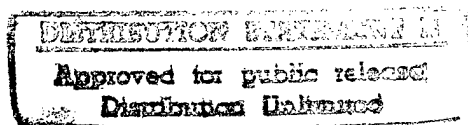


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NOTICE

The above identified patent application is available for licensing. Requests for information should be addressed to:



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ARLINGTON VA 22217-5660

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DTIC QUALITY INSPECTED &

1 Navy Case No. 77059

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3 DIRECTIONALLY SENSITIVE POINTING MICROPHONE

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5 STATEMENT OF GOVERNMENT INTEREST

6 The invention described herein may be manufactured and used
7 by or for the Government of the United States of America for
8 Governmental purposes without the payment of any royalties
9 thereon or therefor.

10
11 BACKGROUND OF THE INVENTION

12 (1) Field of the Invention

13 The present invention relates generally to directional
14 microphones, and more particularly to a directional microphone
15 apparatus equipped to illuminate a remotely located speaker or
16 other sound source as an indication of the microphone's direction
17 of sensitivity.

18 (2) Description of the Prior Art

19 The question and answer period during and following lectures
20 often creates confusion and delays in a lecture program. For
21 example, when someone in the audience wants to comment or ask a
22 question, that person must either shout to be heard or wait for a
23 microphone to be brought to them. In addition, when several
24 audience members seated in the same general area wish to be
25 heard, there is generally confusion as to which audience member
26 is being recognized by the lecturer.

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Another object of the present invention to provide a hand-held directionally sensitive microphone apparatus equipped to illuminate a remotely located speaker as an indication that the microphone apparatus is active and sensitive to sounds made by the remotely located speaker.

Other objects and advantages of the present invention will become more obvious hereinafter in the specification and drawings.

In accordance with the present invention, a microphone apparatus has a hollow cylindrical tube with a microphone mounted therein to form a directional microphone having an axis of sensitivity. The directional microphone is most sensitive to sound produced along this axis of sensitivity. The microphone receives sound directed thereto by the hollow cylindrical tube from a source of sound located on or near the axis of sensitivity and remotely located with respect to the directional microphone. A light source is mechanically coupled to the hollow cylindrical tube to produce and direct a beam of light to impinge upon the source of sound. Both the light beam and microphone are activated simultaneously to give a visual indication that the

1 microphone is active and a visual indication of the direction of
2 the axis of sensitivity of the directional microphone.

3
4 BRIEF DESCRIPTION OF THE DRAWING(S)

5 Other objects, features and advantages of the present
6 invention will become apparent upon reference to the following
7 description of the preferred embodiments and to the drawings,
8 wherein:

9 FIG. 1 is a schematic illustration of the directionally
10 sensitive pointing microphone apparatus according to the present
11 invention;

12 FIG. 2 is a schematic view of a first lens arrangement used
13 to produce the light beam in accordance with the present
14 invention;

15 FIG. 3 is a schematic view of a second lens arrangement; and

16 FIG. 4 is a partial illustration of the microphone apparatus
17 of FIG. 1 showing the pointing light beam angled away from the
18 axis of sensitivity of the apparatus' directional microphone.

19
20 DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

21 Referring now to the drawings, and more particularly to FIG.
22 1, one embodiment of the microphone apparatus of the present
23 invention is shown and is referenced generally by the numeral
24 100. Microphone apparatus 100 includes a hollow cylindrical tube
25 10 with microphone 12 mounted therein. Tube 10 and microphone 12
26 form a directionally sensitive microphone having an axis of

1 sensitivity defined by dashed line 11. Tube 10 with microphone
2 12 can be any one of the designs for directional microphones
3 which are well-known in the prior art, such as those described in
4 U.S. Pat. Nos. 3,095,484 and 3,444,955. In general, these
5 designs form an acoustic horn from hollow cylindrical tube 10
6 such that it has closed end 10A (housing microphone 12) and open
7 end 10B. Tube 10 generally includes a plurality of holes or
8 slots 10C which help define a plurality of different length
9 acoustic paths to microphone 12 as described fully in the
10 aforementioned patents.

11 Light generator 20 and lens 22 are attached to tube 10.
12 Attachment to tube 10 can be a fixed attachment or movable
13 attachment that would allow for position adjustment of light
14 generator 20 and/or lens 22. Light generator 20 is any
15 conventional light source, e.g., a low-power laser, capable of
16 serving as a source of visible, eye-safe light which is
17 represented in FIG. 1 by arrow 21. Light 21 from light generator
18 20 can be used directly, but more typically is directed to one or
19 more lenses, represented in FIG. 1 by lens 22. By way of non-
20 limiting examples, two lens arrangements are shown in FIGS. 2 and
21 3. In FIG. 2, light 21 passes through diverging lens 220 and
22 then through converging lens 222. Diverging lens 220 increases
23 the width of the incoming light and converging lens 22 limits the
24 diameter of outgoing light beam 23 over the desired range of
25 operation. Converging lens 222 accomplishes this by increasing
26 the apparent distance to the source by a desired amount. The

1 apparent distance to the source is the distance at which light
2 rays intersect. For some applications, both diverging and
3 converging lenses may not be needed, e.g., when a laser source is
4 used. In such instances, a diverging lens may be sufficient as
5 shown in FIG. 3 wherein only diverging lens 220 is used to
6 increase the diameter of light 21 to form light beam 23 and
7 control the apparent distance to the source. Note that for non-
8 linear light sources, it may be sufficient to just use a
9 converging lens.

10 Although the requirements of light beam 23 will vary with
11 the application, it is generally desirable to form light beam 23
12 as a relatively constant-diameter beam over the range of
13 sensitivity of the directional microphone formed by tube 10 and
14 microphone 12. Due to spherical spreading, the diameter of light
15 beam 23 will tend to increase with range. This can be controlled
16 with the lens configurations as discussed above so that light
17 beam 23 is a somewhat expanding beam that must be easily visible
18 both at the near and maximum usable range of microphone apparatus
19 100.

20 Light generator 20 and lens 22 are arranged to direct light
21 beam 23 in a direction that is aligned with axis of sensitivity
22 11 thereby providing a visual indication of the direction of axis
23 of sensitivity 11. Depending on how microphone apparatus 100 is
24 to be used, light beam 23 can be parallel to axis of sensitivity
25 11 as shown in FIG. 1, or angled slightly away from axis of
26 sensitivity 11 by a small angle θ as shown in FIG. 4.

Microphone 12 and light generator 20 are simultaneously activated by means of a single switch 30 which can be a trigger type switch mounted on handle 32 extending down from tube 10. Microphone 12 is typically coupled to amplifier 40 which boosts the signal for reproduction by speaker 42.

By way of example, the present invention will be explained in its operation as a hand-held, directionally sensitive pointing microphone that can be used by a lecturer fielding comments/questions from an audience. However, it is to be understood that the present invention can be used in other situations without departing from the teachings of the present invention.

Referring again FIG. 1, when a lecturer (not shown) wishes to field a comment or question from an audience member 201 in audience 200, the lecturer points microphone apparatus 100 towards audience member 201. The lecturer activates switch 30 which simultaneously activates microphone 12 and light generator 20. The lecturer then manipulates microphone apparatus 100 so that light beam 23 illuminates audience member 201. Typically, light beam 23 will impinge upon audience member 201 at about their chest. Thus, light beam 23 provides an indication that audience member 201 was selected to speak and that the microphone is active and sensitive to the voice of audience member 201. This eliminates the time delay associated with bringing a microphone to an audience member 201 as well as any confusion as to which member of the audience is being recognized. In terms of

1 using the present invention in this fashion, light generator 20
2 and lens 22 should produce light beam 23 having a diameter that
3 does not exceed approximately 18 inches at the maximum usable
4 range of the directional microphone formed by tube 10 and
5 microphone 12. This will avoid providing any ambiguous
6 indication as to which audience member is being recognized since
7 this size beam can be manipulated so that it only strikes one
8 audience member.

9 It will be understood that many additional changes in the
10 details, materials, steps and arrangement of parts, which have
11 been herein described and illustrated in order to explain the
12 nature of the invention, may be made by those skilled in the art
13 within the principle and scope of the invention.
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1 Navy Case No. 77059

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3 DIRECTIONALLY SENSITIVE POINTING MICROPHONE

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5 ABSTRACT OF THE DISCLOSURE

6 A microphone apparatus which includes a directional
7 microphone having an axis of sensitivity along which the
8 directional microphone is sensitive to sound. A light source is
9 mechanically coupled to the directional microphone to produce a
10 beam of light in a direction substantially commensurate with the
11 axis of sensitivity as a visual indication thereof.

