

[54] UNDERWATER SPEAKING DEVICE

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[63] Continuation of Ser. No. 731,774, May 24, 1968, abandoned.

[52] U.S. Cl. 181/126, 340/12, 340/5

[51] Int. Cl. H04b 13/02

[58] Field of Search 181/5 A; 340/12, 5

[56]

References Cited

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Primary Examiner—Benjamin A. Borchelt

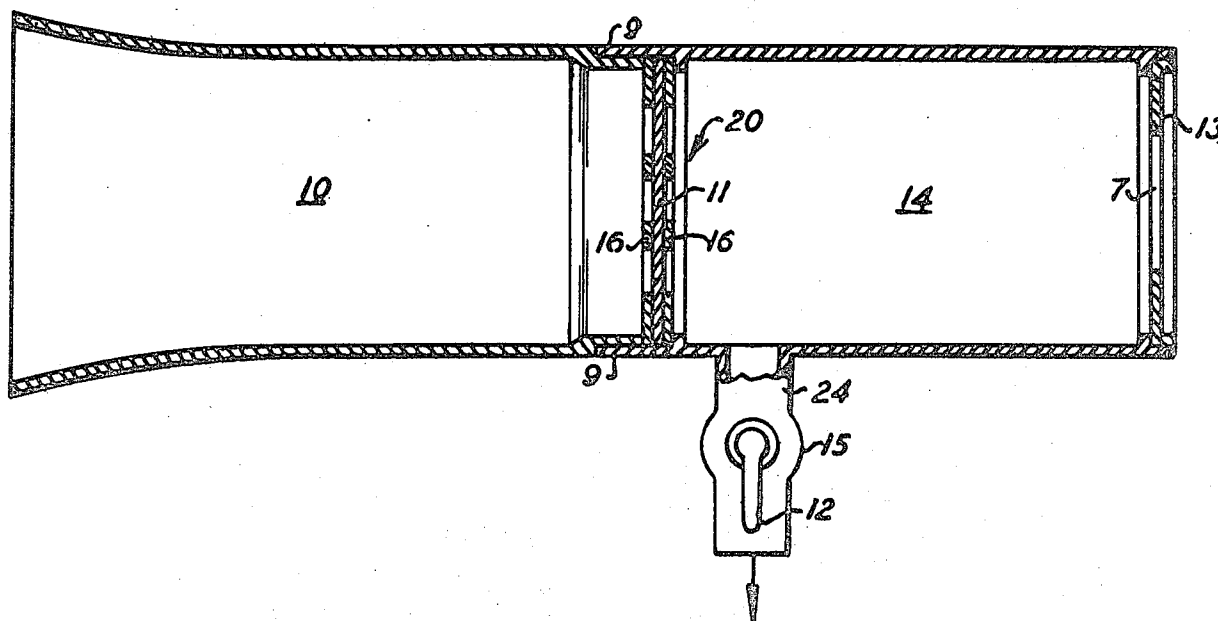
Assistant Examiner—J. V. Doramus

[57]

ABSTRACT

An underwater speaking tube employs a free-flooding speaking section which fits over the speaker's mouth. A venting tube to expel water is separated by a sound-transferring diaphragm from a sound distribution section.

10 Claims, 4 Drawing Figures



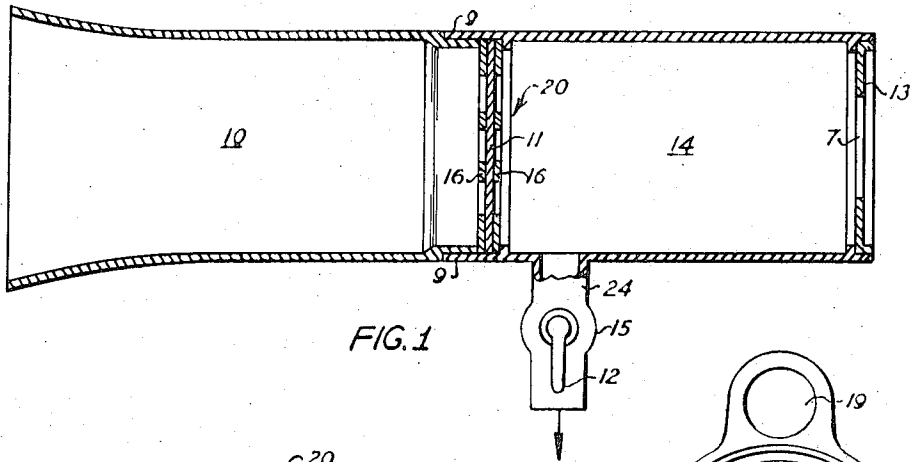


FIG. 1

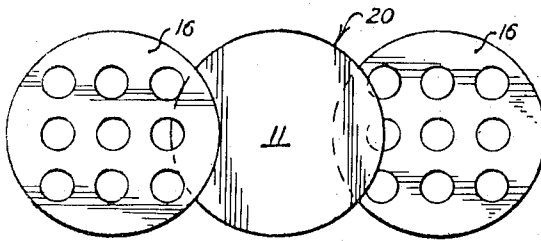


FIG. 2

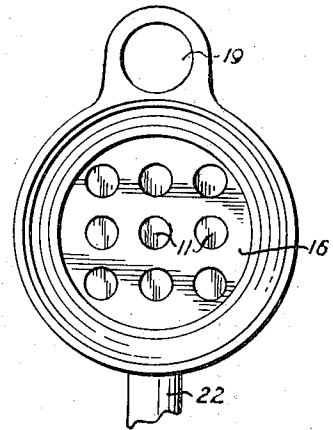


FIG. 4

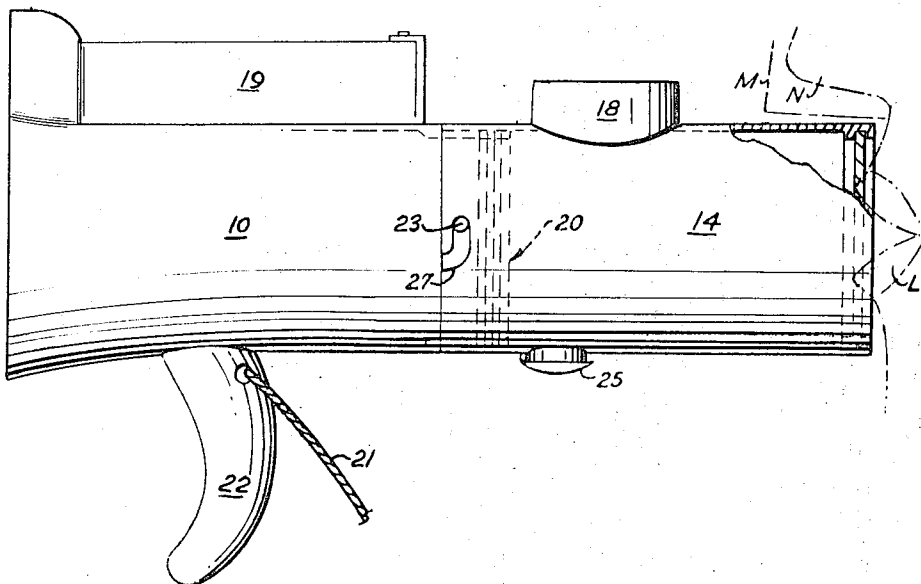


FIG. 3

UNDERWATER SPEAKING DEVICE

This application is a streamline continuation of Ser. No. 731,774, filed May 24, 1968 and now abandoned.

This invention relates to an underwater sound-carrying and -transmitting device such as a megaphone having a sound-transmitting opening at one end of material adapted to be pressure sealed against the lips of a speaker under water, communicating with a speaking chamber and a sound-distributing section separated by a diaphragm, so that the voice of the speaker becomes directionally transferable and amplified for underwater communication.

More specifically, the device comprises a speaking tube for underwater use having openings communicating with the water in both the speaking and the sound-distributing sections, which allow free water-flooding, the sections being separated by a sound-transferring diaphragm. One section, a speaking section, has an opening adapted to be placed around the mouth of the speaker, the speaking section being provided with venting means for displacing the water from the speaking section by the breath of the speaker, whereafter the sound of the voice of the speaker becomes transferable through an air medium developed by the breath of the speaker after displacing the water thereof through the vent. The sound is transferred therefrom through a sound transparent diaphragm and some through the walls of the chamber, most of the sound passing into a water-flooded sound-distributing section usually tubular and somewhat flared at the end as in a horn or megaphone. The vent of the speaking chamber is equipped with a valve which both controls the displacement of water from that speaking section in use and also is adjustable to provide sufficient pressure in the speaking section by the sound and breath of the speaker to allow a breathing pressure and resonance therein to allow the voice or sound to impinge against the diaphragm.

The invention will be further described in detail with reference to the drawings wherein:

FIG. 1 shows a side elevation in section of the device;

FIG. 2 is a detail showing the diaphragm and resilient supporting discs mountable therewith;

FIG. 3 shows a side elevation illustrating how the two sections are assembled together with a supporting handle means for use of the device; and

FIG. 4 is an end view taken on the line 4—4 of FIG. 3.

Referring first to FIG. 3, the device comprises a speaking section 14, flooded when not in use, but from which water is expelled, as will appear, and a sound-distributing section 10 slightly flared as a horn or megaphone for distributing the sound outward into the water as the device is used under water. The two sections 10 and 14 are telescopically interfitted as a pair of sleeves 9 and may be fastened together by a bayonet type sleeve joint 9 secured in fixed position by a pin 23 which slides as a guide in the groove 27 for assembly of the two sections for operation.

The horn or sound-distributing section 10 is separated from the speaking section 14 by a sound-transferring diaphragm 11 which is reinforced for vibrational strength and rigidity by sealing discs 16, one on each side, the diaphragm and disc assembly being

placed against a collar or flange 20 in assembled position in the speaking section, as shown in FIG. 1.

A face or mouth seal 13 is provided in the speaking end of the speaking chamber 14, press fitted for support against an outer end flange 17. The face seal 13 is a disc having an opening 15 large enough to fit about the lips of the speaker with enough clearance to allow the speaker to articulate with his lips into the opening 17. A vent 24 tube having the fluid flow therein controlled by a rotary valve 15, and having a plug handle 12 for fluid flow control through the valve 15 allows water in the pre-flooding chamber 14 to be expelled through the vent 24 with the handle 12 in the open position in the direction of the arrow of FIG. 1. Thereafter the plug 15 is adjusted to constrict the flow of the speaker's breath therethrough sufficient to force the speaking sound or voice to resonate or impact against the speaking diaphragm 11 with sufficient pressure or vibrational force to transfer the sound of the speaker's voice.

In alternate construction the valve plug 15 can be replaced by a spring-hinged vent plate 25, sealing the vent 24 so that the valve operates automatically, the vent plate 25 being resiliently pressed closed but will open by the breath of the speaker to allow expulsion of water from the speaking chamber 14, but will provide a speaking resonance therein by constriction of the vent sufficing to allow the voice to impact against speaking diaphragm. Hence, the speaker, having placed the device about his mouth with the seal 13 sealing the device around his mouth, may first blow through the opening 17 to displace the water from chamber 14 through the valve 15 or a check valve plate 25, whereby the chamber 14 is cleared of water, and he is ready then to speak. The sounds emitted by his voice in his breath-filled chamber with the vent slightly constricted impinge against the diaphragm 11 directly or through the openings of the supporting discs 16 as shown in FIGS. 2 and 4. The sound waves thus produced are transferred by the disc 11 into the water-filled chamber 10 and thence outward into the water and will carry substantial distances under water as ordinary sound waves. It is important that the diaphragm 11 be formed of acoustically transparent material to the extent possible, available in numerous materials such as thin sheet metal, plastic, or rubber, the latter being preferred for easy handling and good sound transparency, and the reinforcing discs 16 may likewise be of metal, plastic, or rubber.

It is often useful to mount a compass 18 upon the device for determining the direction in which the speaking sound is to be projected; that is, the direction in which the device is to be pointed; and sometimes a light source 19 which may include a bulb and a battery with a switch, as is usual in an ordinary flashlight, may be mounted on the outside of the device as shown in FIG. 3 for producing a beam of light by which the receiver can identify the direction or the source of the sound.

As shown in FIG. 3 a handle means 22 may be provided on one of the sections, preferably the sound-projecting section 10, and a lanyard, which may be a wire bail, or a rope sling 21, may be further provided so that the device can be hung from the belt of an underwater diver and used in the manner described whenever needed.

Various modifications will occur to those skilled in the art. The face seal 13 may be made more elaborate

and shaped to more closely fit about the face and lips of the speaker. Indeed, the seal 13 may be fastened to a face mask and fitted over the eyes and nose of the diver. The diaphragm 11 is variable in material as a sound-transferring device. The shape of the sound-projecting horn 10, may be flared more widely or narrowly and, if desired, means for amplifying the sound may be interconnected with the diaphragm 11 as is known for sound-projecting devices such as megaphone bullhorn, and the like, for amplifying the sound as desired, and mounted insulated from the water in a waterproof housing like the flashlight 19. Thus, various modifications known for sound-projection devices may be used herein, including other modified venting mechanisms than those shown.

Accordingly, the description and drawings herein are intended to be exemplary and not limiting except as defined in the claims appended hereto.

I claim:

1. A device for underwater sound projection from the mouth of a speaker, comprising free-flooding speaking and sound projecting sections, said sections being separated from each other by a sound-permeable diaphragm, venting means in said speaking section, and a mouth seal having an opening therein sized to surround the mouth of the speaker to prevent water leakage from the outside to said speaking section in use, whereby the speaker may blow into and thus displace water from said speaking section by way of a said venting means and project his voice in speaking resonance against said sound-permeable diaphragm outwardly through said sound-projection section.

2. The device as defined in claim 1 wherein the said vent is controlled by a valve operable by the speaker.

3. The device as defined in claim 1 wherein said vent is an automatic check valve allowing outward displacement of water by the breath of the speaker, preventing water return through said vent while the device is in use.

4. The device as defined in claim 1 wherein the speaking section and the sound-projection section are manually separably secured together.

5. The device as defined in claim 1 wherein the speaking and the sound-projection sections are telescopically interfitted and secured together.

6. The device as defined in claim 1 having means for support of said device upon the mouth of the speaker in use.

7. The device as defined in claim 1 having lanyard means for support of said device about the person of the user underwater when the said device is not in use.

8. The device as defined in claim 1 having means for projecting light therefrom.

9. The device as defined in claim 1 having a compass means mounted upon said device for projecting the sound in a selected direction.

10. The device as defined in claim 1 wherein the diaphragm separating said speaking and sound-projection sections is reenforced by sound-permeable supporting discs.

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