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Bollard speaker with inground subwoofer

Abstract

Improvements in a bollard speaker with in-ground subwoofer where the bollard contains a first speaker for higher frequencies and the subwoofer that provides lower frequencies that emit from below ground up through the bollard through a grill in the middle or upper portion of the bollard. The in-ground subwoofer provides a structural foundation for the bollard. Placing the subwoofer in an underground housing allows for larger speaker sizes for improved lower frequency response without trying to produce low frequency sounds in a constrained vertical bollard housing pole. The same base subwoofer is used with interchangeable bollards that accommodate both a cylindrical and a square or rectangular above ground bollard. The speaker within the bollard is configurable for omni-directional or directional sound transmission.

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS

(1) Not Applicable

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

(2) Not Applicable

THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT

(3) Not Applicable

INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC

(4) Not Applicable

BACKGROUND OF THE INVENTION

Field of the Invention

(5) This invention relates to improvements in a bollard. More particularly, the present bollard provides a slender vertical post with an enlarged underground base that houses a subwoofer to provide improved lower frequency sound and also provides a structural foundation.

Description of Related Art Including Information Disclosed Under 37 CFR 1.97 and 1.98

(6) Bollards are typically sturdy, short vertical posts that are used as a barrier or support. More modern bollards can include lighting, and or speakers. When a speaker or speakers are installed, one limitation is the diameter of the vertical post that prevents good lower frequency sounds. Another issue is often even distribution of sound from all directions around the pole. A number of patents and or publications have been made to address these issues. Exemplary examples of patents and or publication that try to address this/these problem(s) are identified and discussed below.

(7) U.S. Pat. No. 11,122,348 issued on Sep. 14, 2021, to Franco L. D'Ascanio et al., and is titled Outdoor Omni Bollard Speaker. This patent discloses an omni, bollard speaker has circular, cylindrical lower and upper housings. A domed driver is mounted within the top wall of the lower housing and a speaker is rotatably mounted in the internal space in the upper housing, between the top wall of the lower housing and the speaker cover of the upper housing. The speaker is rotatable from a first horizontal position directly over the domed driver to reflect wide dispersion acoustical output directly over the driver to disburse sound evenly within the listening area. While this patent is for a bollard speaker the lower frequency sound is limited by the size of the bollard.

(8) U.S. Pat. No. 10,433,041 issued on Oct. 1, 2019, to James Garrett et al and is titled Outdoor Loudspeaker with integral Lighting. This patent discloses an outdoor loudspeaker that is weather resistant and includes environmental lighting is described. The lamp is mounted to a cap at the top of the loudspeaker. An audio driver is mounted below the lamp. The lighting circuitry and the audio circuitry is separate, e.g., separate conduits and wiring in the loudspeaker. At least part of the loudspeaker can be mounted underground and, in the case of a sub-woofer, the entire chamber can be mounted below ground. While this patent discloses that at least a part of the loudspeaker can be mounted underground the structure is not configured for a bollard pole.

(9) U.S. Pat. No. 9,004,706 issued on Apr. 14, 2015, to James Banfield and is titled Outdoor Speaker and Illumination Tower. This patent discloses a combination speaker and lighting tower for use outdoors. The lighting tower has a base and a housing that includes at least one lamp. A rotatable coupler is used to mount a speaker unit on the tower, which allows the speaker unit to rotate in a horizontal plane. A stop is provided in the coupler to prevent the speaker unit from rotating a full 360 degrees. The lighting tower may be installed on a patio or anchored in the ground. While this patent is for a speaker tower that can be mounted to the ground it does not provide for an underground speaker.

(10) Published US application 2004/0118630 was published on Jun. 24, 2004, to Ronald Paul Harwood and is titled Pole Speaker. This published application discloses a speaker assembly is provided for enclosure within a structural pole. The speaker assembly includes a sub-plate adapted to be affixed adjacent to an internal cavity formed in a fixed end of the structural pole. A speaker is mounted to the sub-plate and oriented such that acoustical vibrations provided by the speaker are directed toward an underlying support surface of the structural pole. A resonating chamber member is oriented within the structural pole internal cavity and has an open end mounted adjacent to the speaker. While this patent is for a speaker in the pole, it does not provide for an underground speaker.

(11) What is needed is a bollard that provides even sound over the entire audible frequency range. The bollard speaker with in-ground subwoofer disclosed in this document provides the solution.

BRIEF SUMMARY OF THE INVENTION

(12) It is an object of the bollard speaker with in-ground subwoofer to provide a slender vertical bollard configuration that can be used as a barrier or walkway column without compromising the sound quality: due to the limited slender diameter of the bollard full base or low frequency sound is not compromised when the subwoofer is installed below the slender bollard.

(13) It is an object of the bollard speaker with in-ground subwoofer to provide the subwoofer in an area under the bollard. The sound box can be optimized to provide superior low frequency sounds that are moved through the bollard tube so the mid-high frequencies along with the lower frequencies appear to emit from essentially the same vertical position on the bollard column.

(14) It is another object of the bollard speaker with in-ground subwoofer for the subwoofer housing to provide a foundation. When a bollard is installed, there is usually some foundation to prevent damage to the upright nature of the bollard. The foundation is sized based upon the expected side load to resist damage. Because the embodiment in this document uses a subterranean subwoofer the housing of the subwoofer provides a solid foundation as well as a base to install a replacement bollard if damaged.

(15) It is another object of the bollard speaker with in-ground subwoofer to have a bollard that is configurable as a cylindrical or a rectangular/square column. The same base subwoofer is used with interchangeable bollards that accommodate both a cylindrical and a square or rectangular above ground bollard.

(16) It is another object of the bollard speaker with in-ground subwoofer to include frequency or sound cross-overs, digital signal processing (DSP), amplification, audio and signal transformer. The bollard is powered by an external power source or at least speaker wires that drive the speaker elements. The underground housing of the subwoofer provides an envelope for connections and electronics.

(17) It is another object of the bollard speaker with in-ground subwoofer for sound direction of the mid-treble speaker to be configurable for omni-directional or directional transmission. For some installations it is desirable to emit higher frequency sounds in all directions from the bollard and in other installations, such as walkways the sound can be directed towards a walkway.

(18) It is another object of the bollard speaker with in-ground subwoofer. Placing the subwoofer in an underground housing allows for larger speaker sizes for improved lower frequency response without trying to produce low frequency sounds in a constrained vertical bollard housing pole.

(19) Various objects, features, aspects, and advantages of the present invention will become more apparent from the following detailed description of preferred embodiments of the invention, along with the accompanying drawings in which like numerals represent like components.

Description

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

- (1) FIG. 1 shows a perspective view of a bollard speaker with in-ground subwoofer.
- (2) FIG. 2 shows a perspective view of the bollard speaker with in-ground subwoofer with some exterior components removed.
- (3) FIG. 3 shows a side cross-sectional view of the bollard speaker with in-ground subwoofer.
- (4) FIG. 4 shows an exploded view of the major components and options for the bollard speaker with in-ground subwoofer.
- (5) FIGS. 5A and 5B show sectional of the optional mid-treble speaker.
- (6) FIG. 6 shows a sectional view of sound movement from the sub-woofer of the bollard speaker with in-ground subwoofer.

DETAILED DESCRIPTION OF THE INVENTION

(7) It will be readily understood that the components of the present invention, as generally described and illustrated in the drawings herein, could be arranged and designed in a wide variety of different configurations. Thus, the following more detailed description of the embodiments of the system and method of the present invention, as represented in the drawings, is not intended to limit the scope of the invention, but is merely representative of various embodiments of the invention. The illustrated embodiments of the invention will be best understood by reference to the drawings, wherein like parts are designated by like numerals throughout.

(8) TABLE-US-00001 Item Numbers and Description 10 bollard with subwoofer 14 ground lighting 15 crown lighting 16 ground level 17 cap 18 transformer 19 cable 20 subwoofer housing 21 subwoofer shell ring 22 subwoofer shell bottom 23 subwoofer shell top 24 subwoofer mounting ring 25 bollard seal 26 directing ring 27 bollard seal 28 ring clamp 29 bollard mounting flange 30 subwoofer 40 square shell snap adapter 41 bollard port 42 port lower cap 43 inner grill 44 port upper cap 45 subwoofer dispersion cone 46 tweeter 50 bollard column 51 tweeter bridge 52 dispersion rubber 53 sound opening 54 directional cone 55 resonance chamber 60 mid-treble speaker 71 upper speaker grill 72 lower speaker grill mid 80 round shell 81 square shell 90 sound from mid-treble 95 out 96 around 97 up 98 under 99 out

(9) While this technology is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail several specific embodiments with the understanding that the present disclosure is to be considered as an exemplification of the principles of the technology and is not intended to limit the technology to the embodiments illustrated. The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the technology. As used herein, the singular forms “a,” “an,” and “the” are intended to include the plural forms as well, unless the context clearly indicates otherwise.

(10) It will be further understood that the terms “comprises,” “comprising,” “includes,” and/or “including,” when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. It will be understood that like or analogous elements and/or components, referred to herein, may be identified throughout the drawings with like reference characters.

(11) FIG. 1 shows a perspective view of a bollard speaker with in-ground subwoofer **10**. The speaker system is configured with two components that include a subwoofer housing **20** that is configured for burying under ground level **16**. A vent is capped **17** to allow for pressure venting from the subwoofer chamber for sound or air expansion. Within the subwoofer housing **20** is a subwoofer for lower frequency sounds that are ducted or ported up the bollard column **50**. In the bollard column **50** is a separate at least one mid-treble speaker in the upper portion of the bollard column **50**. In the preferred embodiment there are two separate speakers or sound producing elements, there could be three or more speakers. There are sound openings **53** that surround the bollard column **50** so sound can emit from the bollard column **50**.

(12) The bollard speaker with in-ground subwoofer **10** is connected to an external source through a cable **19** that could include data, power, communication power over ethernet (PoE) or a combination thereof. In some embodiments it is contemplated that one, some or all sides of the bollard can include lighting that is shown in the figure as crown lighting **15** band or ground lighting **14**. It is further contemplated that the bollard could include a microphone and/or a camera(s) for communication or monitoring.

(13) In the preferred embodiment the bollard column **50** has a height of about 30 inches but could be configured as a height of 6 to 60 inches. The above ground height of the bollard can also be adjusted by altering the burial depth of the subwoofer housing **20**. While a square or rectangular bollard is shown in this figure, other embodiments in this application show the bollard in a round or cylindrical configuration. Shapes of the bollard are contemplated as round, oblong, rectangular or multi-sided. The above ground height of the sound openings **53** can also be adjusted or manufactured as desired without detracting from the novelty of the bollard speaker with in-ground subwoofer **10**.

(14) FIG. **2** shows a perspective view of the bollard speaker with in-ground subwoofer **10** with some exterior components removed for clarity of the internal components, and FIG. **3** shows a side cross-sectional view of the bollard speaker with in-ground subwoofer **10**. Starting at the bottom of these figures, the housing of the subwoofer has a subwoofer shell bottom **22** that is secured and sealed to a subwoofer shell ring **21** and further covered with a subwoofer shell top **23**. Within the subwoofer housing is a subwoofer mounting ring **24** where a subwoofer **30** is mounted. In the preferred embodiment, the subwoofer is a 10-inch subwoofer, but the subwoofer can be larger/smaller or include multiple subwoofers **30**. It is contemplated that the subwoofer is 6 to 20 inches in diameter.

(15) Above (or behind) the subwoofer the subwoofer housing is configured as a resonance chamber based upon the size, structure and acoustical properties of the subwoofer **30**. A vent is capped **17** for balancing any pressure behind the woofer **30**.

(16) A cable **19** connects to the speaker, transformer **18** or other components within the assembly. The connections from the cable **19** can include frequency or sound crossovers, digital signal processing (DSP), amplification, audio and signal transformer to the speakers **30** and **60**. Sound from the subwoofer **30** is emitted downward towards the bottom of the subwoofer housing **20** and the sound moves into a directing ring **26** that directs the sound up the bollard port **41**. There is a bollard seal **25** that connects and seals the directing ring **26** in the bollard port **41**.

(17) The bollard port **41** passes from the subwoofer housing **20** out the top of the subwoofer housing **20** and is sealed with a ring clamp **28** around a bollard seal **27** and secured (clamped/sealed). This seals the subwoofer housing **20** from water, dirt, bugs, and contamination up to the height of the sound opening **53**. There is a mounting flange **29** for a round shell **80**. If the installation requires a square bollard a square shell snap adapter **40** is installed. For nearly all installations the subwoofer housing **20** and bollard port **41** is initially installed to grade before installation of the shell **80/81** and the bollard column **50** components.

(18) At the top of the bollard port **41** is a port lower cap **42** that centers the bollard port **41** within the selected shell **80/81**. There is also an inner grill **43** around the bollard port **41** within a port upper cap **44**. Sound traveling up the bollard port **41** interacts with a subwoofer dispersion cone **45** that redirects the sound down around the sides of the bollard port **41** and out the sides of the shell **80/81** through the sound opening(s) **53** in the lower speaker grill **72**.

(19) After (or during) when the subwoofer housing **20** is sufficiently secured below ground, the upper portion or mid-treble speaker **60** sub assembly is installed after securing the subwoofer housing **20** or with the subwoofer housing **20**. The bollard top has a separate speaker **60** installed to emit sound downward. In the preferred embodiment, the speaker **60** is a mid-treble speaker **60** of 6.5 inches in diameter, but other diameter speakers as well as multiple speakers of different diameters are contemplated based upon the desired sound and frequency response/sound profile. It

is contemplated that the mid-treble speaker **60** of 6 inches in diameter is 2 to 10 inches in diameter. A higher frequency tweeter **46** may further be secured in proximity of the mid-treble speaker **60**.

(20) The configuration of the speakers prevents liquids (such as rain) from reaching the mid-treble speaker **60** and the subwoofer **30**. The mid-treble speaker **60** is secured and suspended on a tweeter bridge **51** and fires downward into either a dispersion rubber **52** that sends sound in all directions through the sound sides of the shell **80/81** through the sound opening(s) **53** in the upper speaker grill **71** or into a directional cone **54** that sends the sound out 180 degrees, or other direction based upon the shape of the directional cone **54**, and out the side(s) of the shell **80/81** through the sound opening(s) **53** in the upper speaker grill **71**. The upper speaker grill **71** is stacked above the lower speaker grill **72** to provide two separate sound paths that audibly and visibly appear to emit from a single sound opening **53**.

(21) FIG. **4** shows an exploded view of the major components and options for the bollard speaker with in-ground subwoofer. The lower portion of this figure shows the subwoofer housing **20** with the separate bollard column. The round shell **80** option with the sound openings **53** is shown on one side of the bollard port **41** and square shell **81** option with sound openings **53** being shown on the other side of the bollard port **41**.

(22) The subwoofer housing **20** is shown with the connecting cable **19** and the vent cap **17**. The sound opening of the subwoofer housing **20** has sealing components that are shown in this figure with the bollard seal **27**, bollard mounting flange **29** and the ring clamp **28** that clamps and seals the bollard port **41** in the subwoofer housing **20**. If the design requirement is for a square shell **81** the square shell snap adapter **40** is installed around the bollard seal **27**.

(23) At the top of the bollard port **41** is the port lower cap **42**, the inner grill **43** and the subwoofer dispersion cone **45** where the lower frequencies traveling up the bollard port **41** from the subwoofer emit. Above the subwoofer dispersion cone **45** a 180-degree directional cone **54** for the mid-treble speaker is shown. Above and around the directional cone **54** is the tweeter bridge **51**. While this is called a tweeter bridge **51** it is for supporting a speaker that emits higher frequency than the subwoofer in the subwoofer housing **20**. The resonance chamber **55** and enclosure for the mid-treble or tweeter is on the top of the column. The resonance chamber both seals the top of the internal speaker(s) and provides a chamber that is sized to optimize sound from the higher frequency speaker therein.

(24) FIGS. **5A** and **5B** show sectional of the optional mid-treble speaker **60**. In both embodiments the rear of the speaker **60** is in the resonance chamber **55**. The speaker **60** is secured and displaced from sound directing device that sends sound either 360 degrees around the bollard or in a direction from the bollard on the tweeter bridge **51**. The left image shows the speaker **60** emitting sound from the mid-treble **90** down towards the dispersion rubber **52** that sends sound in all directions out of the bollard. In the image to the right the directional cone **54** directs sound to a side of the bollard. The sound can be directed from 360 degrees to a narrow 90 degrees or smaller.

(25) FIG. **6** shows a sectional view of sound movement from the sub-woofer of the bollard speaker with in-ground subwoofer. The subwoofer housing **20** is shown cut-away to show the internal components and the direction of sound from the subwoofer **30**. Lower frequency sound from the subwoofer **30** is directed out **99** of the subwoofer **30** into the bottom of the subwoofer housing **20**. Sound bounces or is otherwise directed from the subwoofer shell bottom **22** and moves under **98** and into the directing ring **26**. The low frequency sound then travels up **97** the bollard port **41**. The sound then bounces, or is directed from the subwoofer dispersion cone **45**, around **96** the dispersion cone **45** and through the inner grill **43** where the sound passes out **95** of the sound opening(s) **53** of the shell **80/81** (not shown in this figure).

(26) The configuration of the subwoofer **30**, or a first speaker and the mid-treble speaker or second speaker **60**, are configured to send sound in opposing directions and emit sound from the bollard through a single sound opening **53**. The sound can be co-mingled at the single sound opening **53** or emitted from stacked sound opening speaker grill **71** and **72**.

(27) Thus, specific embodiments of a bollard speaker with in-ground subwoofer have been disclosed. It should be apparent, however, to those skilled in the art that many more modifications besides those described are possible without departing from the inventive concepts herein. The inventive subject matter, therefore, is not to be restricted except in the spirit of the appended claims.

Claims

1. A bollard speaker with in-ground subwoofer comprising: a bollard secured to a subterranean enclosure that encloses a first speaker; said first speaker that emits sound downward into a shell bottom of said subterranean enclosure; a directing ring at a bottom of a bollard port within said subterranean enclosure that is secured at a first end within said subterranean enclosure and at a second end in said bollard whereby sound reflected off of said shell bottom is directed into said directing ring; said bollard includes a second speaker; said first speaker is configured to produce low frequency sound; said second speaker is configured to produce sound that is at a higher frequency than sound produced from said first speaker; said first speaker is configured to produce sound in said subterranean enclosure and send sound up said bollard and out of said bollard; said second speaker is configured to send sound from said bollard out of said bollard.
2. The bollard speaker with in-ground subwoofer according to claim 1, wherein said first speaker is 6 to 20 inches in diameter.
3. The bollard speaker with in-ground subwoofer according to claim 1, wherein said bollard port has a second end that directs sound from a subwoofer dispersion cone between said bollard port and said bollard.
4. The bollard speaker with in-ground subwoofer according to claim 3, wherein said subwoofer dispersion cone directs sound downward and out of a shell that extends around said bollard port.
5. The bollard speaker with in-ground subwoofer according to claim 1, wherein said second speaker is 2 to 10 inches in diameter.
6. The bollard speaker with in-ground subwoofer according to claim 1, wherein said bollard is configured for a height of between of 6 to 60 inches from ground level.
7. The bollard speaker with in-ground subwoofer according to claim 1, wherein said bollard is changeably mounted to said subterranean enclosure thereby said bollard is changeable from round, oblong, rectangular or multi-sided.
8. The bollard speaker with in-ground subwoofer according to claim 7, further includes at least one adapter that fits between a bollard port and said bollard.
9. The bollard speaker with in-ground subwoofer according to claim 1, wherein said second speaker is configured to emit sound downward into said bollard.
10. The bollard speaker with in-ground subwoofer according to claim 9, wherein said second speaker emits sound onto a dispersion cone that spreads sound 360 degrees around said bollard.
11. The bollard speaker with in-ground subwoofer according to claim 9, wherein said second speaker emits sound onto a directional cone that directs sound to less than 360 degrees around said bollard.
12. The bollard speaker with in-ground subwoofer according to claim 1, wherein there is at least a third speaker.
13. The bollard speaker with in-ground subwoofer according to claim 1, wherein there are at least two separate sound paths within said bollard.
14. The bollard speaker with in-ground subwoofer according to claim 13, wherein at least two separate sound paths travel in opposing directions from within said bollard.
15. The bollard speaker with in-ground subwoofer according to claim 1, wherein said bollard has at least one sound emitting opening located between said first speaker and said second speaker.

16. The bollard speaker with in-ground subwoofer according to claim 15, wherein said at least one sound emitting opening is configured to prevent falling water from entering within said bollard.
