Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2879629 A1 2015/08/19

(21) 2 879 629

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(22) **Date de dépôt/Filing Date:** 2015/01/23

(41) **Mise à la disp. pub./Open to Public Insp.:** 2015/08/19

(30) **Priorité/Priority:** 2014/02/19 (US14/184,601)

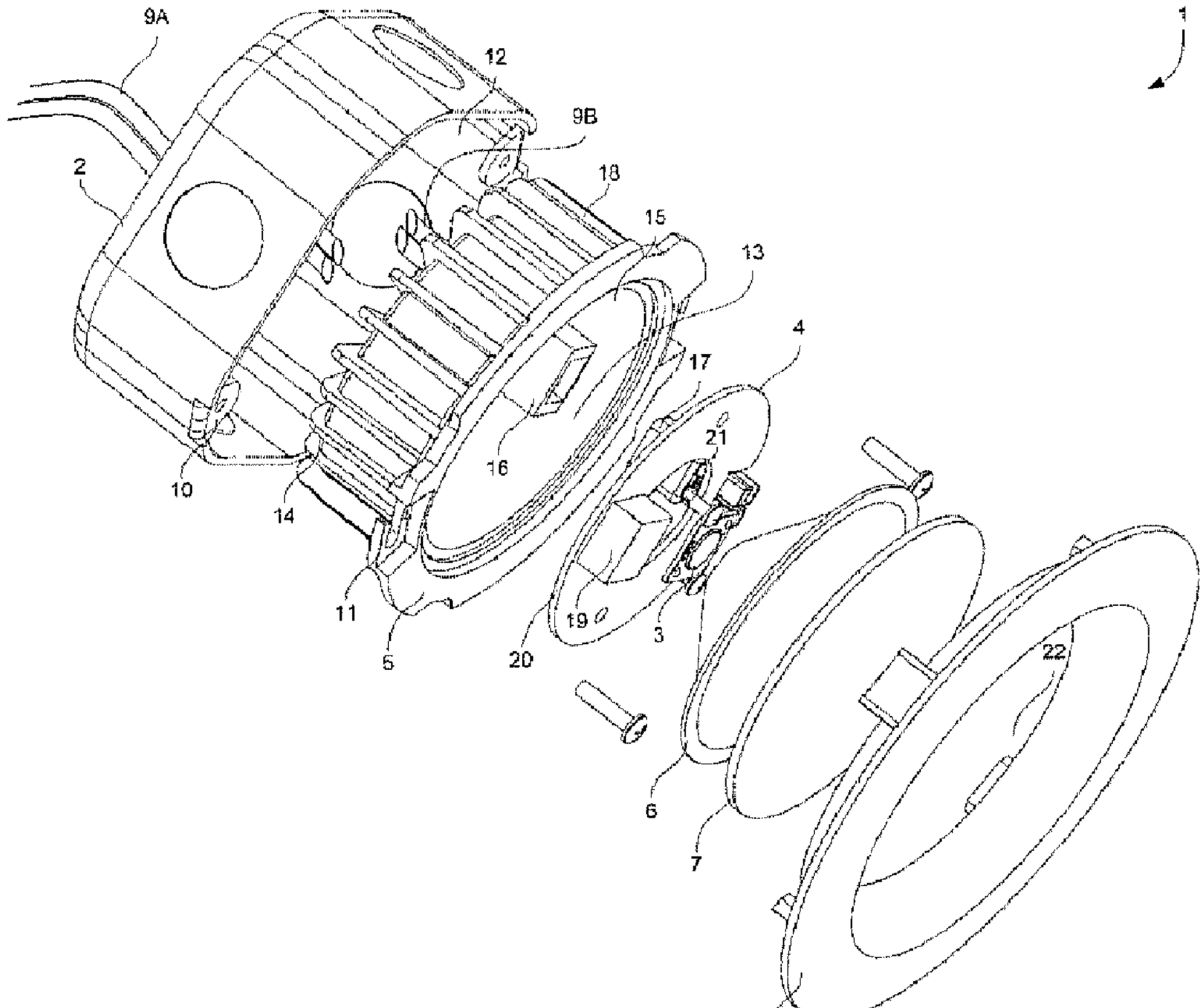
(51) **Cl.Int./Int.Cl.** ***F21V 21/04*** (2006.01),
F21S 8/02 (2006.01), ***F21V 23/00*** (2015.01),
F21V 7/00 (2006.01)

(71) **Demandeur/Applicant:**
DANESH, MICHAEL D., US

(72) **Inventeur/Inventor:**
DANESH, MICHAEL D., US

(74) **Agent:** SMITHS IP

(54) **Titre : DISPOSITIF D~ENTRAINEMENT UNIFIE ET DISPOSITIF DE SOURCE D~ECLAIRAGE POUR ECLAIRAGE ENCASTRE**
(54) **Title: UNIFIED DRIVER AND LIGHT SOURCE ASSEMBLY FOR RECESSED LIGHTING**



(57) **Abrégé/Abstract:**
A compact recessed lighting system is provided. The lighting system includes a light source module and a driver separately coupled to a unified casting. The driver is formed in a "donut" shape such that the light source module may be coupled to the

CA 2879629 A1 2015/08/19

(21) 2 879 629

(13) A1

(57) **Abrégé(suite)/Abstract(continued):**
casting in the center hole formed by the driver. The lighting system may also include a reflector that surrounds the light source module and shields the driver from exposure to the area surrounding the lighting system. Based on this configuration, the lighting system provides a compact design that allows the combined casting, light source module, driver, and reflector to be installed in a standard junction box instead of a "can" housing structure to reduce the overall cost of the lighting system while still complying with all building and safety codes/regulations. This configuration also allows the lighting system to achieve a UL fire-rating of at least two hours.

ABSTRACT

A compact recessed lighting system is provided. The lighting system includes a light source module and a driver separately coupled to a unified casting. The driver is formed in a "donut" shape such that the light source module may be coupled to the casting in the center hole formed by the driver. The lighting system may also include a reflector that surrounds the light source module and shields the driver from exposure to the area surrounding the lighting system. Based on this configuration, the lighting system provides a compact design that allows the combined casting, light source module, driver, and reflector to be installed in a standard junction box instead of a "can" housing structure to reduce the overall cost of the lighting system while still complying with all building and safety codes/regulations. This configuration also allows the lighting system to achieve a UL fire-rating of at least two hours.

TITLE OF INVENTION

UNIFIED DRIVER AND LIGHT SOURCE ASSEMBLY FOR RECESSED LIGHTING

RELATED MATTERS

[0001] This application claims the benefit of the earlier filing date of U.S. provisional application no. 61/843,278, filed July 5, 2013.

FIELD OF THE INVENTION

[0002] An embodiment relates to a compact recessed lighting system that includes a light source module and a driver in a single unified casting, which along with an optical light reflector shields the driver from exposure to outside elements and allows the recessed lighting system to be installed in a standard junction box. In some embodiments, this compact recessed lighting system may be utilized in 4-10" recessed new construction and remodel products and in retrofit applications. Moreover, in some embodiments, this compact recessed lighting system may be utilized with interchangeable trims to accommodate different aperture luminaires. Other embodiments are also described.

BACKGROUND OF THE INVENTION

[0003] Recessed lighting systems are typically installed or mounted into an opening in a ceiling or a wall. Recessed lighting systems generally consist of a trim, a light source module, a driver, and a "can" housing. The driver is insulated from other portions and components of the recessed lighting system, including the light source module, through the use of a separate insulating container. The driver may be electrically coupled to the light source module through the use of wires or other conduits such that the driver may power the light source module to emit light.

[0004] The separation between the driver and the light source module adds to the combined size of the recessed lighting system. In particular, the use of a separate container that houses the driver separate from the other portions and components of the recessed lighting system, including the light source module, increases the size of the recessed lighting system. This increased size restricts the recessed lighting system to be placed in constrained spaces within a ceiling or a wall and may increase the overall cost of the recessed lighting system.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The embodiments of the invention are illustrated by way of example and not by way of limitation in the figures of the accompanying drawings in which like references indicate similar elements. It should be noted that references to "an" or "one" embodiment of the invention in this disclosure are not necessarily to the same embodiment, and they mean at least one.

[0006] **Figure 1** shows an exploded view of a recessed lighting system according to one embodiment.

[0007] **Figure 2** shows top and side views of a junction box according to one embodiment.

[0008] **Figure 3** shows a side view of the recessed lighting system according to one embodiment.

DETAILED DESCRIPTION

[0009] Several embodiments are described with reference to the appended drawings are now explained. While numerous details are set forth, it is understood that some embodiments of the invention may be practiced without these details. In other instances, well-known circuits, structures, and techniques have not been shown in detail so as not to obscure the understanding of this description.

[0010] **Figure 1** shows an exploded view of a recessed lighting system 1. The recessed lighting system 1 may include a junction box 2, a light source module 3, a driver (e.g., a power supply) 4, a unified casting 5, a reflector 6, a lens 7, and a trim 8. As will be described in further detail below, the recessed lighting system 1 provides a more compact and cost effective design while complying with all building and safety codes/regulations. Although shown with a single junction box 2 and trim 8, the light source module 3, the driver 4, the unified casting 5, the reflector 6, and the lens 7 may be similarly used with different sized junction boxes 2 and trims 8. Each of the elements of the recessed lighting system 1 will be explained by way of example below.

[0011] The junction box 2 is a structure that separates the inner components of the recessed lighting system 1, including electrical wires/cables, from the items inside a ceiling or crawl space (e.g., insulation) in which the junction box 2 has been installed. In one embodiment, the junction

box 2 is directly coupled to a stud, beam, or other structural member inside the ceiling or crawl space through the use of resins, clips, screws, bolts, clamps, or any other type of connecting mechanism. The junction box 2 may be equipped with one or more bar-hangers to assist installation when the junction box 2 needs to be located between two studs or joists. In one embodiment, the junction box 2 may be a single or double gang box with a fire rating of up to two hours as described in the National Electrical Code (NEC) and by the Underwriters Laboratories (UL). The junction box 2 may receive electrical wires 9A from an electrical system (e.g., 120 VAC or 277 VAC) within a building or structure in which the recessed lighting system 1 is installed. The electrical wires 9A from the structure may be connected to corresponding wires 9B of the unified casting 5, as will be described in greater detail below.

[0012] In one embodiment, the junction box 2 may include one or more tabs 10 for coupling the junction box 2 to the casting 5. The tabs 10 may be any device/component for receiving corresponding elements 11 of the casting 5 to firmly hold the weight of the unified casting 5, the light source module 3, the driver 4, the reflector 6, the lens 7, and/or the trim 8 up against the junction box 2. As shown in **Figure 1**, the tabs 10 include holes for receiving screws or bolts; however, in other embodiments the tabs 10 may facilitate a twist-and-lock friction connection with corresponding elements 11 of the casting 5 and without the use of separate tools or other devices. In still other embodiments, friction or tension clips may be utilized to couple the casting 5 to the junction box 2.

[0013] In one embodiment, the junction box 2 acts as a heat barrier to block heat emitted by the light source module 3 and the driver 4 from reaching possibly flammable items inside a ceiling or crawl space. In these embodiments, the junction box 2 may be formed of metals, polymers, metal alloys, and/or other heat insulating materials. As shown in **Figure 1**, the junction box 2 may be a polygon that defines a cavity 12 therein. However, in other embodiments, the junction box 2 may be any suitable shape, including an ellipsoid, cone, or cylinder that is capable of receiving therein the casting 5. The cavity 12 that is formed in the junction box 2 may be larger than the casting 5 such that the casting 5 may easily fit into the cavity 12 without coming into direct contact with the walls of the cavity 12. However, in other embodiments, the casting 5 may be sized to come into direct contact with the walls of the cavity 12. The size of the cavity 12 may be pursuant to popular industry specifications for junction boxes and in compliance with all applicable building and safety codes/regulations. For example,

as shown in **Figure 2**, the junction box 2 may have a length of 3½ inches, a width of 3½ inches and a depth of 1½ inches. When coupled together, the combined junction box 2, light source module 3, driver 4, casting 5, reflector 6, lens 7, and trim 8 may have a height/depth of 2 inches.

[0014] The casting 5 is a shell and/or enclosure that further prevents the exposure of heat from the light source module 3 and the driver 4 to the items inside a ceiling or crawl space (e.g., insulation) in which the recessed lighting system 1 has been installed. The casting 5 may be formed of metals, polymers, metal alloys, and/or other heat insulating materials. As shown in **Figure 1**, the casting 5 may be a cylindrical structure that defines a casting cavity 13 therein. However, in other embodiments, the casting 5 may be any suitable shape, including an ellipsoid, cone, or polygon that is capable of housing the light source module 3 and the driver 4. As shown in **Figures 1** and **3**, the cavity 13 is to receive therein the light source module 3 and the driver 4.

[0015] In one embodiment, the casting 5 may include a closed rear face 14 and an open front face 15. The closed rear face 14 allows the light source module 3 and the driver 4 to be securely mounted to the casting 5, while the open front face 15 provides an aperture to allow light emitted by the light source module 3 to be exposed to an outside environment surrounding the recessed lighting system 1 (e.g., into a room). In one embodiment, the rear face 14 of the casting 5 may include one or more mounting elements for receiving and securely holding the light source module 3 and the driver 4. In some embodiments, the mounting elements may be holes, flaps, or other structures designed to receive the light source module 3 and the driver 4. The mounting elements may be capable of receiving resins, clips, screws, bolts, clamps, or any other type of connecting mechanism such that the light source module 3 and the driver 4 may be securely coupled inside the cavity 13 on the rear face 14 of the casting 5. In one embodiment, the light source module 3 and the driver 4 are removably coupled to the casting 5 while in other embodiments one or more of the light source module 3 and the driver 4 form a single continuous and indivisible component with the casting 5.

[0016] Although described as a casting 5, the casting 5 may be formed through other processes other than casting techniques. For example, the casting 5 may be formed through an extrusion process or formed through the welding of metal sheets to form a structure. Further, although described as an enclosed assembly, the casting 5 may be any heat conducting structure

to which the light source module 3 and the driver 4 are mounted and which can be mounted, using any type of fasteners or mounting elements, to the junction box 2.

[0017] In one embodiment, the electrical wires 9A received by the junction box 2 from the electrical system of a building or structure may be coupled to the electrical wires 9B of the casting 5. The electrical wires 9A may be coupled to the electrical wires 9B through the use of electrical caps or other devices. For example, as shown in **Figure 1**, the electrical wires 9A and 9B may be connected using the connectors 23A and 23B. The connectors 23A and 23B are complimentary, keyed or interlocking connectors. The electrical wires 9B of the casting 2 may terminate in a connector holder 16 that may receive a corresponding connector 17 of the driver 4. In one embodiment, the connectors 16 and 17 are complimentary, keyed or interlocking connectors similar to the connectors 23A and 23B described above. When the connectors 16 and 17 are engaged, electricity may pass from the electrical system of the building or structure to the driver 4.

[0018] In one embodiment, the casting 5 includes one or more heat sinks 18 to dissipate heat generated by the light source module 3 and/or the driver 4. Although the heat sinks 18 are shown as passive components that cool the combined casting 5, light source module 3, and driver 4 by dissipating heat into the surrounding air, active heat sinks (e.g., fans) may also be used. In one embodiment, the heat sinks 18 are defined by a set of fins surrounding the casting 5. The heat sinks 18 may be composed of any thermally conductive material. For example, the heat sinks 18 may be made of aluminium alloys, copper, copper-tungsten pseudoalloy, AlSiC (silicon carbide in aluminium matrix), Dymalloy (diamond in copper-silver alloy matrix), E-Material (beryllium oxide in beryllium matrix), and/or thermally conductive plastics or ceramics.

[0019] As described above, the recessed lighting system 1 may include the driver 4. The driver 4 is an electronic device that supplies and/or regulates electrical energy to the light source module 3 and thus powers the light source module 3 to emit light. The driver 4 may be any type of power supply, including power supplies that deliver an alternating current (AC) or a direct current (DC) voltage to the light source module 3. In one embodiment, the driver 4 receives electricity from the casting 5 via a connector. In one embodiment, the connector 17 is coupled to the connector holder 16 of the casting 5 such that electrical wires are not protruding from the casting 5. In this embodiment, the supply connection from the driver 4 terminates in connector

17, which is force-fitted into connector holder 16. In another embodiment, the driver 4 may connect to the supply wires, 9A, via wire nuts.

[0020] Upon receiving electricity, the driver 4 may regulate current or voltage to supply a stable voltage or current within the operating parameters of the light source module 3. The driver 4 receives an input current from the electrical system of the building or structure in which the recessed lighting system 1 is installed and drops the voltage of the input current to an acceptable level for the light source module 3 (e.g., from 120V-240V to 36V-48V). The driver 4 may transfer electricity to the light source module 3 through an electrical connector. For example, the driver 4 may deliver electricity to the light source module 3 through an electrical cable coupled between the light source module 3 and the driver 4 through removable or permanent connectors or soldered leads originating from the driver 4. Although shown with magnetic transformer 19, the driver 4 may include additional circuitry for regulating current to the light source module 3.

[0021] As shown in **Figure 1**, the driver 4 may also include the board 20 for holding the magnetic transformer 19 and other circuitry. In one embodiment, the board 20 is formed in a "donut", torus, or "C" shape with an opening 21. The outside edge of the board 20 is coupled to the casting 5, while the opening 21 formed by the board 20 allows the light source module 3 to be directly coupled to the casting 5 without coming into direct contact with the driver 4. By forming a structure with the opening 21, the driver 4 allows the light source module 3 to avoid the driver 4, eliminating shadows or interference from the driver 4, and allows the light source module 3 to directly contact the casting 5, assisting the casting 5 to dissipate heat generated by the light source module 3. This compact structure allows the light source module 3 and the driver 4 to be contained within the unified casting 5, which in turn may fit inside a standard junction box (i.e., junction box 2) and/or a 4-8 inch recessed lighting fixture (both incandescent and non-incandescent). Accordingly, the recessed lighting system 1 can operate without the use of a "can" housing structure. This simplified and more compact structure reduces the cost and complexity of installing the recessed lighting structure 1 into an existing/pre-installed junction box or a newly installed junction box. Further, this configuration allows the recessed lighting system 1 to achieve a UL fire-rating of at least two hours.

[0022] In one embodiment, the board 20 may be a printed circuit board. The driver 4 may be coupled to the casting 5 using any connecting mechanism, including resins, clips, screws,

bolts, or clamps. For example, in one embodiment, the driver 4 may be coupled to the casting 5 using friction or tension clips.

[0023] The light source module 3 may be any electro-optical device or combination of devices for emitting light. For example, the light source module 3 may have as a single light source a light emitting diode (LED), organic light-emitting diode (OLED), or polymer light-emitting diode (PLED). In some embodiments, the light source module 3 may have multiple light sources (e.g., LEDs, OLEDs, and/or PLEDs). The light source module 3 receives electricity from the driver 4, as described above, such that the light source module 3 may emit a controlled beam of light into a room or surrounding area. The driver 4 is designed to ensure that the approximate voltage and current are fed to the light source module 3 to enable the emission of light by the one or more light sources within the light source module 3.

[0024] As described above and shown in **Figure 1**, the light source module 3 is coupled to the casting 5 in the opening 21 formed by the board 20. As described above, by positioning the light source module 3 in the opening 21, the light source module 3 may avoid the driver 4, thus eliminating shadows or interference from the driver 4, and allowing the light source module 3 to directly contact the casting 5, such that the casting 5 can dissipate heat generated by the light source module 3. Further, this compact design allows the recessed lighting system 1 to utilize a standard sized junction box (e.g., junction box 2) instead of a "can" housing structure. As shown in **Figure 1**, the light source module 3 is coupled to the casting 5 using screws; however, in other embodiments, the light source module 3 may be coupled to the casting 5 using any connecting mechanism, including resins, clips, screws, bolts, or clamps. For example, in one embodiment, the light source module 3 may be coupled to the casting 5 using friction or tension clips.
In one embodiment, the casting 5 may include an insulating gasket 25 that separates the board 20 and the casting 5. The insulating gasket 25 may be placed on a groove 24 that encircles the open front face 15 of the casting 5. The insulating gasket 25 may be formed of materials that provide some degree of malleability and/or flexibility such that the gasket 25 is able to deform and tightly fit within the groove 24, including any slight irregularities. For example, the insulating gasket 25 may be formed of plastic, rubber, metal, and/or ceramic materials. The insulating gasket 25 assists in insulating the driver 4 from the outside environment.

[0025] In some embodiments, the recessed lighting system 1 may include the reflector 6. The reflector 6 may surround the light source module 3 and/or a light source of the light source module 3 to adjust the way light emitted by the light source module 3 is focused inside a room or surrounding area. In one embodiment, the reflector 6 surrounds the light source module 3 and separates the light source module 3 from the driver 4. This separation allows light from the light source module 3 to be emitted into a room or surrounding area while further shielding the driver 4 from being exposed to the room or surrounding area. For example, in one embodiment, the reflector 6 and the casting 5 may be coupled together such that the combined assembly may create a sealed structure to shield the driver 4 from the outside environment and the light source module 3. By shielding the driver 4 from the outside environment, the reflector 6 reduces the risk of fire or other dangers and ensures the recessed lighting system 1 complies with building and safety codes/regulations. The reflector 6 may be formed of any fire retardant material, including steel, aluminum, metal alloys, calcium silicate, and other similar materials.

[0026] In one embodiment, the reflector 6 may be coupled to the casting 5 using screws, rivets or other fasteners. The reflector 6 may also be designed as a snap fit into the casting 5.

[0027] Although shown as conical, the reflector 6 may be formed in any shape that may direct and/or focus light. For example, the reflector 6 may be parabolic, spherical, or a frusto-conical shape that is positioned over the light source module 3 while shielding the driver 4. In one embodiment, the reflector 6 may be coated with a reflecting material or include one or more reflecting elements that assist in the adjustment of light emitted by the light source module 3. For example, the reflector 6 may be coated with a shiny enamel or include one or more mirrors or retroreflectors or a microcellular polyethylene terephthalate (MCPET) material to adjust the focus of light emitted by the light module 3. In other embodiments, the reflector 6 may include various other optic elements to assist in the focusing of light emitted by the light source module 3.

[0028] In one embodiment, the recessed lighting system 1 may include a lens 7. The lens 7 may be formed to converge or diverge light emitted by the light source module 3. The lens 7 may be a simple lens comprised of a single optical element or a compound lens comprised of an array of simple lenses (elements) with a common axis. In one embodiment, the lens 7 also provides a protective barrier for the light source module 3 and shields the light source module 3

from moisture or inclement weather. The lens 7 may also assist in the diffusion of light and increase the uniformity of light over the surface of the recessed lighting system 1. The lens 7 may be made of any at least partially transparent material, including glass and hard plastics. In one embodiment, the lens 7 and the reflector 6 are contained in a single indivisible unit to work in conjunction to focus and adjust light emitted by the light source module 3. In other embodiments, the lens 7 and the reflector 6 are separate, divisible elements as shown in **Figure 1**.

[0029] In one embodiment, the recessed lighting system 1 may include a trim 8. The trim 8 serves the primary purpose of covering the exposed edge of the ceiling or wall where a hole is formed in which the recessed lighting system 1 resides while still allowing light from the light source module 3 to be emitted into a room through an aperture 22. In doing so, the trim 8 helps the recessed lighting system 1 appear seamlessly integrated into the ceiling or wall. In one embodiment, the trim 8 is capable of coupling to the casting 5 while in other embodiments the trim 8 is capable of coupling to the junction box 2. The trim 8 may couple to the casting 5 and/or the junction box 2 using any connecting mechanism, including resins, clips, screws, bolts, or clamps. In one embodiment, the trim 8 may include grooves and/or slots to couple to corresponding grooves and/or slots of the casting 5 and/or the junction box 2 using a twist-and-lock friction connection and without the use of separate tools or other devices.

[0030] In one embodiment, different diameter trims 8 may be capable of being coupled to the casting 5 and/or the junction box 2. The size and design of the trims 8 may depend on the size of the hole in which the recessed lighting system 1 has been fitted and that the trim 8 must conceal, as well as the aesthetic decisions of the consumer. The trims 8 may be made of aluminum plastic polymers, alloys, copper, copper-tungsten pseudoalloy, AlSiC (silicon carbide in aluminum matrix), Dymalloy (diamond in copper-silver alloy matrix), and E-Material (beryllium oxide in beryllium matrix).

[0031] As described above, the light source module 3 and the driver 4 may be integrated into the unified casting 5 while shielding the driver 4 from exposure to outside elements through the use of the reflector 6 or the lens 7. Based on this configuration, the compact recessed lighting system 1 provides a more compact design that allows the combined unified casting 5, light source module 3, driver 4, and reflector 6 to be installed in a standard junction box instead of a

"can" housing structure to reduce the overall cost of the recessed lighting system 1 while still complying with all building and safety codes/regulations. This configuration also allows the recessed lighting system 1 to achieve a UL fire-rating of at least two hours.

[0032] While certain embodiments have been described and shown in the accompanying drawings, it is to be understood that such embodiments are merely illustrative of and not restrictive on the broad invention, and that the invention is not limited to the specific constructions and arrangements shown and described, since various other modifications may occur to those of ordinary skill in the art. The description is thus to be regarded as illustrative instead of limiting.

CLAIMS

What is claimed is:

1. A compact recessed lighting system, comprising:

a light source module for emitting light;

a driver for powering the light source module to emit light;

a unified casting with a closed rear face and an open front face, wherein the light source module and the driver are coupled to the closed rear face of the unified casting; and

a reflector coupled to and surrounding the light source module and separating the driver from the light source module such that the reflector directs light produced by the light source module into an area surrounding the compact recessed lighting system while enclosing the driver from exposure to the area surrounding the compact recessed lighting system.

2. The compact recessed lighting system of claim 1, wherein a combination of the light source module, the driver, the unified casting, and the reflector are mountable inside a junction box installed in a ceiling of a building structure, by directly attaching the unified casting to the junction box.

3. The compact recessed lighting system of claim 2, wherein the combination fits within a junction box having a minimum depth of about 1½ inches.

4. The compact recessed lighting system of claim 2, wherein the unified casting mounts to the junction box through the use of tension of fastening mechanisms.

5. The compact recessed lighting system of claim 1, wherein the driver has a shape that allows installation of the driver within the unified casting and the light source module is coupled to the unified casting in a center hole of the driver.

6. The compact recessed lighting system of claim 5, wherein the driver is donut or "C" shaped.

7. The compact recessed lighting system of claim 1, further comprising:

a trim coupled to the unified casting for covering a hole in which the compact recessed lighting system is placed within.

8. The compact recessed lighting system of claim 7, wherein the trim connects to the unified casting through a set of twist-and-lock connectors integrated in both the trim and the unified casting.

9. The compact recessed lighting system of claim 7, wherein the trim connects to the unified casting through use of retention clips or springs.

10. The compact recessed lighting system of claim 1, wherein the light source module is a light emitting diode (LED) module.

11. The compact recessed lighting system of claim 1, further comprising:

a lens to shield the light source module while being transmissive to light emitted by the light source module.

12. The compact recessed lighting system of claim 1, further comprising:

an inner enclosure for enclosing the driver within the unified casting.

13. The compact recessed lighting system of claim 12, wherein the inner enclosure is a metal or polymeric structure.

14. A compact recessed lighting system, comprising:

a light source module for emitting light;

a driver for powering the light source module to emit light;

a unified casting with a closed rear face and an open front face, wherein the light source module and the driver are coupled to the closed rear face of the unified casting; and

a coupling mechanism for coupling a trim to the unified casting.

15. A compact recessed lighting system, comprising:

a light source module for emitting light;

a driver for powering the light source module to emit light; and

a unified casting with a closed rear face and an open front face, wherein the light source module and the driver are coupled to the closed rear face of the unified casting, wherein when coupled to a recessed box, the combination of the light source module, the driver, the unified casting, and the recessed box has a fire-rating Underwriters Laboratories (UL) classification of up to 2 hours.

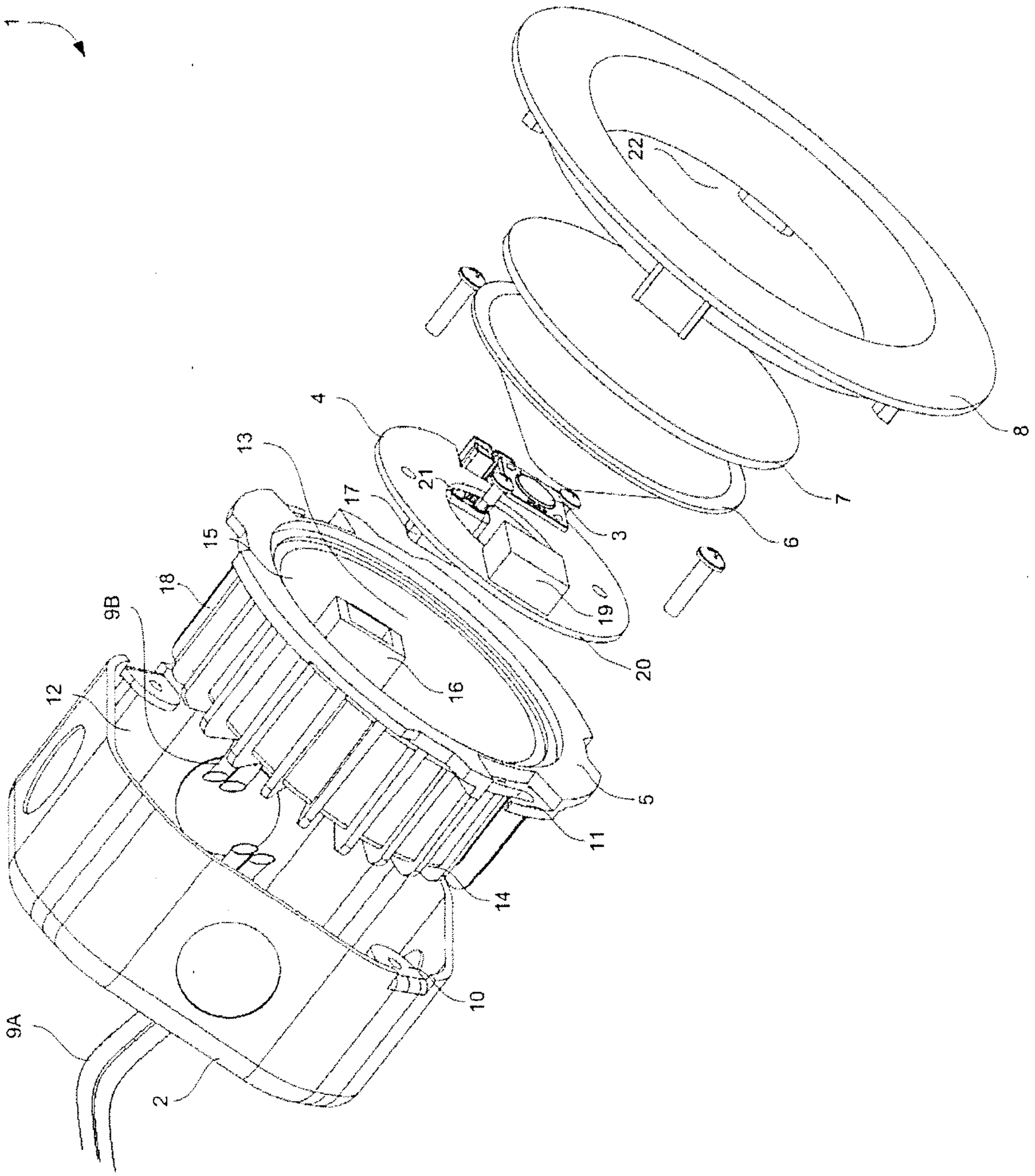


FIG. 1

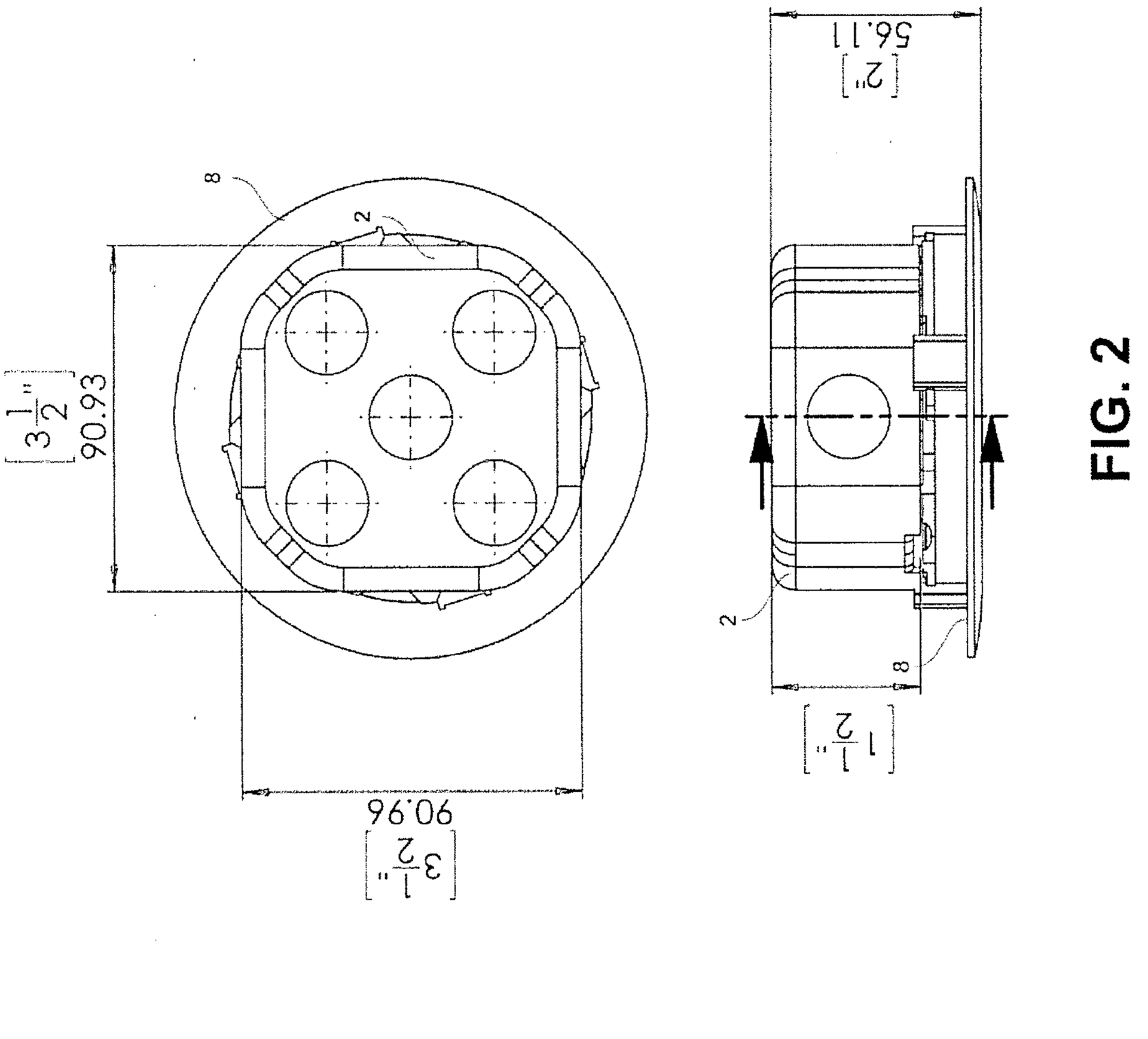


FIG. 2

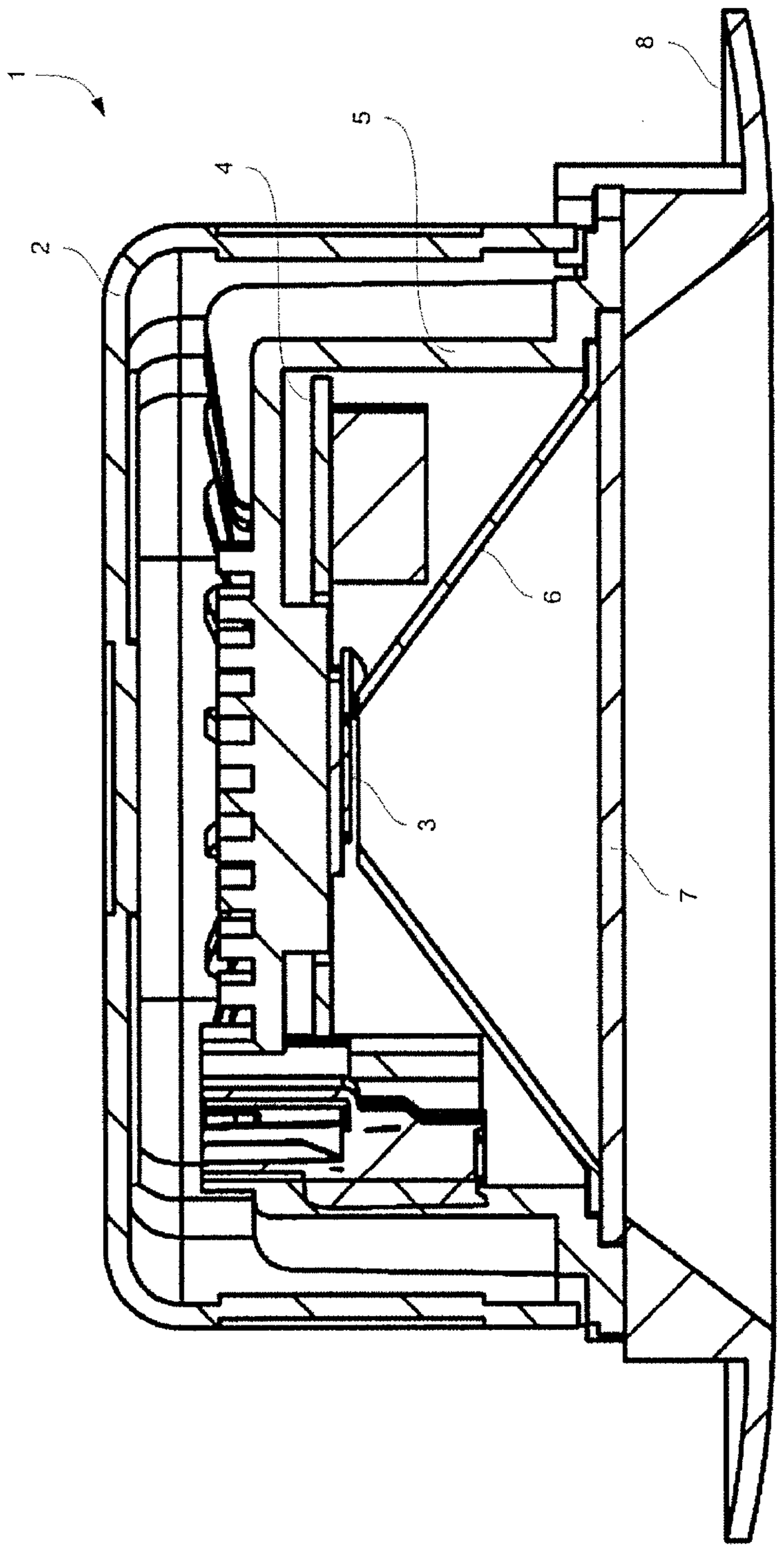
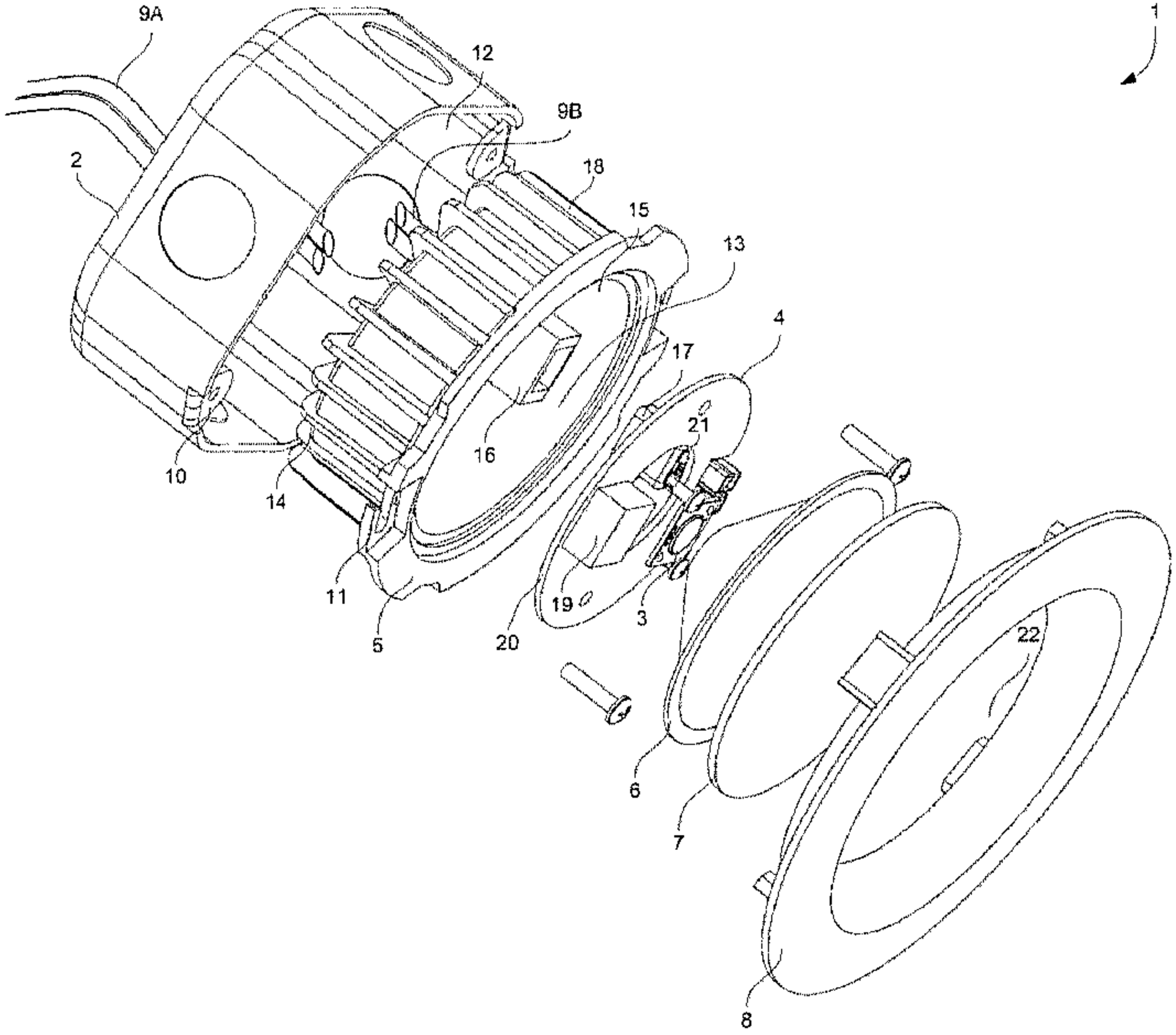


FIG. 3


1
9A
12
9B
2
18
15
13
4
17
21
16
10
14
11
5
19
20
3
22
6
7
8