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(71) Applicant: **Cortem S.p.A.**
34070 Villesse (IT)

(72) Inventor: **Gratton, Riccardo**
34151 Trieste (TS) (IT)

(74) Representative: **Petraz, Gilberto Luigi et al**
GLP S.r.l.
Viale Europa Unita, 171
33100 Udine (IT)

(54) LIGHTING APPARATUS AND CORRESPONDING PRODUCTION METHOD

(57) Lighting apparatus (10), configured to be used in environments with an intermediate or low risk of explosion, comprising a containing body (11) made of metal material, provided with a housing (22) and, internally, with a compartment (12) and a light source (16), attached inside the housing (22), and corresponding production method.

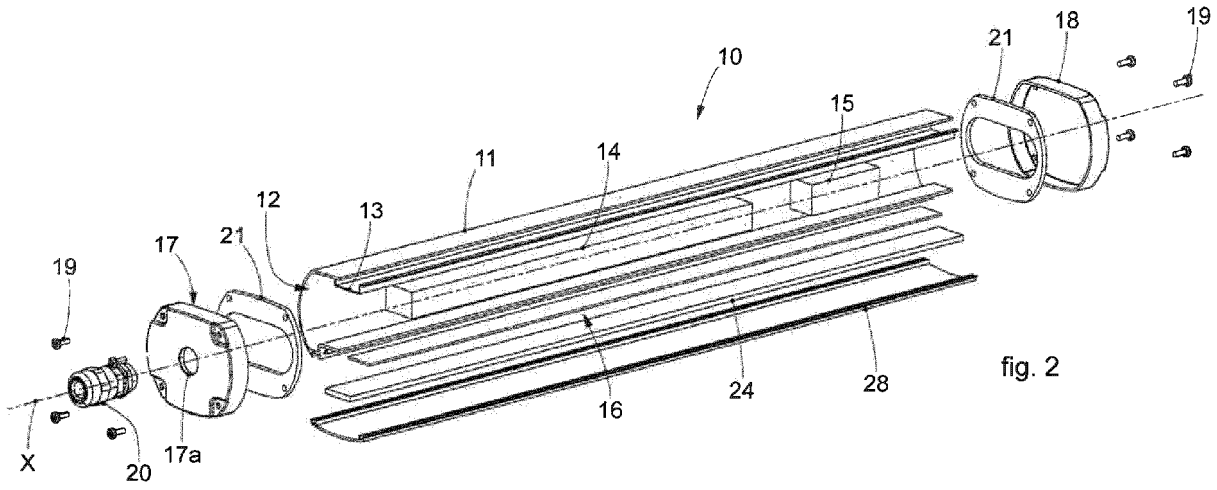

fig. 2

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Description

FIELD OF THE INVENTION

[0001] Embodiments described here concern a lighting apparatus.

[0002] The apparatus is used, advantageously but not exclusively, in industrial areas in which the formation of an explosive atmosphere, consisting of a mixture of air and flammable substances in the form of gas, vapors or fog, is likely to occur occasionally during normal production activities.

[0003] In particular, but not restrictively, the preferential fields of use of the apparatus are, for example, but not limited to, the chemical industry, the oil and natural gas extraction industry, refueling stations, offshore industry, marine sector, tankers, shipyards, power plants, refineries, public rescue services, aviation, sugar refineries, the grain and feed industry, the fertilizer industry, the milling industry, the pharmaceutical industry, waste treatment plants, the wood industry.

[0004] The present invention concerns both the composition and the production method of the apparatus.

BACKGROUND OF THE INVENTION

[0005] Lighting apparatuses are known, which comprise a containing body, made of metal material, provided with a housing in which a light source is located and possibly a compartment in which a power supply unit is located.

[0006] The light source is suitable to generate a beam of light intended, for example, to illuminate an internal or external space, or to provide an alarm signal, for example, associated with a malfunction of machinery inside a production plant.

[0007] According to possible embodiments, the containing body of the lighting apparatus, in addition to the mechanical function of accommodating the various electronic/mechanical components that form the apparatus, advantageously performs a function of thermal dissipation of the heat generated by the light source and by the power supply unit.

[0008] In particular, the category of such apparatuses includes, for example, spotlights, projectors, illuminated fixtures and ceiling lights.

[0009] Currently, the use of LED light sources is becoming more and more widespread in lighting apparatuses since with them, compared to traditional lamps of the same power, it is possible to obtain advantages such as, for example, a reduction in weight and size, high efficiency with great energy savings, long life (over 100,000 hours), with a consequent reduction in maintenance costs, and immediate switch-on.

[0010] In the specific case of the use of LED light sources in the construction of lighting apparatuses that can be used in zones classified according to the ATEX (ATmosphere EXplosive) regulations, the main advantage lies above all in the long life which, in addition to being convenient in economic terms, brings with it the need for a lower number of maintenance interventions (essentially attributable to the replacement of the light source) on said lighting apparatuses.

[0011] Consequently, the exposure of operators to the risk of explosions and/or fires in the event of maintenance is significantly reduced, increasing the safety of use of the lighting apparatus and reducing the costs thereof.

[0012] Known lighting apparatuses comprise a containing body which can have a circular, elliptical, square or rectangular shape, with a longitudinal development, or suchlike.

[0013] In particular, lighting apparatuses with LED technology are configured to contain inside the containing body a light source consisting of an array of LEDs, for example, with LED light sources disposed on a plurality of concentric circumferences, or on parallel longitudinal segments, or suchlike.

[0014] In known lighting apparatuses, in particular in those which use a LED light source, there is the primary need to prevent any dangerous substance, in terms of flammability or explosion, from coming into contact with said light source.

[0015] In some known lighting apparatuses, the light source is hermetically insulated from the external atmosphere. In particular, according to a known solution, the light source is completely covered, and then sealed, by means of a layer of transparent polymer resin.

[0016] A lighting apparatus with this embodiment is advantageously but not exclusively used, at most, in zones with an intermediate risk of explosion.

[0017] A lighting apparatus that is used in zones at risk of explosion is defined as explosion-proof.

[0018] A first disadvantage of known explosion-proof lighting apparatuses is that the presence of the sealing polymer resin, described above, alters the light emission and the color rendering index of the light source, causing an absorption of the light radiation emitted.

[0019] Furthermore, the polymer resin is subject to degradation due to aging and, since it cannot be replaced, it reduces the luminous efficiency of the apparatus over time.

[0020] Document US 8,033,677 B1 describes a lighting device for use in immersion at great depths, comprising a cylindrical containing body provided with a hollow compartment and a LED light source positioned inside the containing body in such a way as to emit light rays in an axial direction. A transparent window is installed above the LED in such a way as to close the compartment and the space between the window and the LEDs is filled with a transparent fluid or gel, to allow volumetric modifications due to a combination of low temperature and high pressure in the ocean depths.

[0021] Document KR100986716B1 concerns a lighting device in the form of a bar that can be used to provide night lighting to a bridge or an overpass, which comprises a containing body and a light source disposed inside the

containing body.

[0022] Neither of the solutions described in documents US 8,033,677 B1 and KR100986716B1 are intended to be used in zones at risk of explosion.

[0023] There is therefore a need to perfect a lighting apparatus that can be used, at most, in all environments with an intermediate risk of explosion (zone 1 according to ATEX regulations), which can overcome at least one of the disadvantages of the state of the art.

[0024] More generally, one purpose of the present invention is to improve an explosion-proof lighting apparatus compared with the state of the art.

[0025] Another purpose of the present invention is not to alter the light emission and the color rendering index of the light source.

[0026] Another purpose is that the luminous efficiency of the apparatus should be high and constant throughout the entire life of use.

[0027] Another purpose is to perfect a method to produce a lighting apparatus that is simple, repeatable in series, efficient, rapid and with limited implementation costs, which allows easier assembly operations and which allows to obtain a long life of the apparatus itself.

[0028] Consequently, a final purpose of the present invention is to provide a lighting apparatus which, even while increasing its performance in terms of luminous efficiency and duration over time, has production costs that are no higher or possibly lower than those of the apparatuses known in the state of the art.

[0029] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0030] The present invention is set forth and characterized in the independent claims. The dependent claims describe other characteristics of the present invention or variants to the main inventive idea.

[0031] In accordance with the above purposes, this document describes a lighting apparatus suitable to be used, advantageously but not exclusively, in environments classified, at most, as zone 1 according to the ATEX regulations.

[0032] According to some embodiments, the lighting apparatus comprises a metal containing body provided internally with a compartment and a light source, which is attached in a special housing present in the containing body.

[0033] According to the present invention, the containing body comprises, in fact, a housing, configured to accommodate the light source inside it, and a sheet of glass, which is disposed above the light source.

[0034] Whatever the type of light source used in the lighting apparatus, the containing body is advantageously made of a material that has good thermal conductivity and, therefore, capable of dissipating the heat produced by the light source itself.

[0035] According to the invention, the sheet of glass is attached in correspondence with the housing of the containing body, so as to isolate the light source from the external atmosphere, by means of sealing elements. The sealing elements comprise sealing material and possible sealing elements.

[0036] The sheet of glass, by cooperating with the housing and with the sealing elements, delimits a hermetically sealed chamber, which comprises the light source inside it.

[0037] According to some embodiments, the housing is outside the compartment and the light source is positioned with the face that emits a light beam facing in the opposite direction with respect to the compartment. Preferably, the housing is made on the perimeter of the containing body.

[0038] According to some embodiments, the light source can be an LED strip, or an LED bar, comprising a plurality of LEDs disposed in such a way as to emit the light beams in a radial direction with respect to a longitudinal axis of the containing body.

[0039] According to some embodiments, the housing comprises at least one first cavity, in correspondence with the support zone of the sheet of glass. The at least one first cavity is suitable to position, and possibly also retain, the sealing material.

[0040] In particular, a lighting device is obtained that can be used in all environments where the maximum risk of explosion is an intermediate one (zone 1 according to ATEX regulations). The lighting apparatus can also be used in environments with a lower risk than the intermediate one, for example zone 2 according to ATEX regulations, or in environments where there is no risk of explosion.

[0041] In addition, the interposition is prevented of a material between the light source and the external environment which, by absorbing light radiation, would reduce the efficiency of the light source as above.

[0042] Another advantage is that the glass is not subject to alterations of the transparency characteristics with aging, throughout the entire operating life of the lighting apparatus.

[0043] Advantageously, the at least one first cavity is made together with the containing body (for example, by means of molding, extrusion or die-casting), thus allowing to avoid any subsequent mechanical workings.

[0044] According to some embodiments, in order to appropriately diffuse the light beam emitted by the light source and eliminate the risk of glare, the containing body of the lighting apparatus is configured to accommodate a diffuser, positioned outside the housing.

[0045] Advantageously, the containing body also has at least one second insertion cavity, which has a retaining tooth, which defines a first seating configured to accommodate and keep in position the diffuser as above, without the aid of attachment elements. Again, other mechanical workings for manufacturing and/or assembling at

least one second cavity for inserting the diffuser are therefore avoided.

[0046] The diffuser can be made of a transparent and/or translucent material, and can guarantee a protective function of the mechanical type.

[0047] According to preferred alternative embodiments, the diffuser can have a main portion made of transparent and/or translucent material and at least one end portion made of deformable material with sealing properties, in order to obtain another sealing effect, in correspondence with at least one second seating made in the at least one second cavity. The use of a diffuser with ends made of a material that has sealing properties further increases the degree of insulation against a potentially explosive atmosphere.

[0048] Advantageously, the main portion and the end portions are made by means of injection molding or coextrusion of two polymeric materials, so as to reduce working times and costs. In this way, a lighting apparatus is obtained that overcomes the limits of the state of the art and eliminates the defects present therein.

[0049] In accordance with some embodiments, there is also provided a method to produce a lighting apparatus, which comprises:

- making a containing body;
- assembling, inside a housing of the containing body, a light source;
- positioning a sheet of glass above the light source, so as to delimit a chamber, containing the light source, separated from the external environment;
- sealing the chamber by applying sealing elements along the entire periphery of the sheet of glass, which comprise sealing material and possible sealing elements.

[0050] According to some embodiments, the method provides to make the housing on the perimeter of the containing body, outside the compartment, and to position the light source with the face that emits a light beam facing in the opposite direction with respect to the compartment.

[0051] According to some embodiments, the method also provides to:

- produce a diffuser by means of molding, extrusion or coextrusion of one or more polymeric materials;
- assemble the diffuser, without the aid of attachment means, inserting it in correspondence with at least one second cavity, made in the containing body, outside the housing.

[0052] In this way, a method to produce a lighting apparatus is obtained in which assembly times are optimized.

[0053] According to some embodiments, the lighting apparatus has an elongated containing body with a longitudinal development. Advantageously, in this case, the production method provides that the containing body is made by extrusion. The extrusion method is more flexible, since it can be adapted to apparatuses of different lengths, simply by cutting the containing body to the desired length, or it allows to modify the structural elements, for example modify the position of the cavities and of the seatings, or to eliminate them, by means of simple operations on the die and on the possible extrusion core, rather than by making a new mold.

[0054] In addition, the variability of the items stored in the warehouse is reduced, minimizing the consumption of energy and raw material required to produce the lighting apparatus.

[0055] According to some embodiments, in the case of lighting apparatuses with a containing body with a longitudinal development, the production method also includes the hermetic closure of the ends of the containing body, by assembling two closing elements together with two corresponding sealing elements, in order to obtain a hermetic closure of the light source and of the entire apparatus.

[0056] The production method described above is used, advantageously but not exclusively, to produce explosion-proof lighting apparatuses, which can be used in all environments with a maximum explosion risk equal to intermediate (zone 1 according to ATEX regulations).

BRIEF DESCRIPTION OF THE DRAWINGS

[0057] These and other aspects, characteristics and advantages of the present invention will become apparent from the following description of some embodiments, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a perspective view of a lighting apparatus;
- fig. 2 is an exploded perspective view, in partial section, of the lighting apparatus of fig. 1;
- fig. 3 is a cross-section view along plane III-III of fig. 1;
- figs. 3a and 3b show an enlargement of detail A, indicated in fig. 3, according to two possible variants.

[0058] To facilitate comprehension, the same reference numbers have been used, where possible, to identify identical common elements in the drawings. It is understood that elements and characteristics of one embodiment can conveniently be incorporated into other embodiments without further clarifications.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

[0059] We will now refer in detail to the possible embodiments of the invention, of which one or more examples are shown in the attached drawings, by way of a non-limiting illustration. The phraseology and terminology used here is also for the purposes of providing non-limiting examples.

[0060] The attached drawings are used to describe

some embodiments of a lighting apparatus 10, hereafter referred to as apparatus, and of a corresponding production method.

[0061] The apparatus 10 is suitable for use, at most, in environments with an intermediate risk of explosion (zone 1 according to ATEX regulations), but also in environments with a lower risk, such as those with low risk (zone 2 according to ATEX regulations) or with no risk.

[0062] The present apparatus 10 comprises a containing body 11 and a light source 16, attached on the containing body 11.

[0063] The containing body 11 is made of metal material, for example steel, aluminum or copper, preferably aluminum alloy. In fact, metal materials have the advantage of having good thermal conductivity, of being able to dissipate the heat produced by the light source 16 and by electronic elements such as, for example, those relating to the power supply. In addition, aluminum alloy is also a lightweight and corrosion resistant material.

[0064] According to some embodiments proposed by the present invention, as shown in the attached drawings, the containing body 11 can be made in a single body.

[0065] In a preferred embodiment, the containing body 11 can have a longitudinal development and, therefore, a substantially elongated shape that extends along a longitudinal axis X, and a closed section, hollow inside, for example almost in the shape of an O.

[0066] According to this embodiment, the containing body 11 is made by molding, die casting or extrusion, preferably by extrusion.

[0067] According to possible alternative embodiments, the containing body 11 can also have a circular, elliptical, square, rectangular shape or suchlike. According to such alternative embodiments, the containing body 11 is made by molding or die-casting.

[0068] The light source 16 can be any device whatsoever capable of converting the electric power supplied by a power supply unit 14 into a light beam, such as for example incandescent, halogen, discharge, LED lamps or suchlike.

[0069] According to a preferential embodiment, the light source 16 comprises one or more LEDs, in particular, in a non-limiting manner, a module consisting of one or more arrays of LEDs. For example, the light source 16 can be an LED strip or an LED bar.

[0070] According to a preferential embodiment, the containing body 11 is provided with a housing 22.

[0071] The housing 22 is outside the compartment, and is defined by a seating, that is, a recess on the perimeter of the containing body 11.

[0072] According to some embodiments, the containing body 11 can have an at least partly tubular shape, which internally defines the compartment 12, which is provided externally on the periphery of a hollowed longitudinal seating that delimits the housing 22.

[0073] This housing 22 can be configured to accommodate the light source 16 inside it.

[0074] According to some embodiments, the light source 16 is positioned in the housing 22 with the face that emits a light beam facing in the opposite direction with respect to the compartment 11.

[0075] In the case of a containing body 11 with an at least partly tubular shape, a light source 16 in the form of an LED strip or LED bar can be used, disposed in such a way as to emit the light beams in a radial direction with respect to a longitudinal axis of the containing body 11, toward the outside of it.

[0076] If the light source 16 produces a significant amount of heat, the housing 22 is also configured to accommodate inside it a dissipator element 16a, capable of dissipating the heat produced by the light source 16 itself.

[0077] Here and hereafter in the description, the light source 16 also comprises the dissipator element 16a.

[0078] Furthermore, the housing 22 can also be configured to position a sheet of glass 24 above the light source 16.

[0079] In order to obtain a hermetic insulation of the light source 16, sealing elements are applied along the entire periphery of the sheet of glass 24. These sealing elements comprise sealing material 25 and possible sealing elements 21.

[0080] According to one possible embodiment, the sealing material 25 is a synthetic elastomer used to make packings (for example, silicone).

[0081] According to some embodiments, the sheet of glass 24, positioned in the housing 22, forms a chamber 26 separated from the external environment, which comprises the light source 16 inside it.

[0082] The sheet of glass 24 can be attached to the housing 26 in such a way as to form a hermetically sealed chamber 26.

[0083] According to one possible embodiment, the housing 22 can be equipped with at least one protuberance 23 that extends toward the outside, configured to define the support base of the sheet of glass 24, on a lower surface 23a thereof.

[0084] According to some embodiments, the lower surface 23a faces the external side.

[0085] The at least one protuberance 23 can also be configured to define the chamber 26.

[0086] According to a preferential embodiment, in which the containing body 11 has an elongated shape, and with reference to figs. 3, 3a and 3b, the housing 22 comprises two protuberances 23 that extend toward the outside and along the entire length of the containing body 11.

[0087] According to a preferential embodiment, the at least one protuberance 23 can possibly comprise at least one mean 31 for retaining the sealing material 25, which protrudes toward the outside, laterally to the lower surface 23a.

[0088] The at least one retaining mean 31 acts as an abutment to correctly position and center, during the assembly steps, the sheet of glass 24 above the light source 16, on the lower surface 23a of the at least one protu-

berance 23.

[0089] Furthermore, the at least one protuberance 23 is disposed so as to define at least one first cavity 27, positioned laterally to the support zone of the sheet of glass 24.

[0090] The at least one first cavity 27 is suitable to position, and possibly also to retain, the sealing material 25.

[0091] According to the embodiment represented in figs. 3, 3a and 3b, the two protuberances 23 are disposed so as to define two first longitudinal cavities 27 inside the housing 22.

[0092] In particular, according to a preferential embodiment, and always with reference to figs. 3a, 3b, a wall 27a of at least one first cavity 27, which cooperates with the sealing material 25, has an angle of inclination α, with respect to the vertical, facing toward the inside of the apparatus 10.

[0093] By means of the configuration of the wall 27a of the at least one first cavity 27, advantageously, the sealing material 25, which fills the at least one first cavity 27, is prevented from translating downward, for example following impacts or due to aging. In this way, the sheet of glass 24, positioned above the light source 16, remains attached in any condition whatsoever.

[0094] In accordance with some embodiments of the present invention, the containing body 11 can also comprise, along the periphery of the housing 22, at least one second cavity 29. This at least one second cavity 29 can have a retaining tooth 32, which can define a first seating 29a configured to accommodate and keep in position a diffuser 28.

[0095] Advantageously, the first seating 29a can keep the diffuser 28 in position without the aid of attachment elements, such as screws, bolts and suchlike.

[0096] With reference, again, to figs. 3, 3a and 3b, the containing body 11 can comprise two second cavities 29 with a longitudinal development.

[0097] The diffuser 28 can be configured to protect the housing 22, for example from dust or impacts, and/or to suitably diffuse the light beam generated by the light source 16. For example, the diffuser 28 can eliminate the risk of glare and therefore considerably increase visual comfort.

[0098] According to one possible embodiment, the diffuser 28 is made in a single body, for example, by molding or extrusion of a transparent and/or translucent polymeric material, such as, for example, polycarbonate (fig. 3a).

[0099] According to one possible variant, the diffuser 28 can comprise a main portion 28a, transparent and/or translucent, made of polymeric material, which along the periphery can have at least one seating 28c, each configured to accommodate at least one deformable end portion 28b.

[0100] In particular, the base of the at least one second cavity 29 can have at least one second seating 29b able to cooperate with the at least one end portion 28b associated with the diffuser 28.

[0101] In fact, the at least one end portion 28b of the diffuser 28 can be made of a polymeric material with sealing properties, so as to form a packing that can be hermetically coupled in correspondence with the at least one second seating 29b of the at least one second cavity 29 (fig. 3b).

[0102] According to this last embodiment, the main portion 28a and the at least one end portion 28b can be separate and be joined during use or, preferably, they can be made in a single body, by means of injection molding or coextrusion of a transparent and/or translucent polymeric material and of a polymeric material with sealing properties.

[0103] The at least one second seating 29b, made inside the at least one second cavity 29, is configured so that the at least one end portion 28b of the diffuser 28, as it is mounted on the apparatus 10, deforms so as to hermetically close the housing 22 with respect to the external environment.

[0104] Advantageously, the use of a diffuser 28 with at least one end portion 28b which has sealing properties increases the degree of insulation of the light source 16 against a potentially explosive atmosphere.

[0105] In order to reduce the number of items stored in the warehouse, the containing body 11 of the apparatus 10 can always comprise at least one second cavity 29 and, in correspondence therewith, a second seating 29b and a retaining tooth 32, which defines a first seating 29a. In this way, three possible variants of the apparatus 10 can be provided with the same containing body 11 (without diffuser 28; with diffuser 28 made of non-sealing material; with diffuser 28 having the end portion 28b with sealing properties).

[0106] According to preferred embodiments, the containing body 11 acts as a casing for the other elements that make up the apparatus 10, and constitutes the bearing structure thereof.

[0107] The containing body 11 is provided internally with a compartment 12, configured to accommodate at least one support element 13.

[0108] The support element 13 is configured in such a way as to accommodate and attach on it electronic elements, such as, for example, the power supply unit 14, a control unit 15, fuses, relays and electronic boards, configured to power and drive the light source 16.

[0109] Advantageously, the at least one support element 13 can be made during the production of the containing body 11, for example, it can be extruded together with the containing body 11. It is thus possible to avoid mechanical workings, such as drilling, threading, flaring, or suchlike. Therefore, chip removal working processes are reduced or eliminated, minimizing the production times of the lighting apparatus 10.

[0110] The external surface of the containing body 11 of the apparatus 10 can be smooth or rough to the touch, for example, it can have grooves.

[0111] The apparatus 10 can comprise closing elements 17, 18 configured to close the ends of the containing body 11.

[0112] According to some embodiments, the closing elements 17, 18 are made by molding or die-casting and, preferably, are of aluminum alloy.

[0113] For example, in apparatuses 10 with a longitudinal development there are closing elements 17, 18, as shown in the attached drawings.

[0114] The closing elements 17, 18 can be configured to be applied to the respective opposite ends of the containing body 11 by means of suitable attachment means 19, such as, for example, self-tapping screws.

[0115] According to one possible embodiment, shown in figs. 1 and 2, the closing elements 17, 18 can comprise a hole 17a, concentric, or not, with the longitudinal axis X, or they can be blind. The hole 17a can be configured to accommodate a hermetically sealed cable gland element 20. The cable gland element 20 can be configured to allow the passage of the electric cable that connects to the power supply unit 14.

[0116] Between the closing elements 17, 18 and the containing body 11 there can also be interposed two sealing elements 21, made of a material with sealing properties. The sealing elements 21 can be configured to achieve, by cooperating with the sealing material 25, the complete hermetic seal of the apparatus 10.

[0117] According to possible embodiments, a method to produce a lighting apparatus 10 is provided, which comprises:

- making a containing body 11;
- assembling, inside a housing 22 of the containing body 11, a light source 16;
- positioning, above the light source 16, a sheet of glass 24, so as to delimit a chamber 26, containing the light source 16, separated from the external environment;
- sealing the chamber 26 by applying sealing elements, along the entire periphery of the sheet of glass 24, which comprise sealing material 25 and possible sealing elements 21.

[0118] In the specific case in which the containing body 11 is elongated and has a longitudinal development, the method to produce the apparatus 10 also comprises sealing the ends of the containing body 11, by assembling two closing elements 17, 18 to two corresponding sealing elements 21, in order to obtain a hermetic closure of the housing 22, containing the light source 16, and of the entire apparatus 10.

[0119] Advantageously, the method can provide that the containing body 11 is made in a single body.

[0120] In accordance with possible embodiments, the method to produce the apparatus 10, according to the present invention, can include manufacturing, by means of molding, extrusion or coextrusion, a diffuser 28.

[0121] Advantageously, the method can provide that the diffuser 28 is made in a single body.

[0122] In alternative embodiments, the method can provide that the diffuser 28 is made by joining several elements.

[0123] It can also provide the subsequent assembly of the diffuser 28, without the aid of attachment elements, by inserting it in correspondence with at least one second cavity 29, made in the containing body 11 inside the housing 22, for example by means of sliding or by applying a light pressure.

[0124] Finally, the method to produce the apparatus 10 can comprise making, during the molding or extrusion of the containing body 11 and inside a compartment 12 of the containing body 11, coupling elements 30 to assemble, without the aid of further attachment elements, elements 13 for supporting electronic elements 14, 15, configured to power and control the light source 16.

[0125] It is clear that modifications and/or additions of parts or steps may be made to the lighting apparatus 10 and to the corresponding production method as described heretofore, without departing from the field and scope of the present invention as defined by the claims.

[0126] In the following claims, the sole purpose of the references in brackets is to facilitate reading: they must not be considered as restrictive factors with regard to the field of protection claimed in the specific claims.

Claims

1. Lighting apparatus (10) comprising:

- a containing body (11), made of metal material, provided with a housing (22) and, internally, with a compartment (12);
- a light source (16) attached in said housing (22);

characterized in that a sheet of glass (24) is positioned in said housing (22), above said light source (16), forming a chamber (26) separated from the external environment, said chamber (26) being hermetically sealed by means of sealing elements (21, 25), which are applied along the entire periphery of the sheet of glass (24).

2. Apparatus (10) as in claim 1, **characterized in that** the housing (22) is equipped with at least one protuberance (23) configured to define the support base of the sheet of glass (24), said at least one protuberance (23) being configured to define said chamber (26).

3. Apparatus (10) as in claim 2, **characterized in that** the at least one protuberance (23) also defines at least one first cavity (27), positioned laterally to the support zone of the sheet of glass (24), wherein said at least one first cavity (27) is suitable to position, and possibly also retain, a sealing material (25).

4. Apparatus (10) as in claim 3, **characterized in that**

a wall (27a) of the at least one first cavity (27), which cooperates with the sealing material (25), has an angle of inclination (α), with respect to the vertical, facing toward the inside of said apparatus (10).

5. Apparatus (10) as in any claim hereinbefore, **characterized in that** the containing body (11) comprises the periphery of the housing (22), at least one second cavity (29), which has a retaining tooth (32), which defines a first seating (29a) configured to accommodate and keep in position a diffuser (28).

6. Apparatus (10) as in claim 5, **characterized in that** the diffuser (28) comprises a transparent and/or translucent main portion (28a), made of polymeric material, which along at least part of the periphery has at least one seating (28c), each configured to accommodate at least one deformable end portion (28b).

7. Apparatus (10) as in claim 6, **characterized in that** the base of the at least one second cavity (29) has at least one second seating (29b) able to cooperate with the at least one end portion (28b) associated with the diffuser (28).

8. Apparatus (10) as in any claim hereinbefore, wherein the containing body (11) is elongated and has a longitudinal development, **characterized in that** it comprises two closing elements (17, 18) and two sealing elements (21), which are interposed between said closing elements (17, 18) and ends of the containing body (11) and are made of material that has sealing properties, wherein said closing elements (17, 18) and said sealing elements (21) are configured to close the containing body (11) and obtain the complete hermetic seal of said apparatus (10).

9. Apparatus (10) as in any claim hereinbefore, **characterized in that** said housing (22) is outside said compartment (12) and said light source (16) is positioned with the face that emits a light beam facing in the opposite direction with respect to said compartment (11).

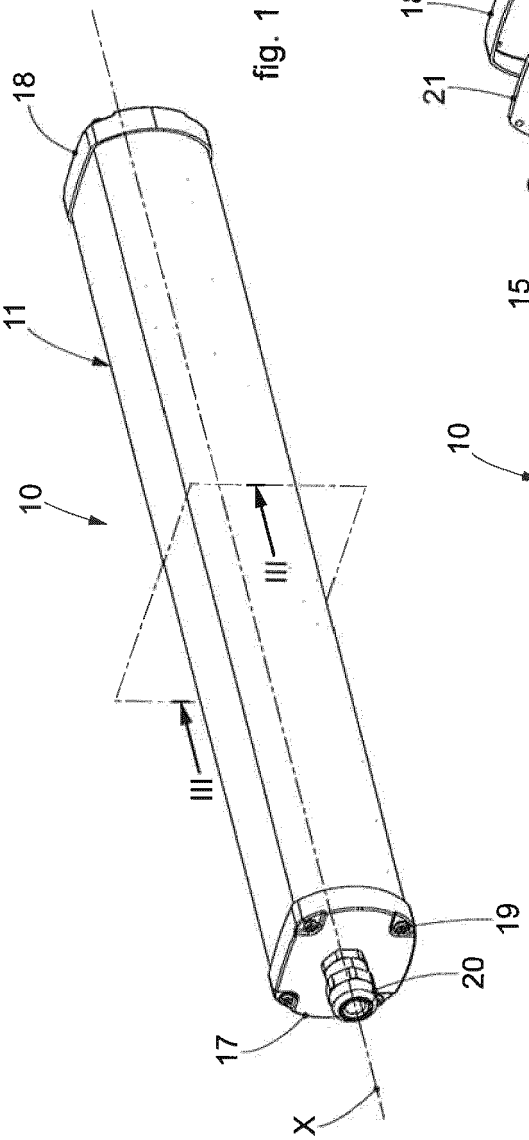
10. Apparatus (10) as in any claim hereinbefore, **characterized in that** said light source (16) is an LED strip or an LED bar comprising a plurality of LEDs disposed in such a way as to emit the light beams in a radial direction with respect to a longitudinal axis of said containing body (11) toward the outside.

11. Method to produce a lighting apparatus (10), **characterized in that** said method comprises:

- making a containing body (11) of the apparatus (10), made of metal material and provided with a housing (22) and, internally, with a compartment (12);
- assembling, inside said housing (22) of the containing body (11), a light source (16);
- positioning sheet of glass (24) in said housing (22), above the light source (16), so as to delimit a chamber (26), containing said light source (16), separated from the external environment;
- sealing the chamber (26) by applying sealing elements, along the entire periphery of the sheet of glass (24), which comprise sealing material (25) and possible sealing elements (21).

12. Method as in claim 11, **characterized in that** it provides to make said housing (22) on the perimeter of said containing body (11) outside said compartment (12) and to position said light source with the face that emits a light beam facing in the opposite direction with respect to said compartment (11).

13. Method as in claim 11 or 12, **characterized in that** it provides to produce a diffuser (28), by using one or more polymeric materials, and to mount said diffuser (28), without the aid of attachment elements, inserting it in correspondence with at least one second cavity (29), obtained in the containing body (11) inside the housing (22).


18
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III
III
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17
X

fig. 1

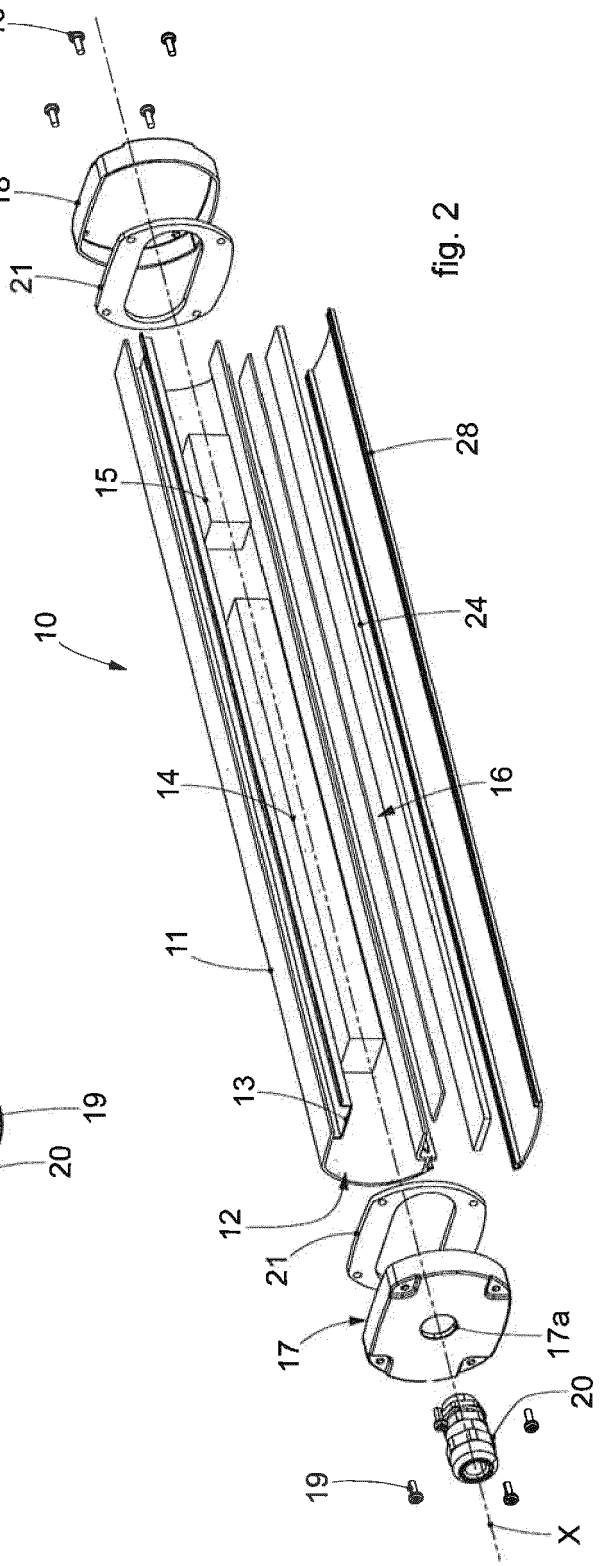
19
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fig. 2

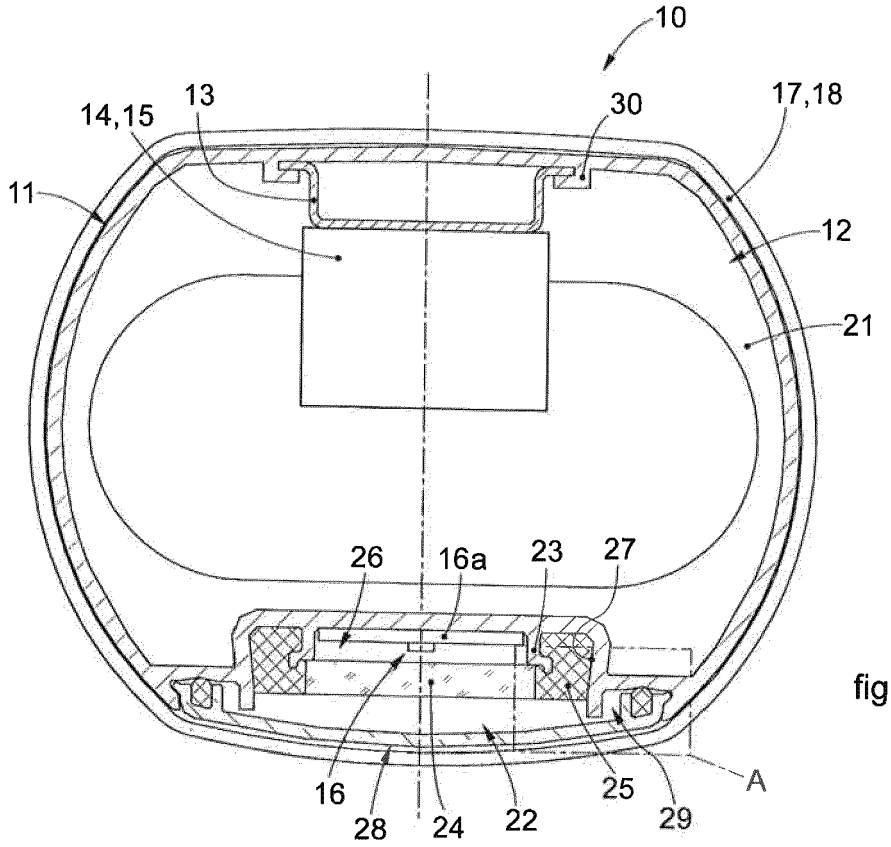

fig. 3

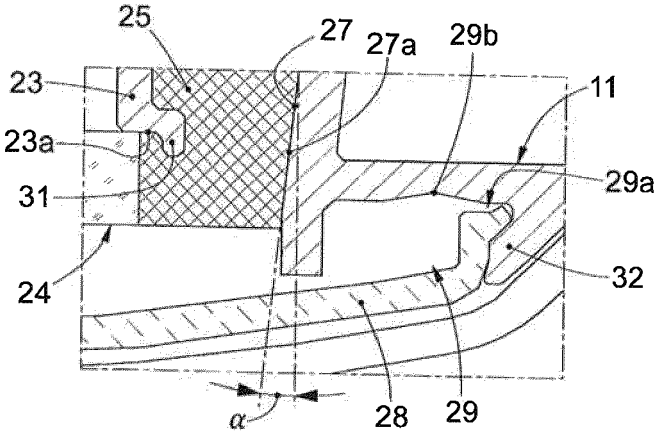

fig. 3a

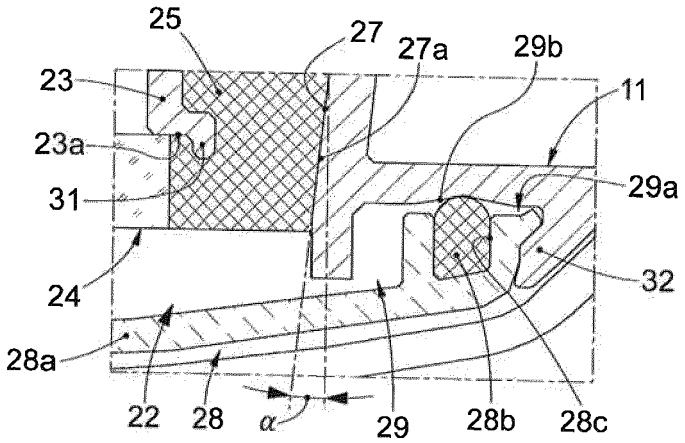

fig. 3b

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EUROPEAN SEARCH REPORT

Application Number
EP 21 17 8637

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 November 2021	Menn, Patrick

CATEGORY OF CITED DOCUMENTS

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08-11-2021

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