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(54) **MODULAR LED LAMP**

(57) Modular lamp (1) comprising:

- A hollow extruded tube (7) of a pre-defined length of a material transparent at least for a portion of the wall of said tube (7), housing
- An electronic board (10 or 11) on which a plurality of LEDs (12) is mounted;
- Two head caps (3);
- A power cable (2);

characterized in that

- Said extruded tube (7) has its external wall impenetrable to liquids, and the two head caps (3) are fixed so as to close in a waterproof way said two ends of said extruded tube (7) through ultrasonic welding;
- A rigid covering profile (8) of opaque material having a channel-like cross section being provided, the said rigid covering profile having clamping means cooperating with

clamping seats at opposite sides of the said tube (7) and covering the said tube (7) for a certain portion of its cross section,

- Optionally at least a clip (5), optionally provided with a screw (6) for the permanent fastening of said lamp to a support, or wherein said clip (5) is produced in the form of a magnet for a removable fastening to a ferromagnetic support;
- The said clip having opposite lateral wings provided with clamping means cooperating with clamping seats on opposite sides of the tube (7) in absence of the covering profile (8) on the said tube (7);
- The said clamping means of the clip cooperating also with engaging means on opposite sides of the covering profile (8) optionally mounted on the said tube (7).

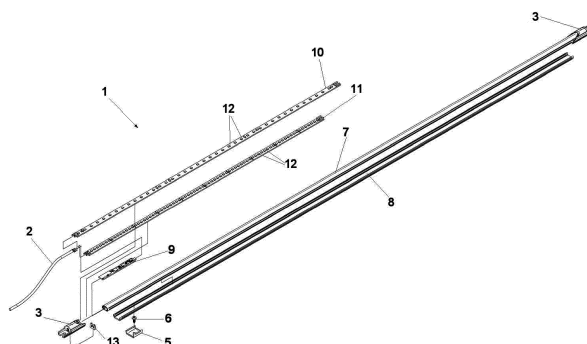


FIG. 2

Description

Description

[0001] The present invention relates to the technical field of lighting, and in particular to modular LED lamps which can be used for a variety of aims, like ambient lighting, the lighting of goods placed on sale shelving, e.g. fruit and vegetable shelving, refrigerated shelving, indoor vegetable growing (microgreen), in greenhouses etc.

[0002] In the art, LED lamps using LEDs with wavelengths chosen according to the desired aim are known.

[0003] Typically said lamps have an oblong shape, with a longitudinal axis much longer than their width and height. Typical exemplary dimensions are height 17 mm, width 17 mm and variable lengths, indicatively 30 cm up to 1 or more metres.

[0004] Typically, said lamps are produced assembling a plurality of components; e.g., a lamp according to the known art is IT 202017000066916 by the same applicant. Said lamp comprises:

- A lamp body;
- An electronic board on which components are mounted;
- A transparent or semi-transparent cover.

[0005] The connection between lamp body and transparent or semi-transparent body requires the presence of a gasket in the case of waterproof lamps; this feature can be important when said lamps are used for indoor growing or inside greenhouses.

[0006] Moreover, the use of a control unit to adjust e.g. the colour temperature of the light emitted by said lamp, or the emission of particular wavelengths is known. If the environment must be sensitive to the presence/absence of persons, inside the lamp there is provided a beacon, allowing a dialogue between the lamp control unit and a portable device carried by a person entering into said environment. Said kind of arrangement is described e.g. in the applications IT 102015000074947 and IT 102015000074960 of ELCA Technologies.

[0007] In this context, a beacon is a device transmitting a signal. A Bluetooth® beacon transmits in a repetitive way, with a pre-determined periodicity, a radio signal according to the Bluetooth® standard at 2.4 GHz, containing a unique identifier in a codified way according to Bluetooth® standard, specific for each device. Analogously, a Wi-Fi beacon transmits in a repetitive way, with a pre-determined periodicity, a radio signal according to IEEE 802.11 standard, containing in a codified way according to IEEE 802.11 standard a univocal identifier for each device.

[0008] For a manufacturing company providing a basic, modular model of lamp is interesting: in this way, different models of lamps, adaptable to the different requirements of sundry customers, can be produced.

[0009] Aim of the present invention is providing a modular LED lamp, which is easy and cheap to produce. A further aim of the present invention is the miniaturization of said lamp, which so becomes even more versatile in its use.

[0010] This object is achieved by an apparatus and a method having the features of the independent claims. Advantageous embodiment and refinements are specified in the claims dependent thereon.

[0011] The lamp according to the present invention is provided with an elongated shape with an approximately elliptic transverse section. The main components of the present invention comprise:

- An extruded tube, totally or partially transparent to light;
- An electronic board on which at least one LED is mounted;
- Two head caps;
- Optionally, a rigid profile, preferably made of aluminium;
- Optionally, a PCB on which control elements are mounted, like e.g. a microprocessor, a beacon, etc.;
- Optionally, a clip for fixing said lamp to a support.

[0012] Said extruded tube and/or said rigid profile has mechanical grooves allowing to position one or more fixing clips, which allow to modify the tilting of the lamp, too.

[0013] A first advantage of the present invention is the extreme modularity of said lamp, from both mechanical and electronic point of view.

[0014] A second advantage is the miniaturization of said lamp: the lamp according to the present invention has the following dimensions of lamp body: width 13 mm, height 8-9 mm, and any desired length ranging 30 cm to 1 metre or more.

[0015] A third advantage is the possibility of obtaining a waterproof lamp, placeable even in environments wherein water for irrigating plants is needed.

[0016] A further advantage consists in the lack of use of glue during lamp mounting; the components are ultrasonically welded, which allows to obtain a waterproof lamp.

[0017] The lamp according to the present invention is provided with a plurality of embodiments starting from the same basic components. In the following, three non-limitative, exemplary embodiments are listed:

[0018] In a first, simplest embodiment, the lamp comprises:

- An extruded tube;
- An electronic board;
- Two head caps;
- A power cable.

[0019] In a second, more complex embodiment, the lamp comprises:

- An extruded tube;
- An electronic board;
- A PCB comprising a sensor and/or a beacon;
- Two head caps;
- A power cable.

[0020] In a third, even more complex embodiment, the lamp comprises:

- An extruded tube;
- An electronic board;
- Optionally a PCB comprising a sensor and/or a beacon;
- Two head caps;
- A power cable;
- Optionally, a profile made of aluminium or a rigid material to improve the mechanical rigidity of the lamp;
- Optionally, at least one clip for fixing said lamp to a support.

[0021] The profile and the clip can be provided in combination with any of the above-disclosed embodiments, both together or the clip only.

[0022] Further advantages and properties of the present invention are disclosed in the following description, in which exemplary embodiments of the present invention are explained in detail based on the drawings:

Figure 1a, 1b Lamp according to the present invention in an axonometric view;
 Figure 2 Exploded axonometric view of the lamp;
 Figure 3a, 3b Transversal section of the extruded tube, empty and while housing an electronic board;
 Figure 4a, 4b Two consecutive details of the cable retainer assembling, shown as exploded axonometric views;
 Figure 5 Enlarged view of an embodiment of the clip;
 Figure 6 A cross section of the tube to which a clip is engaged;
 Figure 7 A cross section of the tube to which the covering profile is attached, and with the clip engaged with the covering profile.

[0023] Figures 1 show a lamp 1 according to the present invention in an axonometric view; in particular, Figure 1a shows the lamp side oriented toward the public, while Figure 1b shows the lamp side oriented towards the support (ceiling, wall, etc.) to which said lamp is fixed.

[0024] Figure 1a shows a lamp 1 comprising a lamp body 4, a head cap 3, from which a power cable 2 sticks out, for the connection to power supply. Optionally, lamp 1 is provided with a clip 5, allowing its fixing, through a screw, to sundry kinds of supports (masonry, wood, etc.).

[0025] Figure 1b shows the lamp 1 comprising said lamp body 4, head cap 3, from which power cable 2 sticks out for connection to power supply. Optionally, lamp 1 is provided with a clip 5; in this view, a screw 6 is visible,

allowing to suitably fasten said lamp 1 to a fixed support (ceiling, wall, etc.). In an alternative embodiment, said clip can be manufactured in the form of a magnet, for its removable fastening to a support made of a ferromagnetic material.

[0026] Figure 2 shows an exploded axonometric view of lamp 1. The lamp is shown with its side oriented towards the public upside, like in Figure 1a.

[0027] Figure 2 shows an extruded tube 7 which can house an electronic board 10 or 11 on which a plurality of LEDs 12 is soldered; a rigid profile 8, preferably made of aluminium; optionally a PCB 9 which can house different electronic components; two head caps 3, one of which is provided with a respective cable retainer 13; a power cable 2.

[0028] Indicatively, an electronic board 10 comprises just one kind of LEDs; an electronic board 11 comprises LEDs of different kind.

[0029] The extruded tube 7 normally houses just one kind of electronic boards 10 or 11 on which LEDs 12 are soldered. Figure 2 has the aim to show the lamp versatility for different aims. E.g., for a simple ambient lighting, an electronic board 10 comprising LEDs of just one kind can be inserted. If the colour temperature has to be varied or lamp 1 is used for plant growing, and therefore radiations having different wavelengths must be provided (e.g. red 620-670 nm; blue 400-500 nm; and far red 710-850 nm), the electronic board 11 can be inserted, comprising LEDs of different types emitting the suitable wavelengths or the desired colour temperatures. In this case, it is possible to obtain a dynamic white, i.e. the emission of white light can be warmer (about 2.000 - 3.000 kelvin) or cooler (4.000 - 6.500 kelvin), according to need.

[0030] Inside the extruded tube 7, optionally a PCB 9 is housed. Said PCB 9 can comprise different kinds of sensors, e.g. presence or motion sensors, light and/or colour temperature sensors, etc., and/or a commercial electronic module known as beacon. Said at least sensor and electronic device and/or beacon must be electrically supplied through cable 2 in order to detect and transmit data.

[0031] When besides electronic board 10 or 11 comprising LEDs, the optional PCB is present too, the two components must be mounted in series and electrically connected for electrical supply inside said extruded tube 7.

[0032] The presence of PCB 9 increases the versatility for different uses of lamp 1: e.g. said PCB 9 can comprise a sensor of presence/motion allowing to detect the presence of a human being, and therefore switch on said lamp 1 only when at least a human being is present inside the environment wherein said lamp is mounted. Said PCB 9 can comprise an electronic unit allowing the variation of colour temperature or the emission of different wavelength by the LEDs mounted on the electronic board 11. The beacon can transmit to a central unit, possibly a cloud, data about the working of a plurality of lamps connected in a network.

[0033] In this context, cloud indicates a type of Internet-based computing that provides shared computer processing resources and data to computers and other devices on demand. It is a model for enabling ubiquitous, on-demand access to a shared pool of configurable computing resources (e.g., computer networks, servers, storage, applications and services), which can be rapidly provisioned and released with minimal management effort.

[0034] Said PCB 9 can be provided with two channels (i.e. two power wires, visible in Figure 4a), allowing to control said LEDs of just one type mounted on electronic board 10. Said PCB 9 can have three channels (i.e. three power wires), allowing to control a variety of LED types mounted on the electronic board 11.

[0035] Figures 3a, 3b show a transversal section of the extruded tube 7. Figure 3a shows an empty extruded tube 7, while Figure 3b shows said extruded tube 7 housing an electronic board 10. The extruded tube 7 has approximately an elliptical section, with a preferably squared lower portion 30 and a preferably rounded top section 31. The squared lower portion 30 has the aim to house said electronic boards 10 or 11 and optionally said PCB 9.

[0036] The rounded top portion 31 has the aim to better diffuse the light emitted by LEDs 12. In an embodiment, the shape of the top section 31 can be chosen in a specific way to improve light scattering, e.g. to concentrate it or to confer a specific direction to light. E.g., suitable lenses can be placed in correspondence of each LED 12.

[0037] When lamps are used to grow plants, e.g. in a greenhouse, said extruded tube 7 can be protected with a UV-protective varnish, so as to maintain its characteristics of light permeability, without darkening or altering (cracking) due to the action of environmental UV radiations.

[0038] Inside the extruded tube 7 there are provided two grooves 32, delimited by a lower protrusion 35 and an upper protrusion 34, which have the aim to retain in place the electronic board 10 or 11 and optionally the PCB 9 as shown in Figure 3b.

[0039] Outside said extruded tube 7 there are provided two external symmetrical protrusions 33, which have the aim to retain the rigid profile 8 when present, and/or at least one clip 5 when present.

[0040] The two external protrusions 33 are each a longitudinal lateral rib extending for the whole axial length of the extruded tube 7. Said rib, integrated in the shape of the profile in the transversal section of the extruded tube 7, is provided along each of the two opposed lateral walls oriented perpendicularly to the electronic board 10 or 11 when mounted inside the extruded tube 7.

[0041] The clip 5 and the profile 8 are provided in their transversal sections with two lateral longitudinal grooves, one on each lateral longitudinal wall, which coincide with the two ribs forming the external protrusions 33. The grooves of clip 5 and/or rigid profile 8 have a shape corresponding to the lateral ribs of extruded tube 7, so as to obtain a fastening. The clip 5 and/or the rigid profile 8 have a channel shape and can be coupled to said ex-

truded tube 7 through sliding.

[0042] According to a not shown embodiment, the rigid profile 8 may be provided, in correspondence of said grooves, with an external protrusion which forms two lateral longitudinal protrusions analogue to those 33 of extruded tube 7, and to which a clip 5 can be fastened, as it is fastened to the extruded tube 7.

[0043] Said external protrusions of the rigid profile 8 are coinciding with the lateral longitudinal grooves and are formed by a shaping of the lateral walls of the rigid profile 8.

[0044] The said external, lateral protrusions 33 of the tube 7, and the said external lateral protrusions of the profile 8 are a specific embodiment of engaging seats for clamping means on the clip 5 and on the profile 8. In the above embodiment, the said clamping means are in the form of grooves on the internal sides of the opposed lateral walls of the channel shaped profile 8 and of the channel shaped clip 5.

[0045] Figures 5, 6 and 7 show an embodiment of the tube 7, the covering profile 8 and the clip 5.

[0046] According to this embodiment, the clip 5 has a base 105, which is provided with a hole for a fastening screw 6. The base 105 is destined to overlap on a rear wall 107 of the tube 7 defined in relation to the direction of emission of the light from the light sources as describe above. A lateral wing 305 is provided on each of two opposed sides of the base 105 departing from the said base 105, and each wing 305 ends with a clamping claw 405. In the present embodiment, the clamping claw is formed by an arched end of the corresponding wing 305, which is bent towards the centre of the base 105. In this way, the wings 305 as well as the claw 405 are elastically flexible and can be engaged either with the tube 7 or with the covering profile 8.

[0047] From each one of the lateral walls 307 of the tube 7 a protrusion 33 extends outwardly forming a step 407 opposed to the said rear wall 107 against which the head edge of a corresponding clamping claw 405 engages when the clip 5 is mounted on the tube 7.

[0048] The covering profile 8 which can be of an opaque material, optionally also light reflecting, on the side facing the tube 7 is destined to cover the rear wall 107 of the tube and partially the two lateral walls 307 of the tube.

[0049] In the present embodiment, the covering profile has a channel shaped cross section and the internal surface facing the tube 7 has a form substantially corresponding to the shape of the tube 7.

[0050] The covering profile 8 has a base wall 108 covering the rear wall of the tube 7 and lateral walls 208, which are provided respectively with one internal longitudinal groove 308 shaped correspondingly to the external protrusions 33 of the tube 7. The grooves 208 end with a longitudinal wall 508 overlapping the step formed by the corresponding protrusion and thus securing the covering profile 8 to the tube 7 against a separation by a transverse displacement of the two parts one from an-

other,

[0051] According to a further feature, which can be provided in combination with the present embodiment and also with the previously described embodiment, the lateral protrusions 33 of the tube show a trapezoidal cross section having inclined lateral walls oriented transversally to the lateral walls 307 of the tube 7 and converging in the outward direction from the centre of the tube 7. In combination with this shape of the protrusions 33, the grooves 308 on the lateral walls 208 of the profile 8 show a cross section having a corresponding shape and dimensions to the one of the protrusions 33.

[0052] Along the external surface of each lateral wall 208 of the covering profile 8 a groove 308 is provided forming an engagement seat for the clamping means of the clip 5, namely for the head edge of the corresponding clamping claw 405 of the clip 5.

[0053] As it appears clearly from the Figures, the intrinsic elasticity of the material of the clamping means 305, 405 of the clip 5, which can be for example metal or plastic, combined with the shape of the said clamping means allows a certain flexibility which provides on the one hand the possibility of spreading out the wings and at the same time of generating a clamping force to the tube 7 or to the covering profile 8 ensuring that the engaging condition with the protrusion 33 of the tube or with the external grooves 408 on the covering profile 8 can be maintained with a predetermined force.

[0054] At the same time the same clip 5 can be used in combination with the two alternatives comprising the tube 7 only (Figure 6), or the tube 7 on which the covering profile 8 is mounted (Figure 7).

[0055] According to a variant embodiment of the clip 5, which can be provided in combination with any of the previously described embodiments of the clamping and of the cooperating engaging means, instead of a fastening screw, the base 105 of the clip can be a magnetic element, or can be provided with a magnetic insert, or can be shaped forming a seat or a housing for a magnet. In this case fastening to magnetic walls can be provided without the need of screws or similar devices.

[0056] As it is apparent from Figures 4a and 4b, the head caps 3, too, have a shape in their lateral section, which is corresponding to the shape of the transversal section of the extruded tube 7 of the corresponding grooves in which they are slid, when a head cap is assembled on a corresponding end of said tube 7. The other walls of the head cap, too, have shapes corresponding to those of the extruded tube 7 in their transversal section, so that the internal surface of each cap comes into contact with a whole area of the tube. In this way, there are no zones wherein the internal surface of the cap and the external surface of the tube 7 are distanced from each other.

[0057] At the ends of the extruded tube 7 there are provided two head caps 3, having the aim to hermetically seal said lamp 1. This type of construction of lamp 1 aims to ensure the impermeability of the lamp to the water

used to irrigate a greenhouse, and even in the case of cyclical washing. In the embodiment shown here, a protection IP66 or higher is ensured (IP Code, International Protection Marking, IEC standard 60529). The first digit after IP indicates the level of protection that the enclosure provides against access to hazardous parts (e.g., electrical conductors, moving parts) and the ingress of solid foreign objects, while the second digit after IP indicates the level of protection that the enclosure provides against harmful ingress of water. IP66 means that concerning the access of hazardous parts, no ingress of dust is possible, and complete protection against contact (dust tight) is ensured; while concerning liquids means protected from water projected in powerful jets.

[0058] The head caps 3 can be connected to said extruded tube 7 in two distinct modes:

- Through ultrasonic spot welding of head caps 3 to the extruded tube 7; in this case there must be provided a (not shown) gasket, or some silicone, in order to ensure the desired IP protection. In this case, the spot welding can be performed with one or two spots.
- Through a continuous ultrasonic welding of the head caps 3 to the extruded tube 7, ensuring a continuity of material capable of ensuring the desired IP protection. In this case, gasket or silicone can be omitted.

[0059] Moreover, the head cap 3 performs an anti-extraction and anti-rotation function with respect to power cable 2.

[0060] In particular, inside said head cap 3 there is provided a cable retainer 13, which works as a guillotine, ensuring a sturdy connection of said cable 2 to lamp 1, simplifying its mounting.

[0061] Said cable retainer 13 has a substantially U-shaped transversal section. The two arms of said U are stretchable apart under pressure, so that cable 2 can be placed between said two arms 14. The pressure applied by said two arms, once the cable is inserted, is sufficient to ensure that said cable cannot pivot around its longitudinal axis.

[0062] Figures 4a, 4b show details of the mounting of said cable retainer 13. The power cable 2, which as above stated comprises two or three power wires, is inserted inside said head cap 3. Figure 4a shows the option with two power wires. Once said wires have been inserted, said cable retainer 13 is pressure-inserted into a suitable split provided in said head cap 3, retaining said power cable 2 so that it can neither be extracted nor pivot. The cable 2 is integrally retained in its seat, ensuring sturdiness to lamp 1 once its mounting is completed.

[0063] In combination with the cable retainer, or integrated in the structure of the cable retainer, there can be provided means for sealing the passage of said cable, so that even the passage of the cable inside its respective head cap is waterproof.

[0064] The rigid profile is optional and can be mounted

when the mechanical structure of said lamp needs be strengthened. Preferably is made of aluminium, even if other materials can be used too, both metallic and plastic materials. It is inserted and slid on said extruded tube 7.

[0065] As stated above, said clip 5 is optional, and can be inserted both directly on the extruded tube 7 and on said profile 8. Said clip 5, which can be slid on said extruded tube 7 and/or on the profile 8 with the aim of positioning it as desired, is particularly useful with the increase in length of lamp 1. E.g., when lamp 1 is 1 metre or more long, two clips 5 can be mounted at its ends, and one clip 5 can be mounted approximately in the middle of lamp body 4, so as to avoid that lamp 1 flexes, distorting under the action of the force of gravity, once it is fastened in place.

[0066] From all said above, it is apparent that there are provided sundry embodiments of said lamp 1, which is modular.

[0067] In a first, simplest embodiment, lamp 1 comprises:

- An extruded tube 7;
- An electronic board 10 or 11;
- Two head caps 3, one of which comprises a cable retainer 13;
- A power supply 2.

[0068] In a more complex, second embodiment, said lamp 1 comprises:

- An extruded tube 7;
- An electronic board 10 or 11;
- A PCB 9 provided with a sensor and/or a beacon and connected in series to said electronic board 10 or 11;
- Two head caps 3, one of which comprises a cable retainer 13;
- A supply cable 2.

[0069] In a third, even more complex embodiment, said lamp 1 comprises:

- An extruded tube 7;
- An electronic board 10 or 11;
- Optionally a PCB 9 provided with a sensor and/or a beacon and connected in series to said electronic board 10 or 11;
- Two head caps 3, one of which comprises a cable retainer 13;
- A power cable 2;
- Optionally a profile 8, made preferably of aluminium, or however of a rigid material in order to improve the mechanical rigidity of lamp 1;
- Optionally, at least a clip 5.

[0070] Lamp 1 allows an extremely easy and rapid mounting and production. The mounting method comprises the following steps:

- a) Definition of lamp length and cutting to size of a segment of extruded tube 7 according to said length;
- b) Definition of the length of an electronic board 10 or 11 commensurate to the length of the extruded tube, and production of said electronic board 10 or 11;
- c) Insertion of the electronic board 10 or 11 sliding it inside said extruded tube 7;
- d) Soldering said power cable 2 to the electronic board 10 or 11;
- e) Positioning and ultrasonic welding of the two head caps 3 to said lamp body 4;
- f) Positioning of said cable retainer 13;
- g) Optional mounting at least one clip (5) on the tube (7) alternatively by transverse pressing it against the tube (7) or by sliding axially at least one clip (5) before positioning at least the second head cap (3) on the tube (7).

[0071] Optionally a further mounting step can be added:

- c1) insertion into said extruded tube 7 of a PCB 9 and electrical connection in series with said electronic board 10 or 11.

[0072] Optionally, further mounting steps can be added:

- h) Optional definition of the length of a segment of rigid profile 8 commensurate to the length of said extruded tube 7 and cut to size of the segment of said length from an extruded profile;
- i) Optional insertion of a rigid profile 8 sliding it on said extruded tube 7 before carrying out step g);
- j) Carrying out step g) by mounting the at least one clip on the profile (8), alternatively by transverse pressing it against the profile (8) or by sliding axially at least one clip (5) before positioning at least the second head cap (3) on the tube (7).

[0073] According to a further embodiment, even the electronic boards 10 and 11 on which LEDs are mounted can be produced so that from an electronic board of a given length, segments of electronic board are cut applying in and out ends to their opposed extremities.

[0074] In a particular embodiment, analogously to the connection in series of said PCB to said electronic board 10 or 11, there are provided a number of different electronic boards having different lengths, each comprising at its ends electric and mechanical connectors to a successive board (analogous to the connectors between PCB 9 and electronic board 10 or 11 of the preceding example). Said electronic boards of different lengths can be combined with each other and connected in series so as to obtain electronic boards of longer different lengths.

1 LED lamp

2	Power cable
3	Head caps
4	Lamp body
5	Clip
6	Screw
7	Extruded tube
8	Rigid profile
9	PCB
10	Electronic board
11	Electronic board
12	LED
13	Cable retainer
14	Clip arms
15	Power wires
30	Lower portion of the extruded tube
31	Top section of the extruded tube
32	Internal grooves
33	External protrusion
34	Upper internal protrusion
35	Lower internal protrusion
105	Base of the clip
107	Rear wall of the tube
108	Base of the profile
208	Lateral wall
305	Wings
307	Lateral wall
308	Groove
405	Clamping claw
407	Step
508	Longitudinal wall

Claims

1. Modular lamp (1) comprising:

- A hollow extruded tube (7) of a pre-defined length of a material transparent at least for a portion of the wall of said tube (7), housing
- An electronic board (10 or 11) on which a plurality of LEDs (12) is mounted;
- Two head caps (3);
- A power cable (2);

characterized in that

- Said extruded tube (7) has its external wall impenetrable to liquids, and the two head caps (3) are fixed so as to close in a waterproof way said two ends of said extruded tube (7) through ultrasonic welding;
- A rigid covering profile (8) of opaque material having a channel-like cross section being provided, the said rigid covering profile having clamping means cooperating with clamping seats at opposite sides of the said tube (7) and covering the said tube (7) for a certain portion of its cross section,

- Optionally at least a clip (5), optionally provided with a screw (6) for the permanent fastening of said lamp to a support, or wherein said clip (5) is produced in the form of a magnet for a removable fastening to a ferromagnetic support;
- The said clip having opposite lateral wings provided with clamping means cooperating with clamping seats on opposite sides of the tube (7) in absence of the covering profile (8) on the said tube (7);
- The said clamping means of the clip cooperating also with engaging means on opposite sides of the covering profile (8) optionally mounted on the said tube (7).

2. Modular lamp (1) according to claim 1, wherein the lateral wings (305) of the clip (5) open out elastically.

3. Modular lamp (1) according to claim 1 or 2, wherein the clamping seat on the tube (7) for the clamping means on the covering profile (8) are the same one for the clamping means on the clip (5).

4. Modular lamp (1) according to one or more of the preceding claims, wherein the clip (5) and the covering profile (8) have a channel-like cross section with a base wall (105, 108) covering a rear wall (107) of the tube (7) and with opposed lateral walls (305, 208) covering partially the lateral walls (307) of the tube (7) and the lateral protrusions (33) on the said lateral walls (307) with clamping means (405, 508) engaging the said protrusions (33).

5. Modular lamp (1) according to one or more of the preceding claims, further comprising inside said extruded tube (7) a PCB (9) on which a sensor and/or a beacon are mounted, said PCB (9) being mounted and connected in series with respect to said electronic board (10 or 11).

6. Modular lamp (1) according to one or more of the preceding claims, wherein inside one of said head caps (3) there is provided a cable retainer (13) working as a guillotine, blocking said power cable (2) and hindering its rotation, the passage of said cable inside said head cap being sealed in a waterproof way.

7. Modular lamp (1) according one or more of the preceding claims, wherein on said electronic board (11) there are mounted a plurality of LEDs emitting radiations of different wavelengths and/or different colour temperature; preferably, said lamp comprises a PCB (9) to control the emitted wavelengths and/or colour temperature.

8. Modular lamp (1) according one or more of the preceding claims, wherein head caps (3) can be connected to said extruded tube (7) in two distinct

modes:

- Through ultrasonic spot welding of head caps (3) to the extruded tube (7) in combination with a gasket or some silicone;
- Through a continuous ultrasonic welding of the head caps (3) to the extruded tube (7), ensuring a continuity of material.

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lighting, the lighting of goods placed on sale shelving, e.g. fruit and vegetable shelving, refrigerated shelving, indoor plant growing (microgreen) or in plant growing in greenhouses.

9. Method for assembling said lamp (1) according to one or more of the claims 1 to 8, comprising the following steps: 10

- a) Definition of lamp length, and cutting to size of a segment of extruded tube (7) according to said length; 15
- b) Definition of the length of an electronic board 10 or 11 commensurate to the length of the extruded tube, and production of said electronic board 10 or 11; 20
- c) Insertion of said electronic board (10 or 11) sliding it inside said hollow extruded tube (7);
- d) Soldering of said power cable (2) to said electronic board (10 or 11);
- e) Positioning and ultrasonic welding of said two head caps (3); 25
- f) Positioning of said cable retainer (13)
- g) Optional mounting at least one clip (5) on the tube (7) alternatively by transverse pressing it against the tube (7) or by sliding axially at least one clip (5) before positioning at least the second head cap (3) on the tube (7). 30

10. Method for assembling said lamp (1) according to claim 9, comprising a further step: 35

- c1) insertion into said extruded tube (7) of said PCB (9) and power connection in series with said electronic board (10 or 11).

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11. Method for assembling said lamp (1) according to claim 9 or 10, further comprising the steps:

- h) Definition of the length of a segment of a rigid profile (8) commensurate to the length of the extruded tube (7), and cutting to size of the segment according to said length from an extruded rigid profile; 45
- i) Insertion of said rigid profile (8) sliding it on said extruded tube (7) before carrying out step g); 50
- j) Carrying out step g) by mounting the at least one clip on the profile (8), alternatively by transverse pressing it against the profile (8) or by sliding axially at least one clip (5) before positioning at least the second head cap (3) on the tube (7). 55

12. Use of lamp (1) according to claims 1 to 8 for ambient

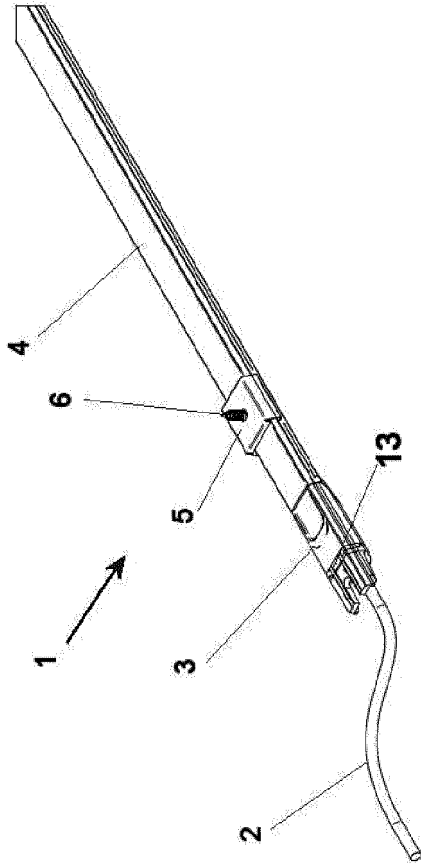


FIG. 1b

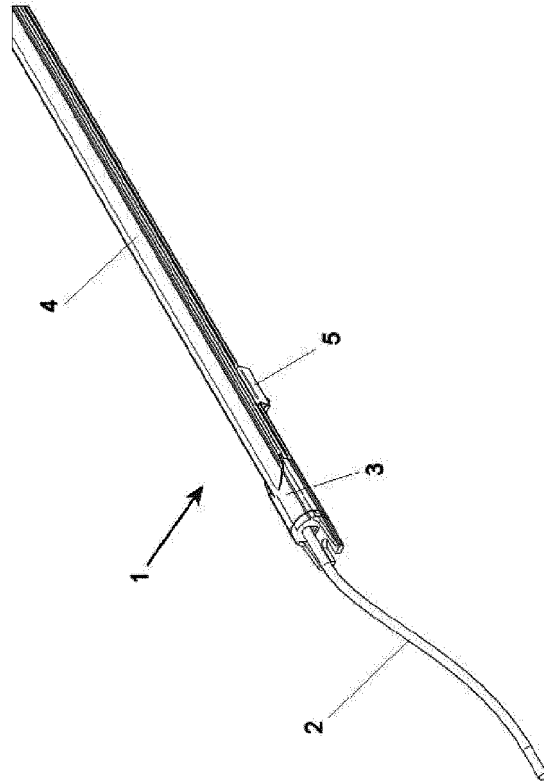


FIG. 1a

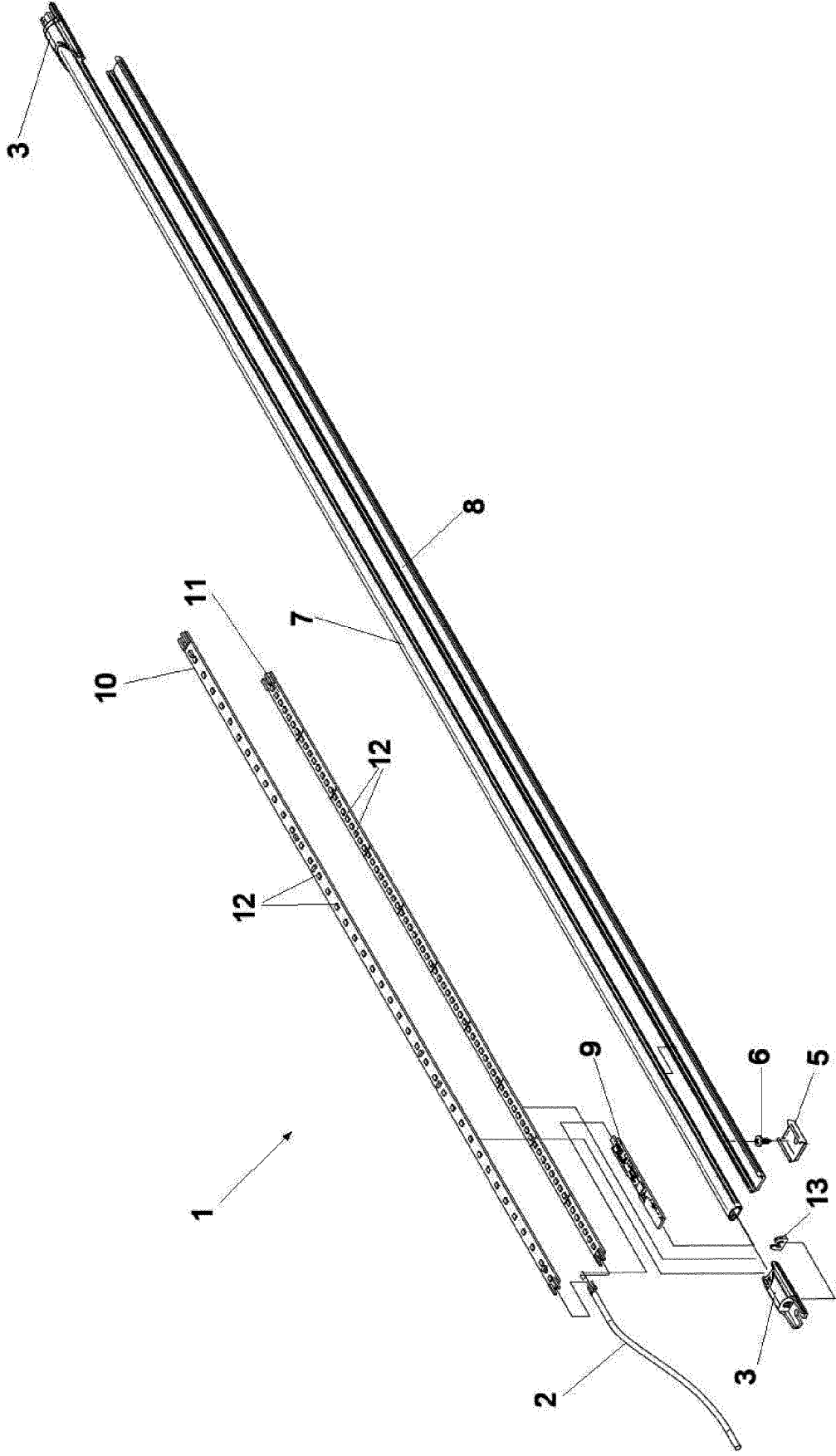


FIG. 2

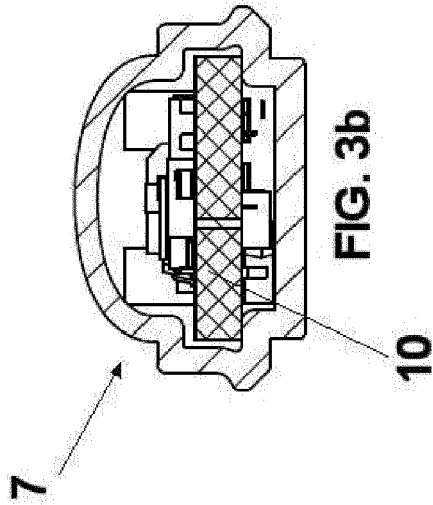


FIG. 3b

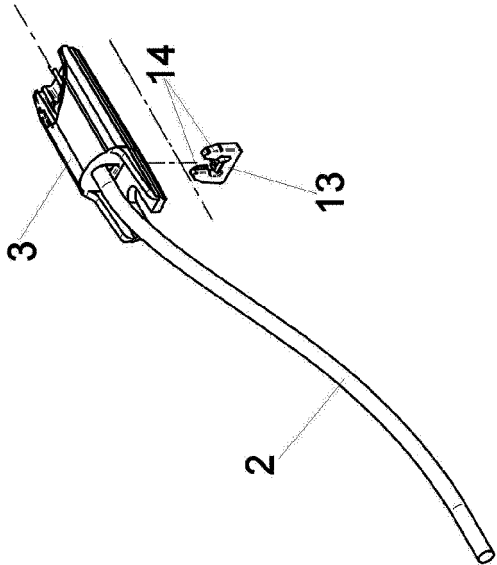


FIG. 4b

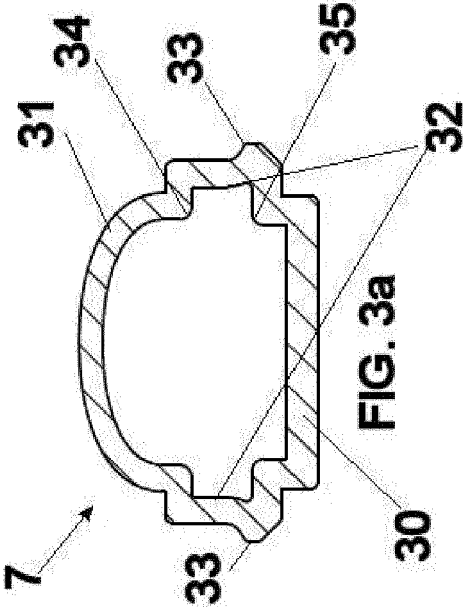


FIG. 3a

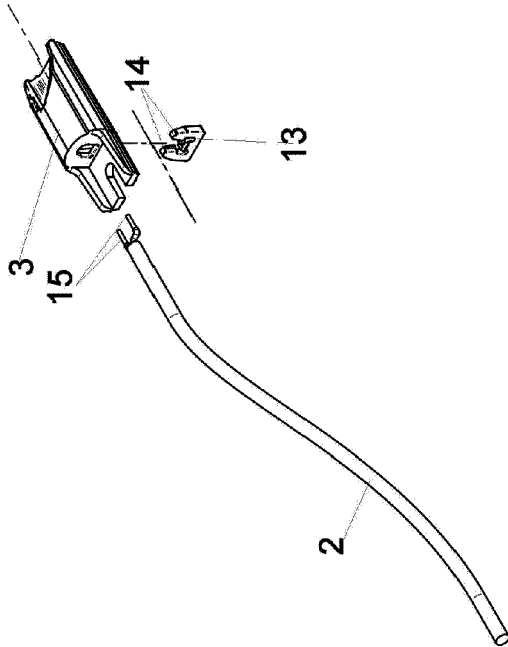


FIG. 4a

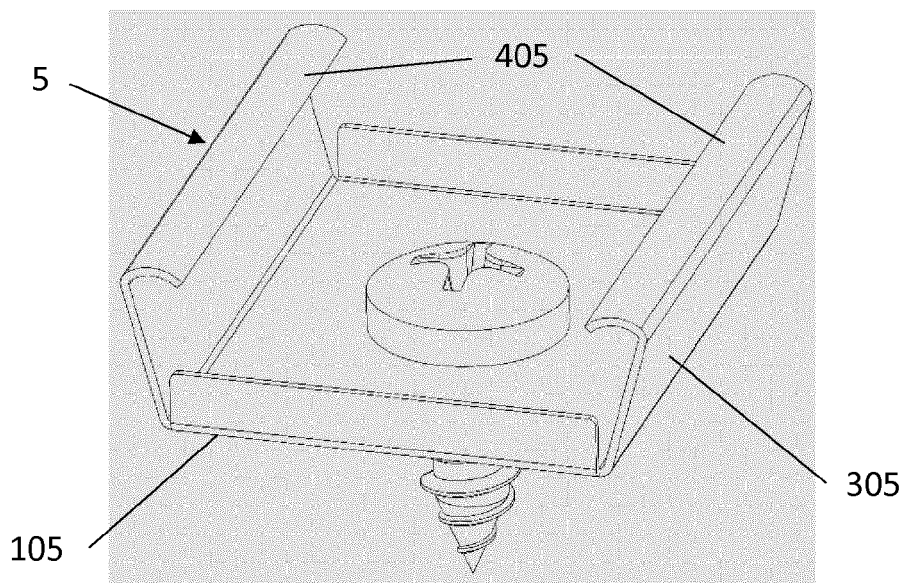


FIG. 5

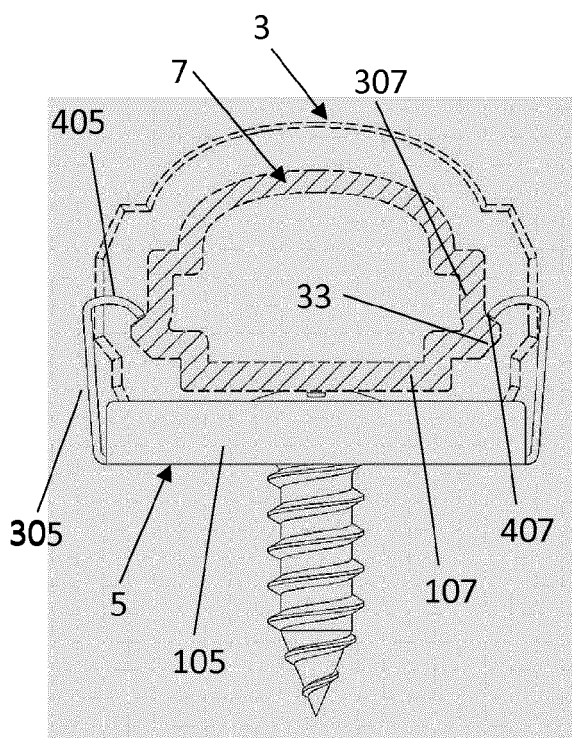


FIG. 6

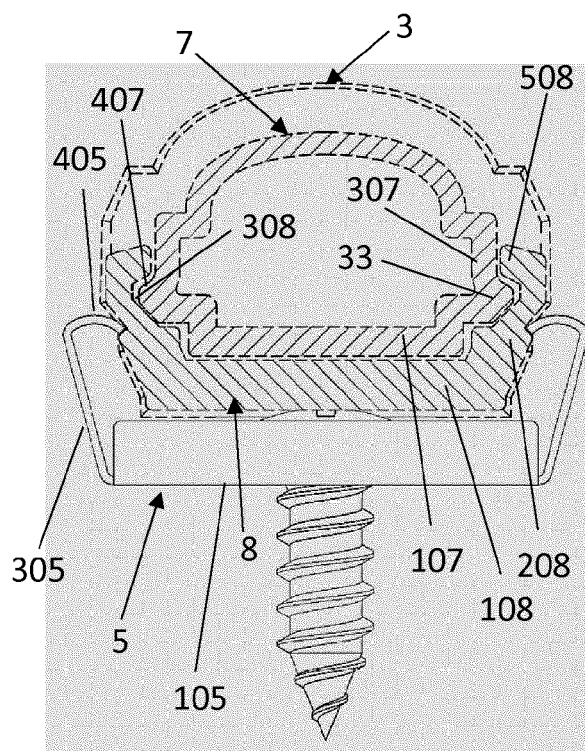


FIG. 7



EUROPEAN SEARCH REPORT

 Application Number
 EP 18 19 2963

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2012/120653 A1 (PECK JOHN PATRICK [US] ET AL) 17 May 2012 (2012-05-17) * paragraphs [0002], [0026], [0030] - [0061]; figures 1,14 *	1-10,12	INV. F21V31/00 F21V15/01 F21V15/015 F21S4/28 F21V21/088
X	US 2009/200966 A1 (WHITEHOUSE DOUGLAS BRUCE [CA] ET AL) 13 August 2009 (2009-08-13) * paragraphs [0068], [0073], [0074]; figures 7,12,13 *	1,7,9,12	
X	DE 10 2016 104084 A1 (INSTA GMBH [DE]) 7 September 2017 (2017-09-07) * paragraph [0015]; figure 4 *	1,9,12	
A	DE 203 19 586 U1 (MUELLER MANFRED [DE]) 15 April 2004 (2004-04-15) * figures 7,8 *	1,2,4,9	
A	US 2015/070884 A1 (WU LAI-FU [TW]) 12 March 2015 (2015-03-12) * paragraphs [0031] - [0033]; figure 1 *	1,5,9-11	TECHNICAL FIELDS SEARCHED (IPC)
A	EP 2 827 051 A1 (RID1 LEUCHTEN GMBH [DE]) 21 January 2015 (2015-01-21) * paragraphs [0036], [0037], [0040]; figures 1,4,10 *	1,6,9,12	F21V F21S F21Y
A	EP 2 430 357 A1 (SLOAN CO INC DBA SLOANLED [US]) 21 March 2012 (2012-03-21) * paragraphs [0035], [0036], [0058] *	1-4,7,9,12	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 24 January 2019	Examiner Krikorian, Olivier
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

 1
 EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 19 2963

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012120653 A1	17-05-2012	CA 2840789 A1	10-01-2013
		EP 2729732 A1	14-05-2014
		US 2012120653 A1	17-05-2012
		WO 2013006614 A1	10-01-2013
US 2009200966 A1	13-08-2009	NONE	
DE 102016104084 A1	07-09-2017	DE 102016104084 A1	07-09-2017
		EP 3217067 A1	13-09-2017
		ES 2693601 T3	12-12-2018
DE 20319586 U1	15-04-2004	NONE	
US 2015070884 A1	12-03-2015	NONE	
EP 2827051 A1	21-01-2015	DE 102013213770 A1	15-01-2015
		EP 2827051 A1	21-01-2015
		PL 2827051 T3	31-01-2017
EP 2430357 A1	21-03-2012	CN 101886782 A	17-11-2010
		CN 105674066 A	15-06-2016
		DE 102010018018 A1	25-11-2010
		EP 2430357 A1	21-03-2012
		MY 156608 A	15-03-2016
		US 2010238655 A1	23-09-2010
		US 2012140459 A1	07-06-2012
		WO 2010132078 A1	18-11-2010

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- IT 202017000066916 [0004]
- IT 102015000074947 [0006]
- IT 102015000074960 [0006]