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(54) REDEVELOPMENT SYSTEM OF INTELLIGENT STREET LAMPS

(57) The general field of application of this invention is in the sector of infrastructure adaptation, to support the transition towards the progressive computerization of urban environments, in line with the evolutionary scenarios typically identified with the expression "Smart City".

The redevelopment system of street lamps for the adaptation of public lighting systems, to support the development of "Smart City" applications, and implemented according to the teachings of the invention, is suitable for practically any type of street lamp, and transforms it into a real "intelligent lamp post", suitable for creating a site to host the nodes of a network of "Smart Objects" of a "Smart City", even in a scenario where computerization is particularly intense.

Said redevelopment system is a modular system that can be expanded over time if necessary, and is adaptable to almost all cases that can be imagined today; as it allows it to be integrated into any support structure of a street lamp for public lighting, obtaining a compartment designed to house, power and connect any generic "Smart Object".

It therefore offers a particularly satisfactory solution to the problem of creating an infrastructure able to support even very unpredictable and contingent evolutions.

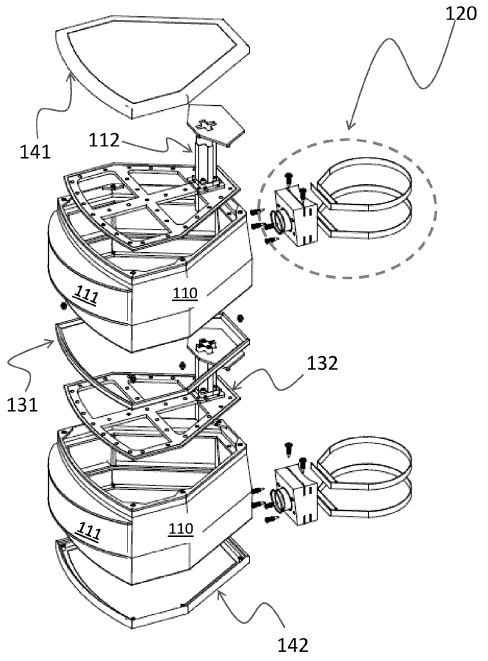

Fig. 1

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Description

Technical Field of the Invention

[0001] The general field of application of this invention is in the sector of infrastructure adaptation, to support the transition towards the progressive computerization of urban environments, in line with the evolutionary scenarios typically identified with the expression "Smart City".

State of the Art

[0002] According to the most accredited visions concerning the evolution of the cities of the future, it is reasonable to expect that urban environments will become highly computerized environments.

[0003] A computerized environment is an environment in which there are numerous sensors, i.e., devices capable of acquiring environmental information of all kinds, in order to reconstruct a computerized representation of the environment itself, in a manner that is as comprehensive as possible.

[0004] Therefore, it is reasonable to expect that cities will increasingly be required to find sites where to install sensors of various types: temperature, air composition, acoustic noise, etc.

[0005] Furthermore, these sites must be connected to a telecommunications network, in order to transfer the acquired data to a special control center, or even to be interconnected each other.

[0006] Finally, it would be desirable that these sites can also accommodate any actuation devices, or devices that, if necessary, carry out some action: for example, the activation of an alarm siren, or the switching on of some light signals, or other actions of this type.

[0007] We do not dwell further on the various sensor, actuation and communication performances, because these are performances destined to evolve and change rapidly.

[0008] Furthermore, the evolutionary scenarios of the so-called "Smart Cities", on the one hand are intended as inevitable scenarios, but on the other hand they are still scenarios that include a certain number of suggestions that are only partially defined; some of which are also unrealistic, if only from the point of view of economic feasibility.

[0009] It is therefore unrealistic to try to define a stable scenario on which to base the problem of implementing the infrastructural assumptions of a "Smart City"; rather, it is convenient to offer open and reconfigurable solutions that generically allow the widespread installation, in urban environments, of sensors, actuator devices and telecommunication terminals, i.e., all those devices, which are referred to with the expression "Smart Objects" (now acquired in international jargon), which will also be used below, in this description, with great frequency.

[0010] In particular, it is certainly advisable to provide installations that allow to place a large number of sensors scattered throughout the cities; in fact, a widespread and numerically consistent sensor park is certainly an essential prerequisite for realizing the concept of "Smart City", given that no computerized initiative can be put into practice except in an environment for which an IT representation as detailed as possible is available.

[0011] Among the sites most suited to the installation of so-called "Smart Objects" in a "Smart City", there are street lamps for public lighting.

[0012] In fact, street lamps are widespread almost everywhere, offering the possibility of supporting small devices such as "Smart Objects" at different heights, and they are reached by the power supply.

[0013] Therefore, it is not surprising that, especially in recent times, lamp posts have been designed (and invented) to illuminate a "Smart City", that is an intelligent city, characterized by a significant presence of technological systems, i.e.; they are designed to function optimally with respect to contingent environmental situation, which must therefore be detected, analyzed, and appropriately managed.

[0014] Among the many solutions proposed, some of them are mentioned below, without claiming to be exhaustive with respect to the breadth of the topic, but essentially by way of example, and only to outline the conceptual lines of development of the known art.

[0015] WO 2021120571 (A1) ["5G Communication module-based intelligent street light" - Chen Yong et al. - June, 24th, 2021] discloses an "intelligent street lamp" which, among other things, also partly uses solar energy to feed itself, and which is designed to house various types of devices, including a small server capable of executing control programs for all the components integrated into the lamp itself. This "intelligent street lamp" is also equipped with communication systems that allow it to be connected with other devices installed remotely, as well as with a control center.

[0016] The particular conformation of the support structure of the street lamp, allows to obtain a room inside it, suitable for installing a good number of electronic devices (therefore in such a way that the components installed there are substantially invisible) that are used in the "Smart City".

[0017] WO 2021109604 (A1) ["Smart City Lighting Device" - Wang Renyin et al. - June, 10th, 2021] indicates another street lamp for "Smart City", similar to the one indicated in the previous patent application, in which particular attention is paid to energy aspects, proposing some optimizations relating to the production of photovoltaic energy and to the lighting regulation.

[0018] Also in this case, the street lamp is in fact a site designed to host the installation of various "Smart Objects".

[0019] CN 2113146337 (U) ["Street lamp for smart city" - Wang Xiaoxia - 7 July, 7th,2021] is patent application for utility model, it describes a further form of structure of a street lamp that allows, among other things, also to

adjust the physical position of the actual lighting bodies.

[0020] Ultimately, it can be said that the street lamps installed in urban environments to provide for the public lighting, considering them as a whole system, can not only be managed in an intelligent way, in order to improve lighting by optimizing consumption, but they also constitute an ideal place for housing a multitude of sensor and actuator devices, as well as communication terminals, eventually constituting the nodes of a real network of "Smart Objects".

[0021] The known art has certainly implemented this potential multifunctional use constituted by the public lighting network, so that it proposes new-concept street lamp, which illuminate in an optimized way (according to the most varied criteria that depend from case to case) and at the same time constitute physical nodes of the networks of "Smart Objects" that will characterize the "Smart Cities" of the near future.

[0022] However, many public lighting systems, which are currently present in many urban centers, are relatively new, but they are not designed to be multifunctional street lamps (or "smart lamps") like those that would be used to implement the applications of a "Smart City".

[0023] In fact, the technological discontinuity introduced by LED (Light Emitting Diode) lighting, which, compared to the previously used technologies, improves the lighting effect and considerably reduces consumption, has determined, a widespread renewal of the public lighting, especially in the last ten years. Among the various reasons that favored the technological change of a large number of street lamps, it must certainly be considered that the investments were essentially paid for with savings in electricity consumption. Unfortunately, almost all of the new public lighting systems are made with poles that have the sole functional purpose of supporting the lighting bodies that are located on their top, and their power supply is remotely controlled, so that, when the lines that feeds these lamps are powered, they turn on and, when instead they are not powered, the lamps are not only off, but also are absolutely not powered, so that they obviously cannot supply power to other devices.

[0024] Ultimately, it can be concluded that a large number of street lamps that make up the public lighting systems of many urban centers are not suitable for use as nodes of the "Smart Object" networks that would serve to implement the applications envisaged in the "Smart City ". At the same time, they are quite new street lamps, in excellent condition, so it is not even advisable to arrange their early dismissal. So, this situation risks constituting a significant brake on the rapid development of "Smart Cities", having to plan the dislocation of the network of "Smart Objects" in a much more inconvenient and complex way.

Purpose of the invention and summary thereof

[0025] The general purpose of the present invention is to indicate a system for the adaptation of existing public lighting systems, characterized by street lamps whose support structures (which are substantially poles) do not have spaces for the installation of other devices, even if these last are small; and the power supply is present only when the street lamps are on. The desired adaptation provides for a redevelopment of the street lamps, which transforms them into "intelligent street lamps", and which allows them to be used as sites to install the various "Smart Objects" that enable the dissemination of typical applications of a "Smart City".

[0026] Therefore, this system for the adaptation of existing public lighting systems must have some essential characteristics, certainly including that of providing a suitable compartment to accommodate all the "Smart Objects" that may reasonably have to be installed in an urban site like a street lamp for public lighting.

[0027] In general, it is desirable that this space can also be expanded over time, to accommodate needs that may change, given that, as mentioned, the very concept of "Smart City" is a concept subject to continuous updates.

[0028] Furthermore, said system for the adaptation of existing public lighting systems must allow to adequately manage the power supply required by the "Smart Objects", taking into account that, as a rule, the street lamps are powered just when they are on, unless to foresee an invasive intervention for modifying the existing lighting control logics.

[0029] Finally, said system for the adaptation of existing public lighting systems must take into account the need to be adaptable to any street lamp, and must be prepared for an absolutely simple installation, ensuring an aesthetically decent result in every situation.

[0030] The simplicity of installation, and the universality of application, are important objectives for assuming the realistic spread of the system itself: in particular, the proposed system must be a system that can be adapted to all contexts and to all needs. In fact, if the costs and complexity of installation were to be significant, or if the aesthetic result was messy, or perceived as a temporary solution, the option of waiting for the opportunity to completely replace the street lamps, with new concept lamps, from the beginning designed to be a node of a network of "Smart Objects", it would be a preferable option in many cases.

[0031] Therefore, all those technical measures that aim to propose a decent and aesthetically pleasing system and, at the same time, absolutely banal installation must not be neglected.

[0032] The aims set for this invention are achieved by means of a system, or kit, for the redevelopment of a street lamp for public lighting which includes at least:

✓ one or more boxed elements, which have the following characteristics:

- they are open both at the top and at the bottom,
- they are shaped to be stacked one on top of the

other,

- the conformations of the edge of the upper opening and of the edge of the lower opening are substantially the same, so that, when stacked one on top of the other, said boxed elements form a larger compound boxed element,
- they are designed to be hooked to the support structure of a street lamp by means of a hooking subsystem, in turn included in said boxed elements;
- the area of the side wall of said boxed elements where they are coupled to said hooking subsystem has a suitable hole to allow power cables coming from the public lighting system to enter the boxed element,
- inside said boxed elements there are vertical conducting elements which go from the lower opening to the upper one, so that, when two or more boxed elements are stacked one on top of the other, a continuous conductive line that crosses the entire compound box element is formed;

✓ a bottom cover shaped to close the lower opening of the boxed element which is located further down;
✓ a top cover shaped to close the upper opening of the boxed element that is higher up.

[0033] The main advantage of the present invention consists in the fact that its teachings appear essential to redevelop a normal street lamp for public lighting and transform it into an "intelligent street lamp".

[0034] Furthermore, this transformation can be carried out without having to implement invasive or complex interventions on the existing street lamps, obtaining a more than decent result also from an aesthetic point of view.

[0035] This invention also has further advantages, which will become more evident from the following description, from an example of embodiment which illustrates further details, from the attached claims which form an integral part of the present description, and from the attached figures in which:

- Figure 1 shows an overall representation of an implementation form of the present invention, in which we see the various parts that must be assembled to create the modular system of adaptation and redevelopment of the street lamps;
- Figure 2 shows a detail of a boxed element, seen from below, according to an embodiment of the present invention;
- Figure 3 shows the hooking subsystem of a boxed element, according to an embodiment of the present invention.

Detailed description and variants thereof

[0036] In Figure 1, the number 100 indicates, as a whole, a modular system for the adaptation of public lighting systems according to the invention, wherein the various pieces that compose it are shown detached from each other. for greater clarity. The number 110 indicates two boxed elements, internally empty, and therefore designed to house electronic devices, which, generally, are the so-called "Smart Objects" necessary to implement the IT applications that will characterize the "Smart Cities" of the future.

[0037] A first important characteristic of said boxed elements 110 is that they are open both above and below, in fact they essentially consist of a side wall and have neither a bottom nor a lid.

[0038] Furthermore, the edges of the upper and lower opening are substantially of the same shape, so that when a pair of equal boxed elements 110 are stacked on top of each other, the edge of the upper opening of the boxed element 110 that lies below mates perfectly with the edge of the lower opening of the boxed element 110 which is located above, thus giving shape to a larger boxed element whose capacity is substantially given by the sum of the capacities of the two stacked boxed elements.

[0039] By stacking a greater number of boxed elements 110 it is possible to obtain an increasingly larger compartment to house larger "Smart Objects", or more in number, so as to satisfy almost every installation need.

[0040] A second characteristic of said boxed elements 110 is that they are arranged to be hooked to a support structure of a street lamp for public lighting. In the most typical case, they are designed to be hooked to a light pole. The coupling subsystem is indicated in Figure 1 with the number 120 and, as it will be better explained later, said coupling subsystem is designed to be able to be coupled to the almost total variety of light poles actually present.

[0041] In the area of the side wall of said boxed elements 110 which, when the adaptation system 100 is installed, faces the light pole (or, in general, the support structure of the street lamp), there is a hole designed to allow entry inside the boxed body 110 of the power cables coming from the public lighting system.

[0042] A third characteristic of said boxed elements 110 is that they, again in the area where said hole arranged to allow said power cables to enter inside the boxed body 110, i.e., in the area closest to the light pole, also have a vertical conducting element, indicated in Figure 1 with the number 112, composed of at least two conducting elements isolated from each other that can be kept at a different electrical voltage, so as to supply power to the components housed inside the boxed element.

[0043] Furthermore, the conformation and positioning of said vertical conducting element are such that, when two or more boxed elements 110 are coupled one on top of the other, said conductive elements 112 of said two or more coupled boxed elements 110 form an electrical contact with each other thus to compose a continuous con-

ductive line that runs vertically throughout the internal space, obtained by coupling said two or more boxed elements 110. In fact, said vertical conducting element 112, which in Figure 1 is shown detached from the boxed element 110 just to make it more clearly visible, is of sufficient length to completely cross the entire height of each single boxed element 110.

[0044] A fourth characteristic of said boxed elements 110 is that they, in the area opposite to the hooking area, have a protuberance, indicated in figure 1 with the number 111.

[0045] Said protuberance 111 allows to obtain holes, or slits, for the passage of air between the inside and the outside of each boxed element 110, it being possible that these slits face downwards even when a boxed element is coupled with another equal boxed element located under it (this is possible precisely because said slits can be made in the lower part of the protuberance 111).

[0046] It is noted that it is quite important that the slits face downwards, so as to almost completely avoid the ingress of moisture through them, even in the event of rain.

[0047] In addition, said protuberance 110 offers the space to house, if necessary, also a fan that can be activated to induce forced ventilation both at the inlet and outlet.

[0048] It is noted that the ventilation of the internal part of said boxed bodies is functional both for the cooling of the components and for the operation of air quality sensors.

[0049] In preferred implementation forms, the coupling between pairs of stacked boxed elements 110 involves the interposition of a gasket, indicated in Figure 1 with the number 131, and which allows to ensure an optimal and well-sealed coupling. In addition to said gasket 131, sometimes, a further separation element may be positioned between two coupled boxed bodies, indicated in Figure 1 with the number 132. In one of the preferred embodiments, said separation element 132 is accommodated in a suitable seat accessible from the upper opening of the boxed element 110, and acts as a support base for components housed inside the boxed element 110, and, eventually inside the one above it; given that, depending on the implementation forms, the support seat of said separation element 132, can be placed at various heights of the boxed element 110.

[0050] The use of these separating elements 132, possibly removable, is very practical because it allows you to neatly place all the "Smart Objects" in the same site, arranging them vertically, keeping them well separated, and without stacking one on top of the other.

[0051] The overall redevelopment system 100 must then be completed with closing covers for the bottom and top.

[0052] Since the lower and upper openings of the boxed bodies 110 have the same shape, it is possible to conceive an embodiment of the invention in which the lower cover, indicated in Figure 1 with the number 142, and the upper cover, indicated in Figure 1 with the number 141, they are the same. This form of implementation has the advantage of providing a system in which the types of pieces (which are typically produced with molds) are minimized, being provided, in this case, a single lid that can be used both as an upper lid 141 and as a bottom lid 142.

[0053] However, a preferable form of implementation can be indicated, in which the two lids are different: the bottom lid 142 has holes, or slits, benefiting from the fact that, when mounted, it faces downwards, while the top lid it incorporates a flat metallic element suitably shaped to act as an antenna for a mobile radio telecommunications terminal.

[0054] In fact, it is observed that, typically, a mobile radio terminal is housed inside the boxed element placed higher, given that the communication functionality is substantially essential in any "Smart Object" network; while a power subsystem equipped with a rechargeable battery is housed inside the lower boxed element, given that the power subsystem is a subsystem which, however efficient it may be, it must still dissipate heat.

[0055] The use of a battery is required in all cases where the lamp to which the adaptation system 100 according to the invention is applied is powered only when the lamp is on. In this case, when the power supply is present (i.e., when the street lamp is on) it is essential to accumulate the energy necessary for the operation of all the "Smart Objects" even when the public lighting system does not provide power.

[0056] Again, with reference to the issue of power supply, it is noted that the presence of a continuous conductive line, which is composed automatically by coupling the various boxed elements 110, can be used to power all the "Smart Objects" in parallel, as well as one or more telecommunication terminals. In fact, said power line can be kept live by a single power supply system, positioned inside the lower boxed element (i.e., the one in which it is easier to dispose of the heat).

[0057] As the position of the power supply subsystem finds its preferred location inside the boxed element 110 which is located further down, the telecommunication terminal (or terminals, if the network architecture of the "Smart Objects" requires more than one) finds its preferred location inside the boxed element 110 which is located higher up. In fact, in this position the terminal can be connected with very short cables to an antenna integrated in the top cover 141; since the top cover 141 is generally wider than a normal mobile radio terminal, an antenna with particularly good performance can be integrated into it; especially since in this position it should not even have particular shielding obstacles.

[0058] Finally, it is observed that the composite vertical conductor element, which is automatically composed when the boxed elements 110 are stacked, in addition to the basic function of distributing the electrical power supply, can also implement a data line on a fast bus, obviously providing for the composition of other conduc-

tive lines isolated from each other (in this regard there are several standards to implement said data bus).

[0059] Thanks to these expedients on the shape of the boxed elements 110 and on the contacts, which are formed automatically when they are stacked, the compartment that is created using the teachings of the present invention, not only offers a housing of adequate and extensible dimensions to install a number, also significant, of "Smart Object", but also provides the power supply, data connectivity, and ventilation for all the "Smart Objects" installed on the site.

[0060] Figure 2 shows the detail of a boxed element 110 seen from below. From this view it is possible to appreciate the ventilation holes which are made in the downward-facing part of the protuberance 111. You can also see a separation element 132 positioned inside the boxed element 110 in an intermediate position between the lower and upper opening of the boxed element 110.

[0061] Finally, the ease of installation of the adaptation and redevelopment system 100 of the street lamps according to the invention also deserves to be emphasized. In Figure 3, a very practical form of implementation for a boxed element hooking subsystem 110 is shown.

[0062] According to this embodiment, the boxed elements 110 are equipped with a coupling subsystem which include a coupling block, indicated with the number 121, fixed to the side wall of each boxed element 110.

[0063] Said coupling blocks 121 are fixed to the boxed element 110 in various ways; for example, with screws, or with joints, or with both techniques, or they can also be fixed with permanent fixing techniques. In turn, said coupling block 121 is connected to flexible bands, indicated in Figure 3 with the number 122, which allow it to be securely tied to any pole.

[0064] Said coupling block 121, when the boxed element 110 is hooked to the support structure of a street lamp, it is then interposed between the actual body of the boxed element 110 and the supporting structure of the lamppost to which it is attached. To allow the possible passage of power cables coming from the structure to which it is coupled, also said coupling block 121 has a hole, through which these cables can penetrate inside the boxed element 110; evidently this hole being aligned with the hole present on the side wall of the boxed element 110.

[0065] It is also noted that the face of the coupling block that must come into contact with the pole can be made of deformable materials, so as to allow perfect coupling with any curvature of the surface on which they are placed.

[0066] In this way, the coupling subsystem 120 can be made practically universal, being able to couple it to poles of any shape and thickness, since also the bands 122 are obviously flexible and can be adapted to any pole.

Concluding remarks

[0067] In conclusion, a redevelopment system 100 of street lamps for the adaptation of public lighting systems in order to support the massive development of "Smart City" applications, and implemented according to the teachings of the invention, is suitable for practically any type of street lamp; and it is able to transform any street lamp into a real "smart lamp", suitable for creating a site able to host the nodes of a network of "Smart Objects" for a "Smart City", even in a scenario where computerization is particularly intense.

[0068] Said redevelopment system 100 is particularly adaptable to almost all cases that can be imagined today.

[0069] Among the components that can be installed in the compartment that is made available, no specific "Smart Objects" have been mentioned, although the state of the art, already today, proposes several, ready-to-implement applications consistent with the concept of "Smart City": in fact, the applications in question are not the subject of the invention.

[0070] The invention has a different purpose, and aims to solve the problem of creating an infrastructure that can also support evolutions with a high degree of unpredictability and contingency. Therefore, the compartment is designed to house, power and connect any generic "Smart Object".

[0071] Certainly, the compartment that is offered is particularly suitable for housing a power supply system, at least a telecommunication terminal and calculation and memory means, as this minimum equipment is apparently essential to implement any advanced operating logic of all the "Smart Objects" regardless their function.

[0072] It is now widely shared the vision that the cities of the future, even the near future, will be infrastructured in such a way as to incorporate a multitude of communication, detection and monitoring devices: increasingly updated and constantly evolving. Well, the invention would have the objective of not requiring to be significantly updated due to the uncertainty on how the concept of "Smart City" will evolve.

Claims

1. A modular redevelopment system (100) of a street lamp for public lighting which includes at least:

    i. one or more boxed elements (110) which have the following characteristics:

        a. they are open both at the top and at the bottom,
        b. they are shaped to be stacked one on top of the other,
        c. the conformations of the edge of the upper opening and of the edge of the lower opening are substantially the same, so that, when stacked one on top of the other, said boxed elements (110) form a larger compound boxed element

d. they are designed to be hooked to the support structure of a street lamp by means of a hooking subsystem (120), in turn included in said boxed elements (110),
e. the area of the side wall of said boxed elements (110) where they are coupled to said hooking subsystem (120) has a suitable hole to allow power cables coming from the public lighting system to enter the boxed element (110),
f. inside said boxed elements (110) there are vertical conducting elements (112) which go from the lower opening to the upper one, so that, when two or more boxed elements (110) are stacked one on top of the other, a continuous conductive line that crosses the entire compound box element is formed;

ii. a bottom cover (142) shaped to close the lower opening of the boxed element which is located further down;
iii. a top cover (141) shaped to close the upper opening of the boxed element that is higher up.

2. Modular redevelopment system (100) of a street lamp for public lighting according to claim 1 in which an antenna for mobile radio terminals is integrated on said top cover (141).

3. Modular redevelopment system (100) of a street lamp for public lighting according to claim 1 in which, on said bottom cover (142) there are holes, or slits, for ventilation.

4. Modular redevelopment system (100) of a street lamp for public lighting according to claim 1 in which, said bottom cover (142) and said top cover (141) are the same.

5. Modular redevelopment system (100) of a street lamp for public lighting according to claim 1 in which the side wall of said one or more boxed elements (110) has a protruding protuberance (111), positioned in an area opposite to the one where said boxed elements (110) are coupled to said hooking subsystem (120), and in the lower part of said protuberance (111) there are holes, or slits, for ventilation.

6. Modular redevelopment system (100) of a street lamp for public lighting according to claim 1 in which said hooking subsystem (120) comprises a coupling block (121) whose face in contact with the support structure of the street lamp it is made with deformable materials, so as to allow a perfect coupling with any curvature of the surface to which it is placed, and said coupling block (121) also has a hole that allows the passage of power cables coming from the structure to which it is coupled.

7. Modular redevelopment system (100) of a street lamp for public lighting according to claim 1 in which the coupling of pairs of boxed elements (110) involves the interposition of a gasket (131).

8. Modular redevelopment system (100) of a street lamp for public lighting according to claim 1 in which at least one separation element (132) is accommodated in a special seat accessible from the upper opening of at least one box element (110).

9. Modular redevelopment system (100) of a street lamp for public lighting according to claim 1 in which the boxed element (110) which is located further down houses a power supply subsystem equipped with a rechargeable battery.

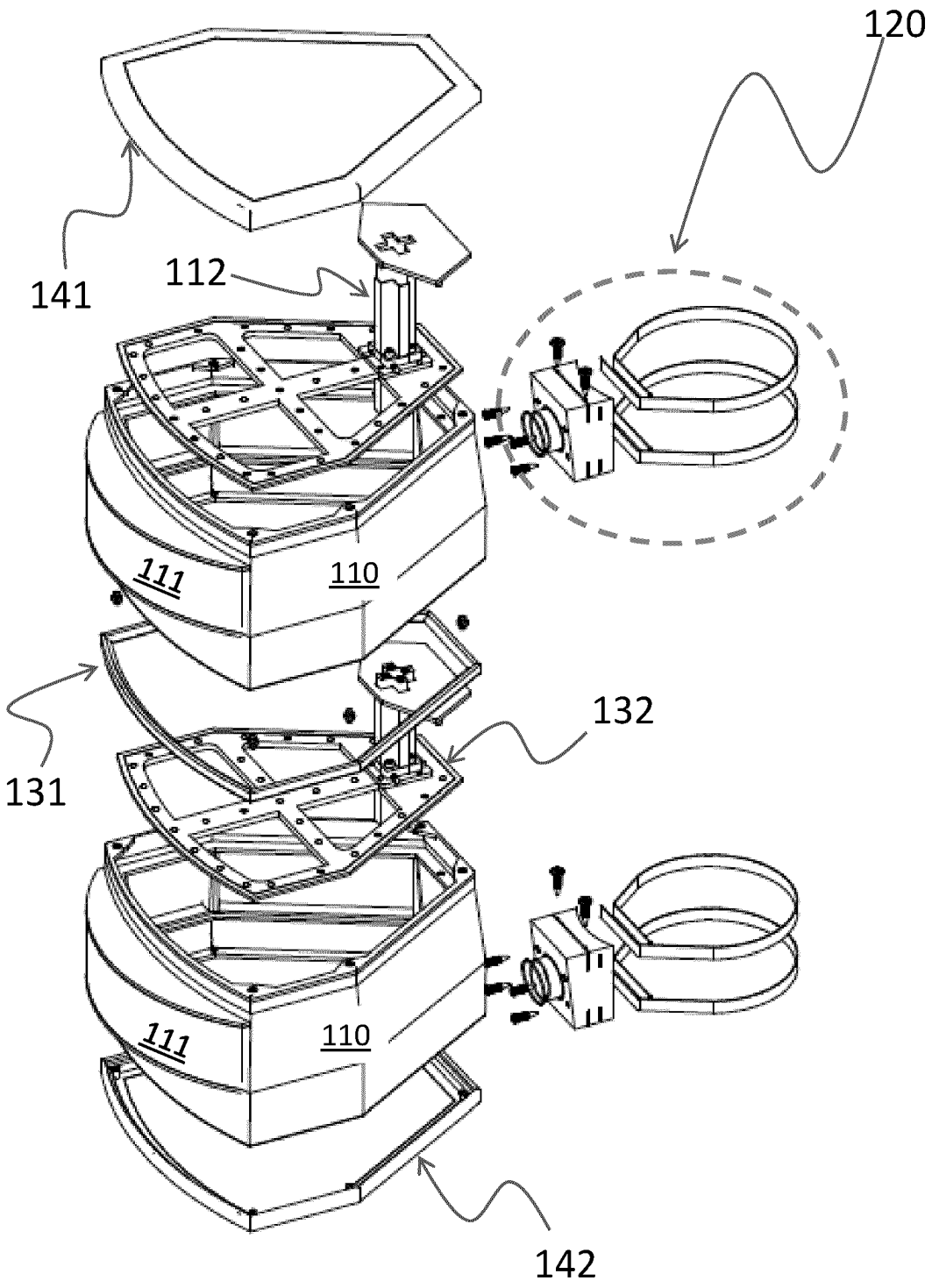

Fig. 1

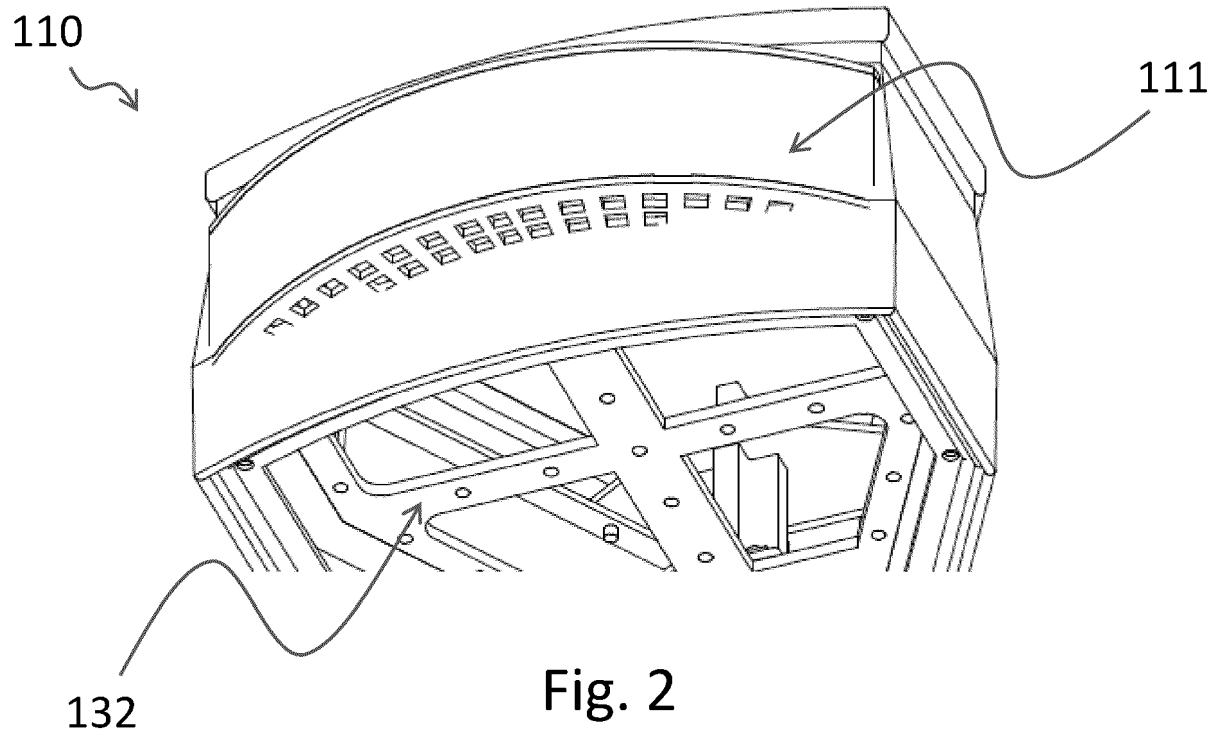

Fig. 2

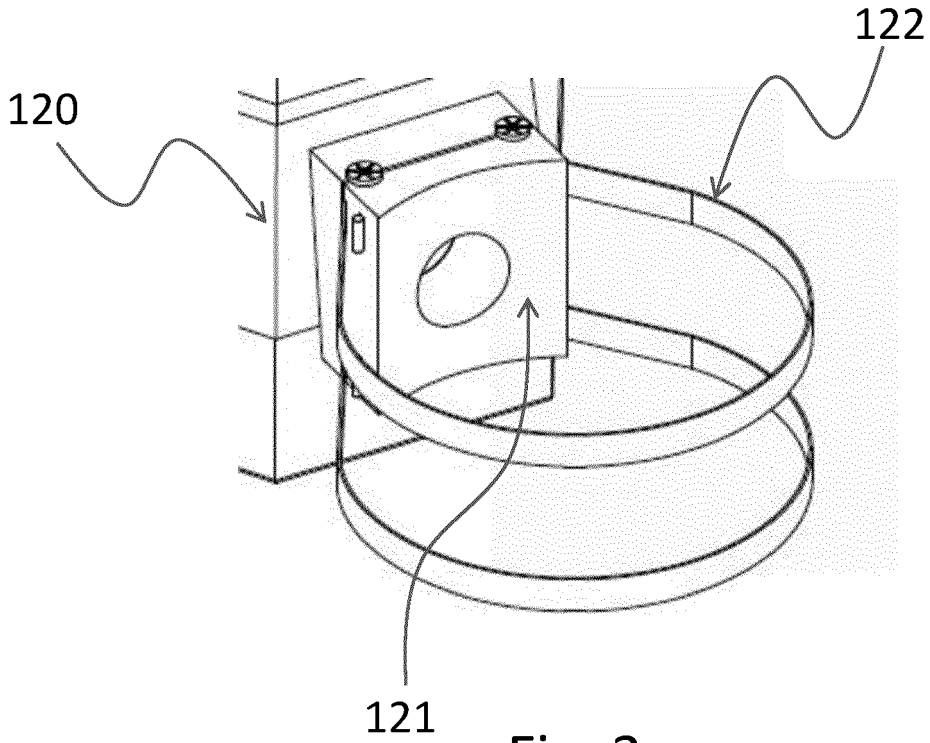

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 22 19 5408

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	KR 100 711 835 B1 (SAMKWANG IND ELECTRIC CO LTD [KR]) 2 May 2007 (2007-05-02) * claim 1; figure 1 *	1-9	INV. F21S2/00 F21S8/08 F21V23/00
A	WO 2019/243948 A1 (MEDICI GUIDO [IT]; MAURI WALTER [AT]) 26 December 2019 (2019-12-26) * claims 1,4,11; figure 5 *	1	ADD. F21V21/116 F21V15/01
A	US 2014/218944 A1 (HOBSON CHARLES O [US] ET AL) 7 August 2014 (2014-08-07) * figure 1 *	1	
A	EP 3 076 073 A1 (SCHREDER [BE]) 5 October 2016 (2016-10-05) * figure 4 *	1	
A	WO 2018/184889 A1 (PHILIPS LIGHTING HOLDING BV [NL]) 11 October 2018 (2018-10-11) * figure 12 *	1	
			TECHNICAL FIELDS SEARCHED (IPC) F21S F21V

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	20 January 2023	Krikorian, Olivier

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