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### (54) Quick connection system for LED lighting devices

(57) A quick connection system for lighting devices (10), especially suitable for the assembly of modular lighting devices with LED (Light Emitting Diode) light source suitable for being connected to a control block or body containing the electrical and electronic components necessary for the lighting device operation and comprising

one or more modules (14) provided with LED light sources and means suitable for forming, via a single joining component, a simultaneous mechanical, electrical and electronic connection between a module (14) and the control block and between single modules.

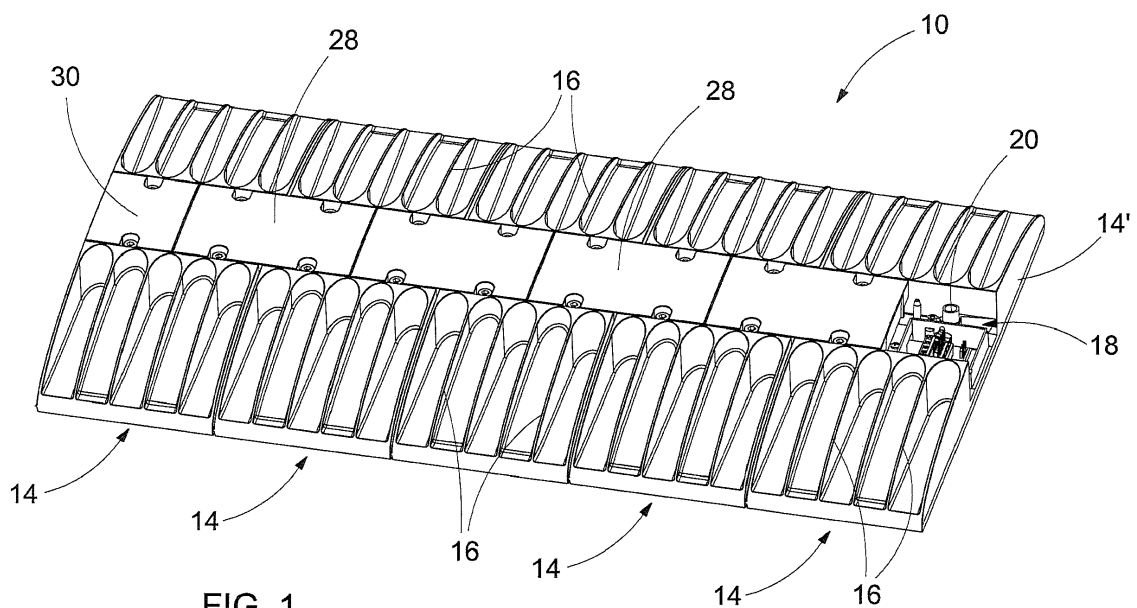


FIG. 1

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## Description

**[0001]** The object of the present invention is a quick connection system for lighting devices.

**[0002]** More particularly, the present invention relates to a system of mechanical/electrical connection of a lighting device mainly of the LED (Light Emitting Diode) type which, as is known, is becoming increasingly widespread in place of lighting devices of the incandescent or fluorescent type as regards the lighting of interior and exterior spaces of civil and/or industrial environments. This is because LED light sources have considerable advantages with respect to traditional light sources with respect whereto they guarantee higher efficiency, light instantaneously without a heating transient and have a longer working life.

**[0003]** The lighting devices, as defined above, can be used to light parking areas, parks/gardens or pedestrian areas or residential green areas, city and town roads, out-of-town roads and/or motorways, billboards and road signs or another known type of sign positioned along the road route. Moreover the same lighting devices can also be applied for the lighting of elements of street furniture such as façades of public and/or private buildings or the like and for the purpose of artistic enhancement and security or, further, they can be used also for interior applications such as the lighting of trade show stands, public and/or private premises, hotel lobbies, offices and the like.

**[0004]** However the technical lighting needs of an interior space are different from those of an exterior space, just as the technical lighting needs between a civil environment and an industrial one are different.

**[0005]** Given what is specified above, lighting devices differ from one another on the basis of the types of support, the direction of the light beam emitted, the type of distribution (for example distribution of the rotary symmetrical or street type, etc.), the intensity of the light beam and other technical lighting features chosen as a function of the specific application.

**[0006]** Therefore different appliances are generally used for different applications.

**[0007]** However a condition of this type has some major disadvantages linked to the need of having to replace the lighting appliances whenever a variation is required in the technical lighting parameters or in the case of malfunctioning, replacement or repair of the same device, with consequent increases in the costs, work times, etc.

**[0008]** A further disadvantage of these traditional lighting devices is represented by the higher storage costs linked to the need to hold stocks for different lighting devices.

**[0009]** To avoid these disadvantages lamps or lighting devices have been developed with modular structure suitable for being configured and reconfigured as a function of the specific technical lighting needs.

**[0010]** The lighting device described in the document KR101004260, for example, describes a lighting appli-

ance which comprises a series of modules which can be coupled one to the other in a different number as a function of the specific lighting needs. More particularly each of the modules comprises a male plug and a female plug, arranged opposite one to the other at the ends of the single module in such a way that the male plug of a module can couple with the female plug of another module to form the electrical connection between the modules, while the connection and mechanical stabilisation are performed by means of support bars with respect whereto said modules are fitted, with said bars whose length is chosen as a function of the number of modules coupled.

**[0011]** Other solutions such as, for example, the one described in the document US2012/0063138 or in the document EP2444716 refer to a central element or hub with respect whereto two lighting modules are secured, with said central element comprising the electrical contacts for the transmission of the electrical power supply between modules or openings apt to allow the passage of the electrical contacts of the male/female end portions of the two modules to be connected one to the other.

**[0012]** The document WO2012/052440 also describes a central element or block defining a hub with respect whereto two or more modules can be connected electrically and mechanically.

**[0013]** However these traditional lighting devices also have some disadvantages linked to the fact that each module has to be electrically connected to a central body or hub or to a support structure which differs as a function of the number and/or type of modules to be connected, with said modules which need additional components in order to form the mechanical connection necessary for the support of the coupled modules, with these additional components which have to be dimensioned as a function of the number of modules to be connected one to the other.

**[0014]** Moreover these modular lighting systems also have considerable disadvantages linked to the number of components, to the long times of assembly/disassembly, to the need for a stock of components of various sizes.

**[0015]** The object of the present invention is that of obviating the disadvantages stated above. More particularly the object of the present invention is that of providing a system of quick connection for lighting devices of the modular type such as to make the connection between one or more modules particularly easy and fast.

**[0016]** A further object of the present invention is that of providing a connection system for modular lighting devices which allows the operative to assemble the lighting device with complete safety.

**[0017]** A further object of the present invention is that of making available to users a system of connection for lighting devices suitable for guaranteeing a high level of resistance and reliability in time and such, moreover, as to be able to be easily and economically manufactured.

**[0018]** These and other objects are achieved by the

device of the invention that has the features of claim 1.

**[0019]** According to the invention a quick connection system for lighting devices is provided, especially suitable for the assembly of modular lighting devices with LED (Light Emitting Diode) light source suitable for being connected to a control block or body containing the electrical and electronic components necessary for the lighting device functioning and comprising one or more modules provided with LED light sources and means suitable for forming, via a single joining component, a simultaneous mechanical, electrical and electronic connection between a module and the control block and between single modules.

**[0020]** Advantageous embodiments of the invention are disclosed by the dependent claims. The constructional and functional features of the connection system for lighting devices of the present invention will be made clearer by the following detailed description, in which reference is made to the accompanying drawings which represent a preferred and non-limiting embodiment thereof and in which:

Figure 1 shows schematically an axonometric view of a lighting device provided with the connection system of the present invention;

Figure 2 shows schematically a partially blown-up, axonometric view of the lighting device provided with the connection system of the invention;

Figure 3 shows schematically an axonometric view of a component of the connection system of the invention;

Figure 4 shows schematically an axonometric view of a further component of the connection system of the invention.

**[0021]** Referring to the aforesaid drawings, the connection system of the present invention is suitable for being used to form a quick mechanical-electrical connection between modules of a lighting device denoted by 10 in Figures 1 and 2.

**[0022]** Referring to the preferred embodiment as per the drawings the lighting device 10 comprises one or more modules 14 defining the optical compartments provided with light sources (for example LED) and means for the distribution and diffusion of the light (screens, lenses and optics) suitable for being connected one to the other and to a control block or body (not shown in the drawing) connected to a support structure of the pole, wall type or the like and inside whereof the electrical and electronic components are arranged, suitable for the functioning of the lighting device and the optional devices for the regulation of the light flow as a function of the specific environmental characteristics (for example the devices for intelligent dimming, self-learning and similar known functions).

**[0023]** Each module 14 is typically made in aluminium or alloys thereof or in another known material suitable for the purpose and is provided externally with a plurality

of fins 16, developed integrally with each module or attached thereto in a known manner, and having the function of allowing a dispersion of the heat developed during the functioning of the lighting device. Said fins 16 are developed on the upper outer face of the single module on the opposite side with respect to the lower face wherefrom the light beam is projected, emitted by the light sources of the LED or similar known types.

**[0024]** The single module 14, starting from one of its end side faces 14', develops a pocket 18 longitudinally extended in the direction of the opposite end side face open above. Said pocket 18 is suitable for housing the means necessary for an electrical/electronic and mechanical connection of said modules one to the other and with respect to the control block.

**[0025]** The means suitable for allowing a connection and mechanical stabilisation comprise pairs of opposite pins or appendages 20 projecting with respect to the base plane 22 of said pocket 18 and placed in proximity of the opposite lateral shoulders 24 of the same compartment co-operating with a casing or cover 28 and/or with a further casing or cover 30 placed as closure of the box-like compartment 18 of each module according to the methods described in detail here below.

**[0026]** The means suitable for allowing an electrical/electronic connection between the modules 14 comprise, for each module, two plugs or disconnectors, respectively, a male disconnector or plug 32 and a female disconnector or plug 32' adjacent one to the other and placed on the base plane of the pocket 18 and preferably in an intermediate position between the projecting appendages or pins 20. Said plugs or disconnectors are with several contacts in such a way as to allow the electrical connection for the transmission of the voltage and, at the same time, allow the transmission of signals suitable for managing and dimming the light according to the time and the methods of use of the lighting device.

**[0027]** These male 32 and female 32' disconnectors or plugs are suitable for coupling with two corresponding further male 34 and female 34' disconnectors or plugs attached to the casing or cover 28 according to what is described here below. More particularly the further male 34 and female 34' disconnectors or plugs, placed inside adjacent pockets 29 and 29' of the casing or cover 28, are electrically connected one to the other to form the electrical connection between modules as detailed here below.

**[0028]** The further casing or cover 30, unlike the casing or cover 28, does not have the function of forming the connection between two adjacent modules, but instead it is suitable for closing the electrical connection between the modules and, moreover, allows the closure of the portion of the pocket 18 of the module 14 not closed by the casing or cover 28 which connects mechanically and electrically two adjacent modules 14 or a module 14 and the control block.

**[0029]** Said further casing or cover 30 is provided with a lateral shoulder 31 which closes laterally the pocket 18

and with a boxed body 33 inside whereof a male plug 35 is placed, suitable for coupling with a corresponding female plug or disconnecter 32' of a module 14 for the closure of the electrical circuit of the last module of the sequence of one or more modules connected to the control block, with said lateral shoulder 31 which remains flush with the end side face 14' ensuring aesthetic continuity and uniformity for the lighting device.

**[0030]** Said casing or cover 28 and further casing or cover 30 are likewise apt to close the compartment defined by the pocket 18 ensuring aesthetic uniformity and continuity of the lighting device.

**[0031]** The casing or cover 28 and the further casing or closure 30 are provided with optional gaskets (not shown in the drawings) apt to guarantee the sealing and avoid the entry of dust, liquids or other elements harmful to the good functioning of the device of the invention.

**[0032]** The plugs or disconnectors 32, 32', 34, 34' and 35 are with one-way connection and allow a single direction of coupling making, in this way, the inversion of the electrical transmission between the control block and the one or more modules 14 impossible.

**[0033]** Here below a description is given of the modes of mechanical and electrical connection of the modules of the lighting device described above with reference to the constructional features of its component elements and, in particular, with reference to Figures 2 and 4.

**[0034]** As a function of the specific lighting needs, the lighting device comprises one or more modules 14 connected to the control block or body and one to the other. The exemplary embodiment as per the drawings comprises a first module 14 apt to be connected to a control block or body (not shown) and four further modules 14 connected to said first module and in sequence one in relation to the other.

**[0035]** The first module 14 is joined and attached to the control block or body by means of the casing or cover 28 which is fitted on said first module and control block, closing said control block and part of the pocket 18 (substantially the portion occupied by the plug or disconnecter) of the module 14 to form both the mechanical connection and the electrical/electronic one.

**[0036]** More specifically the mechanical connection is formed by fitting, on the opposite pins or projecting appendages 20 of a module 14 and of the control block, the casing 28 which is attached to the pins or appendages 20 by means of screws 50 or equivalent retaining means inserted in holes 40 of the same casing.

**[0037]** The electrical/electronic connection between a module and the control block is formed by coupling a male disconnecter or plug 34 of the casing or cover 28 with a corresponding female plug of the control block and, at the same time, a female disconnecter or plug 34' of the same casing 28 with a male plug or disconnecter 32 of an adjacent module 14. In this way the passage is performed of the electrical voltage and of the signals of management/control coming from the control block connected to the electrical supply network.

**[0038]** In a similar way the mechanical and electrical connection between two or more successive modules takes place.

**[0039]** In this way the electrical voltage and the signals of management/control are transmitted starting from the control block and, by means of casings or covering elements 28, from one module 14 to the successive one in cascade.

**[0040]** The further casing 30 performs the mechanical closure of the outermost portion of the pocket 18 of the module 14 (the last module of the sequence of modules) not closed by means of the casing 28 and the closure of the electrical connection. The further casing 30 is also attached in position by means of screws 50 or rivets inserted in dedicated through holes 42 of the casing and coupled with the pins 20 of each module 14.

**[0041]** As can be seen from the above the advantages that the system of the invention achieves are clear.

**[0042]** The quick connection system for lighting devices of the present invention allows advantageously assembly of lighting devices of modular type forming, simultaneously and with junction means, a connection both mechanical and electrical/electronic.

**[0043]** Further advantageous is the fact that the connection system of the invention, thanks to the presence of male/female disconnectors or plugs, does not require, for the electrical connection, the stripping of electrical wires and their connection to the terminals or their connection to the connectors. This allows an extremely rapid connection free from risks.

**[0044]** A further advantage is represented by the fact that the connection system of the invention also allows the electronic connection for the management of the signals necessary for the control of the lighting device, performed simultaneously to the mechanical and electrical ones, without the need for further connections.

**[0045]** A further advantage is represented by the fact that the system of the invention allows the assembly of one or more identical modules at the control block without the need to perform further electrical connections, in addition to that defined by the plugs or disconnectors, to allow the flowing of the feed voltage from one module to the next one.

**[0046]** Further advantageous is the fact that the quick connection system of the invention makes the operations of maintenance and/or replacement of the lighting device or of its component modules particularly easy.

**[0047]** Although the invention has been described above with particular reference to one of its embodiments given solely by way of a non-limiting example, numerous changes and variations will appear clear to a person skilled in the art in light of the description given above. The present invention intends, therefore, to embrace all the modifications and the variations that fall within the scope of the following claims.

## Claims

1. A quick connection system for lighting devices (10), suitable for modular lighting devices with LED (Light Emitting Diode) light source connected to a control block or body containing the electrical and electronic components necessary for the lighting device operation and comprising one or more modules (14) provided with LED light sources, said connection system being **characterised in that** it comprises components of mechanical and electrical connection defined by plugs or disconnectors (32, 32') of the male and female type respectively, attached to each module (14) and to the control block and suitable for coupling with corresponding plugs or disconnectors (34', 34) of the female and male type respectively attached to a single joining component coupled with said modules and control block for a mechanical and electrical connection between a module (14) and the control block and between adjacent single modules (14). 5 10
2. The quick connection system according to claim 1, **characterised in that** the components of mechanical and electrical connection comprise a casing or cover (28), suitable for being fitted above the control block and to one or more modules (14). 25
3. The quick connection system according to claim 1 or 2, **characterised in that** it comprises stabilising means comprising pairs of opposite pins or appendages (20) projecting with respect to a base plane (22) of a pocket (18) of a module (14) longitudinally extended from an end side face (14') of said module in the direction of the opposed side end face open above, said pins or appendages (20) being arranged in proximity of opposite lateral shoulders (24) of said pocket (18). 30 35
4. The quick connection system according to claim 3, **characterised in that** the male (32) and female (32') plugs or disconnectors are arranged in pairs on the base of the pocket (18) of each module (14), in an intermediate position between the pins or appendages (20) and adjacent one to the other. 40 45
5. The quick connection system according to any one of claims 2 to 4, **characterised in that** the male (34) and female (34') plugs or disconnectors of each casing or cover (28) are electrically connected one to the other to allow the transmission of electrical voltage and of signals of management/control of the lighting device. 50
6. The quick connection system according to any one of claims 1 to 5, **characterised in that** the plugs or disconnectors (32, 32', 34, 34') are with one-way connection with only one direction of coupling. 55
7. The quick connection system according to any one of claims 3 to 5, **characterised in that** it comprises a further casing or cover (30) provided with a lateral shoulder (31) suitable for closing an open lateral portion of one end of the pocket (18) of a module (14) and of a boxed body (33) inside whereof a male closure plug (35) is placed, suitable for being fitted on the female plug or disconnector (32') of a module (14) at a portion of the pocket (18) not closed by the casing or cover (28), the lateral shoulder (31) being flush with the end side face (14') of the module (14).
8. The quick connection system according to claim 7, **characterised in that** the casing or cover (28) and the casing or cover (30) close the compartment defined by the pocket (18), maintaining aesthetic uniformity and continuity of the lighting device (10).
9. Use of the quick connection system according to any one of the preceding claims for assembling modular lighting devices (10) by means of a simultaneous mechanical, electrical and electronic connection between modules (14) arranged in sequence and between a module (14) and a control block, with the mechanical connection made by fitting a casing or cover (28) between the control block and a module (14) and between two modules (14) in sequence, the casing coupling with opposite pins or appendages (20) of the modules (14) and with the electrical and electronic connection made by means of a coupling between male (32) and female (32') plugs or disconnectors respectively of a module (14) and of the control block (12) and male (34) and female (34') plugs or disconnectors of the casings or covers (28), with the electrical voltage and the management/control signals which through the single male or female plug or disconnector (32, 32') are transmitted from the control block in cascade to one or more modules (14) via the plugs or disconnectors.

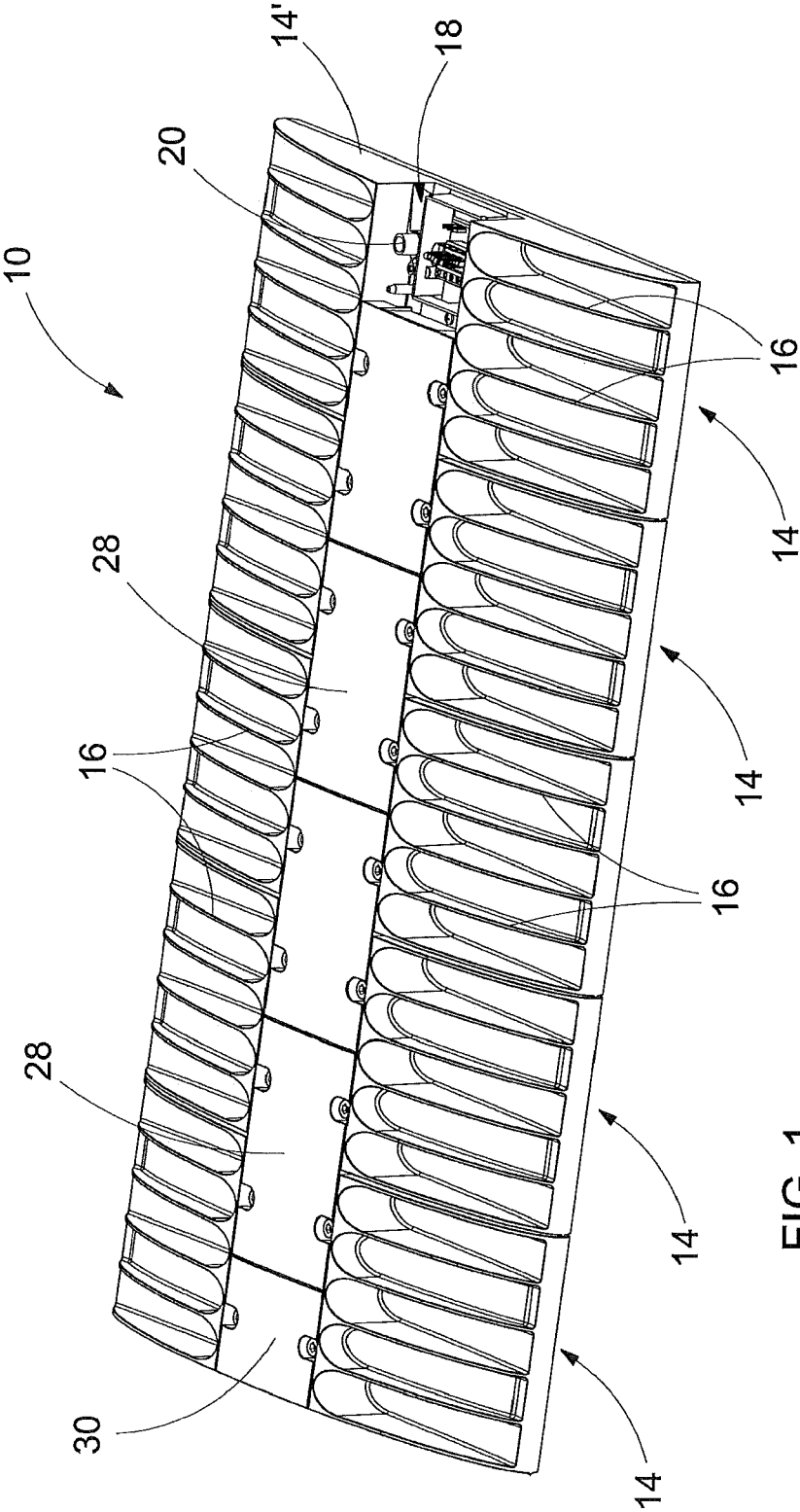
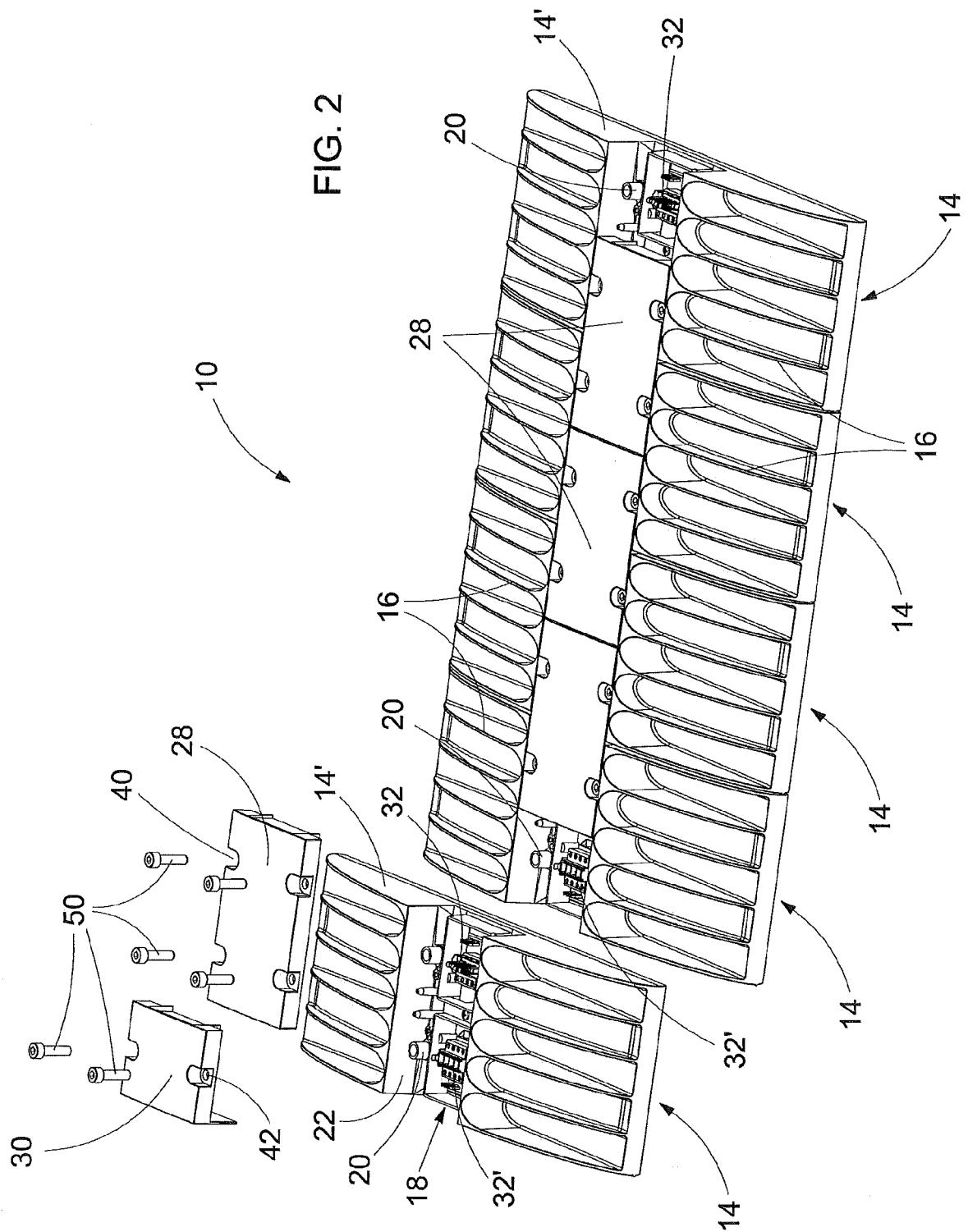


FIG. 1

FIG. 2



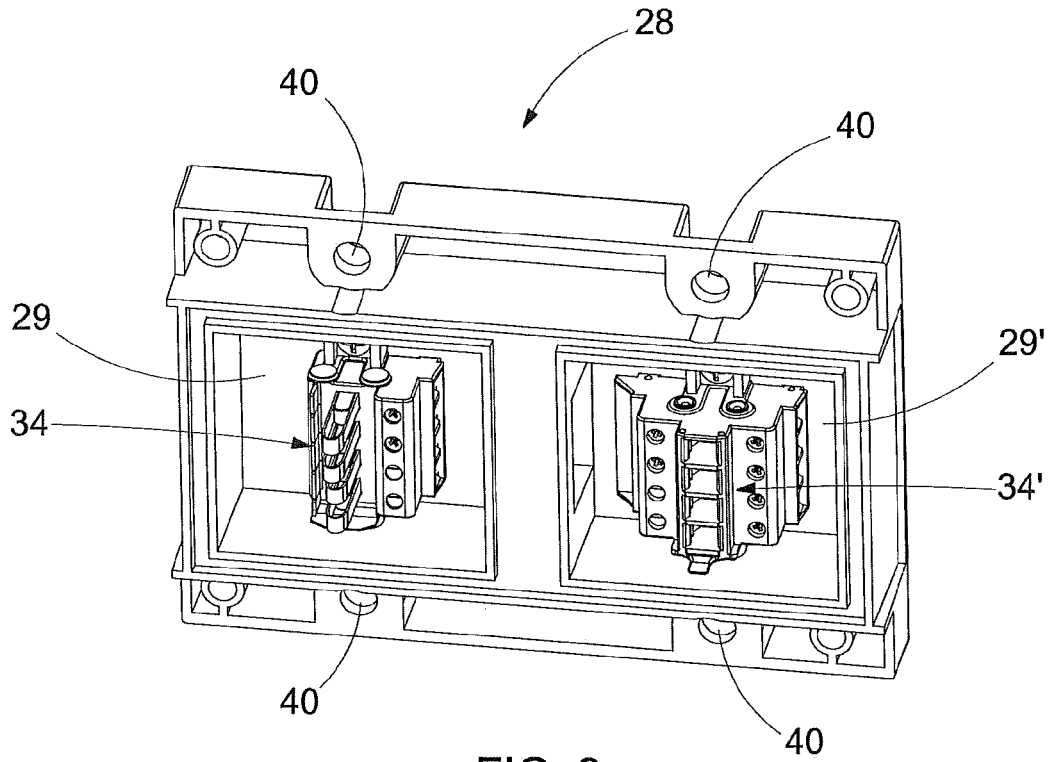


FIG. 3

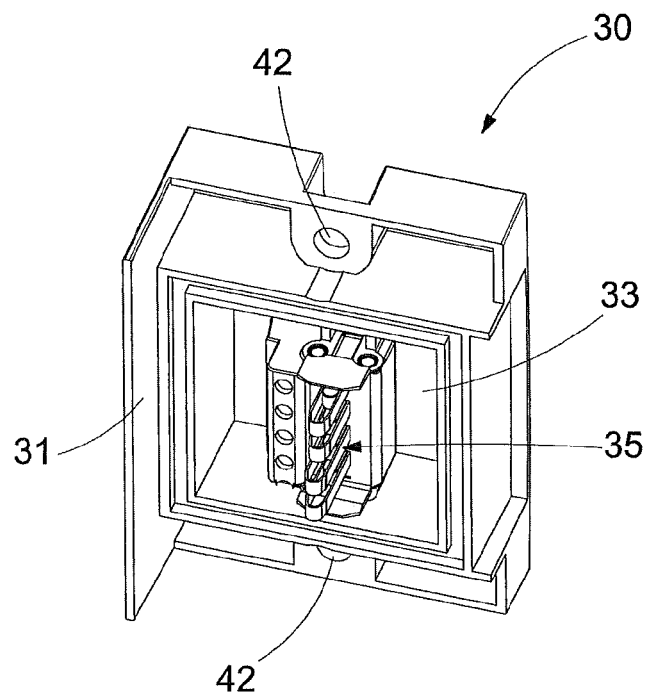


FIG. 4





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Place of search Munich		Date of completion of the search 20 March 2015	Examiner Berthommé, Emmanuel
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