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(54) **LIGHTING SYSTEM**

(57) The object of the present description is a lighting system (1), comprising: an electrified track (2) comprising a bar with U-profile defining a cavity (3) in which a plurality of electrical conductors (2a) are housed connectable to a power supply network (4) for receiving an alternating current; a power supply (5) comprising first electrical input terminals (5a) connectable to the electrical conductors (2a) for receiving the input alternating current, and first electrical output terminals (5b) for supplying a constant output supply voltage, first constraining means (5c) configured for mechanically constraining the power supply (5) to the electrified track (2); at least one optical device (6) having a light source (7) and at least partially housed inside the cavity (3). A characteristic of the sys-

tem is that the optical device (6) comprises second constraining means (6c) configured for mechanically constraining the optical device (6) to the electrified track (2) and second electrical input terminals (6a) electrically and mechanically connected to the first electrical output terminals (5b) for receiving the constant input supply voltage for electrically supplying the at least one light source (7); said at least one optical device (6) comprises second electrical output terminals (6b) electrically and mechanically connectable to said second electrical input terminals (6a) of a further and distinct optical device (6) for transmitting said constant supply voltage to said distinct optical device (6).

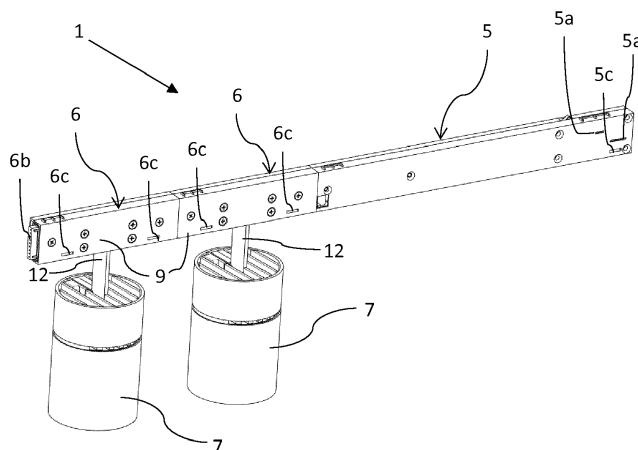


Fig. 1

Description

FIELD OF APPLICATION

[0001] The object of the present description is a lighting system, in accordance with the preamble of claim 1.

[0002] In particular, the present description refers to a lighting system comprising a three-phase electrified track adapted for supporting and supplying mains voltage to at least one power supply for LED light sources.

Description of the prior art

[0003] In the state of the art it is known to use an LED track lighting system. For example, such a system comprises an electrified track, configured as a bar with U-profile, which defines a cavity where a plurality of electrical conductors are housed, and a power supply, which is incorporated in the mechanical structure of the lighting apparatus.

[0004] In particular, the power supply is arranged outside the electrified track and is in the form of an AC/DC converter that has the task of converting the voltage, for example the mains voltage, from alternating to direct. The direct voltage thus generated supplies a driver, for example an LED control unit configured for generating a constant current capable of supplying at least one LED device. In this way, the LEDs receive direct current and voltage from the electronic power supply. The electronic control board present in the driver makes it possible to adjust the operation of the LEDs, for example adjusting the switching on, the intensity of luminosity and the colour temperature.

[0005] Moreover, such lighting systems also comprise an electromechanical adapter which is configured to electrically and mechanically connect to the electrified track.

[0006] The electrified track is configured to capture the controlled current generated by the power supply-driver assembly to supply it to the electromechanical adapter, so as to supply an LED light source. Optionally, the electrified track can supply a mechanical support to the electromechanical adapter.

Problem of the prior art

[0007] Known lighting systems have a series of drawbacks, like for example those linked to the large space occupied by the electronic power supply, which adjusts the use thereof outside of the electrified track, also conditioning the aesthetics of the lighting apparatus.

[0008] Moreover, in the case of failure or breaking of the converter of the known lighting system, it is necessary to replace the entire apparatus, because its repair would require that the system as a whole be involved, causing a decline in its integrity. This results in an increase in costs and a difficulty in carrying out the maintenance and repair operations of the system.

[0009] Moreover, known electromechanical supports have some critical aspects linked particularly to the mechanical and electrical connection between the electromechanical adapter and the electrified track. For example, in the case of LED spotlights able to be oriented through a ball joint, there is a high risk of breaking or damaging the mechanical supports between adapter and electrified track when a user adjusts the orientation of the spotlights. Indeed, in the case in which the mechanical connection between adapter and track is broken or weakened, there is also the risk of the electrical connection between the two components being lost, causing the LED spotlights to switch off.

SUMMARY OF THE INVENTION

[0010] The purpose of the invention in object is that of overcoming the drawbacks of the lighting systems of the prior art.

[0011] A further purpose of this invention is that of making an LED lighting system capable of facilitating the installation, maintenance and repair operations.

[0012] A further purpose of this invention is that of making an LED lighting system that occupies less space whilst comprising at least the same essential components as a known lighting system.

[0013] A further purpose of the present invention is that of making a lighting system in which the light sources have greater stability and practicality of use in the electrical and mechanical connection with the electrified track.

Advantages of the invention

[0014] Thanks to an embodiment, it is possible to make a lighting system with high flexibility in installation, in repair/replacement and in maintenance.

[0015] Thanks to an embodiment, it is possible to make a lighting system with greater reliability of operation.

[0016] Thanks to an embodiment, it is possible to make a lighting system that occupies less space.

[0017] Thanks to an embodiment, it is possible to make a lighting system in which the LED spotlights can be oriented with greater safety and reliability.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The characteristics and advantages of the present disclosure will become clear from the following detailed description of a possible practical embodiment, illustrated as a non-limiting example in the set of drawings, in which:

- figure 1 shows a perspective view of a lighting system in accordance with the present invention,
- figure 2 shows a front view of the lighting system of figure 1,
- figure 3 shows a perspective view of a lighting system

- in accordance with a variant embodiment of the present invention,
- figure 4 shows an enlargement of the portion of the lighting system identified by a dashed box of figure 3,
 - figure 5 shows an assembly configuration of a plurality of components of the lighting system of the present invention,
 - figures 6, 7 and 8 respectively show a view from below, the side and the front of a component of the lighting system of the present invention,
 - figures 9, 10 and 11 respectively show a front, side and top view of a variant embodiment of the lighting system of the present invention,
 - figures 12, 13 and 14 show in sequence three steps of the assembly of the lighting system illustrated in figures 9, 10 and 11.

DETAILED DESCRIPTION

[0019] The lighting system illustrated in the attached figures must be deemed to be schematically represented, not necessarily to scale and not necessarily with the represented proportions between the various constituent elements.

[0020] Even if not explicitly shown, the single characteristics described in reference to the specific embodiments should be considered as accessory and/or interchangeable with other characteristics, described in reference to other embodiments.

[0021] The object of the present invention is a lighting system 1 that uses LED light sources.

[0022] The lighting system 1 comprises at least one optical device 6 provided with an LED light source and an electrified track 2 that defines an inner cavity 3 having a U-profile (when seen in cross section), in which a plurality of electrical conductors 2a are housed that can be connected to a power supply network 4 so as to be able to receive alternating supply voltage.

[0023] The electrified track 2 extends along a direction of extension X-X for a predefined length and defines two side walls P substantially parallel to one another and perpendicular with respect to the direction of extension X-X, a base wall L, perpendicular to the two side walls P, and an opening A opposite to the base wall L.

[0024] According to one aspect, the electrical conductors can comprise two or more conductors, each of which is arranged along a respective wall P of the electrified track 2.

[0025] According to known techniques, the conductors of the plurality of electrical conductors 2a are in the form of conductive tracks.

[0026] It should be noted that the electrified track 2 is of the three-phase type and is configured to take an alternating voltage from an electrical power supply network 4 so as to distribute it over the plurality of electrical conductors 2a.

[0027] In one form of use, it is foreseen for the lighting system 1 to comprise a plurality of electrified tracks 2

electrically and mechanically connected to one another. In particular, the respective inner cavities 3 make a single cavity seamlessly and the respective electrical conductors 2a are connected to one another to distribute the supply voltage.

[0028] Alternatively or in combination to the embodiments outlined above, it is possible to make an electrified track 2 having a transversal U-profile, but extending longitudinally with curvilinear and/or angled progression to adapt to the different requirements.

[0029] In order to supply the LED light sources, the lighting system 1 comprises a box-shaped power supply 5 having:

- first electrical input terminals 5a connectable to the electrical conductors 2a for receiving the input alternating current and
- first electrical output terminals 5b for supplying a constant output supply voltage.

[0030] Such first electrical input terminals 5a are configured as reed contacts and act to make the electrical contact with the plurality of electrical conductors 2a of the electrified track 2.

[0031] The power supply 5 comprises first constraining means 5c configured for mechanically constraining the power supply 5 to the electrified track 2.

[0032] According to one aspect, the first constraining means 5c are in the form of rigid fins capable of engaging in complementary seats formed in one or both of the walls P of the electrified track 2.

[0033] In particular, the mechanical fins 5c are pairs of fins arranged symmetrically on two opposite side walls of the power supply 5 so as to respectively engage with corresponding seats formed in the two side walls P of the electrified track 2.

[0034] In an embodiment, the power supply 5 comprises a rotating cam 5d, able to be actuated by a user, which is operatively connected to the constraining means 5c to allow the power supply 5 to be connected/disconnected to/from the electrified track 2, respectively, by means of a rotation thereof. In other words, each rotating cam 5d can be moved (for example by means of a rotation thereof) by a user both to insert the fins in the seats of the electrified track 2 and to extract the fins from the seats, respectively, to constrain and free the power supply 5 to/from the electrified track 2.

[0035] According to one aspect, the power supply 5 is housed hidden (or is completely contained) inside the cavity 3 of the electrified track 2, i.e. it does not protrude or does not extend in height beyond the side walls P of the track 2.

[0036] In other words, the power supply 5 is completely contained in the cavity 3 therefore not being visible from the outside when observed by a user.

[0037] Advantageously, the space occupied by the lighting system 1 is thus reduced since the power supply 5 is within the volume of the electrified track 2.

[0038] Advantageously, it is possible to install the power supply along the predefined length of the electrified track 2, by adjusting the position thereof in a practical and easy manner.

[0039] Moreover, the maintenance and repair/replacement operations are easy and do not involve other components of the lighting system since it is possible to intervene only on the single component (for example power supply 5).

[0040] Optionally, the power supply 5 can comprise a selector S for the steps (for example 0, 1, 2, 3) of the three-phase system of the plurality of electrical conductors 2a arranged inside the electrified track 2.

[0041] The supply system 1 comprises at least one optical device 6 equipped with at least one light source 7, preferably, a LED light line (for example linear LED system) or an orientable light projector, for example an LED spotlight.

[0042] The optical device 6 can be at least partially housed inside the inner cavity of an electrified track 2 (figures 9-11).

[0043] The optical device 6 comprises second electrical input terminals 6a electrically and mechanically connectable to the output terminals 5b to receive a constant input supply voltage, so as to be able to electrically supply the light source 7.

[0044] In the case in which the light source 7 is made as an LED light line, the optical device 6 can be housed hidden in the cavity 3 of the electrified track 2. In other words, the light source 7 is made flush with the side wall P of the electrified track 2 so as to be able to project the light emitted by the lamp outside the electrified track 2.

[0045] For example, in the case in which the light source 5 comprises a spotlight, it is possible for it to project with respect to the side wall P of the electrified track 2. In other words, the LED lamps face and project from the opening A formed in the side wall P of the electrified track 2, or alternatively they can be made flush with the wall P being entirely projecting in the profile of the electrified track 2.

[0046] With reference to figures 12 to 14, the light source 7 comprises an LED system 10 configured as an LED spotlight. Moreover, the optical device comprises an enclosure 9 that comprises a clutched grip 11 inside it adapted to allow the rotation of the LED system 10 with respect to the enclosure 9 about a predetermined axis of rotation Y-Y. Preferably, the predetermined axis of rotation Y-Y is perpendicular to the direction of extension X-X.

[0047] According to an aspect, the enclosure 9 comprises two complementary shells 9a intended to be coupled together through fixing means 9b, like for example screws, to define a volume inside the enclosure 9 suitable for housing the clutched grip 11.

[0048] As described earlier, the LED system 10 comprises a spotlight mounted on a shaft 12 arranged axially along the predetermined axis of rotation Y-Y. The clutched grip comprises two complementary plates 11a

each provided with a longitudinal groove 11c having substantially semi-circular section. The two plates 11a are coupled together and constrained through fixing means 11b, like for example screws, so that also the two grooves 11c couple with one another to define a cylindrical seat adapted for holding a first end of the shaft 12.

[0049] In this way, the clutched grip only allows a relative rotation of the shaft 12, and therefore of the spotlight, around the predetermined axis of rotation Y-Y.

[0050] Preferably, the clutched grip 11 also comprises an anti-rotation stop that determines an end stop for the rotation of the shaft 12.

[0051] For example, the end stop can be made through a tooth projecting from the cylindrical profile of the shaft 12, intended to abut with a corresponding tooth formed in one of the two plates 11a. For the sake of completeness, it should be specified that the shaft 12 also has a second end, opposite the first end, on which an LED system 10 is mounted, like for example an LED spotlight.

[0052] In accordance with a preferred solution of the invention, the at least one optical device 6 is an optical device module. In other words, the lighting system 1 comprises one or more modular optical devices 6, i.e., optical device modules.

[0053] According to a peculiar aspect of the present description, the optical device 6 comprises second electrical output terminals 6b electrically and mechanically connectable to the second electrical input terminals 6a of a further and distinct optical device 6 to transmit the constant supply voltage to it. That is to say that the optical devices 6 are optical device modules that are electrically and mechanically connectable to each other.

[0054] The optical device 6 is partially housed inside the cavity 3 of the electrified track 2. In an embodiment, the LED system 10 (i.e. the LED spotlight) is arranged outside the cavity 3, whereas the enclosure 9 is entirely housed inside the cavity 3.

[0055] Preferably, the optical device 6 comprises second constraining means 6c configured for mechanically constraining the optical device 6 to the electrified track 2.

[0056] In accordance with a preferred solution of the invention, the second constraining means 6c are configured as rigid fins adapted to engage into complementary seats formed in one or both of the walls P of the electrified track 2.

[0057] In an analogous way to what has been described regarding the first constraining means 5c, the second constraining means 6c are configured as mechanical fins, for example as pairs of fins arranged symmetrically on the two opposite side walls of the enclosure 9, so as to respectively engage with corresponding seats formed in the two side walls P of the electrified track 2.

[0058] The optical device 6 comprises at least one rotating cam 6d, able to be actuated by a user, which is operatively connected to the constraining means 6c so as to be able to allow the optical device 6 to be connected/disconnected to/from the electrified track 2, respectively, through a rotation thereof. In other words, each

rotating cam 6d can be moved (for example through a rotation thereof) by a user both to insert the fins in the seats of the electrified track 2 and to extract it from them, respectively, to constrain and free the optical device 6, and in particular the enclosure 9 to/from the electrified track 2.

[0059] Preferably, the second electrical input terminals 6a of the optical device 6 are electrically and mechanically connected to the first electrical output terminals 5b of the power supply 5 to receive the constant input supply voltage to electrically supply the at least one light source 7.

[0060] In accordance with a preferred solution of the invention, the power supply system 1 comprises a plurality of optical devices 6 arranged in series inside the cavity 3 and electrically connected together in parallel.

[0061] As stated earlier, each optical device 6 is an optical device module that comprises second electrical output terminals 6b electrically and mechanically connectable to the second electrical input terminals 6a of a further and distinct optical device 6 to transmit the constant supply voltage to such a distinct optical device 6.

[0062] Preferably, the second electrical input terminals 6a are electrically and mechanically connected to the first electrical output terminals 5b of the power supply 5 or to the second electrical output terminals 6b of a further and distinct optical device 6 to receive the direct supply voltage.

[0063] According to an aspect, the first electrical output terminals 5b of the power supply 5 and the second electrical output terminals 6b of the optical device 6 are configured as male connectors; whereas the second electrical input terminals 6a are configured as female connectors electrically and mechanically connectable to the male connectors. The male and female connectors are adapted for mechanically connecting to one another in a removable manner to also allow an electrical connection to one another. The particular conformation of the electric terminals makes it possible to make a direct electrical and mechanical connection between power supply 5 and optical device 6, or between two optical devices 6, so that such elements are electrically and mechanically connected together in series inside the cavity 3 of the electrified track 2.

[0064] For example, the electrical connection can be of the parallel or series type and this depends on the specific circuit requirements that must be tackled at the design stage.

[0065] In this way, it is possible to make a configuration of optical devices 6 electrically connected together, and able to be housed inside the cavity 3 of the electrified track in a series arrangement.

[0066] For example, a first optical device 6 has the second electrical input terminals 6a connected to the first electrical output terminals 5b of the power supply 5, whereas a second optical device 6 has the second electrical input terminals 6a connected to the second electrical output terminals 6b of the first optical device 6, and

so on.

[0067] It should be specified that in this case the power supply 5 is sized so as to be able to electrically power a plurality of optical devices 6 connected in parallel, and more precisely a predetermined number of optical devices 6 greater than or equal to two.

[0068] Advantageously, since the optical devices 6 are optical device modules, the electrical connection in parallel of the plurality of optical devices 6 supplied by a single power supply 5 creates an electrical connection such that, in the case of malfunctioning of one of the optical devices 6, the circuit is not interrupted and the intact optical devices 6 continue to operate in a regular fashion.

[0069] Moreover, as stated earlier, it is particularly easy to replace the damaged components (for example one of the various optical device modules provided, i.e., optical devices 6, or the power supply 5 itself).

[0070] According to an aspect, the power supply 5 is configured to take an alternating current AC from an electrical power supply network 4, so as to convert it into a direct current DC to be supplied to at least one optical device 6 to electrically supply the light source 7. In particular, the power supply 5 comprises an electronic control board equipped with a driver configured so that it emits a direct current (with constant current or voltage) to supply the light source 7.

[0071] For this purpose, the power supply 5 comprises electrical input terminals 5a configured to take an alternating current AC from the electrical power supply network 4, through the connection to the conductors 2a of the electrified track 2, and electrical output terminals 5b configured to transmit the direct current DC to at least one optical device 6. The electronic control board of the driver makes it possible to control the operation of the light source, for example to adjust the luminosity or the intermittence range thereof, etc.

[0072] In accordance with a further preferred solution, the lighting system 1 comprises an electrical connection cable 8 that is in the form of an electrical cable, equipped with:

- electrical input terminals that are mechanically and electrically connectable to the first electrical output terminals 5b of the power supply 5 and
- electrical output terminals mechanically and electrically connectable to the second electrical input terminals 6a of an optical device 6.

[0073] It should be specified that, in accordance with the preferred embodiment outlined above in which the lighting system 1 comprises a plurality of optical devices 6 that are optical device modules, then the electrical input terminals of the cable 8 can be mechanically and electrically connected to the electrical output terminals 6b of a first optical device 6, so as to be able to make the electrical connection between two modular optical devices 6.

[0074] Of course, in this case, the electrical output ter-

minals of the electrical connection cable 8 are connectable to the second electrical input terminals 6a of a second optical device 6.

[0075] It should be noted that in this scenario, the cable 8 has a predefined length that makes it possible to determine the linear distance between the power supply 5 and an optical device, or between two optical devices 6 inside the cavity 3 of the electrified track 2. Compatibly with the preferred solution outlined above, the electrical input and output terminals are respectively configured as female and male terminals to be complementary with the respective connectors of the power supply 5 and of the optical device 6. Advantageously, it is possible to position the optical devices 6 in a remote position with respect to the power supply 5.

[0076] In accordance with a further preferred embodiment of the invention, the power supply 5 and/or each optical device 6 can slide, along the direction of extension X-X, in a constrained manner to the electrified track 2. This makes it possible to position the components as a function of the specific requirements of space occupied and of lighting of rooms.

[0077] Of course, those skilled in the art can bring numerous modifications to the variants described above, in order to satisfy contingent and specific requirements, all in any case covered by the scope of protection as defined by the following claims.

Claims

1. Lighting system (1) comprising:

- an electrified track (2) comprising a bar with U-profile defining a cavity (3) within which a plurality of electrical conductors (2a) are housed, connectable to a power supply network (4) for receiving an alternating current;
- a power supply (5) comprising:

- first electrical input terminals (5a) connectable to said electrical conductors (2a) for receiving said input alternating current and first electrical output terminals (5b) for supplying a constant output supply voltage,
- first constraining means (5c) configured for mechanically constraining said power supply (5) to said electrified track (2);

- at least one optical device (6) provided with at least one light source (7) and at least partially housed within said cavity (3), said optical device (6) comprising second constraining means (6c) configured for mechanically constraining said optical device (6) to said electrified track (2) and second electrical input terminals (6a) electrically and mechanically connected to said first electrical output terminals (5b) for receiving said con-

stant input supply voltage for electrically supplying said at least one light source (7);

characterized in that

- said at least one optical device (6) is an optical device module,
- said at least one optical device (6) comprising second output electrical terminals (6b) electrically and mechanically connectable to said second electrical input terminals (6a) of a further and separate optical device (6) for transmitting said constant supply voltage to said separate optical device (6).

2. Lighting system (1) according to claim 1, wherein said power supply (5) is housed hidden inside said cavity (3) of said electrified track (2).

3. Lighting system (1) according to claim 2, wherein

- said second electrical input terminals (6a) are electrically and mechanically connected to said first electrical output terminals (5b) of said power supply (5) or to said second electrical output terminals (6b) of a further and distinct optical device (6) for receiving said direct supply voltage.

4. Lighting system (1) according to claim 2 or 3, comprising:

- a plurality of optical devices (6) arrayed in series in said cavity (3) and to electrically connected to one another in parallel or in series.

5. Lighting system (1) according to any one of claims 2 to 4, wherein

- said first output electrical terminals (5b) of said power supply (5) and said second electrical output terminals (6b) of said optical device (6) are configured as male connector, and said second electrical input terminals (6a) are configured as female connectors electrically and mechanically connectable to said male connectors.

6. Lighting system (1) according to any one of claims 2 and 5, comprising at least one electrical connection cable (8) which comprises an electrical cable, third electrical input terminals mechanically and electrically connectable to said first electrical output terminals (5b) of said power supply (5) or to said second electrical terminals (6b) of said optical device (6), and third electrical output terminals mechanically and electrically connectable to said second electrical input terminals (6a) of said optical device (6).

7. Lighting system (1) according to any one of the pre-

ceding claims, wherein said first electrical input terminals (5a) are configured as reed contacts.

8. Lighting system (1) according to any one of the preceding claims, wherein said first constraining means (5c) are configured as rigid fins adapted to engage into complementary seats formed in said cavity (3) for mechanically constraining said power supply (5) to said electrified track (2),
 - said second constraining means (6c) are configured as rigid fins adapted to engage into complementary seats formed in said cavity (3) for mechanically constraining said optical device (6) to said electrified track (2).
9. Lighting system (1) according to any one of the preceding claims, wherein said light source (7) comprises a LED system (10) arranged externally to said cavity (3), said optical device (6) comprises an enclosure (9) housed within said cavity (3), wherein said enclosure (9) comprises an internal clutched grip (11) adapted to allow the rotation of said LED system (10) with respect to said enclosure (9) about a predetermined axis of rotation (Y-Y).
10. Lighting system (1) according to any one of the preceding claims, wherein
 - said electrified track (2) is shaped as a bar with U-profile which extends longitudinally along an axial direction (X-X) by a predefined length, so as to define said cavity (3) which extends seamlessly along said axial direction (X-X) by said predefined length,
 - said power supply (5) and/or each optical device (6) are slidably constrained to said electrified track (2) to slide within said cavity (3) along said axial direction (X-X).

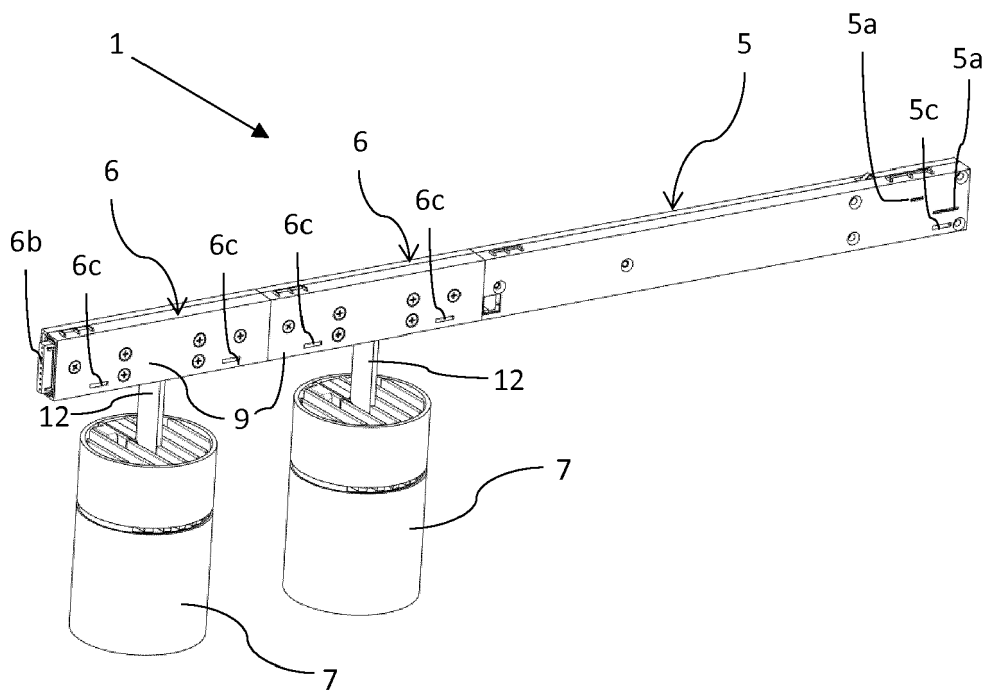


Fig. 1

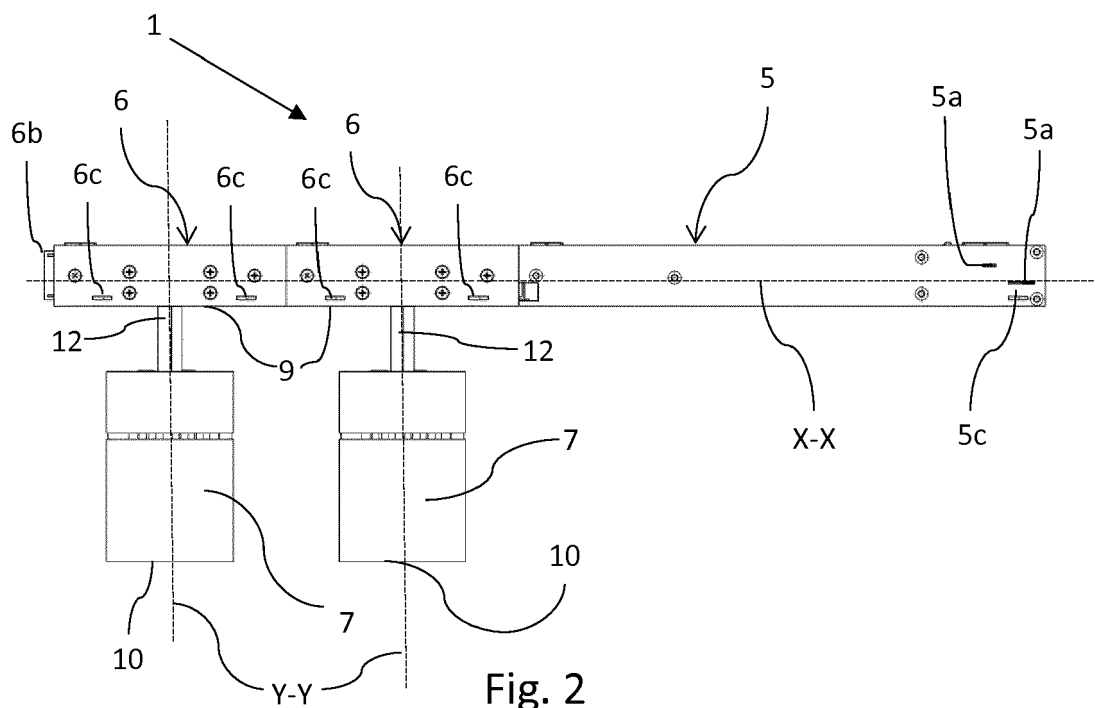


Fig. 2

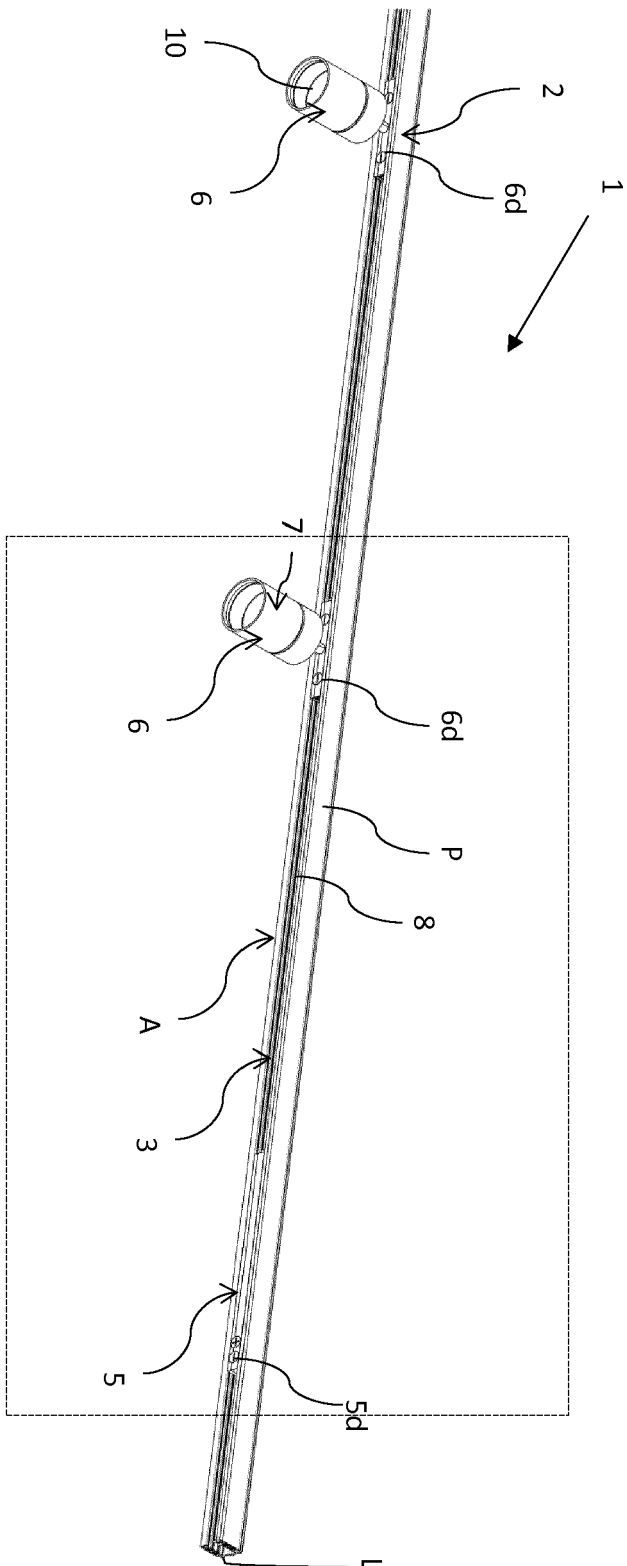
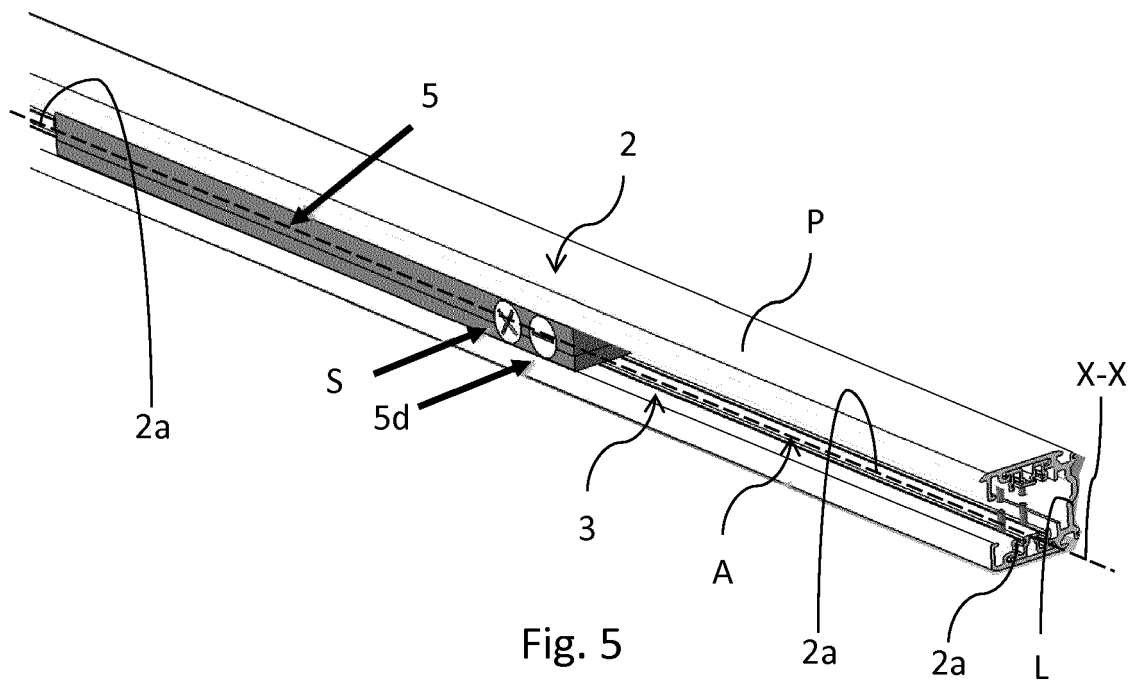
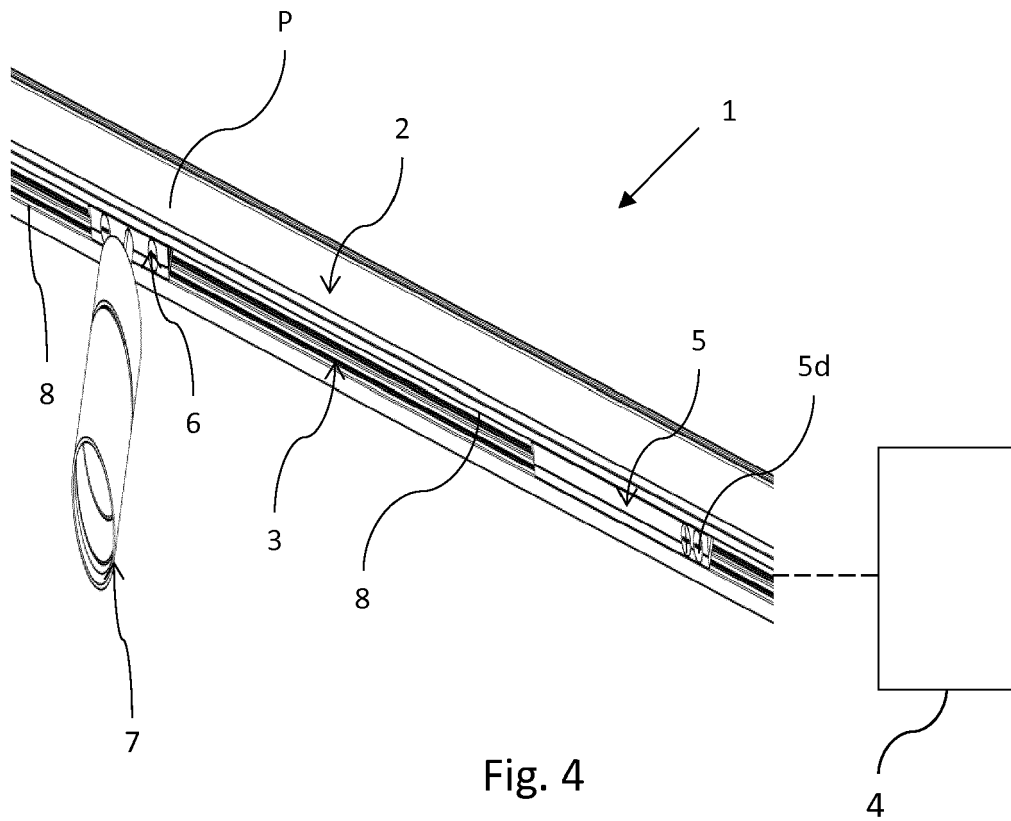
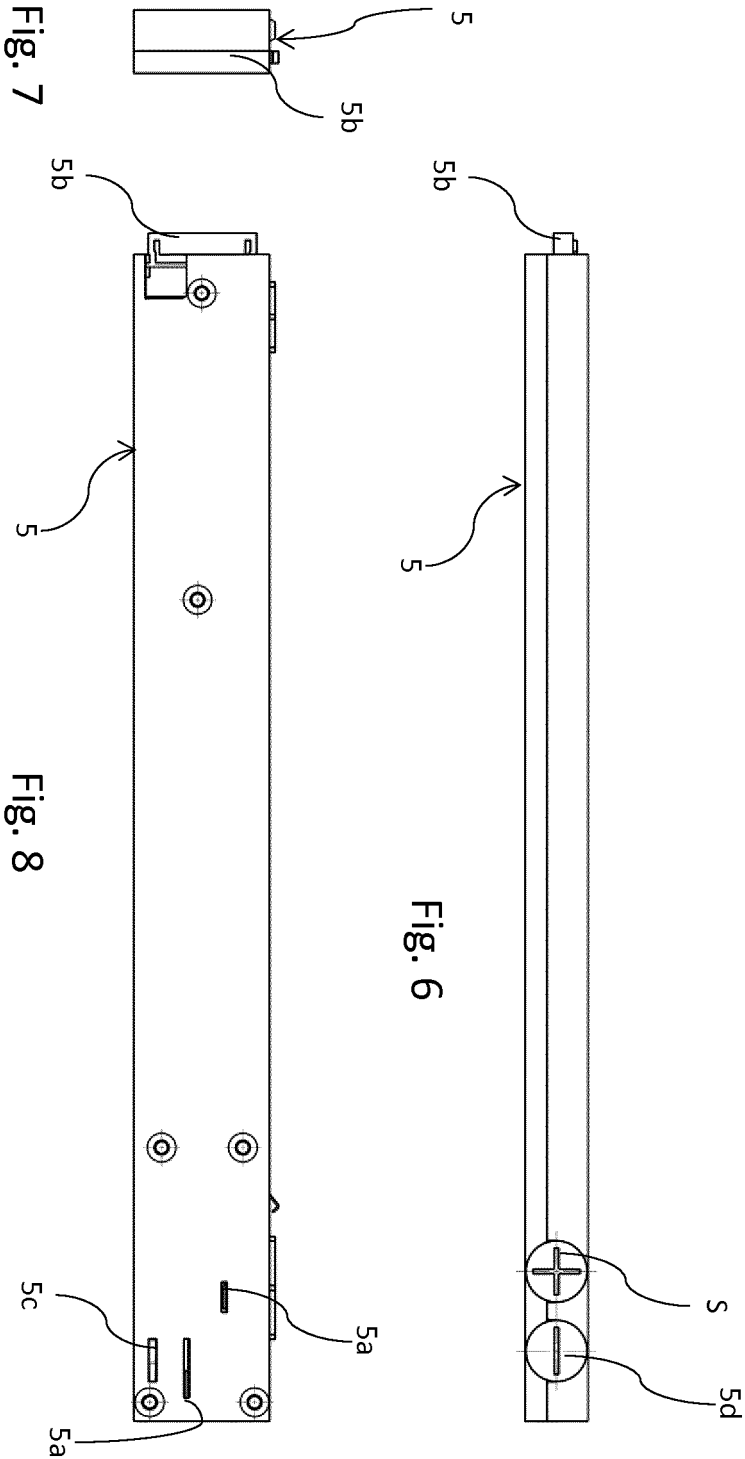


Fig. 3





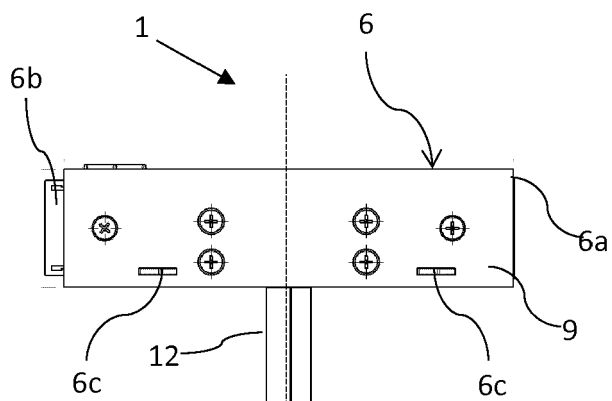


Fig. 9

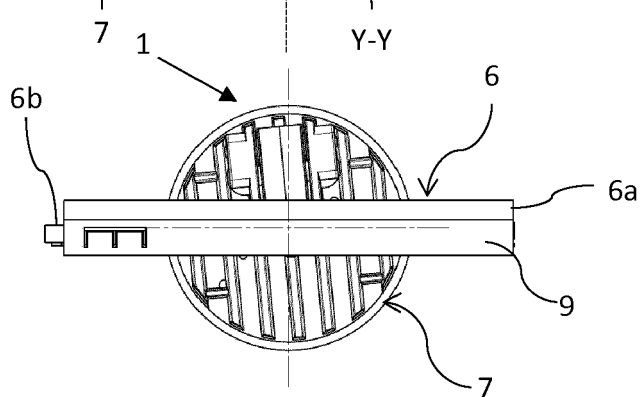


Fig. 11

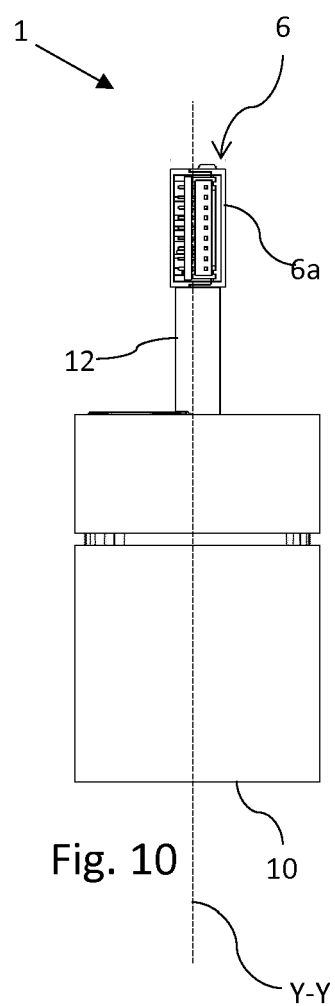


Fig. 10

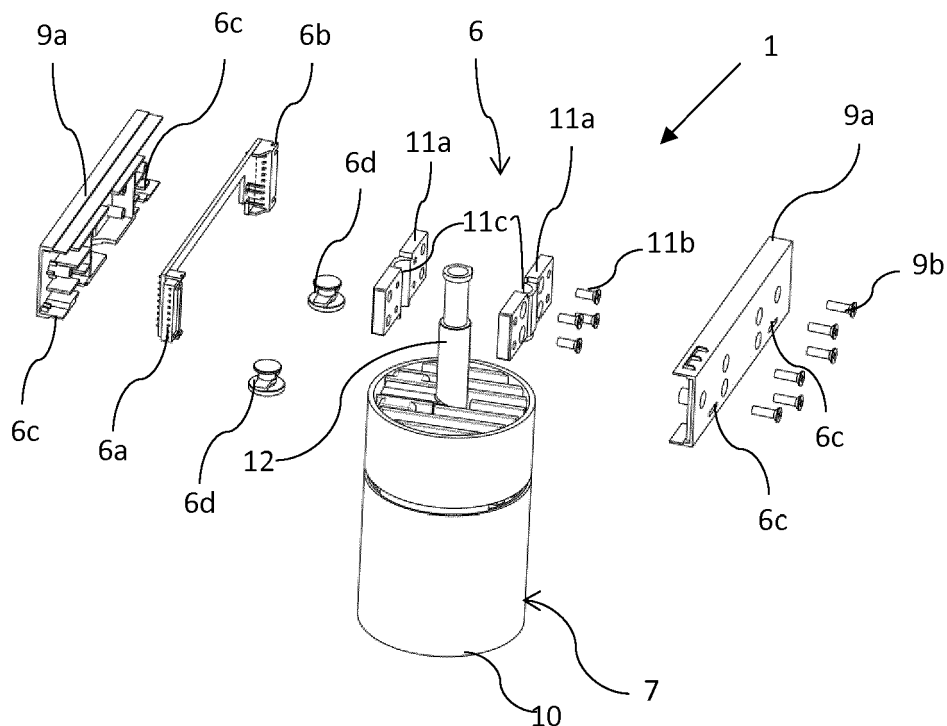


Fig. 12

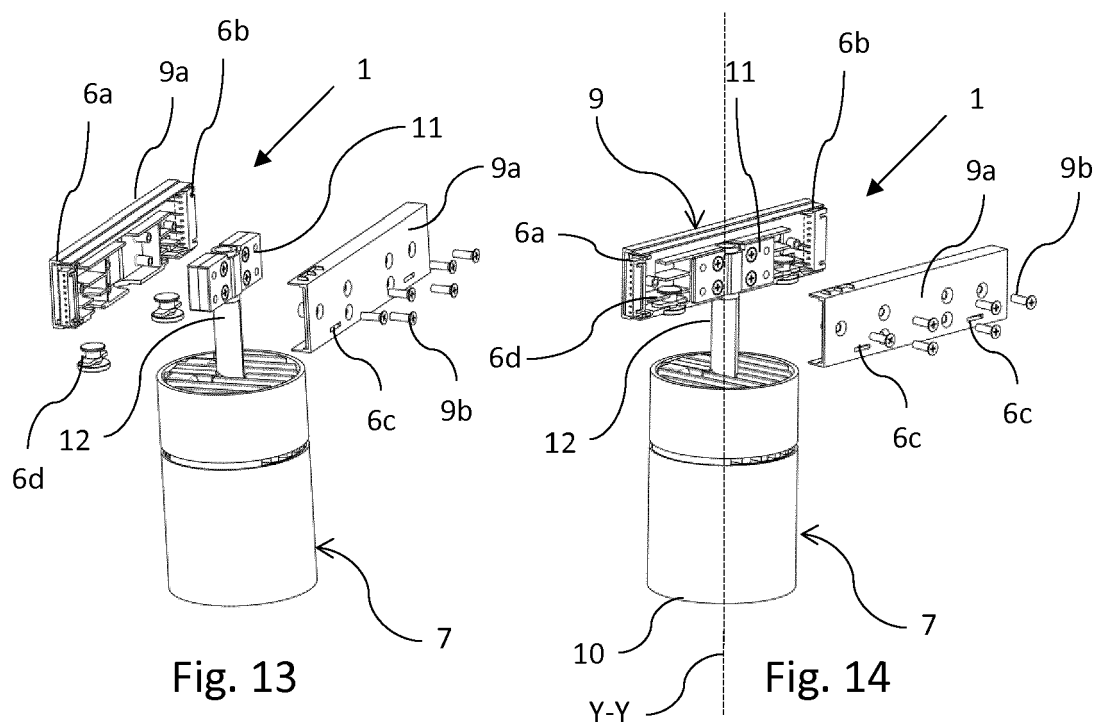


Fig. 13

Fig. 14