(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 675 291 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.07.2020 Bulletin 2020/27

(51) Int Cl.:
H01R 25/14 *(2006.01)* ***H01R 13/24*** *(2006.01)*

(21) Application number: **19217522.2**

(22) Date of filing: **18.12.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **27.12.2018 CN 201811618665**

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(54) LOW VOLTAGE ELECTRIFICATION TRACK SYSTEM

(57) The invention discloses a track system for low voltage power supply, comprising a power transmission track, an electrical plug configured to be detachably connected to the power transmission track, wherein a surface of the power transmission track is provided with a first conductive bar, the electrical plug is provided with a second conductive bar which is contacted with the first conductive bar when the electrical plug is connected to the power transmission track for low voltage power supply.

According to the invention, surfaces of the first conductive bar and of the second conductive bar are wrapped with a conductive elastomer. The conductive elastomer on the second conductive bar squeezes to contact with the conductive elastomer on the first conductive bar when the electrical plug is connected to the power transmission track, wherein the portions of the conductive elastomer that are squeezed due to their mutual contact when the electrical plug is connected to the power transmission track take a reduced electric resistance value to form a conductive contact portion for low voltage power supply.

The invention has the advantages of expanding the applicable range of the track system, good safety performance and high power transmission efficiency.

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Description

RELATED APPLICATION

[0001] This present application claims priority of Chinese Patent Application No. CN 201811618665.3, filed on December 27, 2018 the whole contents of which are hereby incorporated by reference.

FIELD OF INVENTION

[0002] The present invention relates to the field of lighting, with particular emphasis on a track system for low voltage power supply, particularly for providing a low power supply voltage for lighting of shelves for product display purposes.

BACKGROUND OF THE INVENTION

[0003] Track system for low voltage power supply is widely used in commercial lighting fields such as supermarket shelves and freezer floors and for other commercial lighting purposes. In order to ensure good electrical contact, a conventional track system for low voltage power supply uses bare copper bars as positive and negative electrodes, and in order to improve the effective utilization of electricity, often uses pure copper.

[0004] However, copper bars exposed to air are prone to produce patina (e.g. copper green), which leads to a higher contact impedance between the electrical plug and the copper bars used as electrodes, which affects the power supply. In order to overcome the above problems, the surface of the copper bar is often plated, but this still cannot solve the problem that a wet environment or an environment with high humidity will cause the formation of liquid or moisture on the surface of the track and in the contact areas used for electric power supply. The positive and negative poles of the exposed copper bar are prone to be short-circuited by the liquid or moisture, causing frequent failure of such track systems for low voltage power supply, which makes such track systems suitable for low voltage power supply only for the dry environments.

[0005] From the prior art there are known conductive elastomers. A conductive elastomer is a form of elastomer, often natural rubber or other rubber substitute, that is manufactured to conduct electricity. This is commonly accomplished by distributing carbon or other conductive particles, particularly conductive metal particles, throughout the raw material prior to setting it. Conductive elastomers are often uniformly doped with metal conductive particles in the rubber. Currently, conductive elastomers are mainly used in the industry for shielding, anti-interference, contact buttons, signal conduction and other small current applications. However, conductive elastomers are not used power devices for power transmission. The main reason is that a simple conductive elastomer, particularly a simple conductive rubber, has a relatively high impedance. Conductive elastomers are often pressure-sensitive, with their conductivity varying with the amount of pressure put on it. Although the impedance is relatively small after being squeezed, when a conductive elastomer is directly used as a conductive member for long distance power transmission, its impedance will increase with the increase of the distance, resulting in very high Ohmic transmission losses, and the so-called long distance here is equivalent to a very close distance in the traditional sense by contrast, such as 10 cm.

BRIEF SUMMARY OF THE INVENTION

[0006] In view of the above problems, it is an object of the present invention to provide an enhanced track system for low voltage power supply, particularly for power supply of shelves used for product display, that enables a reliable operation even in humid environments.

[0007] This problem is solved by a track system for low voltage power supply as claimed in claim 1. Further advantageous embodiments are the subject-matter of the dependent claims.

[0008] A track system for low voltage power supply enables a wide application range, high power transmission efficiency and good safety performance, even in humid environments.

[0009] According to the present invention there is provided a track system for low voltage power supply, comprising a power transmission track and an electrical plug that is configured to be detachably connected to the power transmission track. A surface of the power transmission track is provided with a first conductive bar, and the electrical plug is provided with a second conductive bar, wherein the electrical plug is configured such that the second conductive is contacted with the first conductive bar for low voltage power supply. According to the present invention surfaces of the first conductive bar and of the second conductive bar are wrapped or coated with a conductive elastomer, wherein the conductive elastomer on the second conductive bar squeezes to contact with the conductive elastomer on the first conductive bar when the electrical plug is connected to the power transmission track, and wherein the portions of the conductive elastomer that are squeezed due to their mutual contact when the electrical plug is connected to the power transmission track take a reduced electric resistance value to form a conductive contact portion for low voltage power supply.

[0010] According to a further embodiment, the second conductive bar is bent towards the first conductive bar to form a bending portion extending in parallel with the first conductive bar, and the bending portion squeezes and contacts with the first conductive bar when the electrical plug is assembled with and connected to the power transmission track; and wherein the shape of the conductive elastomer on the surface of the second conductive bar is matched to the deformation of the second conductive bar.

[0011] According to a further embodiment, the second conductive bar extends out of the electrical plug, and the protruding portion of the second conductive bar is surrounded by a common rubber layer.

[0012] According to a further embodiment, the second conductive bar extends out of the electrical plug, and the electrical plug is provided with a limiting portion extending in the direction of the second conductive bar, and the lower end of the limiting portion contacts the second conductive bar and applies a pressure thereto in the direction of the power transmission track when the electrical plug is connected to the power transmission track.

[0013] According to a further embodiment, the electrical plug comprises an upper end cover and a lower end cover fixedly assembled with the upper end cover; wherein the lower end cover is provided with an opening, and the bending portion is exposed from the opening to the outside of the electrical plug.

[0014] According to a further embodiment, the electrical plug is assembled with and connected to the power transmission track by a clamp fixedly mounted thereto; and the power transmission track is provided with a clamping portion having two clamping plates, and the lower ends of the two clamping plates of the clamp pass through the electrical plug from top to bottom and are clamped on both sides of the clamping portion when the electrical plug is connected to the power transmission track.

[0015] Compared with the prior art, the invention has the advantages that the copper bar is coated with the conductive elastomer, which can not only make the conductive elastomer play the role of protection and isolation, avoid the copper bar direct contact with the air to generate copper rust, thereby preventing the copper bar from short circuit caused by condensation of the liquid on the track in the humid environment, and at the same time can fully utilize the characteristics that the conductive elastomer has good electrical conductivity when subjected to pressure, when the electrical plug is in contact with the track, it acts as a conductive medium to assist the copper bar to transmit power, which makes the track system for low voltage power supply can be safely used in humid environments, expands the scope of application, and effectively ensures power transmission efficiency.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

FIG. 1 is a schematic structural view of a preferred embodiment of a track system for low voltage power supply of the present application.

FIG.2 is an exploded view of the embodiment of FIG. 1.

FIG.3 is a perspective view of FIG.2 from below the track system.

FIG.4 is a schematic view of FIG. 2 from above the track system.

DETAILED DESCRIPTION OF THE INVENTION

[0017] The present application is illustrated by way of the following detailed description based on of the accompanying drawings. It should be noted that illustration to the embodiment in this application is not intended to limit the invention. The embodiments of the present invention are described in detail below, and the examples of the embodiments are illustrated in the drawings, wherein the same or similar reference numerals are used to refer to the same or similar elements or elements having the same or similar functions. The embodiments described below with reference to the accompanying drawings are intended to be illustrative of the invention and are not to be construed as limiting.

[0018] For an introductory explanation, FIG.1-4 illustrate one embodiment of a track system for low voltage power supply according to the present application. The track system for low voltage power supply includes a power transmission track 1 and an electrical plug 2 (electrical connector) that is configured to be detachably connected to the power transmission track 1. The surface of the power transmission track 1 is provided with at least one first conductive bar 11, and particularly may be provided with two first conductive bars 11 extending in parallel with each other and spaced apart from each other, as shown in Fig. 4. The electrical plug 2 is provided with at least one second conductive bar 21 which can be contacted with the first conductive bar 11 to get electricity. Particularly, the electrical plug 2 may be provided with two second conductive bars 21 extending in parallel with each other and spaced apart from each other, as shown in Fig. 2.

[0019] The track system for low voltage power supply further includes a connection portion 3 for connecting external low voltage power supply, as shown in FIG.1. Of course, the track system for low voltage power supply further includes other components, such as a corner adapting piece between the power transmission track and the power transmission track, etc., however, as these are not the focus of this present application, they are not elaborated here, and the connection portion 3 will be briefly explained below.

[0020] As shown in FIG.1, the connection portion 3 is preferably located at one end of the power transmission track 1, and the connection portion 3 is connected to the low voltage power supply via a copper bar 5. The low voltage power supply generally takes a value of 24V or 48V. The copper bar 5 may be electrically connected to the power transmission track 1 by welding, and the copper bar 5 transmits the power of the power supply end to the power transmission track 1, and the electrical plug 2 takes power from the power transmission track 1 to supply power to a lighting end. Of course, the copper bar 5 may also be electrically connected to the power trans-

mission track 3 in other ways. This technology is well known to those skilled in the art and therefore will not be described in detail herein.

[0021] According to the present application, the surfaces of the first conductive bar 11 and of the second conductive bar 21 are wrapped with conductive elastomer 4, particularly with a conductive rubber. When the electrical plug 2 is connected to the power transmission track 1, the conductive elastomer 4 on the second conductive bar 21 squeezes to contact with the conductive elastomer 4 on the first conductive bar 11, and due to this squeezing the resistance value of those portions of the conductive elastomer 4 that are pressed against each other when the electrical plug 2 is connected to the power transmission track 1, and that are contacted is reduced to thereby form a conductive contact portion of a proper resistance value suitable for low voltage power supply. For details, please refer to FIG.3-4.

[0022] When the conductive elastomer is not under pressure, it has a larger resistance value. Because the conductive elastomer is wrapped on the surface of the conductive bars, the conductive elastomer can exert an elastomeric (rubber) insulation function and enable a good sealing performance to isolate the conductive bar from ambient air and humidity or moisture. Even if the track system for low voltage power supply is used in a humid environment, due to the isolation and insulation by the conductive elastomer, it can also effectively prevent the conductive bar from coming into contact with any liquid or moisture condensed on the track to thereby effectively preventing a short circuit. Thus, according to the present invention power failures can be avoided and the safety can be improved, to thereby overcome the problem of a conventional track system for low voltage power supply that could only be applied in a dry environment. Thus, according to the present invention the range of applications of track systems for low voltage power supply can be significantly extended.

[0023] At the same time, the conductive elastomer is subjected to a certain pressure when the electrical plug is connected to the power transmission track. Thus, the electric resistance of the squeezed portions of the conductive elastomers will decrease, offering a good conductivity for low voltage power supply. In this way, when the second conductive bar is pressed into contact with the first conductive bar, the resistance value of the squeezed contact portions of the conductive elastomer is reduced to form a conductive contact portion for low voltage power supply, thus acting as a conductive power transmission bridge between the first conductive bar and the second conductive bar, while other portions not directly contacted and pressed are substantially unchanged in resistance. Thus, the non-squeezed portions of the conductive elastomer continue to exert an excellent insulating isolation function. Thus, the conductive bars can complement the conductive elastomer and have good power transmission performance while being applicable to a humid environment.

[0024] In order to enable the conductive elastomer on the second conductive bar 21 to be effectively squeezed in contact with the conductive elastomer on the first conductive bar 11, the second conductive bar 21 is resiliently biased against the first conductive bar 11 toward a position, in which both conductive elastomer are sufficiently pressed against each other to form a enabling the low voltage power supply. More specifically, as shown in Fig. 2 the second conductive bar 21 bent toward the first conductive bar 11 to form a U-shaped bending portion 211 having a bar that extends in parallel with the first conductive bar 11, wherein the bending portion 211 squeezes and is in contact with the first conductive bar 11 when the electrical plug 2 is connected to the power transmission track 1. The shape of the conductive elastomer 4 on the surface of the second conductive bar 21 is adapted to the deformation of the second conductive bar 21, that is, the conductive elastomer 4 on the second conductive bar 21 is bent due to the deformation of the second conductive bar 21, and the formed bending portion 211 squeezes and contacts with the conductive elastomer 4 on the first conductive bar 11 to form a conductive contact portion for low voltage power supply.

[0025] The second conductive bar 21 extends out of the electrical plug 2, as shown in FIG.1. In order to facilitate long-term use in a humid environment, the protruding portion of the second conductive bar 2 extending out of the electrical plug 2 is surrounded by a common rubber layer. Referring to Figs. 2 - 4, the electrical plug 2 comprises an upper end cover 22 and a lower end cover 23 fixedly assembled with the upper end cover 22. The electrical plug 2 is provided with a limiting portion 24 extending in the direction of the second conductive bar 21. The lower end of the limiting portion 24 contacts the second conductive bar 21 and applies a pressure to the second conductive bar 21 toward the direction of the power transmission track 1. Since the limiting portion 24 can apply a force to the second conductive bar 21 in the direction of the track 1, the second conductive bar 21 can be prevented from being pulled out of the power transmission track 1 due to excessive force. And the pull-off preventing effect provided by the limiting portion 24 is good. The limiting portion 24 may be disposed perpendicular to the second conductive bar 21, that is, the limiting portion 24 may be perpendicular to the inner wall of the upper end cover 22. Particularly, the limiting portion 24 may be shaped as a limiting bar, as shown in FIG. 3, but it can also be another structure that can achieve the anti-pull-off effect.

[0026] At the same time, it should be mentioned that in order to realize the squeezing contact between the second conductive bar 21 and the first conductive bar 11, it is obvious that the lower end cover 23 of the electrical plug 2 is provided with at least one opening 231, so that the bending portion 211 of the second conductive bar 21, around which the conductive elastomer 4 is wrapped, can extend through the opening 231 to the outside of the electrical plug 2. FIG. 3 is a schematic view

showing the structure between the lower end cover 23 and the opening 231.

[0027] In order to facilitate maintenance, in the embodiment, the electrical plug 2 is detachably connected to the power transmission track 1, so that only the faulty parts need to be removed without the necessity of repairing the entire system, which saves cost.

[0028] More specifically, in the embodiment shown in the drawings, the electrical plug 2 is assembled and connected with the power transmission track 1 by means of a clamp 6 fixedly mounted on the electrical plug 2 that has at least one clamping plate 61, and the power transmission track 1 is provided with a clamping portion 12, has a rectangular profile in this example. When the electrical plug 2 is assembled and connected to the power transmission track 1, the front end of the clamping plate 61 positively grips behind the rear side of the clamping portion 12 of rectangular profile to thereby fix the position of the electrical plug 2 relative to the power transmission track 1. At the same time, the clamping plate 61 is resiliently biases the electric plug 2 against the power transmission track 1, so that the associated bending portion 211 of the electric plug 2 is resiliently pressed against a slanted surface of the first conductive bar 11 facing away from the clamping portion 12.

[0029] As shown in Fig. 2, the electrical plug 2 may comprise two clamping plates 61 resiliently biased against each other like the two legs of a clothespin so that the two clamping plates 61 may clamp the opposite front and rear side of the clamping portion 12 of rectangular profile to thereby fix the position of the electrical plug 2 relative to the power transmission track 1. As shown in Fig. 5, the lower ends of the two clamping plates 61 of the clamp 6 can extend through the opening 231 to the outside of the electrical plug 2 from top to bottom. At the same time, the associated bending portion 211 of the electric plug 2 is resiliently pressed against a slanted surface of the first conductive bar 11 facing away from the clamping portion 12.

[0030] Of course, other connection methods can be used to detachably connect the electrical plug to the power transmission track. There are various specific ways, which can be designed according to actual situations, and this is not the protection focus of the present application, and therefore is not enumerated here.

[0031] The above disclosure has been described by way of example and in terms of exemplary embodiment, and it is to be understood that the disclosure is not limited thereto. Rather, any modifications, equivalent alternatives or improvement etc. within the spirit of the invention are encompassed within the scope of the invention as set forth in the appended claims.

Claims

1. A track system for low voltage power supply, comprising
   a power transmission track (1), and
   an electrical plug (2) configured to be detachably connected to the power transmission track (1), wherein
   a surface of the power transmission track (1) is provided with a first conductive bar (11),
   the electrical plug (2) is provided with a second conductive bar (21), and
   the second conductive bar (21) is contacted with the first conductive bar (11) when the electrical plug (2) is connected to the power transmission track (1) for low voltage power supply, **characterized in that**
   surfaces of the first conductive bar (11) and the second conductive bar (21) are wrapped with a conductive elastomer (4),
   the conductive elastomer (4) on the second conductive bar (21) squeezes to contact with the conductive elastomer (4) on the first conductive bar (11) when the electrical plug (2) is connected to the power transmission track (1), and
   those portions of the conductive elastomer (4) that are squeezed due to their mutual contact when the electrical plug (2) is connected to the power transmission track (1) take a reduced electric resistance value to form a conductive contact portion for low voltage power supply.

2. The track system for low voltage power supply as claimed in claim 1, wherein
   the second conductive bar (21) is bent towards the first conductive bar (11) to form a bending portion (211) extending in parallel with the first conductive bar (11), and the bending portion (211) squeezes and contacts with the first conductive bar (11) when the electrical plug (2) is connected to the power transmission track (1); and
   the shape of the conductive elastomer (4) on the surface of the second conductive bar (21) is matched to a deformation of the second conductive bar (21).

3. The track system for low voltage power supply as claimed in claim 1 or 2, wherein the second conductive bar (21) extends out of the electrical plug (2), and the protruding portion of the second conductive bar (2) is surrounded by a common rubber layer.

4. The track system for low voltage power supply as claimed in claim 2 or 3, wherein the second conductive bar (21) extends out of the electrical plug (2), and the electrical plug (2) is provided with a limiting portion (24) extending in the direction of the second conductive bar (21), and a lower end of the limiting portion (24) contacts the second conductive bar (21) and applies a pressure thereto in the direction of the power transmission track (1) when the electrical plug (2) is connected to the power transmission track (1).

5. The track system for low voltage power supply as

claimed in any of claims 2 to 4, wherein the electrical plug (2) comprises an upper end cover (22) and a lower end cover (23) fixedly assembled with the upper end cover (22); the lower end cover (23) is provided with an opening (231); and the bending portion (211) is exposed from the opening (231) to an outside of the electrical plug (2).

6. The track system for low voltage power supply as claimed in any of the preceding claims, wherein the electrical plug (2) is connected to the power transmission track (1) by a clamp (6) fixedly mounted thereto; and the power transmission track (1) is provided with a clamping portion (12) having two clamping plates (61), and the lower ends of the two clamping plates (61) of the clamp (6) pass through the electrical plug (2) from top to bottom and are clamped on both sides of the clamping portion (12) when the electrical plug (2) is connected to the power transmission track (1).

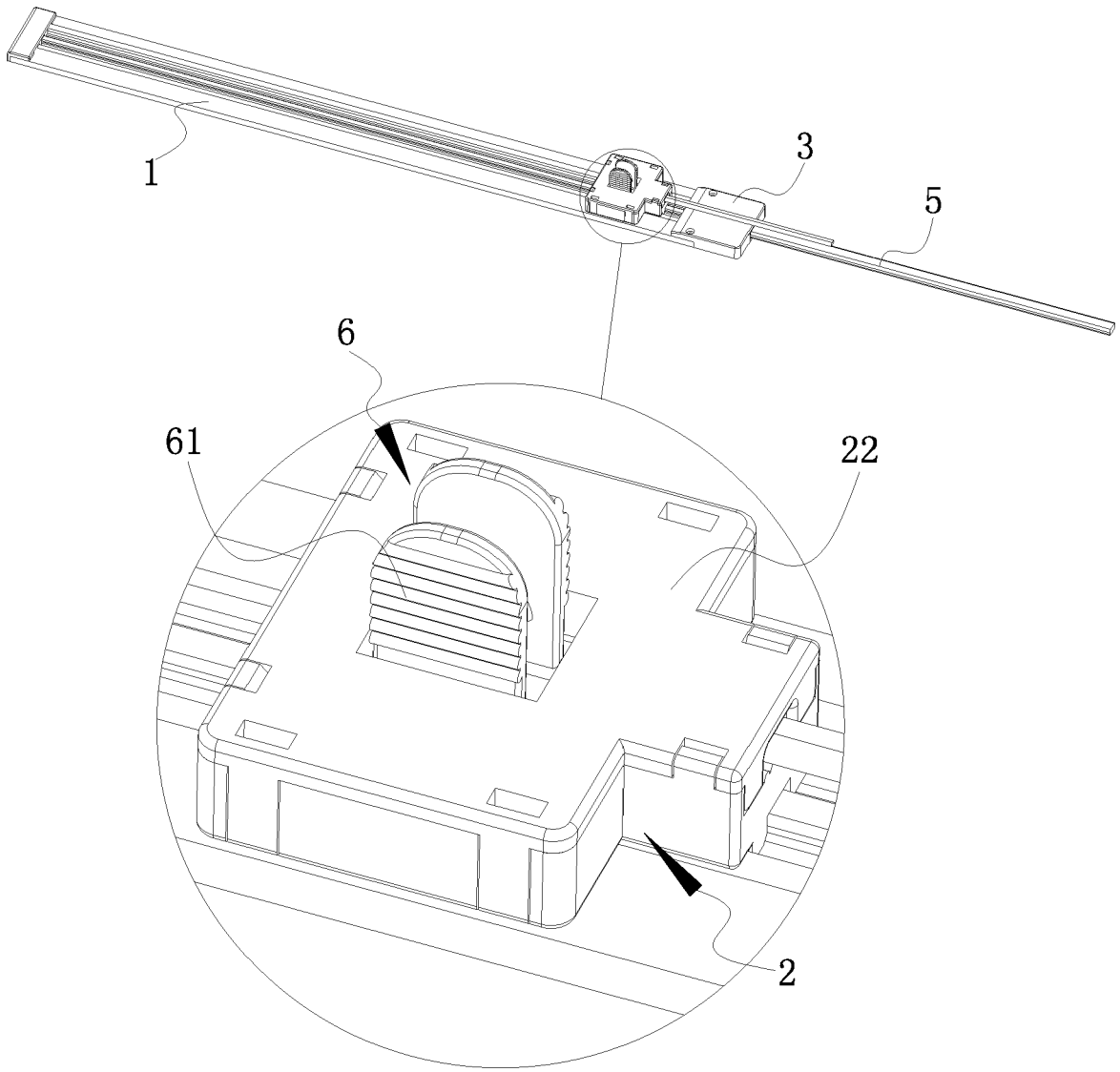

FIG. 1

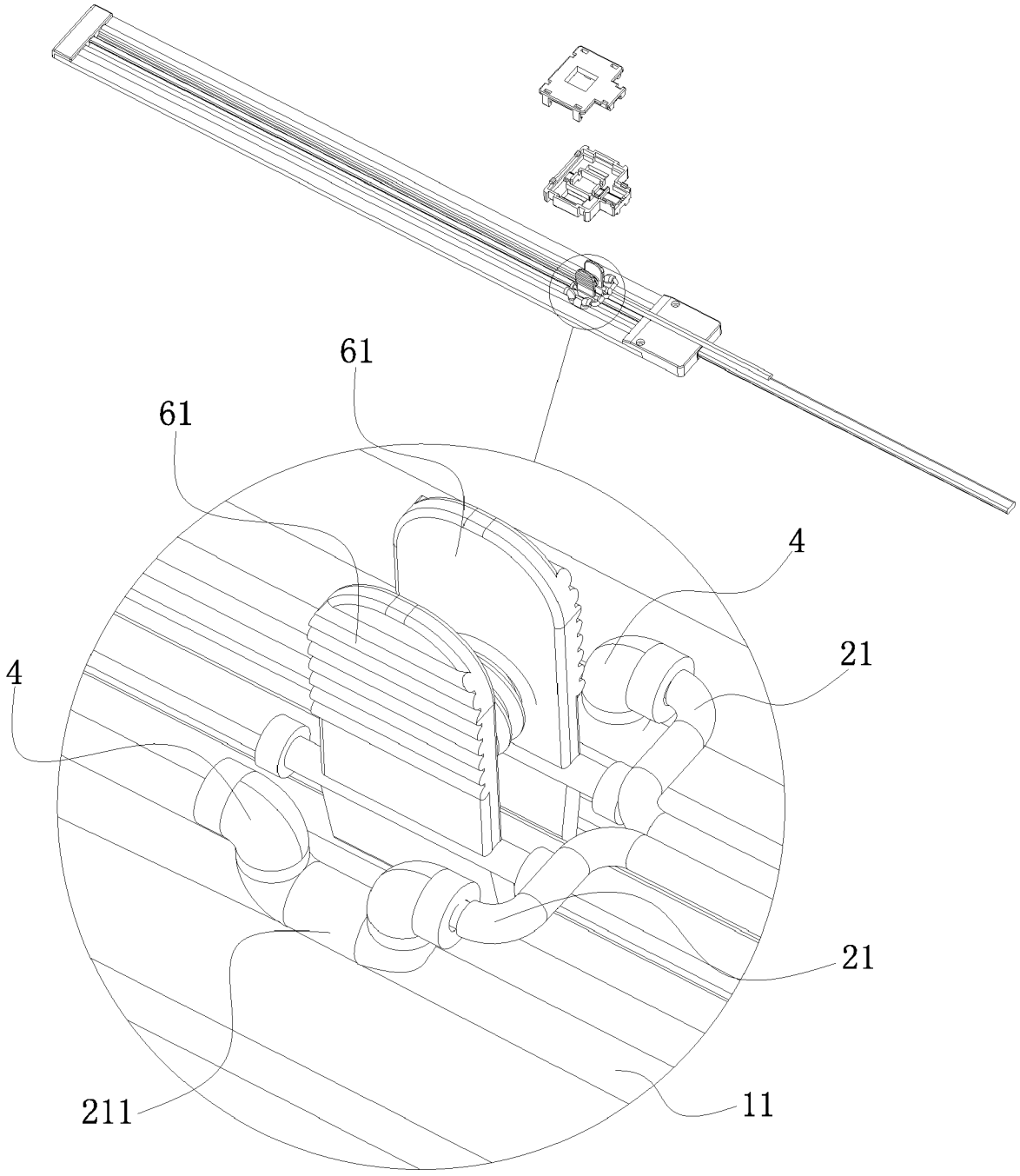

FIG. 2

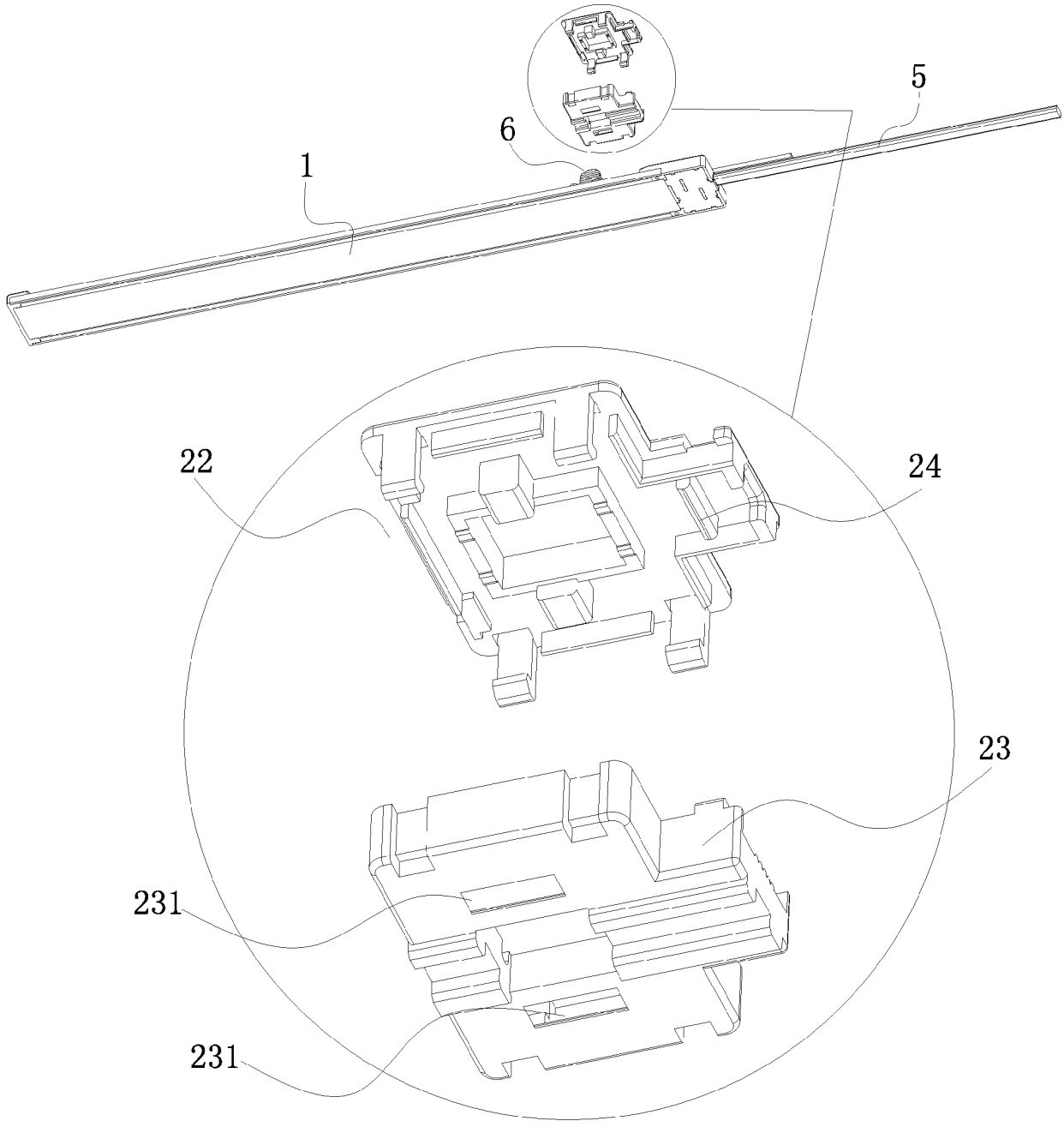

FIG. 3

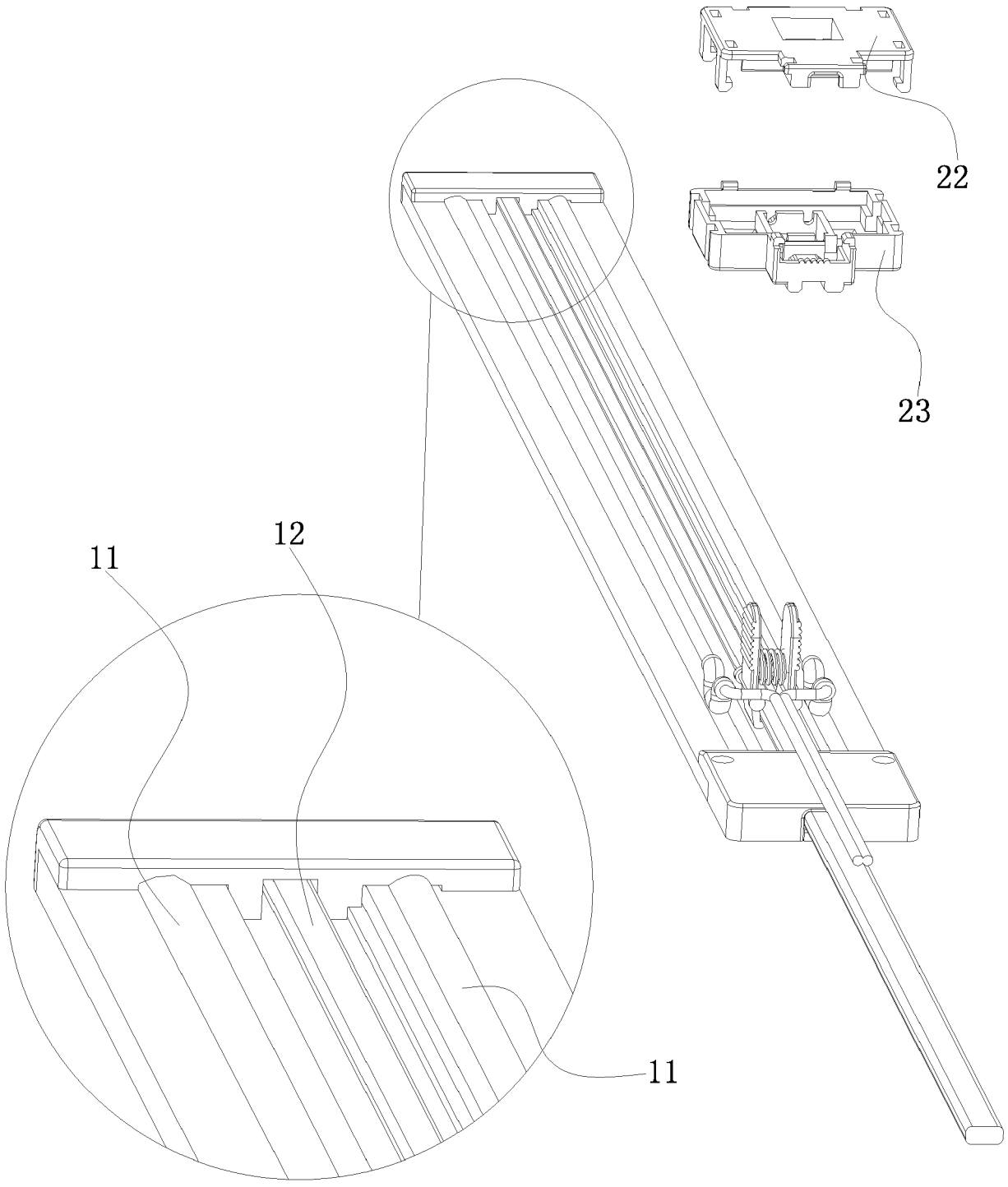

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 19 21 7522

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 April 2020	Corrales, Daniel

CATEGORY OF CITED DOCUMENTS

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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