

[54] **CONNECTING PLUG FOR A CURRENT SUPPLY RAIL**
[72] Inventor: **Kauko Kalervo Hyrylainen**, Helsinki, Finland
[73] Assignee: **Oy Nokia AB**, Helsinki, Finland
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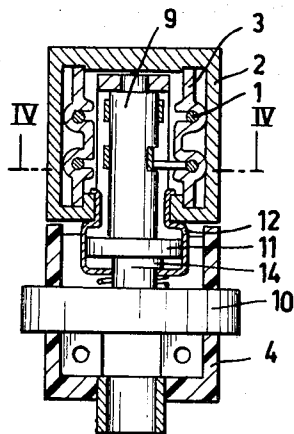
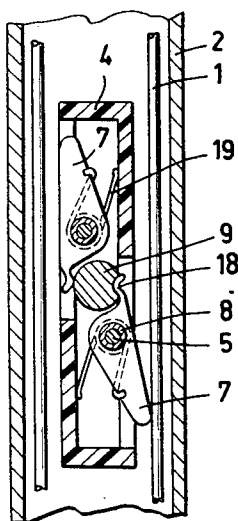
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Assistant Examiner—Robert A. Hafer
Attorney—Waters, Roditi, Schwartz & Nissen

[57] **ABSTRACT**

A connecting plug for a current supply rail, provided with contact fingers mounted in the plug pivotably around fixed shafts perpendicular to the conductors of the supply rail. The plug is further provided with a separate rotatable operating shaft extending in parallel with said pivot shafts of the contact fingers and actuating said contact fingers selectively between a contact position and an inoperative position upon rotation of the operating shaft.

8 Claims, 8 Drawing Figures



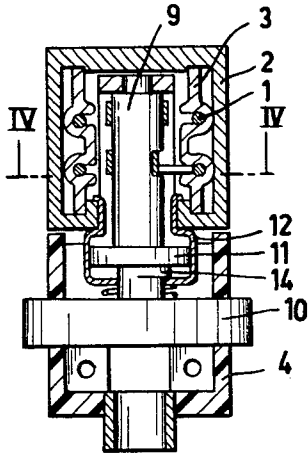


FIG. 1

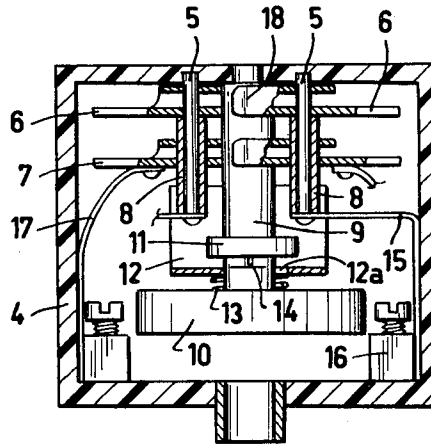


FIG. 2

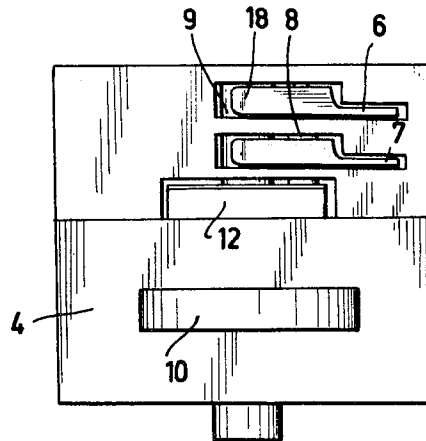


FIG. 3

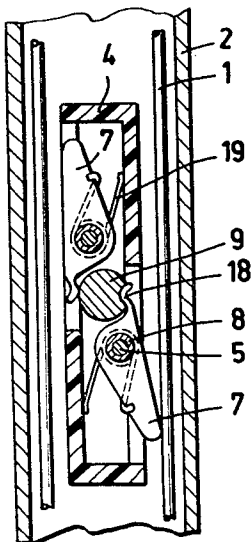


FIG. 4

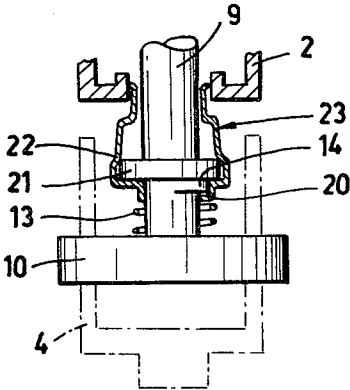


FIG. 5

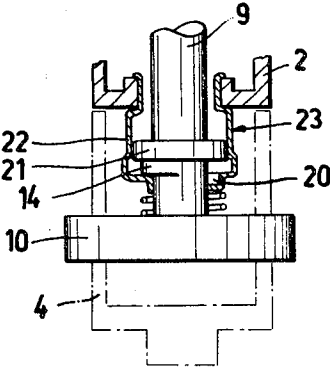


FIG. 6

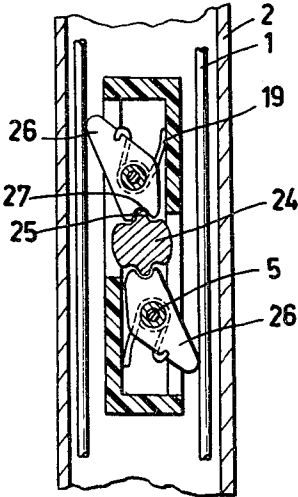


FIG. 7

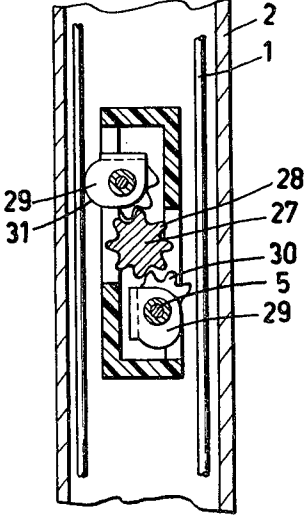


FIG. 8

CONNECTING PLUG FOR A CURRENT SUPPLY RAIL

This invention relates to a connecting plug for a current supply rail arrangement comprising a channel shaped rail and longitudinally extending conductors provided in the rail, said connecting plug consisting of a casing, contact fingers displaceably mounted in the casing and operating means engaging said contact fingers for displacement of the contact fingers between a position, retracted inside the casing and a position protruding from the casing to make contact with said conductors.

In this type of connecting plugs the contact fingers are usually located in a body in such a way that they may be pivoted around a shaft which is positioned in parallel with the conductors in the current supply rail when the body is inserted in the rail and is located outside the rail arrangement. The difficulty with this type of connecting plugs is to ensure that the contact fingers always make good contact with the conductors. Because of the actuate tolerances required the manufacturing of such connecting plugs is relatively expensive.

Connecting plugs are also known in which the contact fingers are located in a body in such a way that they may be pivoted around a shaft which is positioned perpendicular to the conductors in the current supply rail when the body is inserted in the rail. In this type of arrangement, however, all the contact fingers are attached to a common shaft which rotates relative to the body and which shaft as well forms the operating means by which the contact fingers can be pivoted to make contact with the conductors. One drawback with such a connecting plug is that the contact fingers cannot be operated independently, but all the contact fingers simultaneously make contact with their respective conductors.

The object of the present invention is to eliminate the aforementioned drawbacks and the connecting plug according to the invention is characterized in that the contact fingers are pivotably mounted in the casing on shafts extending perpendicularly with respect to the longitudinal direction of the conductors, and that the operating means consists of a separate cam shaft rotatably mounted in the casing in engagement with the contact fingers and extending in parallel with said shafts for the contact fingers.

According to the invention a reliable connecting plug of small size can be manufactured with moderate production costs. As the contact fingers are assembled so that they pivot in the same level as the conductors they make good contact with the conductors in spite of small dimensional inaccuracies. The shaft which operates the contact fingers is located perpendicularly to the rail, which provides a simple embodiment for fulfilling the requirement that the current phases cannot be connected before the connecting plug has been attached to the rail and the protective ground phases been connected, and that the connecting plug cannot be disconnected from the rail while any of the current phases remain connected. A locking spring or some other means which is connectable to the rail can be used as the protective ground phase switch.

The invention will be described in detail in the following with references to the accompanying drawings in which,

FIG. 1 is a vertical sectional view of a connecting plug according to the invention in a first position after insertion of the plug into the current rail.

FIG. 2 is a vertical sectional view of the connecting plug along the plane of the rail.

FIG. 3 is a front view of the connecting plug.

FIG. 4 is a section along line IV—IV in FIG. 1, whereby the rail arrangement has been simplified for clearer presentation.

FIG. 5 is a side view of another embodiment of the locking spring in inserting position.

FIG. 6 shows the same in locking position.

FIG. 7 is a cross sectional view similar to FIG. 4 of another embodiment of the connecting plug.

FIG. 8 is a cross sectional view similar to FIG. 4 of a third embodiment of the connecting plug.

The current supply rail arrangement comprises several current conductors 1 embedded in insulating strips 3 which are attached to an aluminum rail 2.

The connecting plug comprises a case type body 4 made for example of phenol plastics. Two parallel shafts 5 are attached to the top part of the body. Contact fingers 6 and 7 are pivotably mounted on the shafts and the lower set of fingers is insulated from the shafts 5 by means of insulating tubes 8. Alternatively, one of these tubes can be eliminated and the shafts can be connected to each other electrically, so that all these phases are connected together. Hereby it is possible to select by means of the connecting plug which phase is connected to the rail.

In addition a rotatable cam shaft 9 which is in parallel with the shafts 5 is rotatably mounted in the body. At the ends of the contact fingers cams are attached to the cam shaft so that the contact fingers can be caused to pivot in a certain pattern by the cams when the shaft 9 is rotated by means of a knob 10 attached thereto.

A U-shaped spring 12 is fitted to the cam shaft 9 which is provided with an eccentric disc 11 between the arms of the spring. When the shaft is rotated the eccentric disc widens the spring so that its arms make contact with the sides of the slot of the rail and thus fasten the connecting plug to the rail. To prevent accidental turning of the shaft 9, the shaft is provided with a cam 14 which fits into a notch 12a in the locking spring 12 when a spring 13 urges the spring towards the eccentric disc 11. When the body 4 is inserted so deep into the rail 2 that the rail pushes the locking spring towards the disc 10, the cam 14 is released from the notch 12a. Only then the cam shaft and the eccentric disc 11 can be rotated so that the locking spring 12 is forced into engagement with the rail. When the cam shaft is rotated, the cam 14 turns beneath the locking spring, thus preventing it from being unlocked and the body 4 from being withdrawn perpendicularly away from the rail. The cams attached to the cam shaft cause the corresponding contact fingers to pivot out from the body when the shaft is rotated over a certain angle, so that the fingers make contact with the required conductors.

From the upper contact finger 6 the current passes along the shaft 5 and the conductor 15 is to contact screw 16, and from the lower contact finger 7 along flexible wires 17 to another contact screw.

FIG. 4 illustrates how the operation of the contact fingers is controlled by the cam shaft 9. A cam 18 on

one of the contact fingers has moved into a notch in the cam shaft, whereby the contact finger is pressed against a conductor in the rail by a spring 19. When the cam shaft is rotated further the contact finger breaks its contact with the conductor and after a rotation of 180° the other contact finger makes contact with the corresponding conductor. The cams can of course be designed to different purposes and each contact finger may be provided with its own notch disc on the cam shaft.

FIGS. 5 and 6 show an alternative method of locking the connecting plug into the rail. The notch 12a and the eccentric 11 in the U-shaped locking spring 23 have been replaced by a notch 20 and a cylindrical part 21. When the plug is inserted in the rail the cylinder 21 is displaced into a narrower part 22 of the locking spring and expands the spring so that it grips the edges of the rail aperture. Only when the locking spring has been moved by means of the rail 2 such a distance along the shaft 9 that the cam 14 is released from the notch 20 the spindle is allowed to be rotated by the operating knob 10.

FIG. 7 shows an arrangement in which the cam shaft 24 is provided with teeth 25, one for each contact finger 26. Each tooth is engaged with a notch 27 in each contact finger so that the contact fingers pivot when the shaft is rotated. A suitable contact pressure is effected by means of springs.

FIG. 8 shows an arrangement in which the shaft 27 is formed as a toothed wheel 28 and the contact fingers are formed as eccentrically pivotably mounted discs 29. Which are provided with teeth 30 which are in engagement with the cam shaft. The contact fingers form a curved contact surface 31 which is of such shape that when the contact finger is turned outwards the contact surface slides continuously along the conductor so that the contact finger is wedged between the shaft 5 and the conductor 1 and locked thereby into the projecting position.

According to an advantageous embodiment the cams on the cam shaft are positioned mutually so that the contact fingers make contact with the conductors in a certain sequence when the cam shaft is rotated.

What we claim is

1. A connecting plug for a current supply rail arrangement comprising a channel shaped rail and longitudinally extending conductors provided in the rail, said connecting plug consisting of a casing, contact fingers displaceably mounted in the casing and operating means engaging said contact fingers for displacement of the contact fingers between a position retracted inside the casing and a position protruding from the casing to make contact, with said conductors, characterized in that the contact fingers are pivotably mounted in the casing on shafts extending perpendicularly with respect to the longitudinal direction of the conductors, and that the operating means consists of a separate cam shaft rotatably mounted in the casing in sliding engagement with the contact fingers and extending in parallel with said shafts for the contact fin-

gers.

2. A connecting plug according to claim 1 provided with fastening device for locking the casing in the current supply rail in a fully inserted position, characterized in that the fastening device consists of a U-shaped locking spring and that the cam shaft is provided with an eccentric which upon rotation of said shaft forces the arms of the locking spring outwards into engagement with the rail.

3. A connecting plug according to claim 1 provided with a fastening device for locking the casing in the current supply rail in a fully inserted position, characterized in that the fastening device consists of a U-shaped locking spring which is mounted on the cam shaft slidably in the longitudinal direction of said shaft and that the cam shaft is provided with a cylindrical part which forces the arms of the locking spring outwards into engagement with the rail when the locking spring slides along the cam shaft.

4. A connecting plug according to claim 2 characterized in that the locking spring is mounted on the cam shaft slidably in the longitudinal direction thereof against the action of a spring and that the cam shaft is provided with a locking device which, when the locking spring is in its initial position on the cam shaft, is unrotatably engaged with the locking spring, and when the locking spring is displaced from said initial position on the shaft, is turnable with respect to the locking spring to a position in which the locking device prevents the locking spring from returning under the action of the spring to said initial position.

5. A connecting plug according to claim 4, characterized in that the locking device on the cam shaft is formed by a projecting cam and that the locking spring is provided with a corresponding notch with which the projecting cam engages in said initial position.

6. A connecting plug according to any of claim 1, characterized in that the cam shaft is provided for each contact finger with at least one tooth which engages a corresponding notch in the contact finger.

7. A connecting plug according to any of the preceding claims, characterized in that the contact finger consists of a disc like plate forming a curved contact surface which is so shaped and located with respect to a corresponding conductor in the current supply rail, that the contact surface is forced in a wedge-like manner against the conductor when the disc is pivoted to a position in which it projects from the casing.

8. A connecting plug according to claim 3, characterized in that the locking spring is mounted on the cam shaft slidably in the longitudinal direction thereof against the action of a spring and that the cam shaft is provided with a locking device which, when the locking spring is in its initial position on the cam shaft, is unrotatably engaged with the locking spring, and when the locking spring is displaced from said initial position on the shaft, is turnable with respect to the locking spring to a position in which the locking device prevents the locking spring from returning under the action of the spring to said initial position.

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