A coupler electrically connecting exposed tracks conductors in neighboring lengths of electrical distribution tracks, the coupler having contact elements which are moved by a cam assembly.

10 Claims, 4 Drawing Figures
TRACK COUPLING FOR ELECTRICAL DISTRIBUTION TRACKS

The present invention relates to a coupler for electric distribution tracks, and is particularly but not exclusively suitable for electrically coupling two lengths of track of the form disclosed and claimed in our British Patent Specification No. 1,169,318.

According to the present invention, there is provided a coupler for electrically connecting conductors in neighbouring lengths of electrical distribution tracks, which are of the kind having bare track conductors, the coupler having a casing containing a pair of conductor elements which are insulated from one another and a cam assembly operable from the exterior of the casing to urge the conductors to positions in which, in use, the conductor elements can clamp the coupler to the neighbouring lengths of track and can each engage one of the track conductors in each of the two tracks to establish electrical continuity between the conductors engaged thereby.

Preferably, the conductor elements each have two upstanding ears, each provided with a contact finger for abutting the end of one track conductor. The coupler thus has four ears and contact fingers located opposite one another forming two opposed pairs of banks of contact fingers. One pair of opposed fingers is to contact the ends of the track conductors of one length of track and the other pair is to contact the track conductors of the other length of track. In the preferred coupler, two identical cam assemblies are provided to operate the two banks of contact fingers independently from one another.

The cam assembly may comprise a cam-shaft, a slidably mounted cam on the cam-shaft, a cam-seat disposed around the cam-shaft, and the conductor elements may be arranged to bias the cam against the cam-seat which is provided with a pair of arcuate inclined surfaces for coacting with the biased cam to resist movement of the cam out of its position in which it urges the conductor elements apart for abutting the track conductors. With this arrangement, a positive action is needed to move the cam to the position in which the conductor elements are released from the track conductors. The cam-seat preferably includes rotational limit stops for the cam.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a partial perspective view of two lengths of distribution track to be connected by a coupling embodying the present invention;

FIG. 2 is an exploded perspective view illustrating the coupling per se;

FIG. 3 is a longitudinal sectional view through the tracks with the coupling shown partially in section; and

FIG. 4 is a cross-sectional view through the coupling and track, taken along the line IV—IV of FIG. 3.

For clarity, a description of an electric distribution track will first be given. Each length of track 10 consists of an elongate member which is, for example, an extrusion 11 of a plastics material such as P.V.C. The extrusion has a base 12 and sides 13, 14 extending perpendicularly from the longitudinal edges thereof. The sides 13, 14 include housings in which track-conductor strips 15, 16 are carried. The track-conductors 15, 16 are accessible from the inner region of the extrusion 12 by way of longitudinally-extending recesses or slots 17 or 18. A further track-conductor 19 is supported in the base 12 of the extrusion 11 and is used to provide an earth line. The sides 13, 14 of the extrusion 11 additionally include flanges 22, 23 which are located remote from the base 12, and which project inwardly from the sides 13, 14. As viewed in the drawing, the flanges 22, 23 have downwardly-projecting extensions 24, 25 and a pair of grooves are thereby formed between the extensions 24, 25 and the sides 13, 14. The flanges 22, 23 and the said grooves 26, 27 extend longitudinally along the length of the extrusion 11. The grooves are provided to accommodate lips 28 of an external covering track 29.

It will be noticed that the extrusion 11 is of asymmetrical transverse cross-section. This asymmetrical shape results from the provision of firstly a longitudinally-extending recess 30 adjacent side 13 and secondly a surface 31 adjacent the side 14 which is inclined towards the further conductor 19.

A track 10 of the above form has been disclosed and claimed in our British Patent No. 1,169,318.

The covering track 29 has a generally T-shaped form 33 on its upper side 34, as shown in FIG. 1, which is used in conjunction with appropriate fixing brackets to secure the track 10 and covering track 29 to a wall, ceiling or the like. An elongated T-shaped slot 35 is formed within the body of the side 34 and extends inwardly from the ends of the covering track 29. The slot 35 accommodates a corresponding T-shaped bar 36 used in fastening adjoining lengths of track 10 to one another.

The adjoining lengths of track 10 are fastened together in the following manner. One end of the T-shaped bar 36 is first inserted into one length of covering track 29 already fitted with the track 10. The bar 36 is then secured to the track 10 and covering track, with its other end projecting therefrom. The bar 36 is secured by a screw 37 which passes through the conductor 19, through a hole in the base 12 of the extrusion 11 and into a screw-threaded aperture in the bar 36. The conductor 19 is locally deformed in the region of the said hole so as to enable the head of screw 37 to be recessed at least partially below the exposed surface of the conductor 19. Having secured the bar 36 to one length of track, the second length of track is brought into abutment with the first and the bar 36 is secured to the second length in the same way. This fastening ensures continuity between the conductors 19 of the separate lengths of track 10. When fastening two lengths of track 10 together, it is important that their recesses 30 and inclined surfaces 31 are aligned with each other. This is facilitated using the coupling embodying the invention, which will shortly be described.

The open ends of the tracks 10 are preferably closed for safety by a plate 40. The plate 40 is a plastics moulding e.g. of P.V.C. It has two spaced ears 41 which are received within the ends of the recesses or slots 17, 18 that provide access to the track conductors 15, 16. The plate also has an apertured lug 42 whereby it can be screwed or otherwise secured to the track 10. The plates 40 may be supplied already fitted to the ends of each length of track 10, and is formed with V-shaped slots 43 enabling the plate to be readily severed therealong. The plates 40 at the adjoining ends of two lengths of track 10 are so severed to enable a coupling, embodying the invention, to bridge the said adjoining
ends and their severed plates 40. The severed plates are not illustrated in the longitudinal sectional view of FIG. 3 for clarity of illustration.

The coupling per se will now be described. The coupling 50 includes a casing 51 which is made from a rigid plastics material such as P.V.C. or glass filled nylon. The casing 51 has a central dividing wall 52 which separates the casing into two compartments. A pair of conductor elements 53, 54 is provided, one of which is mounted inside each of the compartments. The conductor elements 53, 54 are therefore kept insulated from one another by the dividing wall 52. The conductor elements are made from a resilient material such as brass, and as will be seen from the drawings, each element includes two spaced, upstanding ears 55. The ears are bent to form contact fingers for engaging the track conductors 15 or 16 of the separate lengths of track 10 to be coupled. The ears 55 incline inwardly towards one another as shown, with the distance between the contact fingers 56 initially less than the distance between the track conductors 15, 16. When the coupling 50 is positioned in the two lengths of track 10, the contact fingers 56 are moved apart from their innermost positions by deflecting the ears 55 outwardly so that each is pressed into contact with its associated track-conductor. This not only establishes electrical continuity between the conductors 15 and 16, respectively, of the adjoining lengths of track 10 but also clamps the coupling 50 thereeto. When clamped to the tracks 10, the contact fingers 56 are engageable with the recesses or slots 17, 18 to prevent the coupling 50 being inadvertently detached from the tracks 10.

The opposed pairs of ears 55 and their associated contact fingers 56 are moved outwardly by means of two cam arrangements. The cam arrangements each operate to press air pair of opposed contact fingers 56 apart. As the cam arrangements are identical, only one will be hereinafter described.

The cam arrangement is constituted by a generally elliptical cam 62, a cam-seat 63 and a cam-shaft 64. The cam arrangement is assembled within the casing as follows. The cam-shaft 64 is passed through an aperture 65 provided in the base of the casing 51, so that the head 66 of the cam-shaft 64 is accessible from the exterior of the casing 51. The head 66 of the cam shaft is slotted so that the shaft may be rotated by means of a screw driver.

The cam-seat 63 is then positioned in the casing 51, on top of the conductor elements 53, 54. A further aperture 67 is provided in the cam-seat 63 to allow the cam-shaft 64 to extend therethrough. The cam 62 is then positioned along the cam-shaft 64, upon a square portion thereof so as to rotate with the shaft 64. The cam is retained on the cam-shaft 64 by conventional means such as a snap ring, a U-shaped flat washer or by a circlip. The cam 62 and its associated cam-seat 63 are both free to move slightly along the cam-shaft 62 and both are made from insulating, plastics materials such as polycelal. A pair of arcuate inclined surfaces 69 are formed on the surface of the cam-seat 63 which contacts the cam 62. The inclined surfaces project from the surface 70 of the cam-seat 63 to the raised portions 71, which include surfaces 71a, 71b, forming rotational limit stops for the cam 62. When the cam-shaft 64 is rotated so as to align the cam 62 with its major axis across the housing 51, the cam 42 moves the associated pair of ears 55 and their contact fingers 40 apart laterally into an “on” position against the resilient bias conferred by the material from which the elements 53, 54 are made. The required rotation is anticlockwise as viewed from above. The inward inclination of the ears of the resilient conducting elements 59, 54 biases the cam 62 against the cam-seat 63, so that on rotation the cam remains in contact with and rides on the inclined surfaces 69. The cam is held in the “on” position by flats formed on its camming-surface which engage the ears 55, and further rotation in the same direction is prevented by the limit stop 71a. If the cam 62 is now rotated through approximately 90° in a clockwise direction it is driven up the inclined surfaces 69 and is correspondingly moved upwardly along the cam-shaft 64. The 90° rotation aligns the cam 62 with its major axis parallel to the longitudinal axis of the housing 51, the contact fingers then having returned to their innermost or “off” position. Further rotation in this direction is prevented by the limit stop 71b. As described, to allow the contact fingers 56 to assume their innermost or “off” position, it is necessary to rotate the cam 62 in a clockwise direction and drive it up the inclined surfaces 69. This movement of the cam 62 is resisted however by the co-operation of the resilient, inwardsly inclined ears 55 of the conducting elements 53, 54 and the inclined surfaces 69. This resistance ensures that when the contact fingers 56 are in their outermost or “on” position, inadvertent inward movement is prevented, thereby ensuring that the coupler 10 will remain locked to the two lengths of track 10.

It will be seen that the ends of the casing 51 are similarly asymmetrical as the tracks 10. Thus, the ends each include an inclined portion 73 and a lug 73. The coupler 50 will therefore only fit properly into the adjoining tracks if their grooves 30 and inclined surfaces 31 are aligned, and if the coupler is offered to the tracks 10 such that lugs 73 can directly enter the grooves 30. The coupler 50 therefore serves as a useful check that the two lengths of track 10 are correctly mated whilst fastening them together. The check is preferably carried out before finally securing the tracks 10 together with the screws 37. When electrical continuity between the track conductors 15, 16 of the corrected mated lengths of track 10 is established by means of the coupler 10 and the conductors are connected to a power supply, each of the conductors 15 will have one and the same polarity and each of the conductors 16 will have the opposite polarity. Thus, power supplied by the track 10 to appliances via appropriately asymmetrical connectors (not shown) will be of correct polarity irrespective of whether the connectors are affixed to one length of track 10 or to the other.

It will be seen that there is a notch 74 centrally formed in opposite sides of the casing 51. The purpose of the notches is to enable the coupler to bridge adjoining ends of two lengths of track 10 having severed end plates 40, as mentioned above, fixed to their ends. The severed plates 40 are accommodated in the notches 75 and the arrangement serves to centre the coupler 50 about the junction of the two lengths of track 10. The coupler 50 described and illustrated incorporates two conductor elements 53, 54 providing two spaced pairs of opposed contact fingers 56. Each opposed pair of fingers 56 is individual to one of the lengths of track 10 and the positions of the fingers 56 of each opposed pair thereof is controlled by an asso-
A coupler for electrically connecting exposed track conductors in neighboring lengths of electrical distribution tracks, the coupler comprising:

1. A casing, a pair of conductive elements, insulated from one another, which are mounted within said casing for movement between operative and inoperative positions, and a cam assembly within said casing, but operable from the exterior thereof, for moving said conductive elements between their operative and inoperative positions, whereby in their operative positions, said conductive elements, in use, clamp the coupler to the neighboring lengths of track and each engage one of said track conductors in each of said two tracks to establish electrical continuity between the conductors engaged thereby, said cam assembly comprising:

a cam-shaft, a slidably mounted cam on said cam-shaft and a cam-seat disposed around said cam-shaft, said cam being biased against said cam-seat by said conductive elements, and a pair of arcuate inclined surfaces being provided on said cam-seat for coaction with said cam to resist movement of said cam from the position thereof in which it urges the conductor elements to their operative track conductor-engaging positions.

2. A coupler according to claim 1, wherein said conductive elements are mounted side by side within said casing and are movable apart upon operation of said cam assembly whereby said conductive elements, in use, press against spaced-apart track conductors located on opposite sides of the tracks.

3. A coupler according to claim 2, wherein each conductive element has an outwardly-directed contact finger for engaging the appropriate track conductors.

4. A coupler according to claim 3, wherein each conductive element has a pair of spaced, upstanding ears each carrying an outwardly-directed contact finger, individual cam assemblies being provided to control the positions of said fingers of each opposed pair of ears.