United States Patent [19]

Hart

[11] **3,795,886**

[45] **Mar. 5, 1974**

[54] **TRACK COUPLING FOR ELECTRICAL DISTRIBUTION TRACKS**

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[22] Filed: **Aug. 4, 1972**

[21] Appl. No.: **278,039**

[30] **Foreign Application Priority Data**

Sept. 17, 1971 Great Britain 43,547/71

[52] **U.S. Cl.** ..... **339/21 R**

[51] **Int. Cl.** **H01r 9/00**

[58] **Field of Search** ...339/14 R, 20, 21 R, 21 S, 22 R, 339/22 B, 22 T, 23, 24

[56] **References Cited**

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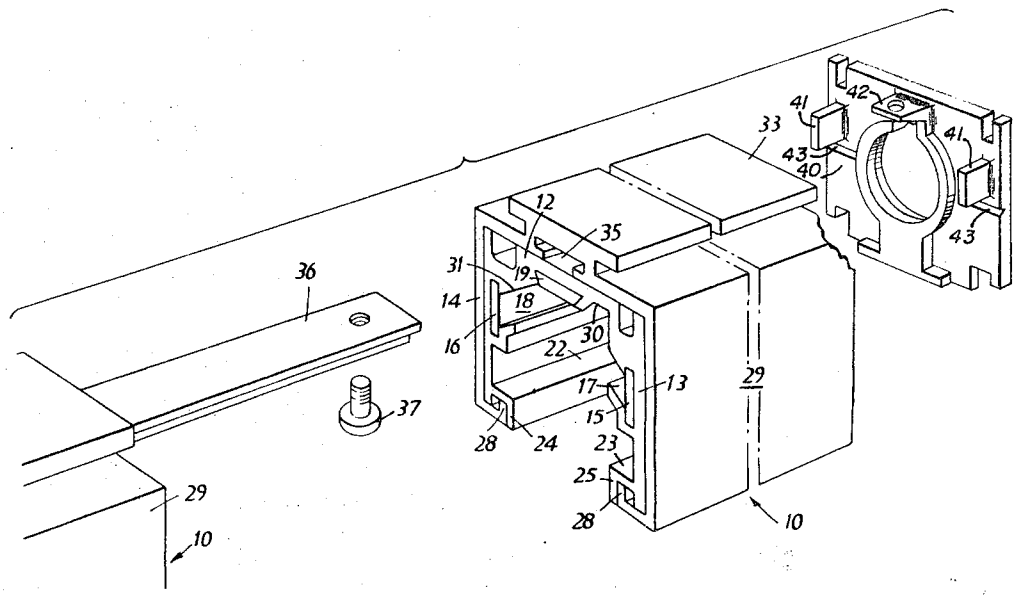
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[57] **ABSTRACT**

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



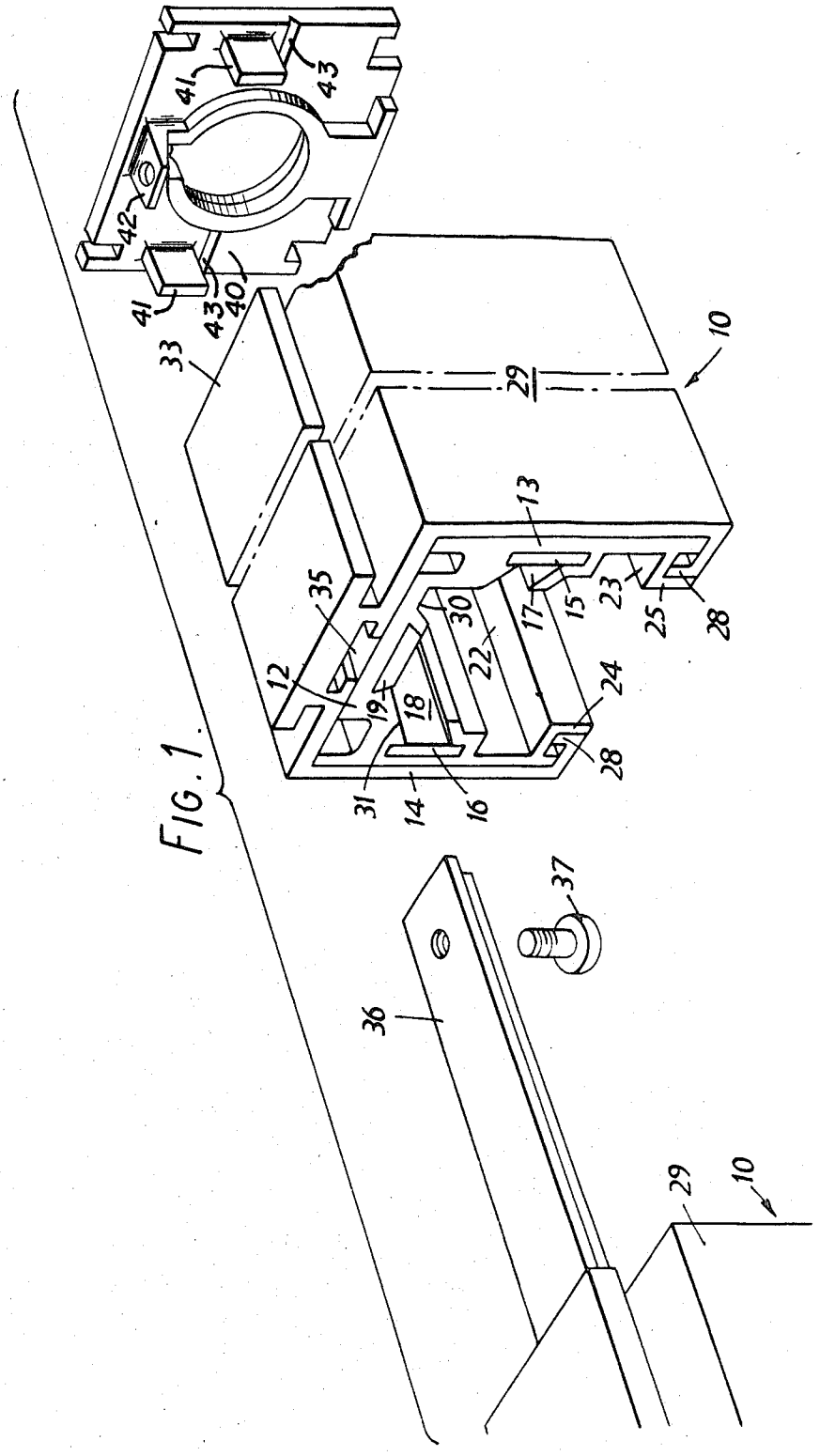
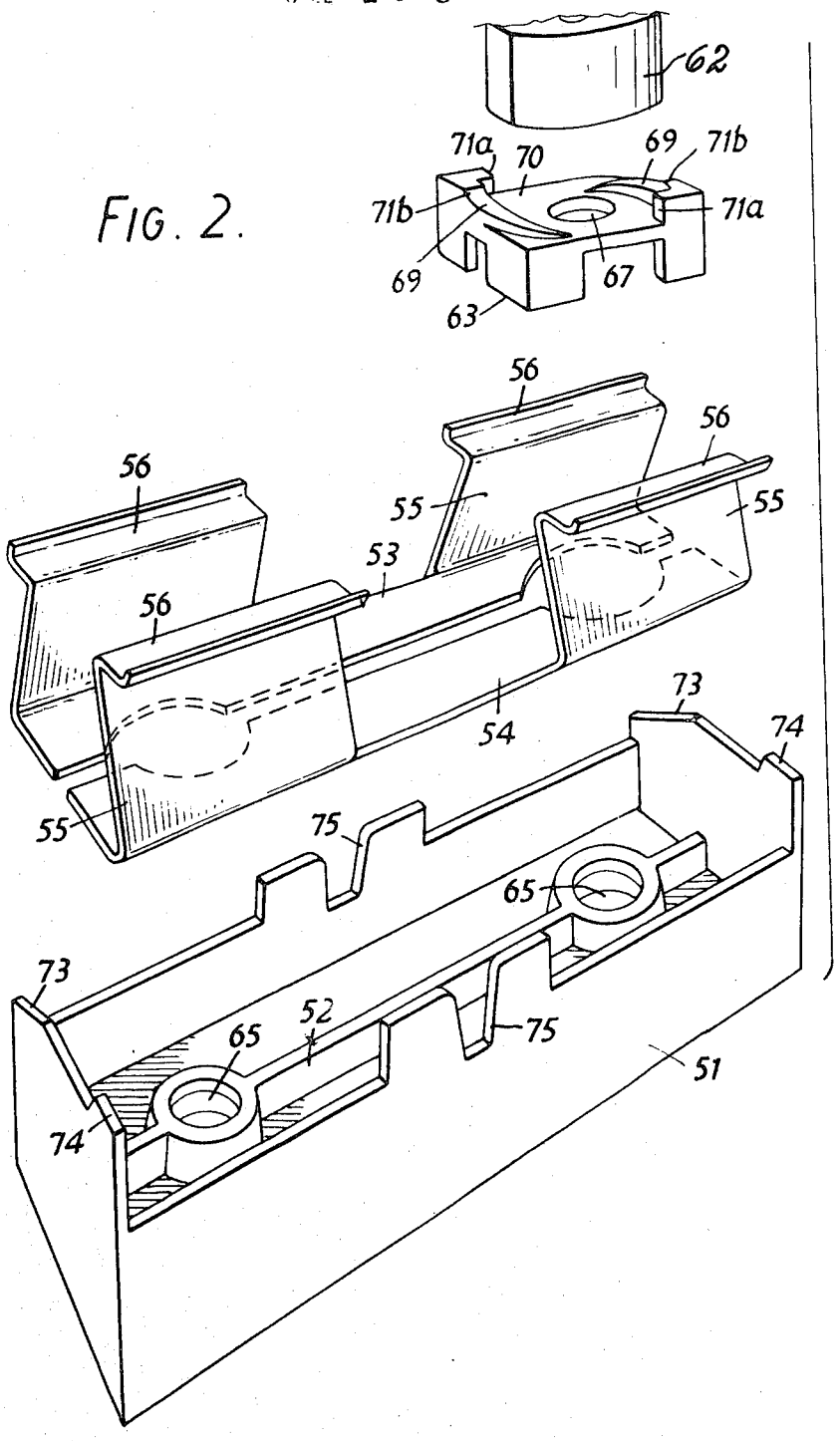

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FIG. 1.

FIG. 2.


62
71a
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71b
71b
71a
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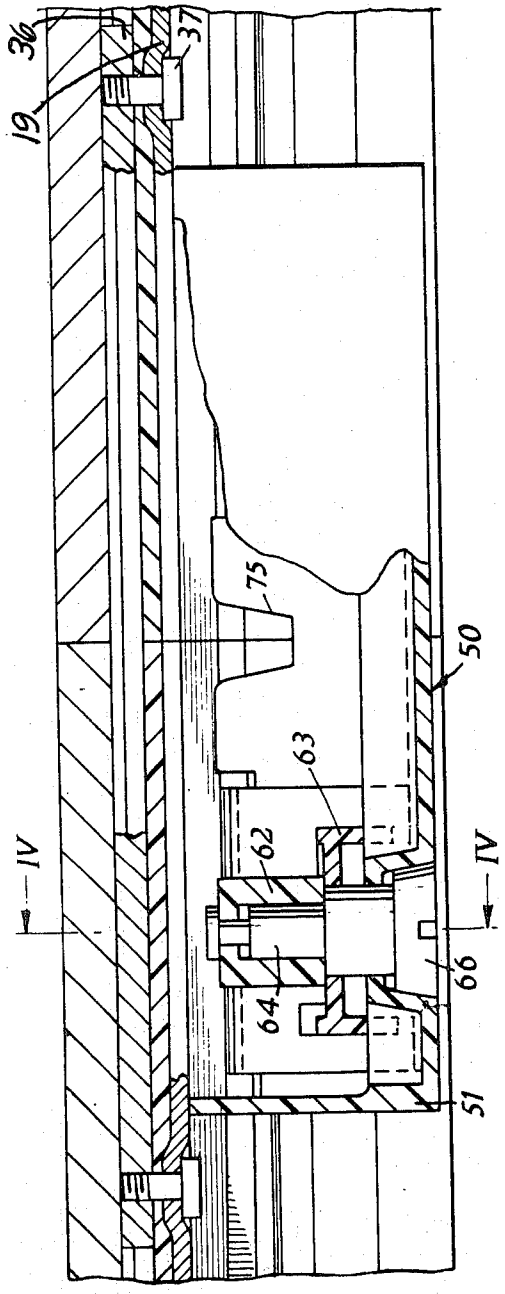

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63
62
IV
IV
66
64
51

FIG. 3.

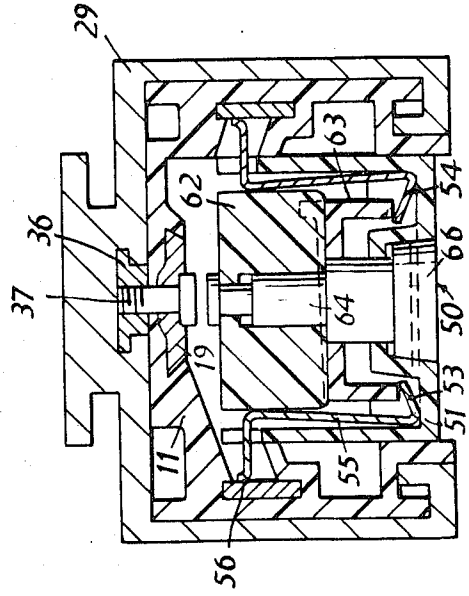

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63
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62
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66
37
64
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19
53
51
11
55
56

FIG. 4.

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 formation **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 correspondingly 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 drawing, 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** thereto. 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 **65** 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 on 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 spreading the end of the cam-shaft **64**. Otherwise, the cam can be retained on the cam-shaft **64**, for example by using 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 polyacetal. 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 **71***a*, **71***b*, 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 **49**. 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 **71***a*. 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 **71***b*. 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, inwardly 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-

ciated cam assembly. It will be appreciated that the arrangement could be modified suitably such that the elements **53** each need only have one contact finger to establish continuity between the track conductors **15** or **16** of the two lengths of track **10**. In this case, only one cam assembly is necessary.

I claim:

1. A coupler for electrically connecting exposed track conductors in neighbouring lengths of electrical distribution tracks, the coupler comprising:

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 neighbouring 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 camshaft and a cam-seat disposed around said camshaft, 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.

5. A coupler according to claim **1**, wherein said camseat includes rotational limit stops for said cam.

6. Electric distribution apparatus including at least two lengths of distribution track joined together electrically by a coupler as claimed in claim **1**.

7. A coupler for electrically connecting exposed track conductors in neighbouring lengths of electric distribution tracks, the coupler comprising:

a casing,

a pair of conductive elements, insulated from one another, which are mounted within said casing, each of said elements having two spaced, upstanding ears and each ear carrying an outwardly-directed contact finger,

said elements being mounted side-by-side with their ears located opposite one another, said ears being movable apart whereby in use, said contact fingers press against the track conductors on opposite sides of the tracks to clamp said coupler to said tracks, each element engaging one of said track conductors in each of said two tracks to establish electrical continuity between the conductors engaged thereby,

and two cam assemblies within said casing, each of which is operable from the exterior thereof to effect movement of one of the opposite pairs of said ears,

said cam assemblies each comprising a cam, a camshaft and a cam seat mounted for movement along said camshaft, said cam seat being biased against said cam by said conductive elements, and said cam seat having a pair of arcuately-inclined surfaces for coaction with said cam to resist movement of said cam from the position thereof in which it urges said conductive elements to their track conductor-engaging position.

8. A coupler according to claim **7**, wherein said conductive elements are movable against a biasing force when each cam assembly is operated to urge their contact fingers into engagement with said track conductors.

9. A coupler according to claim **7**, wherein said camseat includes rotational limit stops for said cam.

10. A coupler according to claim **7**, wherein said cam is generally elliptical and has flats formed at its opposite ends to coact with said conductive elements to aid in resisting movement of said conductive elements from their track conductor-engaging positions.

* * * * *