

PATENT SPECIFICATION

(11) 1 363 577

1 363 577

- (21) Application No. 15629/72 (22) Filed 5 April 1972
(44) Complete Specification published 14 Aug. 1974
(51) International Classification H02G 5/06
(52) Index at acceptance H2E 7E1
(72) Inventor OLIVER WILMONT OAKLEY



(54) IMPROVEMENTS IN ELECTRICAL POWER DISTRIBUTION SYSTEMS

(71) We, COMPACT SWITCHGEAR PTY. LIMITED, a company incorporated in the State of New South Wales, Commonwealth of Australia of 1a Newbridge Road, Liverpool, New South Wales 2170 do hereby declare the invention, for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to an electrical power distribution system and a feeder strip to be used therefor and has as its object the provision of an improved distribution system which is intended to overcome defects in systems at present in use.

Electrical distribution systems of the kind with which the present invention is concerned consists simply of an arrangement of electrical conductors, usually heavy section copper bar or rod supported on an insulating support and arranged so that electrical power from the mains may be connected to one set of conductors or bus bars and from these to a number of loads to which electrical power is to be supplied. Such systems usually have attached to them, fuses, isolating links and other apparatus.

The distribution systems at present in use consist normally of an insulating panel on the rear of which an exposed system of conductors is arranged, fuses and other apparatus being carried on the front of the panel. The conductors are either uninsulated, wrapped in tape or coated with a thin layer of polyvinylchloride. These have been found to have the following disadvantages:

(a) They are liable to damage by short circuit even when the conductors are insulated, as the insulating material used is not sufficiently strong to resist damage when a tool or sharp or heavy object is dropped on a conductor,

(b) The volume occupied by the system of conductors is relatively large owing to the

necessity for spacing the conductors to an adequate extent.

(c) Conductive dust and moisture can settle on the joints of the conductors which causes tracking and ultimately breakdown of the insulation, with resultant damage.

(d) The system usually has to be assembled from manufactured parts and fitted to a switchboard or load centre piecemeal, thus necessitating the use of a considerable amount of tradesman's labour on the site.

(e) Owing to the presence of exposed live conductors, working on the system when live is dangerous.

The present invention provides a power distribution system which to a large extent overcomes the defects described above. The invention further provides a means of building up a system from a number of standardised units referred to as "feeder strips" which may be manufactured in a limited number of different forms capable of being combined in a variety of ways to form systems suitable for different purposes.

Accordingly, the invention provides an electrical power distribution system made up of a plurality of separate feeder strips secured together side by side, each feeder strip comprising a plurality of bus bar elements extending across the width of the strip and a plurality of conductors extending longitudinally of the strip and arranged to distribute power from the bus bar elements to points on the strip at which connections may be made to the system, the bus bar elements and conductors being contained within a block of insulating material cast about them so that the ends of each bus bar element disposed at opposite sides of the block remain exposed, positions on said bus bar elements and conductors being accessible at each feeder strip to enable connection to be made to them and fuses or other devices connected in circuit with them, means being provided securing adjacent strips together with the exposed ends of corresponding bus bar elements in metal-

[Price 25p]

to-metal contact whereby each set of corresponding bus bar elements forms a bus bar extending through the system.

The invention also provides a feeder strip for such an electrical power distribution system, the feeder strip comprising a plurality of bus bar elements extending across the width of the strip and a plurality of conductors extending longitudinally of the strip and arranged to distribute power from the bus bar elements to points on the strip at which connection may be made to the conductors, the bus bar elements and conductors being contained within a block of insulating material cast about them so that the ends of each bus bar element disposed at opposite sides of the block remain exposed, positions on said bus bar elements and conductors being accessible at the feeder strip to enable connection to be made to them and fuses or other devices connected in circuit with them. the exposed ends of the bus bars at the sides of the block being such as to enable the strip to be connected side by side with a similar strip with the said exposed ends of one strip being in metal-to-metal contact with those of the adjacent strip.

In order that the invention may be better understood and put in practise a preferred form thereof is hereinafter described, by way of example, with reference to the accompanying diagrammatic drawing in which:

Figure 1 is a perspective view of one form of feeder strip, according to the invention.

Figure 2 is a front elevation thereof,

Figure 3 is a side elevation thereof, and

Figure 4 is a front elevation showing three feeder strips arranged side by side to form a distribution system.

In the preferred form of the invention each feeder strip consists of a block of cast quartz-filled epoxy or polyester resin, the strip being approximately $26\frac{1}{2}$ " long, $4\frac{1}{2}$ " wide and $2\frac{1}{2}$ " deep. It should be emphasised, however, that these dimensions are given purely by way of example to assist in an understanding of the succeeding description. A block formed of this material is stable, has a certain amount of flexibility and will withstand temperatures of up to 85°C .

Cast into the strip is a system of conductors consisting of bus bar elements 10, 11 and 12, each of which extends transversely across the strip and is exposed at each side of the feeder strip to provide a contact surface. The bus bar element 10 for example terminates in surfaces 13 and 14 which stand slightly proud of the surrounding resin. This effect is preferably achieved by controlling the shrinkage of the resin during curing. The central portion of the bus bar element 10

is accessible through a window 15 which is formed in the material of the block and which itself lies within a well 16 formed in the front surface of the block and which has a depth of approximately 1"; holes 17 in the bus bar element 10 give access to captive nuts 20 which are held in the block so that pieces of apparatus such as fuse connectors (not shown) may be secured to the bus bar element by means of cap screws. The nuts may be fully captive or they may be held in hexagon recesses so as to be removable and replaceable in the event of any damage occurring to the thread.

Holes 18 and 19 are available in the end surfaces 13 and 14 respectively of the bus bar element, there being provided behind the holes 18, hexagonal section pockets for loose deep nuts and behind the holes 19 similar pockets for the heads of cap screws. It will be appreciated that as each pair of holes 18 and 19 are aligned, two strips may be secured side by side, the cap screws passing through the holes 19 being accessible through the holes 18 so that they may be securely tightened. Thereafter, the captive nuts may be inserted behind the holes 18 and a further strip connected. The bus bar elements 11 and 12 are constructed in the same manner as the bus bar element 10 described above but details of the holes are not shown in Figure 1 for the sake of clarity.

Extending longitudinally through the strip are conductors in the form of droppers 21, 22, and 23 which pass through the block constituting the feeder strip but have exposed faces 24, 25 and 26 respectively at the lower end of the strip. Holes are provided in these, behind which captive nuts are arranged to enable connection to be made to the droppers. The exposed portions are isolated from each other by partitions 27, 28 and 29 which are cast integrally with the block. The upper ends of the droppers 21, 22 and 23 are accessible through windows 31, 32 and 33, holes and captive nuts being provided as in the case of the bus bar elements.

In the arrangement described each of the bus bar elements serves for the distribution of one phase of the three phase system and each dropper may be connected to one bus bar through a fuse link, the fuse links being mounted in the wells formed in the front surface of the block. In the casting of the block the bus bar elements and droppers are held in position and appropriately spaced apart.

The configuration of the feeder strip described above is given only by way of example as it will be readily appreciated that a variety of different forms of strip may be constructed varying the current carrying

capacity of the conductors to make them suitable for different loads and thereby enabling a system to be built up from a plurality of feeder strips secured side by side which is particularly suited for any desired application, one such system being shown in Fig. 4. This arrangement has considerable practical advantages over the construction of a complete system cast into a resin block as the number of moulds required for the formation of the feeder strips is smaller. In addition, the handling of individual feeder strips presents far smaller problems than the handling of a complete system.

15 WHAT WE CLAIM IS:—

1. An electrical power distribution system made up of a plurality of separate feeder strips secured together side by side, each feeder strip comprising a plurality of bus bar elements extending across the width of the strip and a plurality of conductors extending longitudinally of the strip and arranged to distribute power from the bus bar elements to points on the strip at which connections may be made to the system, the bus bar elements and conductors being contained within a block of insulating material cast about them so that the ends of each bus bar element disposed at opposite sides of the block remain exposed, positions on said bus bar elements and conductors being accessible at each feeder strip to enable connection to be made to them and fuses or other devices connected in circuit with the means being provided securing adjacent strips together with the exposed ends of corresponding bus bar elements in metal-to-metal contact whereby each set of corresponding bus bar elements forms a bus bar extending through the system.

2. A feeder strip for an electrical power distribution system as claimed in Claim 1, the feeder strip comprising a plurality of bus bar elements extending across the width of the strip and a plurality of conductors extending longitudinally of the strip and arranged to distribute power from the bus bar elements to points on the strip at which connection may be made to the conductors, the bus bar elements and conductors being contained within a block of insulating material cast about them so that the ends of each bus bar element disposed at opposite sides of the block remain exposed, positions on said bus bar elements and conductors being accessible at the feeder strip to enable connection to be made to them and fuses or other devices connected in circuit with them, the exposed ends of the bus bars at the sides of the block being such as to enable the strip to be connected side by side with a similar strip with the said exposed

ends of one strip being in metal-to-metal contact with those of the adjacent strip.

3. A feeder strip as claimed in claim 2, wherein the exposed ends of the bus bar elements are end portions standing slightly proud of the surface of the surrounding insulating material.

4. A feeder strip as claimed in claim 2 or claim 3, wherein the insulating material is quartz filled epoxy or polyester resin.

5. A feeder strip as claimed in any one of claims 2 to 4, wherein the two main surfaces of the strip respectively constitute the front and back thereof, wherein the strip has three bus bar elements arranged at intervals along its longitudinal extent and three conductors, each conductor extending from a point adjacent one of the bus bar elements to one of three positions lying side by side at one end of the strip, the positions at which the bus bar elements and the conductors are accessible being disposed at the front of the strip and being such as to enable each conductor to be connected to the adjacent bus bar element by a fuse link.

6. A feeder strip as claimed in claim 5, wherein the three positions lying side by side are separated by partitions cast integrally with the insulating material of the block.

7. A feeder strip as claimed in claim 5 or claim 6, wherein the front of the strip is formed with three separate wells in each of which lie the positions at which one bus bar element and the corresponding conductor are accessible.

8. A feeder strip as claimed in claim 7, wherein holes are provided in the exposed ends of each bus bar element the holes passing through into the wells and each hole terminating in a cavity formed in the side of the well adapted to receive a nut or the head of a screw.

9. A feeder strip as claimed in claim 8, wherein the cavities are hexagonal and are arranged to hold captive a loose deep nut.

10. An electrical power distribution system made up of a plurality of feeder strips as defined in any one of claims 2 to 9 secured together side by side so that the exposed ends of corresponding bus bar elements are in metal-to-metal contact whereby each set of corresponding bus bar elements form a bus bar extending through the system.

11. A feeder strip for an electrical power distribution system substantially as illustrated in and as described with reference to Figures 1 to 3 of the accompanying drawings.

12. An electrical power distribution system substantially as illustrated in and as described with reference to Figure 4 of the accompanying drawings.

capacity of the conductors to make them suitable for different loads and thereby enabling a system to be built up from a plurality of feeder strips secured side by side which is particularly suited for any desired application, one such system being shown in Fig. 4. This arrangement has considerable practical advantages over the construction of a complete system cast into a resin block as the number of moulds required for the formation of the feeder strips is smaller. In addition, the handling of individual feeder strips presents far smaller problems than the handling of a complete system.

15 WHAT WE CLAIM IS:—

1. An electrical power distribution system made up of a plurality of separate feeder strips secured together side by side, each feeder strip comprising a plurality of bus bar elements extending across the width of the strip and a plurality of conductors extending longitudinally of the strip and arranged to distribute power from the bus bar elements to points on the strip at which connections may be made to the system, the bus bar elements and conductors being contained within a block of insulating material cast about them so that the ends of each bus bar element disposed at opposite sides of the block remain exposed, positions on said bus bar elements and conductors being accessible at each feeder strip to enable connection to be made to them and fuses or other devices connected in circuit with the means being provided securing adjacent strips together with the exposed ends of corresponding bus bar elements in metal-to-metal contact whereby each set of corresponding bus bar elements forms a bus bar extending through the system.

2. A feeder strip for an electrical power distribution system as claimed in Claim 1, the feeder strip comprising a plurality of bus bar elements extending across the width of the strip and a plurality of conductors extending longitudinally of the strip and arranged to distribute power from the bus bar elements to points on the strip at which connection may be made to the conductors, the bus bar elements and conductors being contained within a block of insulating material cast about them so that the ends of each bus bar element disposed at opposite sides of the block remain exposed, positions on said bus bar elements and conductors being accessible at the feeder strip to enable connection to be made to them and fuses or other devices connected in circuit with them, the exposed ends of the bus bars at the sides of the block being such as to enable the strip to be connected side by side with a similar strip with the said exposed

ends of one strip being in metal-to-metal contact with those of the adjacent strip.

3. A feeder strip as claimed in claim 2, wherein the exposed ends of the bus bar elements are end portions standing slightly proud of the surface of the surrounding insulating material.

4. A feeder strip as claimed in claim 2 or claim 3, wherein the insulating material is quartz filled epoxy or polyester resin.

5. A feeder strip as claimed in any one of claims 2 to 4, wherein the two main surfaces of the strip respectively constitute the front and back thereof, wherein the strip has three bus bar elements arranged at intervals along its longitudinal extent and three conductors, each conductor extending from a point adjacent one of the bus bar elements to one of three positions lying side by side at one end of the strip, the positions at which the bus bar elements and the conductors are accessible being disposed at the front of the strip and being such as to enable each conductor to be connected to the adjacent bus bar element by a fuse link.

6. A feeder strip as claimed in claim 5, wherein the three positions lying side by side are separated by partitions cast integrally with the insulating material of the block.

7. A feeder strip as claimed in claim 5 or claim 6, wherein the front of the strip is formed with three separate wells in each of which lie the positions at which one bus bar element and the corresponding conductor are accessible.

8. A feeder strip as claimed in claim 7, wherein holes are provided in the exposed ends of each bus bar element the holes passing through into the wells and each hole terminating in a cavity formed in the side of the well adapted to receive a nut or the head of a screw.

9. A feeder strip as claimed in claim 8, wherein the cavities are hexagonal and are arranged to hold captive a loose deep nut.

10. An electrical power distribution system made up of a plurality of feeder strips as defined in any one of claims 2 to 9 secured together side by side so that the exposed ends of corresponding bus bar elements are in metal-to-metal contact whereby each set of corresponding bus bar elements form a bus bar extending through the system.

11. A feeder strip for an electrical power distribution system substantially as illustrated in and as described with reference to Figures 1 to 3 of the accompanying drawings.

12. An electrical power distribution system substantially as illustrated in and as described with reference to Figure 4 of the accompanying drawings.



URQUHART-DYKES & LORD,
11th Floor,
St Martin's House,
140 Tottenham Court Road,
London W1P 0JN.
and
11th Floor,
Tower House,
Merrion Way,
Leeds LS2 8PB,
Chartered Patent Agents.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1974.
Published by the Patent Office, 25 Southampton Buildings, London. WC2A 1AY from
which copies may be obtained.

