(12) UK Patent Application (19) GB (11) 2 218 578 (13) A

(43) Date of A publication 15.11.1989

(21) Application No 8905751.7

(22) Date of filing 13.03.1989

(30) Priority data
(31) 04194 (32) 30.03.1988 (33) FR

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(51) INT CL⁴
H01R 13/645 25/16, H02G 5/08

(52) UK CL (Edition J)
H2E ECE

(56) Documents cited
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US 2907839 A

(58) Field of search
UK CL (Edition J) H2E ECE ECJA ECJE EDBA
INT CL⁴ H01R, H02G

(54) Connection device with coded safety cover

(57) Power busbars (2) and low current conductors (3) are mounted in a duct (1) carrying a connecting socket (6). A connector (7) carries contacts (11,12) adapted to extend through passages (8,9) in order to grip busbars (2) and conductors (3). The connector (7) also carries a finger (34) which first presses on a slope (27) actuating a sliding shutter for the passages (8,9).

The movement of the shutter is parallel to the longitudinal direction of the busbars (2). The connector (7) carries a lug (58) carrying a coding configuration (67) and adapted to engage in a well (43) bearing a coding configuration which, if the codes correspond, is complementary to the code of the lug (58). The shutter only opens if the codes are correct. The construction reduces bulk and enables the user to avoid faulty connections when there are a number of co-existing supply networks with different electric parameters.

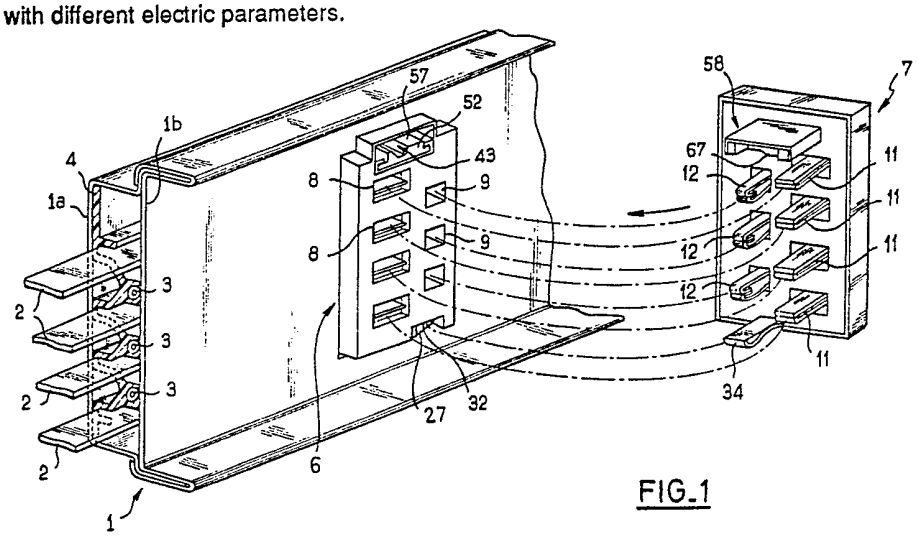

FIG.1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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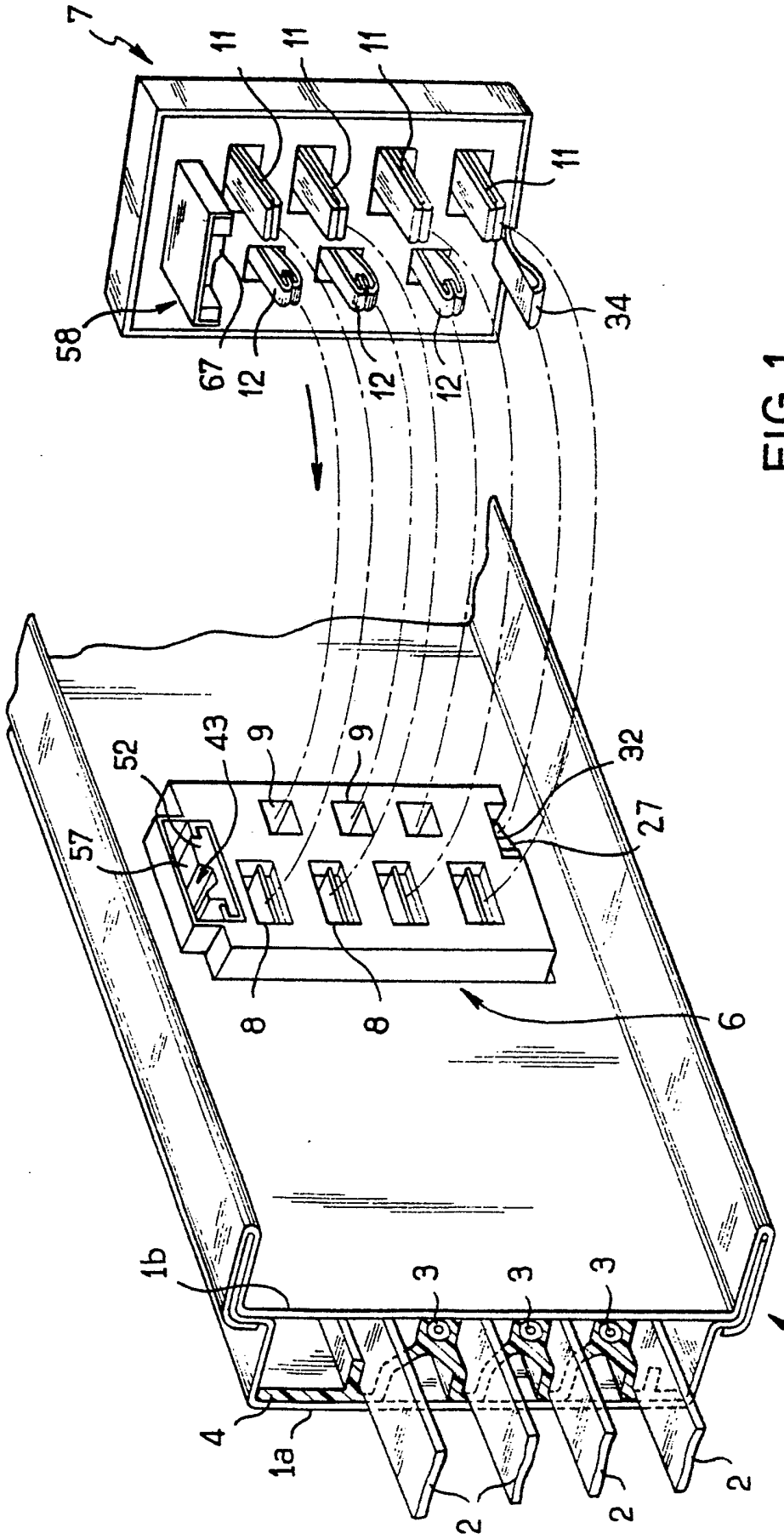

FIG_1

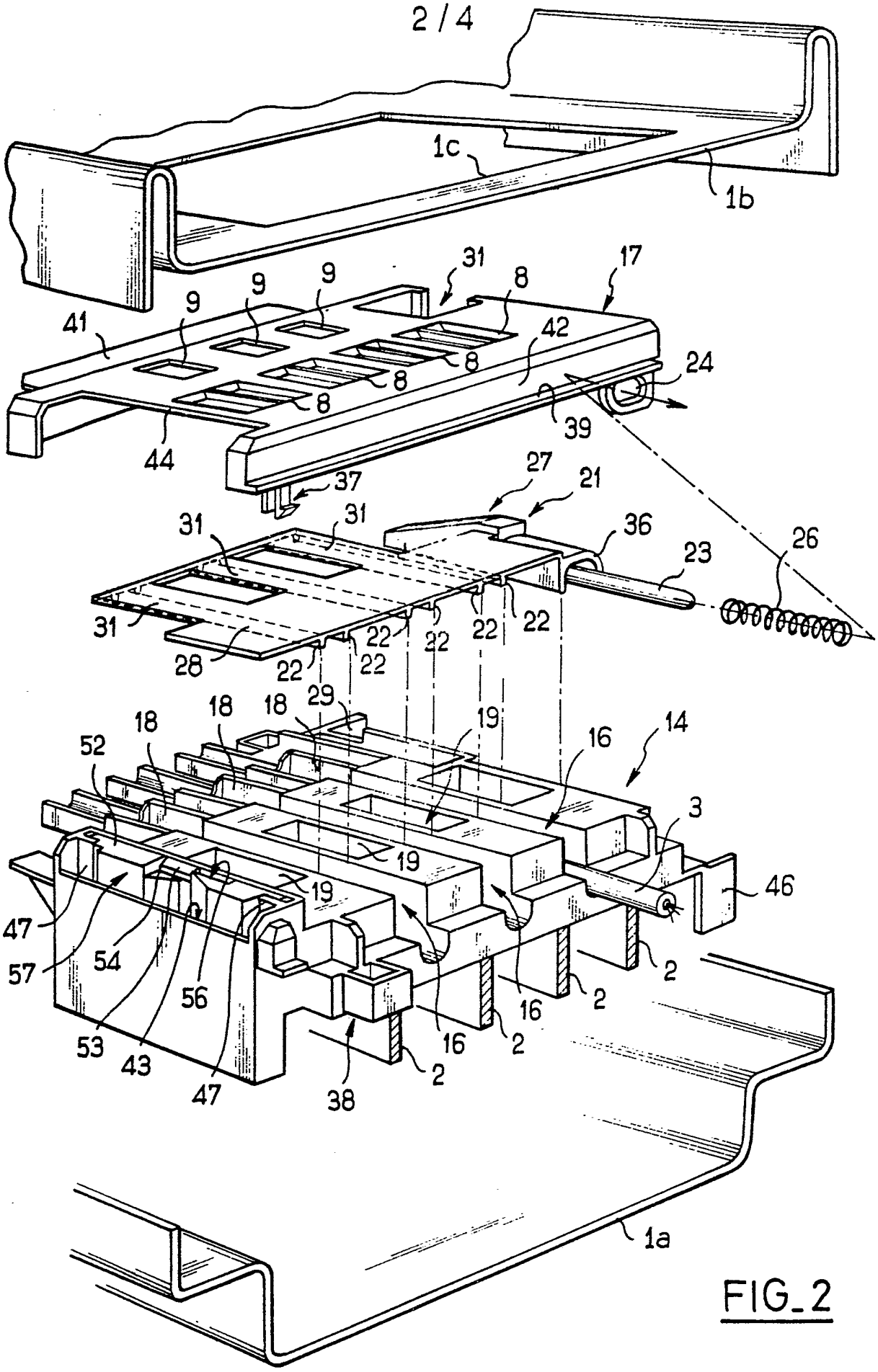
1c
1b
31
17
8
9
41
42
24
44
39
37
27
21
36
23
26
31
22
28
29
18
19
16
14
52
3
46
47
57
54
56
53
43
2
38
1a

FIG_2

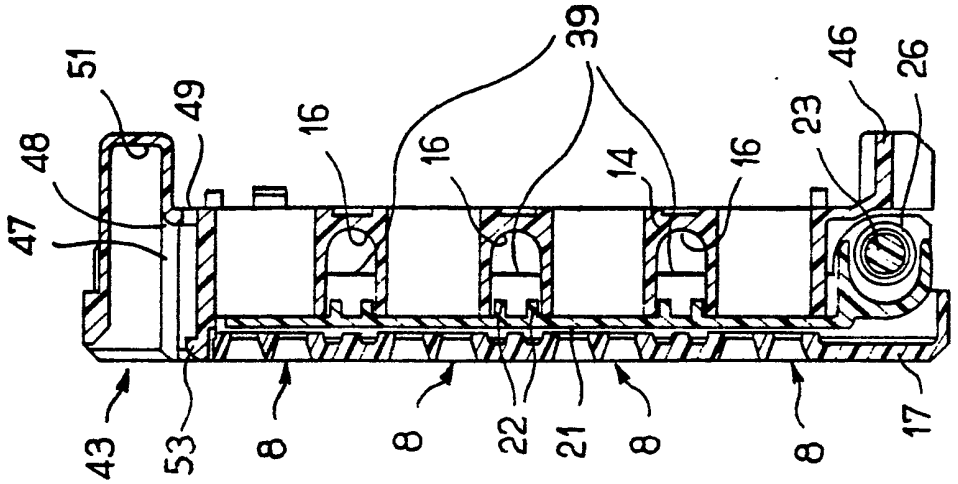
51
49
48
47
16
39
16
16
14
16
23
46
26
43
53
8
8
22
21
8
8
17

FIG_4

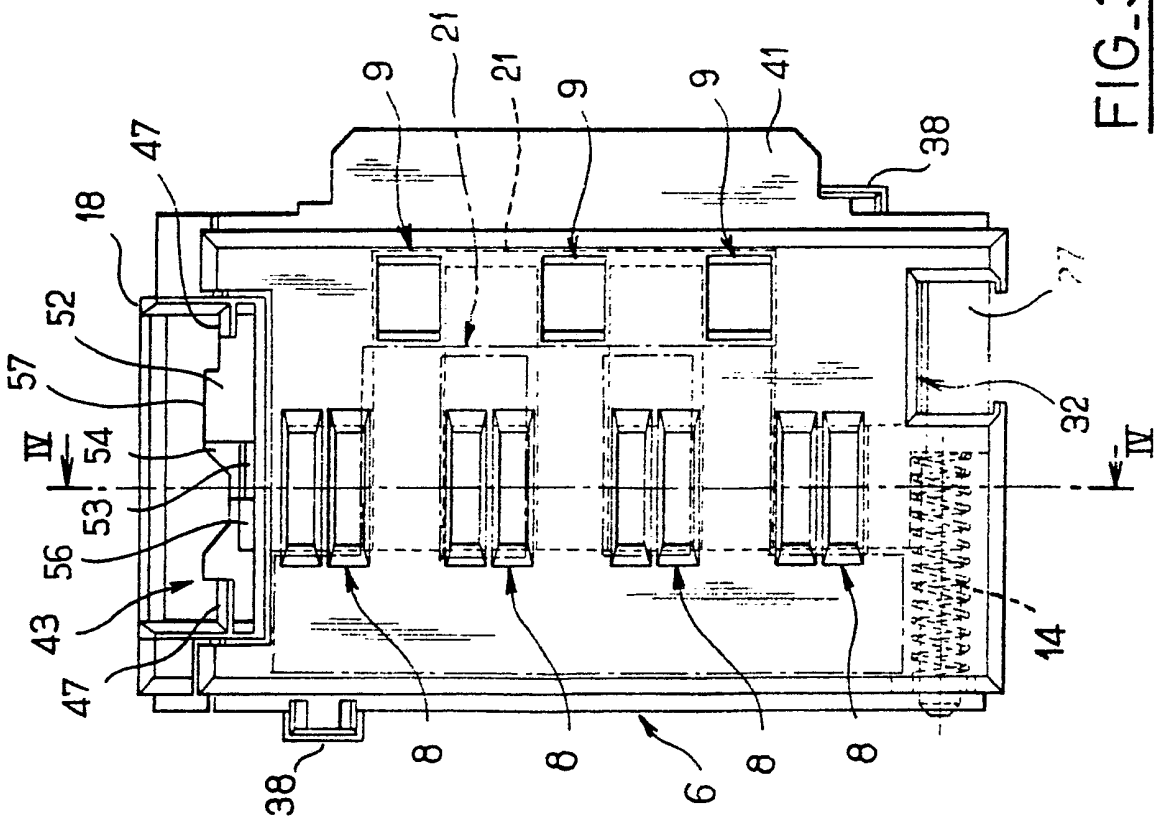
9
21
21
9
9
41
38
47
18
52
57
IV
54
53
56
43
47
38
8
8
6
8
8
27
32
IV
14

FIG_3

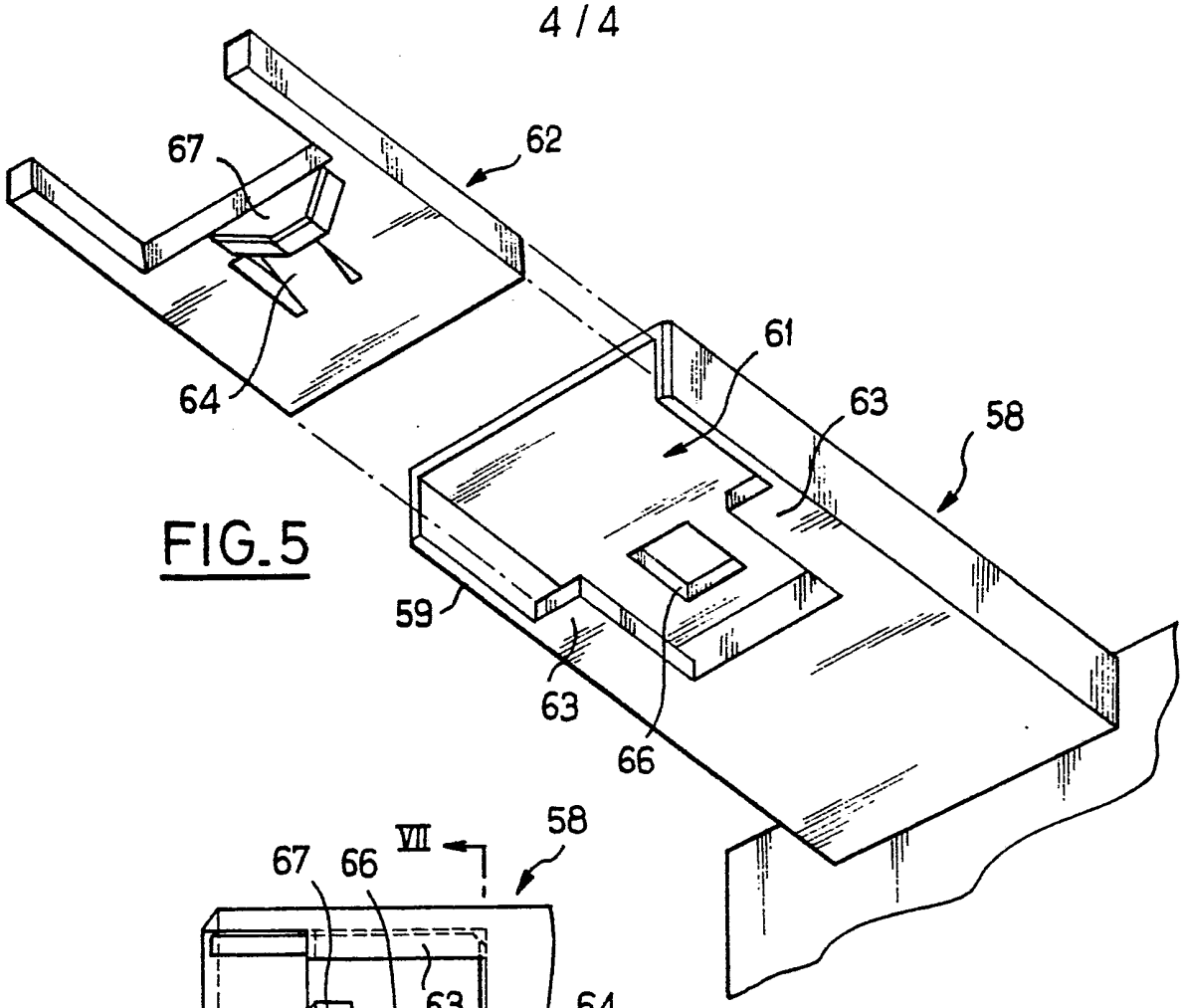

FIG.5

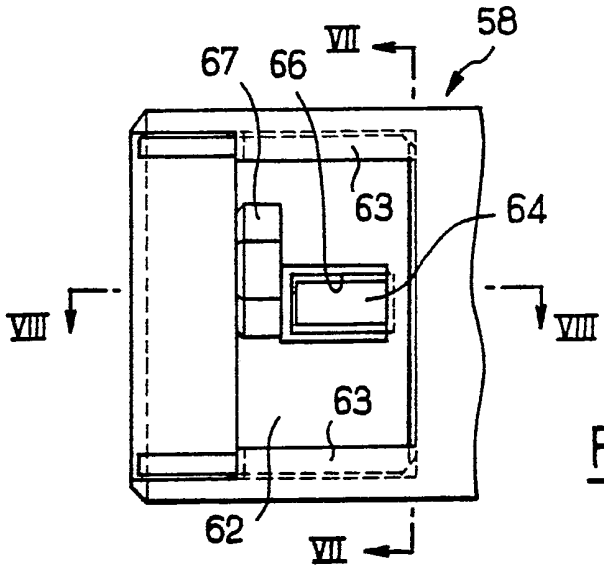

FIG.6

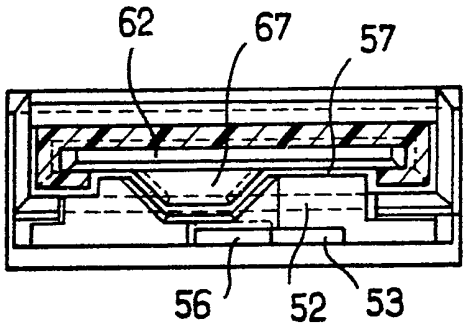

FIG.7

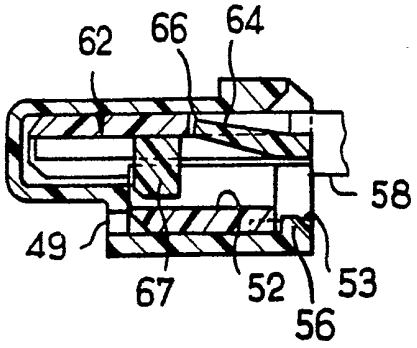

FIG.8

"A Connecting Device for Electric Distribution Systems"

The invention relates to a connection device for electric distribution systems comprising busbars enclosed in a duct.

Some known devices of this kind comprise a connector and a connecting socket made of insulating material and adapted to be secured in an opening at the side of the duct. The socket has a row of passages enabling power contacts on the connector to reach the busbars when a shutter or safety cover, mounted for sliding in the socket in a direction transversely to the busbars, has been actuated so as to uncover the passages.

More particularly, US-A-2 907 839 discloses a connecting device comprising a shutter mounted on the duct for sliding in a longitudinal direction and adapted, depending on its position, to uncover or cover openings giving access to the busbars.

The aforementioned device has an advantage over devices comprising a transversely moving shutter, since in the latter case the spacing between each pair of adjacent busbars must be sufficient for two successive passages intended for contacts to be separated by a width equal to an individual shutter associated with one of the adjacent passages.

In the various known devices, the shutter prevents accidental contact with the busbars in the absence of the connector.

Even so there is still a risk of connecting the socket to a receiver having characteristics incompatible e.g. with the voltage or frequency of the electric energy conveyed by the busbars.

One aim of the invention is to obviate this risk.

To this end, according to the invention, a well opens in the front wall of the socket at one end of the row of passages and extends

towards the interior of the duct on the side of the busbars and contains a coding configuration on the inside and the connector has a lug formed with a coding configuration which, if it agrees with the configuration of the well, enables the lug to engage in the well and the power contacts of the connector to meet the busbars enclosed in the duct.

Advantageously also the connecting socket has passages adapted to be opposite weak-current conductors placed in the duct, the passages being offset parallel to the busbars with respect to the row of passages and being covered and uncovered by the shutter at the same time as the row of passages, and allowing weak-current contacts mountable in the connector to meet the weak-current conductors during the same operation as that in which the power contacts are connected to the busbars.

Other features and advantages of the invention will be clear from the following description.

In the accompanying drawings, given by way of non-limitative example:

Fig. 1 is a general perspective view of a connecting device according to the invention;

Fig. 2 is an exploded perspective view of the duct and the connecting socket;

Fig. 3 is a plan view of the connecting socket in Figs. 1 and 2;

Fig. 4 is a view in section along the plane IV-IV in Fig. 3;

Fig. 5 is an exploded large-scale perspective view of a coding lug of the connector according to the invention;

Fig. 6 is a plan view of the coding lug in Fig. 5, and

Figs. 7 and 8 diagrammatically show the respective positioning of the male and female coding means, in section along planes VII-VII and VIII-VIII respectively of the male means as shown in Fig. 6.

As Fig. 1 shows, a duct 1 comprising an end 1a and a crimped cover 1b contains power conductors in the form of busbars 2, and insulated flexible conductors 3 for carrying weak currents used for remote control or transmission purposes. Busbars 2 and conductors 3 are held by insulating supports 4 distributed along the duct and positioned on the inner walls thereof. The four busbars 2 are aligned side by side with their major surfaces disposed parallel to one another. The three insulated conductors 3 are each disposed in a respective space between two adjacent bars 2.

At a place where a connection can be made if required, the cover 1b of duct 1 (Fig. 2) has a rectangular opening 1c into which a connecting socket 6 is installed, for co-operation with a connector 7 (Fig. 1). Socket 6 has a row of four double openings 8 and a second row of three openings 9 for four clamps 11 for connecting to busbars 2 and three clamps 12 for connecting to previously bared portions of conductors 3. Openings 9 are offset parallel to bars 2 with respect to openings 8. Clamps 11 and 12 are carried by connector 7. During insertion, the two arms of each clamp 11 extend on either side of the central bar of an opening 8.

As Figs. 1 and 2 show, the connecting socket 6 comprises a moulded plastics body 14 adapted to receive the power busbars 2 on the one hand and the insulated conductors 3 on the other hand. Conductors 3 are received in channels 16 which are open towards cover 1b. Opposite the openings 9, which are formed in a plate 17 for covering the insulated conductors 3 and the body 14 on the side of opening

1c, the channels 16 widen to form connecting chambers 18 adapted to receive the clamps 12 through the openings 9.

The three channels 16 extend between four rectangular windows 19 adapted to coincide with the openings 8 in plate 17 so that clamps 11 of connector 7 can make contact with the power busbars 2.

A sliding shutter 21 is disposed between the body 14 and conductors 3 on the one hand and the plate 17 on the other hand. According to an important feature of the invention, the direction in which shutter 12 slides is parallel to the longitudinal direction of the power bars 2. For this purpose, the surface of shutter 21 facing the end 1a has longitudinal ribs 22 adapted to fit between the side walls of channels 16 to help in guiding the shutter. Shutter 21 also has a finger 23 which during operation engages in an eyelet 24 in plate 17. Finger 23 is surrounded by a compression spring 26 which during operation is inserted between eyelet 24 and a slope 27 for actuating the shutter 21.

Shutter 21 comprises a screen 28 which closes the four windows 19 when, under the action of spring 26, the actuating slope 27 abuts an edge 29 of body 14. Screen 28 is prolonged by three individual screens 31 which, when shutter 21 is in the same position, each cover a chamber 18. When shutter 21 is in this position, therefore, openings 8 and 9 of plate 17 are covered.

Plate 17 has a notch 32 opposite the slope 27. As Fig. 1 shows, connector 7 has an actuating means 34 adapted to extend through notch 32 and bear against slope 27 so as to push it, together with the shutter assembly 21, in the direction for compressing spring 26 until an abutment 36 partly surrounding spring 26 is pressed against eleyet 34. Shutter 21 cannot jam when it slides, since slope 27 is substantially coaxial with spring 26, i.e. the action and reaction are substantially aligned.

When abutment 36 presses against eyelet 34, screen 28 uncovers windows 19 and the individual shutters 31 are disposed between windows 19 and consequently permit communication between openings 9 and chambers 18.

Near two diametrically opposite corners, plate 17 has catches 37 adapted to engage in corresponding ears 38 of body 14. During operation, a lip 39, 41 along the two sides of plate 27 transversal to the longitudinal direction of the busbars is pressed against the inner surface of cover 14. In other words, the assembly comprising body 1, shutter 21 and plate 17 is mechanically held between end 1a and cover 1b of duct 1. Also, lips 39, 41 hold the insulated conductors 3 in the base of channel 16 and the connecting chamber 18.

Slope 27, finger 23 and spring 26 are disposed at one end of the row of windows 19. At the other end of the row of windows 19, the socket 14 is formed with a well 26 extending towards the interior of duct 1 alongside busbars 2. Well 43 is closed relatively to the interior of duct 1, but it opens towards the exterior of duct 1 via a notch 44 in plate 17. The wall defining the well 43 co-operates with two tongues 43 disposed on the other side of busbars 2 (only one tongue is visible in Fig. 2) to form feet bearing the socket 14 on the end 1a of duct 1.

At the opposite end faces of well 43 there are two opposite ribs 47. As Fig. 4 shows, ribs 47 extend over slightly more than half the depth of well 43 and, at their inner end 48, meet a shoulder 49 beyond which the well 43 is narrower down to its base 51, relative to the direction across the busbars. A coding plate 52 is slid behind ribs 47 and is held between shoulder 49 and a catch projection 53 near the opening of well 43. Projection 43 occupies a set-back 54 in plate 52. Set-back 54 is adjacent a recess 56 at the back of plate 52. Recess 56 is for inserting a tool such as a screwdriver

between plate 52 and the adjacent wall of well 43, so as to bend plate 52 in order to release it from the catch projection 53 when removing or replacing the coding.

Inside well 43, plate 52 has a surface 57 which, in a plane transversal to the direction for inserting the connector 7, has a profile which is characteristic of the code allocated to duct 1.

Connector 7 has a coding lug 58 (Fig. 5) for insertion into well 43. Lug 58 has a support 59 having a recess 61 into which a coding plate 62 is removably inserted (Fig. 5). Recess 61 is open on the side opposite the surface 57 of plate 52 of well 43 when lug 58 is inserted into well 43. However, two ribs 63 prevent plate 62 from any movement transversely to the open side. Also, plate 62 has an oblique tongue 64 which, when plate 62 has fully engaged in recess 61 by sliding behind ribs 63, catches in an opening 66 in the support 59 on the side opposite the open side of recess 61.

Plate 62, substantially at the middle of its dimension corresponding to the depth of well 43, has a profiled boss 67 which matches the profile of the surface 57 of plate 52, if the codes on plates 52 and 62 correspond.

The plates 52, 62 which are coded in the same manner have a specific colour different from other colours corresponding to other codes. This greatly simplifies checking the coding of an installation.

The connecting device according to the invention operates as follows:

In the absence of connector 7, shutter 21 covers passages 8 and 9.

When connector 7 is brought near the connecting socket 6, the lug 58, which projects further than contacts 11, 12 and finger 34, first engages in well 43. Since boss 67 is not disposed at the free end

of lug 58, initial engagement is always possible even if the codes do not agree. The initial engagement is for positioning socket 6 relative to connector 7 and also for positioning plate 52 secured in well 43 relative to plate 62 carried by lug 58.

Next, boss 67 on lug 58 arrives opposite the apparent end of plate 52. If the codes agree, boss 67 engages by sliding against the coding profile of plate 52. At the same time, the actuating means 34 makes contact with slope 27 and begins to move it in the direction for compressing the spring 26. Shutter 21 progressively uncovers passages 8 and 9.

If, on the other hand, the codes do not agree, the insertion movement of connector 7 is stopped before shutter 21 has begun to open.

Returning to the case where the codes agree - after passages 8 and 9 have completely opened, contacts 11 and 12, via passages 8 and 9 respectively, engage bars 2 and the bared flexible conductors 3 respectively.

The respective dimensions of lug 38, actuating means 34 and contacts 11 and 12 are such that the aforementioned sequence is substantially adhered to.

More particularly, lug 58 must project further than means 34, which itself projects more than the contacts. The coding well is disposed in duct 1 alongside busbars 2, so that the coding means do not appreciably project from duct 1. The coding means on socket 6 could have been longitudinally offset relative to the rows of passages 8 and 9, but this would have increased the overall bulk of the device. The coding means can be placed at the end of the rows of passages, since the shutter 21 slides longitudinally.

The coding plates 52, 62 are removable and consequently the connecting device can be used when well 43 and lug 58 are not coded. This avoids complication for users of a simple installation.

Coding is advantageous in the case of installations where various ducts such as 1 convey electric energy at e.g. different voltages or different frequencies. In such cases the user avoids any faulty connection by coding the sockets 6 of each duct with a code specific to the duct, and in allocating each connector the code corresponding to the duct conveying the current at which the apparatus served by the connector is designed to operate.

Thus, the inserted coding components enable the coding to be selectively used. Furthermore, since plates 52 are not only inserted but also removably mounted, any fault in coding can be eliminated during installation.

Alternatively, conductors 3 and contacts 12 can be omitted if the user does not need this improvement.

C L A I M S

1. A connecting device for an electrical distribution system comprising busbars enclosed in a duct, the device comprising a connector and a connecting socket made of insulating material and adapted to be secured in an opening at the side of the duct, the socket being formed with a row of passages through which the power contacts of the connector can reach the busbars when a shutter slidably mounted in the socket uncovers the passages for movement in the longitudinal direction of the busbars, characterised in that a well opens in the front wall of the socket at one end of the row of passages and extends towards the interior of the duct on the side of the busbars and contains a coding configuration on the inside and the connector has a lug formed with a coding configuration which, if it agrees with the configuration of the well, enables the lug to engage in the well and the power contacts of the connector to meet the busbars enclosed in the duct.

2. A connecting device according to claim 1, characterised in that the connecting socket also has passages adapted to be opposite weak-current conductors placed in the duct, the passages being offset parallel to the busbars with respect to the row of passages and being selectively covered and uncovered by the shutter substantially at the same time as the row of passages, and allowing weak-current contacts mountable in connector to meet the weak-current conductors during the same operation as that in which the power contacts are connected to the busbars.

3. A device according to claim 1, characterised in that the well is in the form of a guide means for sliding the lug of the connector.

4. A device according to any of claims 1 to 3, characterised in that the coding configurations of the connector and the connecting socket are added.

5. A device according to any of claims 1 to 4, characterised in that the coding configurations of the connector and the connecting socket are removably mounted.

6. A device according to claim 3 or 4, characterised in that each pair of mutually corresponding coding configurations on the well and lug respectively have a specific colour.

7. A device according to any of claims 1 to 6, characterised in that the connector comprises an actuating means capable of acting on the shutter in order to uncover the passages after the well and lug codes agree and the lug can at least partially engage in the well, but before the power contacts of the connector reach the busbars, the shutter being returned to the closed position by a return spring.

8. A device according to claim 7, characterised in that the shutter, near the other end of the row of passages, has an actuating slope adapted to receive the action of the actuating means.

9. A device according to claim 7, characterised in that an actuating slope carried by the shutter and adapted to co-operate with the actuating means on the connector is disposed substantially along the line of action of the spring.

10. A device according to claim 9, characterised in that the actuating slope is situated near the other end of the row of passages.

11. A device substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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