

COUPLING DEVICE FOR THE CONTACT BLOCK AND THE HANDLE OF AN ELECTRICAL CONNECTOR.

DESCRIPTION

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The present invention refers to a device for coupling the contact block and the handle of an electrical connector member, such as, for example, a mobile electric plug or socket of the industrial type.

10 As is known, mobile electric plugs or sockets of the industrial type consist of two separate elements which can be connected to each other: a first element called a contact block and a second element called a handle. Inside the contact block there are disposed electrical contact elements of the male type (pins of the plug) or female (seats of the socket). An electric cable having a plurality of electric conductor wires
15 connected to the electrical contacts disposed inside the contact block passes inside the handle.

According to the current electrical safety standards, the contact block and the handle must be made in two separate pieces which can be removably assembled with each
20 other. Disassembly of the handle from the contact block must necessarily be done with the aid of a tool.

For this reason, devices for coupling the contact block and handle are widely available on the market which provide screw means which are screwed/unscrewed by means of
25 a screw driver to allow connection/disconnection of the handle to/from the contact block. This system proves inconvenient particularly in the case of assembly of the connector, since it requires the use of a tool operated manually by the operator and thus with a considerable waste of time.

30 In order to overcome this drawback at least in part, coupling systems are known to the art which allow assembly without the use of tools and disassembly with the use of tools.

A coupling system is known to the art in which the handle has a protruding portion in which a seat is formed to house a flexible tongue. The contact block, on the other hand, has a protruding tooth in which a seat matching the flexible tongue is formed.

- 5 In this manner, when the handle and the contact block are assembled with each other, the flexible tongue bends and snaps into the seat of the protruding tooth, preventing disassembly of the two elements. Such disassembly involves the use of the tip of a tool to bend the flexible tongue so as to cause uncoupling thereof from the seat of the tooth.

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- Said coupling device holds the disadvantage of having to modify the structure of the handle and the contact block excessively to provide the protruding seat and the protruding tooth, respectively. It further involves complex mechanical working to form the matching seat in the protruding tooth. In normal use, particularly in difficult settings like building sites, workshops, carpenter's shops, etc. the part for access to the flexible tongue, being protruding, can easily become obstructed or go out of alignment (if, for example, it is dragged on the ground) and consequently no longer allow the two parts to be disassembled. As a result, said coupling system is excessively expensive, difficult to produce and uncertain in its reliability over time.

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Furthermore, in coupling devices of the prior art, operating with the tip of a screwdriver on the flexible tongue causes rapid wear thereof.

- 25 The object of the present invention is to overcome the drawbacks of the prior art, providing a coupling device between the contact block and the handle of an electrical connector member that is practical, inexpensive, simple to produce and is reliable in its operation over time.

- 30 This object has been achieved in accordance with the invention with the characteristics listed in appended independent claim 1.

Advantageous embodiments of the invention are apparent from the dependent claims.

According to the invention, the coupling device for a contact block and a handle of an electrical connecting member comprises an elastic member made integral with the contact block near the proximal end thereof. Said elastic member has an outward protruding end part, designed to snap engage elastically inside a through hole formed
5 near a proximal end of the handle.

In this manner, the handle can be assembled on the contact block without the aid of any tool, whilst for disassembly it is sufficient to insert the tip of a tool into the hole of the handle to cause the elastic member to bend so as to release it from the hole.

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It should be noted that said solution is extremely simple and economical and furthermore does not involve particular operations of mechanical working on the structure of the contact block and the handle.

15 Further characteristics of the invention will be made clearer by the detailed description that follows, referring to a purely exemplary and therefore non limiting embodiment thereof, illustrated in the appended drawings, in which:

Figure 1 is a perspective view, illustrating, in an exploded view, a handle, a contact block and a deformable member forming part of an electrical connector provided with
20 the coupling device according to the invention;

Figure 2 is a front view of the contact block of Figure 1;

Figure 3 is bottom plan view of the contact block of Figure 2;

Figure 4 is a rear view of the contact block of Figure 2, rotated 180° with respect to Figure 2;

25 Figure 5 is an axial sectional view of the handle of Figure 1;

Figure 6 is a cross sectional view taken along the plane of section VI-VI of Figure 5;

Figure 7 is a perspective view illustrating the three elements of Figure 1 assembled but not yet in the locking position, in which a portion of the handle has been removed to make the elastic member visible;

30 Figure 8 is a perspective view, like Figure 7, illustrating the three elements of Figure 1 assembled and in the locking position, in which a portion of the handle has been removed to make the elastic member visible.

The coupling device according to the invention is described with the aid of the figures.

Figure 1 illustrates the structure of an electrical connector member 1 comprising a contact block 2, an elastic member 6 and a handle 8.

- 5 The contact block 2 is designed to accommodate the electrical contacts of the connector 1. Said electrical contacts can be in the form of male elements (pins of a plug) or female elements (seats of a socket).).

10 The contact block 2 comprises a substantially cylindrical body, hollow on the inside, which has a distal end 23 and a proximal end 24. Retaining teeth 25 designed to retain the electrical contact assembly of the connector 1 are provided on the inside surface of the body 20, near the proximal end 24.

15 An abutment flange 21 protrudes radially outwards from the body 20 of the contact block, near the proximal end 24.

A seat 26 designed to receive the elastic member 6 is formed on the outer side surface of the body 20 between the abutment flange 21 and the proximal end 24. The seat 26 has a substantially rectangular shape and is delimited by two longitudinal partitions 27 and 28. The partition 27 has a slot 27' which opens into the seat 26 and the partition 28 has a circumferential portion 30 with a slot 30' which opens into the seat 26. A rectangular protrusion is provided in the seat 26 in a central position.

25 The elastic member 6 is preferably a spring band or a leaf spring consisting of a small metal plate which has a flat rectangular portion 60 with a larger surface and a portion 61 with smaller surface folded in a U shape on the portion with a larger surface 60. The larger surface portion 60 has a rectangular hole 62 designed to receive the rectangular protrusion 29 of the seat 26. The portion with a smaller surface 61 has an end 63 which protrudes outward forming an angle of about 90° with respect to the plane of the portion with a smaller surface 61.

The elastic member 6 is housed in the seat 26 of the contact block. To be precise, the plate with a larger surface 60 abuts against the surface of the seat 26 and its edges are retained in the slots 27' and 30'. Furthermore, the protrusion 29 of the seat 26 engages

in the hole 62 of the plate with a larger surface 60 to avoid any shifting of said plate. In this manner the plate with a smaller surface 61 protrudes outward from the seat 26 and can bend elastically, coming nearer to the plate with a larger surface 60.

- 5 A radial protrusion 31 is provided in the side surface of the contact block, between the abutment flange 21 and the proximal end 24, with reference to Figures 1, 2 and 3, to the right of the partition 27. Defined between the protrusion 31 and the partition 27 is a first longitudinal channel 32 which continues with a first circumferential channel 33 defined between the protrusion 31 and the flange 21.

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- With reference to Figure 4, the first radial channel 33 is interrupted by a longitudinal stop partition 34. To the right of the partition 34 there is another radial protrusion 35. Between the partition 34 and the radial protrusion 35 there is defined a second longitudinal channel 36 which continues with a second circumferential channel 37
15 between the protrusion 35 and the flange 21. The second radial channel 37 is interrupted by a longitudinal stop partition 38. Beneath the longitudinal wall 38 the protrusion 35 continues toward the right (Figure 4) with a radial protruding part 39.

- Returning to Figures 2 and 3, the partition 28 which defines the seat 26 of the elastic
20 member continues towards the left with a radially protruding part 42. Between the radial protruding part 42 and the radial protruding part 39 there is defined a third longitudinal channel 40 which continues with a third circumferential channel 41 defined between the radial protruding part 42 and the flange 21. The third circumferential channel 41 ends in the protruding part 30 which defines the slot 31 of
25 the seat 26.

- With reference to Figure 1, the handle 8 is designed to receive inside it an electrical cable which carries the various electrical wires destined to be connected to the conductors installed in the contact block 2.

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The handle 8 has a substantially cylindrical body 80, hollow on the inside, having a proximal end 81 and a distal end 82.

An external thread 83 is provided on the body 80, near the distal end 82, to receive a ring nut designed to clamp the electrical cable.

Going toward the proximal end 81, the body 80 has a truncated conical transitional portion 84 increasing in diameter which ends in a proximal end portion 85 of greater diameter. The outside diameter of the proximal end portion 85 is substantially equal to
5 the outside diameter of the flange 21 of the contact block 2. The inside diameter of the proximal end portion 85 is slightly greater than the outside diameter of the part of contact block body 20 between the flange 21 and the proximal end 24 of the contact block.

10 In the body of the handle, between the transitional portion 84 and the proximal end portion 85, there is a rectangular hole 86 of such a size as to allow the passage of the end 63 of the elastic member 6.

With reference to Figure 5, a recessed rectangular seat 87 in which the hole 86 is
15 situated is formed in the inner side surface of the proximal end portion 85.

With reference also to Figure 6, three radial protrusions 88, 89 and 90, set at equal angular distances of about 120° from each other, are formed in the inner surface of the end part 85. With reference to Figure 6, starting from the hole 86 in a
20 counterclockwise direction, a first radial protrusion 88, a second radial protrusion 89 and a third radial protrusion 90 are provided.

The size of the radial protrusions 88, 89, 90 is slightly smaller than the size of the longitudinal channels 32, 36, and 40 of the contact block 2. The longitudinal thickness of the radial protrusions 88, 89, 90 is slightly smaller than the longitudinal
25 measurement of the circumferential channels 33, 37, and 41 of the contact block 2.

Operation of the coupling device according to the invention is described with the aid of Figures 7 and 8.

30 For assembly, the radial protrusions 88, 89, 90 of the handle 8 are disposed in register with the longitudinal channels 32, 36, and 40 of the contact block 2. In this situation the elastic member 6 which is housed in the seat 26 of the contact block is in register with the recessed seat 87 of the handle.

At this point the handle 8 is pushed axially toward the contact block 2, so that the radial protrusions 88, 89, 90 of the handle slide in the longitudinal channels 32, 36 and 40 of the contact block, until the proximal end 81 of the handle abuts against the flange 21 of the contact block.

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In this situation, as shown in Figure 7, the protruding end 63 of the elastic member 6 is disposed in the recessed seat 87 of the handle, away from the hole 86. As a result, the plate with a smaller surface 61 is bent towards the plate with a larger surface 60 and thus the elastic member 6 is loaded.

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At this point, the handle 8 is rotated manually in the direction of the arrow F1 with respect to the contact block 2, or the contact block 2 is rotated in the direction of the arrow F2 with respect to the handle or both the handle 8 and the contact block 2 are rotated at the same time in the direction of the arrows F1 and F2, respectively. As a result, the radial protrusions 88, 89, 90 of the handle 8 slide in the respective circumferential channels 33, 37 and 41 of the contact block 2, until they abut against the respective longitudinal abutment walls 34, 38 and 30. It should be noted that in this manner the handle 8 couples with the contact block 2 in a bayonet coupling relationship which provides for axial insertion and subsequent rotation.

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During this rotation of the handle with respect to the contact block, the end 63 of the elastic member 6 slides in the recessed seat 87 of the handle until it enters the hole 86. As a result, the elastic member 6 is released and the plate with the smaller surface 61 snaps outwards so that the protrusion 63 of the elastic member engages the hole 86 of the handle, as shown in Figure 8.

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In this situation any relative rotation of the handle 8 and the contact block 2 is prevented since the protrusion 63 of the elastic member abuts against a wall of the hole 86 of the handle and the radial protrusions 88, 89, 90 of the handle 8 abut against the respective longitudinal abutment partitions 34, 38, and 30 of the contact block 2.

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For disassembly it is necessary to use a tool. In fact, the user must insert the tip of the tool into the hole 86 of the handle, pushing the plate with a smaller surface 61 of the elastic member radially inward. At the same time the user rotates the handle 8 in the

direction of the arrow F3 or rotates the contact block 2 in the direction of the arrow F4, until the protruding part 63 of the elastic member 6 disengages from the hole 86 and is disposed in the recessed seat 87 of the handle.

- 5 It should be noted that the tip of the tool acts directly on the metal plate 61, thus avoiding the problems of wear encountered in devices of the prior art.

At this point, the user can extract the tip of the tool from the hole 86 and continue to rotate the handle and/or the contact block in the direction of the arrow(s) F3/F4, until
10 the first radial protrusion 88 of the handle abuts against the longitudinal partition 27 of the contact block. In this situation, the radial protrusions 88, 89, 90 of the handle 8 are again disposed in register with the longitudinal channels 32, 36, and 40 of the contact block 2. Thus the handle can be extracted axially with respect to the contact block.

- 15 Numerous variations and modifications of detail within the reach of a person skilled in the art can be made to the present embodiment of the invention without departing from the scope of the invention as set forth in the appended claims.

CLAIMS

1. A coupling device between the contact block (2) and the handle (8) of an electrical connector member (1) characterised in that it comprises an elastic member
5 (6) made integral with the contact block (2) near a proximal end (24) of the contact block (2) and having an outward protruding end part (63) designed to snap engage elastically in a through hole (86) formed near a proximal end (81) of the handle (8).
2. A device according to claim 1, characterised in that said elastic member is
10 a spring band or leaf spring (6).
3. A device according to claim 2, characterised in that said elastic member (6) consists of a metal band bent into a U-shape.
- 15 4. A device according to claim 3, characterised in that said elastic member (6) comprises a first portion of plate with a larger surface (60) and a second portion of plate with a smaller surface (61) bent into a U-shape on said first portion of plate (60), in which the end (63) of said second portion of plate with a smaller surface (61) protrudes outward at right angles to engage in said hole (86) of the handle.
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5. A device according to any one of the preceding claims, characterised in that near said proximal end (24) of the contact block (2) there is a seat (26) designed to receive said elastic member (6).
- 25 6. A device according to claim 5, when it is dependent upon claim 4, characterised in that said seat (26) is defined by longitudinal and or circumferential partitions (27, 28, 30) having slots (27', 30') able to receive the edges of said first portion of plate with a larger surface (60) of said elastic member (6).
- 30 7. A device according to claim 5 or 6, when it is dependent upon claim 4, characterised in that in said first portion of plate with a larger surface (60) a through hole (62) able to be engaged by a protrusion (29) provided in said seat (26) of the contact block is provided.

8. A device according to any one of the preceding claims, characterised in that said contact block (2) has a substantially cylindrical body having an abutment flange (21) which protrudes radially outward, near to said proximal end (24) of the contact block and able to abut against said proximal end (81) of the handle.

9. A device according to any one of the preceding claims, characterised in that said handle (8) has a substantially cylindrical body (80) having a transitional portion (84) with an increasing diameter towards said proximal end (81), ending with a proximal end portion (85) with a larger diameter.

10. A device according to any one of the preceding claims, characterised in that in the inner surface of the body of the handle (8), near the proximal end (81), there is a recessed seat (87) disposed around said hole (86).

11. A device according to any one of the preceding claims, characterised in that in the inner surface of the body of the handle (8), near the proximal end (81) there is at least one protrusion (88, 89, 90) which protrudes radially inward and in the outer surface of the body of the contact block (2) there is at least one longitudinal channel (32, 36, 40) which continues with a respective circumferential channel (33, 37, 41) to receive said at least one protrusion (88, 89, 90) so as to allow a bayonet type coupling of the handle (8) on the contact block (2).

12. A device according to claim 11, characterised in that in the inner surface of the body of the handle (8), near the proximal end (81), there are three protrusions (88, 89, 90) which protrude radially inward, angularly equidistant from each other, and in the outer surface of the body of the contact block (2) there are three longitudinal channels (32, 36, 40) which continue with respective circumferential channels (33, 37, 41) to receive said three protrusions (88, 89, 90) respectively.

13. An electrical connector member (1) comprising a contact block (2) and a handle (8) connected removably to each other by means of a coupling device according to any one of the preceding claims.