

[54] **RAPID CONNECTION DEVICE FOR AN ELECTRICAL CONDUCTOR**

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[51] Int. Cl. **H01r 9/06**

[58] Field of Search **339/95, 96, 97, 98, 99, 247, 339/253, 273, 274, 217; 24/134 L**

[56] **References Cited**

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[57] **ABSTRACT**

A rapid connection device for an electrical conductor comprises a flat element mounted in a support so as to be rotatable around an axis of rotation perpendicular to its middle plane. The flat element and support have a complementary hollow and projection forming the axis of rotation. The flat element has at its periphery a gripping surface which faces a support surface provided on the support. One at least of the gripping and support surfaces are metallic and electrically conducting. Elastic means urge the flat element in a direction of rotation so that after positioning an electrical conductor between the surfaces, the elastic means facilitates the wedging and locking of the conductor between the surfaces under the action of traction exerted on the conductor. The elastic means is constituted by a flexible strip which is an integral part of the flat element. Consequently the connector is easily and cheaply manufactured by stamping, molding, etc.

14 Claims, 5 Drawing Figures

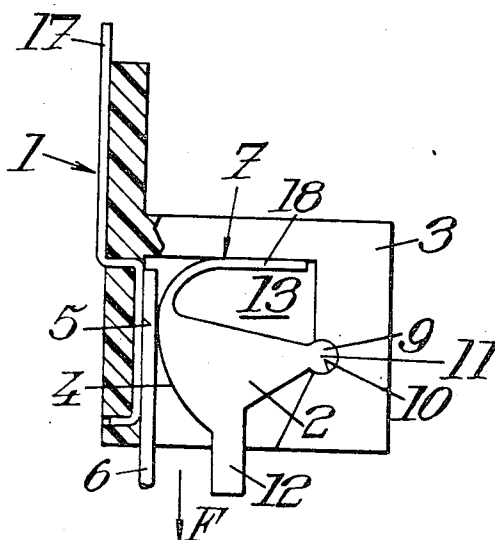


Fig. 2.

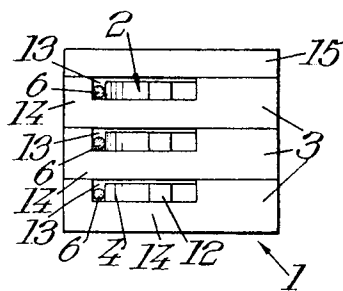


Fig. 1.

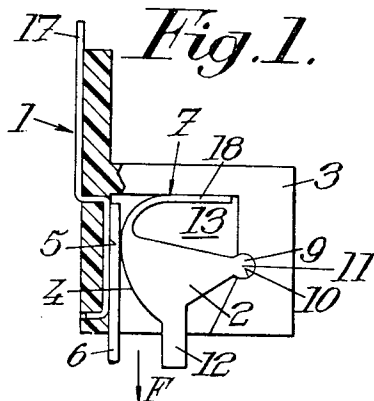


Fig. 4.

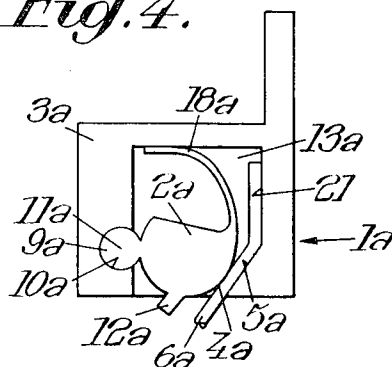


Fig. 3.

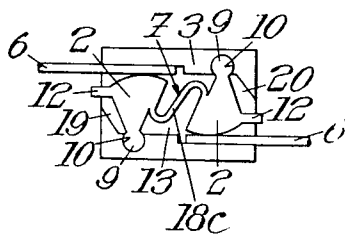
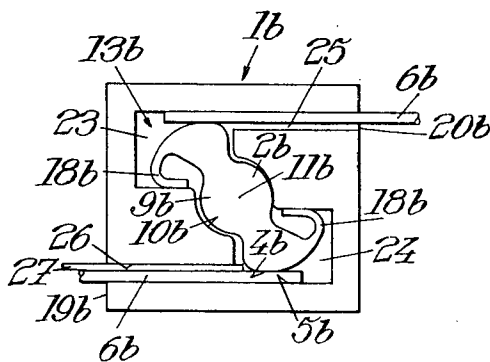


Fig. 5.



RAPID CONNECTION DEVICE FOR AN ELECTRICAL CONDUCTOR

The invention relates to a connecting device for an electrical conductor of the type which comprise, on one hand, a flat element mounted in a support, so as to be rotatable around an axis of rotation perpendicular to its middle plane, said flat element and support having a complementary hollow and projection forming the said axis of rotation, the said flat element comprising, at its periphery, a gripping surface located opposite a support surface provided on the support, one at least of the gripping and support surfaces being metallic and conductive of electricity and on the other hand, elastic means adapted to urge the flat element in one sense of rotation such that after the placing in position of an electrical conductor between the said surfaces, the elastic means favor wedging and locking of the conductor between the said surfaces under the action of traction exerted on this conductor.

The invention relates more particularly, among these rapid connection devices, to those for electrical conductors of small diameter, especially for electrical conductors used in electronic installations.

There have already been proposed rapid connection devices of the type described above, but the obtaining of the different constituents of these devices and their assembly, especially that of the elastic means, are not sufficiently simple and cheap.

It is a particular object of the invention to render the abovesaid devices such that they respond better than hitherto to the various exigencies of practice and especially that they be of great simplicity of manufacture and assembly.

A rapid connection device of the type concerned is characterized by the fact that the elastic means are constituted by at least one flexible strip forming an integral part of the flat element.

The flat element can comprise a tongue which projects out of the support and enables the flat element to turn in the sense which frees the locked conductor, that is to say in the sense which is opposite the above-indicated sense.

The invention consists, apart from the features explained above, of certain other features which are preferably used at the same time and which will be more explicitly considered below, with regard to several embodiments of the invention and which will now be described in a more detailed manner with reference to the accompanying drawing, but which are given purely by way of non-limiting illustration.

FIG. 1 of this drawing is a plan view, with portions removed, of one embodiment of a rapid connection device according to the invention.

FIG. 2 shows, viewed in elevation, several devices identical with the embodiment of FIG. 1, but placed side by side.

FIG. 3 shows a variation of the embodiment of FIG. 1.

FIG. 4 shows another variation of the embodiment of FIG. 1.

FIG. 5, lastly, shows another variation of the embodiment of FIG. 1.

Referring to FIG. 1, it is seen that the rapid connection device 1 comprises a flat element 2, mounted in a support 3, substantially in the form of a parallelopiped, so as to be rotatable around an axis perpendicular to its

middle plane, which plane is parallel to that of the Figure.

The element 2 comprises, at its periphery, a curved gripping surface 4 located opposite a support surface 5 provided on the support 1. One at least of the surfaces 4,5 is metallic. The element 2 being generally metallic, preferably of beryllium-copper, the surface 4 is, in practice, always metallic and conductive of electricity.

The assembly is arranged so that rotation in a suitable sense of the element 2, in anticlockwise direction is the case of FIG. 1, causes wedging and locking of the conductor 6 situated between said surfaces 4,5. If traction is exerted on the conductor 6 in the direction of the arrow F, the assembly is arranged so that the effects of wedging and locking of the said conductor increase.

Elastic means 7 are provided to return the flat element 2 in the above-indicated sense, that is to say, for FIG. 1, in anticlockwise direction. The element 2 is held by the elastic means 7 in contact with the conductor 6, which facilitates wedging and locking of the conductor 6 when traction is exerted on the latter.

The elastic means 7 are constituted by a flexible strip 18 forming an integral portion of the element 2. This flexible strip is supported against a wall of a cavity 13 and, preferably, is curved. It extends, in a way, the surface 4 towards the inside of the cavity 13.

The element 2, has a projection 9, with a partially circular contour, arranged in a housing 10, partly cylindrical, arranged in the support 3. The diameter of the housing 10 is equal or slightly greater than that of the projection or portion 9 and the assembly is such that it enables the rotation of flat element around an axis passing, at least approximately, through the center 11 of the portion 9. The gripping surface 4 of the flat element 2 is situated at a distance from the center 11 greater than the radius of the contour of the portion 9.

In the embodiment of FIG. 1, the surface 4 is cylindrical and comprises generators perpendicular to the middle plane of the flat element 2. Said surface 4 is cut by a plane parallel to the middle plane of the flat element along a convex curve of which the radius of curvature varies regularly, but remains greater than the distances of the center 11 to the points of the curve. The ends of the surface 4 are connected with the part 9 by flat surfaces converging substantially towards the center 11 so that the element 2 has practically the shape of a circular sector.

Advantageously, a tongue 12, projecting on the outside of the support 3, is provided on the flat element 2 to enable the latter to turn, without a tool, in the sense which frees the conductor 6. For FIG. 1, this sense is clockwise. The tongue 12, of substantially rectangular shape, has a large dimension oriented in a direction substantially parallel to the support surface 5. The tongue 12 is arranged with respect to the element 2, on the side opposite that of the spring 18.

The element 2 is housed in the cavity 13 provided in the support 3. This cavity 13, substantially in the shape of a parallelopiped, is limited, on one side, by a wall 14 (FIG. 2) parallel to the middle plane of the element, whilst it is open on the side opposite the wall 14.

It is thus seen that it is very easy to mount the element 2 in the support 3 since it suffices to introduce it, flat, from the side at which the cavity 13 is open.

The cavity 13 can have a depth enabling it to receive only a single element 2. In this case, there is advantageously arranged side by side the supports 3 (FIG. 2) so that the open side of the cavity 13 of a support is closed by the wall 14 of an adjacent support. A dismountable flange 15 is naturally provided to close the cavity 13 of the latter support. There can thus be produced a parallel arrangement of conductors. It will be noted that in FIG. 2 the conductors 6 are arranged one below the other to the left of the cavity 13. Naturally, this arrangement could be changed and the said conductors could be placed alternately left and right.

The cavity 13 can also be sufficiently deep to receive several superposed elements 2. A single support 3 is then necessary for the placing in parallel of several conductors.

The support surface 5 can be constituted by a surface of a metallic part 17 imprisoned in the support 3, which is advantageously constituted by a cage of molded plastics material. The connecting device 1 hence enables the establishment of an electrical and mechanical connection between the conductor 6 and 17.

The device of FIG. 3 enables the connection of two conductors 6 and plays the role of an extender. Cavity 13 of the support 3 is open at two opposite ends 19 and 20 whilst, in the embodiments described hitherto, the said cavity was only open at the opposite end to the wall against which the elastic means 7 are supported. Two housings 10, symmetrical with respect to the center of the support 3, are provided in the said support. Each housing receives a part 9, of partly circular contour, of an element 2 analogous to that of FIG. 1. The support 3 of FIG. 3 comprises therefore two flat elements 2 symmetrical with respect to the center of the said support. The elastic means 7 are constituted by a flexible strip 18c in an S, forming an integral part of at least one or two of the flat elements 2 and compressed between the latter.

The constituents, analogous to those described previously, are designated in FIG. 4 by the same reference numerals followed by the letter a.

The device of FIG. 4 comprises a flexible strip 18a, analogous to the strip 18 of FIG. 1. It will be noted that the support surface 5a forms an obtuse angle with a flat zone 21, of the inner wall of the cavity 13a, in contact with the conductor 6a.

The device of FIG. 5 enables two conductors 6b staggered transversely, to be connected, as in the case of FIG. 3; this device comprises a single flat element 2b.

The element 2b is constituted, in a way, by two elements 2, analogous to that of FIG. 1, assembled symmetrically with respect to an axis perpendicular to the plane of the elements and passing through the center 11b of the projection or part 9b of partly circular contour. The cavity 13b provided in the support 3b, has a central housing 10b partially a cylinder of revolution. The cavity 13b is symmetrical with respect to the axis of this housing and comprises two parts 23, 24 in the form of parallelepipeds which communicate with the housing 10b. Grooves 25, 26 emerging respectively from the parts 23, 24 open, outwardly, in the planes of the ends 19b, 20b, of the support 3b. These grooves enable the passage of the conductors 6b.

The flexible strips 18b of the flat element 2b are supported against the walls of the cavity 13b and have a

tendency to recall the elements 2b in the direction of locking the conductors, that is to say, for FIG. 5, in clockwise direction.

Sufficient play is provided between the walls of the part 9b and the walls of the housing 10b to enable the same gripping on conductors 6b, to be ensured.

The other components of the device of FIG. 5, analogous to those previously described, bear the same reference numerals followed by the letter b.

In the case of the embodiment of FIG. 5, to release a conductor 6b introduced into the device, a dismounting tool is used constituted by a strip 27 which is slid into a groove, for example the groove 26, so as to push the element 2b and to make it rotate in anticlockwise direction.

The operation of the various embodiments described above is clear. The introduction of the conductor 6, 6a, 6b in the device is done directly and, in all cases, without intervention of a tool, if the conductor is sufficiently rigid to push the flat element 2, 2a or 2b.

If the conductor is not sufficiently rigid, a thrust is exerted on the tongues 12 and 12a of the elements 2 and 2a to facilitate the introduction of the conductor. In the case of FIG. 5, the strip 27 is used to make the flat element 2b turn.

To separate the conductor 6, 6a, 6b from the device, it suffices to make the element 2, 2a, 2b, turn in suitable direction, either by pushing on the tongues 12, 12a, without the need for a tool, or by using the strip 27 to push the element 2b.

Whatever the embodiment of the connecting device, the latter is of very low cost price since: on one hand, the various components and parts and especially the flat element 2, 2a, 2b and the elastic means 7 can be obtained in a very simple manner, by cutting, stamping, pressing, molding, etc.; and on the other hand, the assembly is equally very simple since the number of parts to be assembled is reduced.

The embodiments comprising a tongue 12, 12a, are in addition particularly advantageous since they eliminate the need for a tool for assembly or disassembly for the connection or the separation of a conductor. It is obvious that the tongues 12, 12a are electrically insulated when the element 2, 2a is metallic and capable of being subjected to a voltage.

The system of machining of various components of the rapid connection device, according to the invention, lends itself well to manufacture of the "machine gun belt" type, that is to say to a manufacture which enables a series of identical parts connected to one another by a thin cord very easy to break subsequently, to be obtained. Production on automatic machines can for this reason be considered.

Naturally, the flat element and the flexible strip 18, 18a, 18b are subjected, after cutting out, to a treatment, especially thermal, intended to give this strip a sufficient elasticity.

As is self-evident, and as emerges already besides from the preceding description, the invention is in no way limited to those of its methods of application, nor to those of its methods of production of its various parts, which have been more particularly indicated; it embraces, on the contrary, all variations, especially the following.

The projection borne by the element 2, 2a, 2b may consist of an angular part in the form of a corner of which the point is borne in the hollow, also angular, arranged in the support 3, 3a, 3b. The angle formed by the walls of the hollow is naturally greater than that formed by the walls of the projection so as to enable rotation of the element 2, 2a, 2b.

The projection can be borne by the support 3, 3a, 3b and the hollow can be arranged in the flat element 2, 2a, 2b, said projection and hollow being partly circular as shown in the drawings, or angular as previously explained.

I claim:

1. Rapid connection device for an electrical conductor, said device comprising a flat element and a support adapted to hold said flat element rotatable around an axis of rotation perpendicular to its middle plane, said support and flat element having respectively a complementary hollow and projection forming said axis of rotation, a support surface provided on the support, a gripping surface at the periphery of the flat element situated facing said support surface, one at least of the gripping and support surfaces being metallic and electrically conducting, and at least one flexible strip forming an integral part of the flat element and constituting elastic means adapted to urge the flat element in a direction of rotation such that after positioning an electrical conductor between said surfaces, the elastic means facilitate wedging and locking of the conductor between said surfaces under the action of traction exerted on said conductor.

2. Device according to claim 1, including a tongue on the flat element which can project out of the support and enables the flat element to be rotated in a direction which compresses the elastic means and frees the conductor.

3. Device according to claim 1, in which the gripping surface of the flat element is constituted by a curved cam surface eccentric with respect to the axis of rotation of the flat element, wherein said flexible strip extends said gripping surface and is adapted to be supported against the support.

4. Device according to claim 1, wherein said projection is borne by the flat element and said hollow by the support, said hollow and projection being constituted by portions of cylindrical surfaces of partly circular contour, wherein the projection is located centrally in the flat element, the latter being symmetrical with respect to an axis perpendicular to its middle plane and comprising two tongues and two gripping surfaces, the support of the device having also an axis of symmetry at right angles to the middle plane of the said support, so that two conductors arranged on both sides of the support can be locked in the latter by the single flat element, a radial play being provided between the conjugate cylindrical surfaces of the flat elements and of the support to enable substantially identical gripping of the two conductors.

5. Device according to claim 1, wherein the support comprises a cavity of sufficient dimensions to receive two flat elements of which the middle planes are coincident, the axes of rotation of said elements being separated in a direction of introduction of the conductors in the support, the directions of rotation of said flat elements causing the wedging of the conductors being

opposite, the flexible strip constituting the elastic means extending between the two elements and forming an integral part of at least one of them.

6. Device according to claim 1, wherein the support comprises a cavity in which the flat element is placed, said cavity being limited on one side only by a wall of the support parallel to the middle plane of the flat element and being open on the other side, whereby several supports may be arranged side by side so that said wall of each support closes the open side of said cavity, an individual flange being provided to close the cavity of the last support.

7. Device according to claim 1, wherein the support surface of the support forms an obtuse angle arranged for contact with the conductor.

8. Device according to claim 1, wherein the flat element is of beryllium-copper.

9. Device according to claim 1, wherein the flat element is formed from cut-out sheet material.

10. Device according to claim 1, wherein the support is constituted by a cage of molded plastic material, and a metallic part imprisoned in said cage and which serves as support surface and constitutes an electrical output element adapted to contact a said conductor locked in the casing.

11. Device according to claim 1, wherein the flat element is formed from molded material.

12. Rapid connection device according to claim 1, said device including a tongue on the flat element which can project out of the support and enables the flat element to be rotated in a direction which compresses the elastic means and frees the conductor, the gripping surface of the flat element being constituted by a curved cam surface eccentric with respect to the axis of rotation of the flat element, wherein said flexible strip extends said gripping surface and is adapted to be supported against the support and wherein said projection is borne by the flat element and said hollow by the support, said hollow and projection being constituted by portions of cylindrical surfaces of partly circular contour, wherein the projection is located centrally in the flat element, the latter being symmetrical with respect to an axis perpendicular to its middle plane and comprising two tongues and two gripping surfaces, the support of the device having also an axis of symmetry at right angles to the middle plane of the said support, so that two conductors arranged on both sides of support can be locked in the latter by the single flat element, a radial play being provided between the conjugate cylindrical surfaces of the flat elements and of the support to enable substantially identical gripping of the two conductors.

13. Rapid connection device for an electrical conductor, said device comprising,

a flat element and

a hollow support adapted to contain said flat element,

said flat element being so-shaped as to comprise a boss at a first portion of its periphery, a cam surface at a second portion of its periphery, and elastic means at a third portion of its periphery, all of these elements lying in the same plane,

said hollow support having an inner surface forming socket means for said boss to enable the rotation of said flat element in its plane and also forming a

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support surface to face and cooperate with said cam surface,
one at least of said cam and said support surfaces being electrically conductive,
said elastic means being so arranged as to tend to rotate said flat element in said socket means and urge said cam surface against said support surface, whereby on inserting said conductor between said

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cam surface and support surface it is gripped therebetween,
traction on said conductor having the effect of locking it between said cam and said support.
14. Device according to claim 13, wherein said elastic means is arranged to thrust against the inner surface of said hollow support.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,686,622 Dated August 22, 1972

Inventor(s) Francois R. Bonhomme

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet, insert -- [30] Foreign Application
Priority Data November 19, 1969 France 6939846 -- .

Signed and sealed this 20th day of March 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents