Sept. 30, 1969 J. L. A. JOLY 3,470,526

ELECTRICAL CONNECTION TERMINAL

Filed Dec. 21, 1966

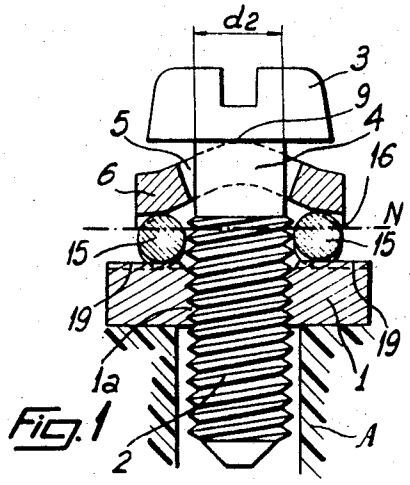


Fig. 1

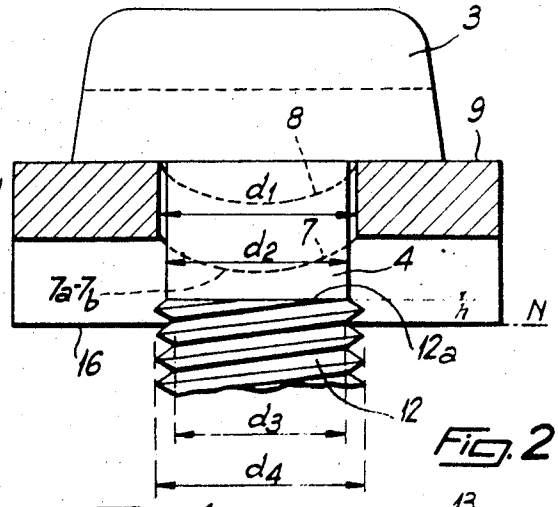


Fig. 2

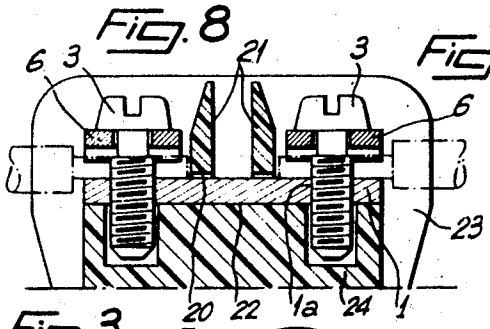


Fig. 8

Fig. 3

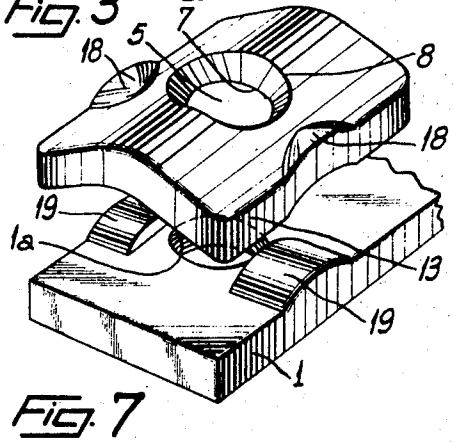


Fig. 7

Fig. 4

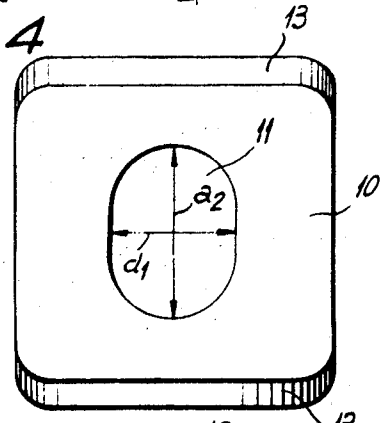


Fig. 5

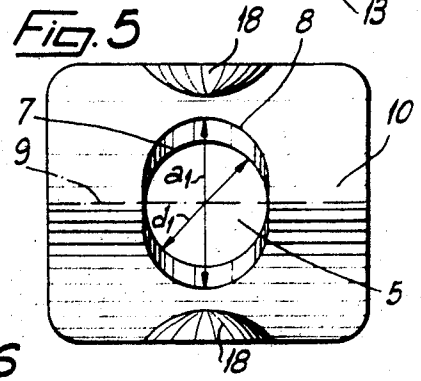
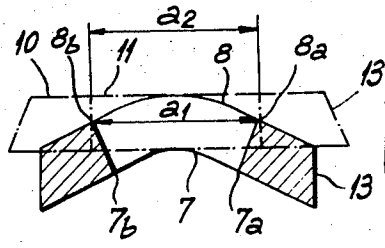
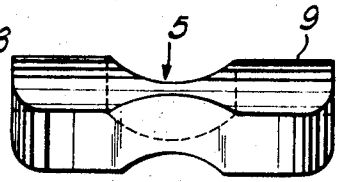


Fig. 6





Inventor
Jean Louis Andre Joly
By
Karl W. Flocks
Attorney

United States Patent Office 3,470,526
Patented Sept. 30, 1969

3,470,526

ELECTRICAL CONNECTION TERMINAL

Jean Louis André Joly, Houilles, France, assignor to La Telemecanique Electrique, Nanterre, Hauts-de-Seine, France, a company of France

Filed Dec. 21, 1966, Ser. No. 603,476
Claims priority, application France, Dec. 29, 1965, 52,905
Int. Cl. H01r 7/24
U.S. Cl. 339—246 5 Claims

ABSTRACT OF THE DISCLOSURE

The invention relates to an electrical connection terminal comprising an arched clamp which can be tightened down on to the stripped end of an electrical conductor by a tightening screw. The improvement comprises extending the thread on the tightening screw by at least one turn to allow plastic deformation of the clamp and so permit its use with conductors of small diameter or very flat.

The present invention concerns a screw type connection terminal for the attachment and electrical connection of stripped ends of straight conductors.

It is known that such terminals are constituted by a tightening screw under the head of which is arranged an arched clamp supported under the head of the screw and pressing by its concavity, when the screw is tightened, the conductors to be attached, against a conductive plate forming the end of the connection terminal.

Compared with previous constructions, the connection terminal in accordance with the invention is distinguished by its simplicity. It comprises however, in addition to features of the terminals already known, some further advantages.

Indeed, if in the construction of the terminal in accordance with the invention, the arched clamp is in a known manner made captive of the screw by the rolling of the thread, this clamp is such that it is not possible to separate it from the screw by engaging the edge of its aperture on the threads of the screw. Moreover, the thread allows tightening of the screw even when the clamp is in contact with the plate. Finally, the terminal plate can be flat and be provided with a simple tapped hole, and this simplifies its machining and allows tightening of straight conductors without deforming them, making possible their reemployment after loosening of the terminal.

The terminal in accordance with the invention comprises three parts: a body of the terminal with a tapped plate, a screw engaged in this tapping and an arched clamp made captive of this screw by the rolling of its thread, is characterized in that the tapping being started at the surface of the plate, the threaded part extends by at least one thread beyond the plane determined by the parallel edges of the clamp when its top of the arch touches the head of the screw, while this arched clamp comprises an aperture whose projection of the edge turned towards the threaded surface is a circle of a diameter only little larger than that of the screw before rolling, the said aperture being widened in the direction of the head of the screw only in the transversal direction to the arched clamp.

In such a construction, due to the extension of the threaded surface of the screw under the clamp and to the flexibility of the clamp, it is possible to tighten against the plate, even if the latter is flat, of very small diameter or a very flat conductor.

Moreover, by reason of the transversal widening of the aperture, the clamp can rock about the top of the arch, in

relation to the stem of the screw, in the desired direction for tightening on to unequal diameter conductors, but, due to the fact that the edge of the aperture turned towards the threaded screw surface is a skew curve traced on a cylinder of a diameter very close to that of the stem of the screw (and can be considered as a short portion of such a cylinder) in all positions of the clamp, neither of the two portions of the aperture edge nearest to the threaded stem can straddle the latter and be therein engaged, so allowing by unscrewing the separation of the screw and of the clamp; moreover, by reason of the rounded shape of these portions, the latter present themselves always tangentially to the end of the threaded surface and cannot be cut into by the latter.

The form of the aperture of the arched clamp in accordance with the present invention can be obtained when the clamp is already arched, by means of stamping for example. Preferably, the clamp initially in the form of a flat plate is provided, by punching, with an oval aperture, after which the plate is arched into a clamp by bending following the short axis of this oval, this closing the aperture towards the interior of the clamp and gives it a desired widened form and transforms the edge of the aperture into a skew curve inscribed on a cylinder.

It is to be noted that it is known to arch a plate provided with a circular hole, when it is already engaged on a contracted portion of the screw, so as to transform it into an arched clamp thus made captive of the screw. In this case also, a widened aperture is obtained, transversely to the top of the clamp, but after arching the projection of the edge of the aperture turned towards the threaded surface is not a circle but an oval whose long axis is directed in the same direction as the top of the arch, which favours the rocking movement of the clamp in the undesirable direction, in particular because such a rocking movement allows the clamp to place itself sufficiently at an angle so that the end of the thread of the screw can cut into the edge of the clamp aperture.

An embodiment of the invention will now be described in greater detail with reference to the accompanying drawings in which:

FIG. 1 is a cross-section of the embodiment,

FIG. 2 is a cross-section on a larger scale at right angles to the section of FIG. 1,

FIG. 3 is a perspective view of an arched clamp and of the corresponding plate,

FIG. 4 is a view in plan of a flat plate before formation into an arched clamp,

FIG. 5 is a view in plan of a convex side of the same plate arched into a clamp,

FIG. 6 is an elevation of an arched clamp,

FIG. 7 is a schematic representation of the evolution of the clamp during arching, and,

FIG. 8 is a longitudinal cross-section of a double connection terminal.

The terminal shown in FIG. 1 comprises a body of a terminal of suitable form of which only a flat plate **1** of conducting material is shown. The terminal is mounted upon a support A of insulating material and has a tapped opening **1***a*. In this opening is engaged a screw having a portion **2** threaded by rolling and, between the thread and the head of the screw **3**, a non-threaded portion **4** which passes through an aperture **5** of an arched clamp **6**.

As can be seen in FIGS. 3 and 5, the aperture **5** has, on the concave side of the clamp, an edge **7** in the form of a skewed, closed outline, whose projection on a plane perpendicular to the axis of the aperture is a circle of diameter d_1 only slightly larger (FIG. 2) than the diameter d_2 of the portion **4** of the screw.

This aperture **5** is widened only in the transversal direction with regard to the arched top **9** of the clamp **6**,

so that the shape of its edge **8**, on the convex side of the clamp, is also a closed skewed curve, but which projects on the same plane in the form of an oval whose minor axis is of dimension d_1 and whose major axis is of dimension a_1.

Such an arched clamp can be made from a flat rectangular plate **10** provided with a punched oval-shaped aperture **11** whose minor axis is equal to d_1 and whose major axis is equal to a_2, somewhat greater than the major axis a_1 of the oval corresponding to the projection of the edge **8** of the aperture **5** (FIG. 5). The plate has also two chamfers **13** on the edges perpendicular to the major axis a_2.

By arching this plate transversely as shown in FIG. 7, the portions **7***a* and **7***b* of the edge **7** approach each other, until the distance between them becomes equal to d_1, while approach of portions **8***a* and **8***b* of the edge **8**, situated on the convex side of the clamp, being less, the aperture **5** obtained after formation of the plate is widened transversely with respect to the top of the arch **19**. In this arching operation, the chamfered edges **13** become parallel to the axis of the aperture **5**.

The curve **7** projecting as a circle can be considered as being inscribed on a cylinder of diameter d_1 approaching diameter d_2 of the non-machined portion **4** of the screw.

The operation of rolling of thread **12** of the portion **2**, brings about, as is well known, forcing of the material constituting the stem of the screw from the bottom of the thread to the tip of the thread, so that approximately the original diameter d_2 is a mean between the diameter at the bottom of the threads d_3 and the overall diameter of the thread d_4. As d_4 is larger than d_1, the thread rolling holds the clamp captive on the screw.

It is known that arched clamps permit effective tightening of the straight and stripped ends of electrical conductors and that this removes the need to use clips or to form loops on the conductors.

Thus, it is possible to tighten, under an arched clamp, conductors which may be equal or unequal in thickness, and are shown at **15** in FIG. 1, because of the provision for rocking movement of the clamp around the top of the arch **9**.

However, if the conductor is very slender or very flat, the edges **16** of the clamp can touch the plate **1** before an effective tightening is obtained.

To remedy this disadvantage, in accordance with another feature of the invention, the rolling of the thread of the portion **2** is carried out in such manner that, the clamp being in contact through top of the arch **9** with the head of the screw, the threaded surface extends below the clamp by at least one complete revolution. This is to say that N being the level of the plane determined by the two edges **6** of the clamp, when the top **9** of the arch touches the head of the screw, the threaded surface terminates at a distance h from the level N which is at least equal to a pitch of the thread **12**.

Thus, without it being necessary to cut out the plate **1** around the tapped hole **1***a* as is the case in some known constructions where the rolled thread is not extended under the clamp, it is possible by forcing the tightening to obtain, by pushing the edges of the clamp against the terminal plate, an elastic deformation of the clamp which allows it to tighten on conductors however thin or flat.

Moreover, by reason of the shape of the aperture of the clamp, the only parts of the edge **7** which can touch the start of the thread **12** are parts **7***a* and **7***b* which, in the direction of the thread, are convex and which, whatever the position of the clamp on the screw, are always very near the portion **4** of the screw and are positioned, during the rotation of the screw in the direction of unscrewing, tangentially to the start **12***a* of the thread. Thus, this start cannot contact outline **7** and cut into it, and neither can edge of the edge **7** be engaged into hollow of the thread **12**, which would allow the clamp to behave as a nut in relation to the screw, with all the undesirable consequences.

In any case, conductors **15**, after tightening against the plate **1**, remain practically straight and have maximum surface of contact with the terminal.

Construction of the clamp shown in the drawings is on either side of the aperture **5** such that it provided symmetrical bosses **18** on the convex face, and a central hollow along each of the parallel edges of the clamp.

This arrangement gives the following advantages: the central part of the carrying surface of the clamp on a conductor **15** is thus clear, which concentrates the tightening at the two ends of this surface and improves the tightening. In addition, the plate **1** may have on each side opposite to internal face of bosses **18** a small convex projection **19**, this improving the carrying surface of the clamp on the plate and contributing to the prevention of rotation of the conductors and of the clamp during tightening.

FIG. 8 shows a practical embodiment of the invention in which a double connection terminal is used to connect two conductors.

The body of the terminal is a flat bar **20** whose two ends form two plates **1** provided with tapped holes **1***a*. This bar carries, in these tappings, two screws **2** and **3** and two arched clamps **6**.

The bar **20** is inserted against a surface **22** under the projections **21** which join two insulating plates **23**. The surface **22**, the projections **21** and the plates **23** belong to one moulded part in insulating material, which is provided also with bore-holes **24** into which enter the screws, this holding the parts together.

It will be understood that modifications can be introduced into the methods of construction which had been described, in particular by substitution of equivalent technical means, without in so doing going beyond the scope of the invention.

What I claim is:

1. A connection terminal comprising

a fixed plate having a tapped hole therethrough;

a screw engaged in said tapped hole of said fixed plate and including

a head with a flat underface,

a shank attached to said head having a raised thread beginning at a distance from said underface and a smooth portion of said shank between said thread and said head;

an arched clamp captive on said screw shank between said underface and the beginning of said thread and having an axial aperture with an edge of which turned towards said screw thread is a skewed, closed outline having a projection on a plane perpendicular to the axis of the aperture which is a circle of a diameter of the size between the diameter of said smooth portion of said shank and the external diameter of said raised thread, said aperture being flared in the direction of said screw head only in a transverse direction with respect to said arched clamp, and the total height of said clamp being more than the distance between said underface and said thread.

2. A connection terminal in accordance with claim **1**, further characterized by

said clamp having straight edges with a boss on the convex face and a hollow on the concave face of said arched clamp on each of said straight edges.

3. A connection terminal in accordance with claim **2**, further characterized by

said plate having a boss on each side of its tapped hole on one surface of said plate corresponding to said hollow on the concave face of said clamp.

4. A connection terminal in accordance with claim **1**, further characterized by

insulating material enclosing the terminal located to guide said clamp.

5. A connection terminal in accordance with claim **1**, further characterized by

a second screw and a second clamp having construction similar to said first mentioned screw and clamp,

said fixed plate having a second tapped hole therethrough to receive said second screw therethrough and said second clamp against it,

two cheeks of insulating material between said screws located to guide said clamps on said screws.

References Cited

UNITED STATES PATENTS

1,979,091	10/1934	Alsaker et al.	339—246
2,161,246	6/1939	Carlson	339—266 X
2,712,123	6/1955	Wibell et al.	339—246
3,081,507	3/1963	Gribble	339—246 X
3,141,722	7/1964	Nielsen	339—246
3,238,495	3/1966	Lanius	339—246
3,372,366	3/1968	Cochrum	339—246 X

MARVIN A. CHAMPION, Primary Examiner

J. H. McGLYNN, Assistant Examiner

U.S. Cl. X.R.

339—263

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,470,526 Dated: Sept. 30, 1969

Jean Louis André Joly

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

In column 1, lines 7 and 8, the claim for priority should read as follows:

Claims priority, application France, December 29, 1965, 44,090 and 52,905; application France, March 14, 1966, 53,346.

SIGNED AND
SEALED
SEP 1 - 1970

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents