

[54] **SCREWLESS ELECTRICAL
 QUICK-CONNECTION TERMINAL**

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[22] Filed: **Mar. 22, 1972**

[21] Appl. No.: **236,876**

[30] **Foreign Application Priority Data**

Apr. 1, 1971 Switzerland..... 4766/71

[52] U.S. Cl..... **339/217 R**, 24/115 G, 339/95 D,
 339/244 R, 339/255 R

[51] Int. Cl..... **H01r 9/08**

[58] Field of Search 339/217, 95 D, 248 S,
 339/214, 215, 244, 253, 254, 255, 198;
 24/255, 257, 81, 115 G, 263 SB

[56] **References Cited**

UNITED STATES PATENTS

3,596,229	7/1971	Hohorst	339/61 R
3,671,924	6/1972	Nagano	339/95 D
3,496,521	2/1970	Hohorst	339/95 D

Primary Examiner—Marvin A. Champion

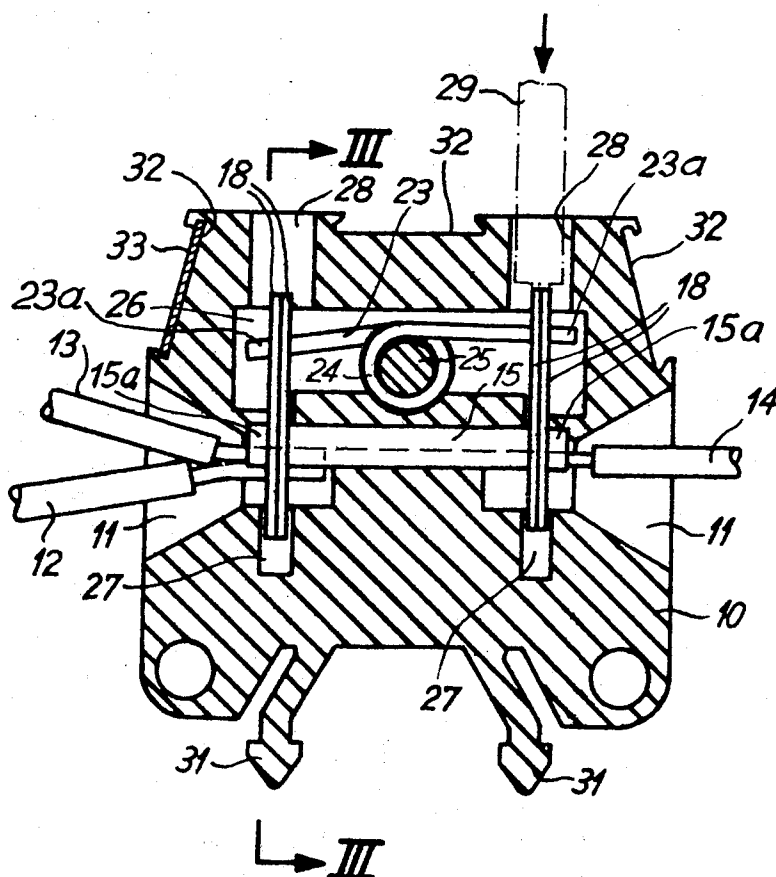
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[57] **ABSTRACT**

A screwless electrical quick-connection terminal comprising an insulated housing having at least one recess for the introduction of at least one electrical conductor. A contact element at least partially bounds this recess and is arranged in the insulated housing. At least one clamping slide having an opening is arranged displaceably transverse to the direction of introduction of the conductor into the recess. A spring cooperates with the clamping slide and strives to force such clamping slide into a position wherein the opening thereof is transversely displaced with regard to the cross-section of the recess, thus reducing the free width of said recess. The clamping slide comprises a plate member disposed at least approximately perpendicular to the conductor-introduction direction for said recess, with the contact element extending through the opening of such clamping slide-plate member. At least one edge of the opening of the clamping slide-plate member which extends parallel to the direction of displacement of such clamping slide-plate member is displaceably guided in a transverse slide groove of the contact element.

4 Claims, 6 Drawing Figures



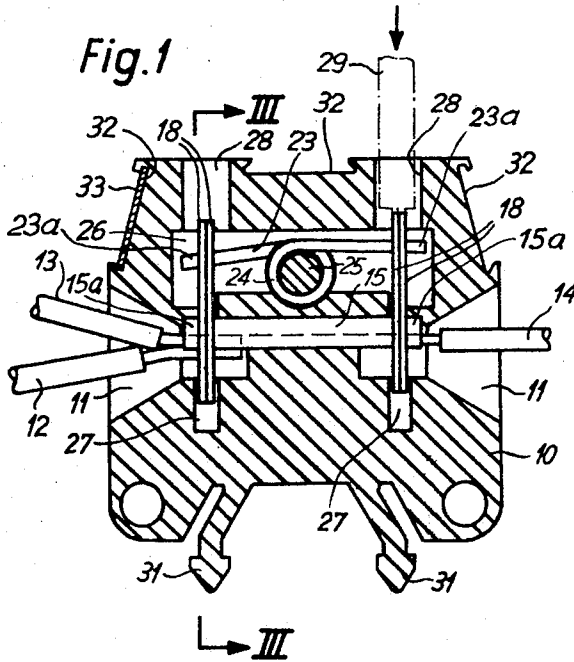


Fig. 2

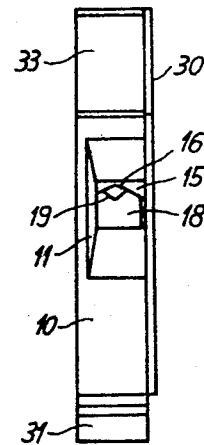


Fig. 3

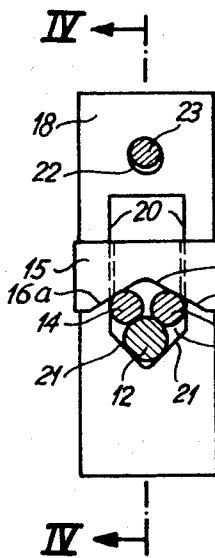


Fig. 4

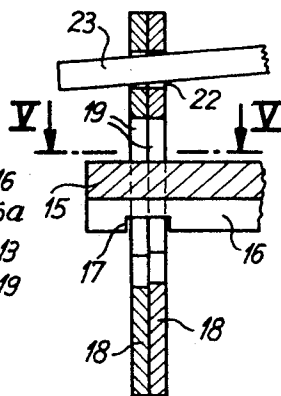


Fig. 5

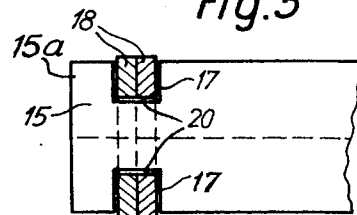
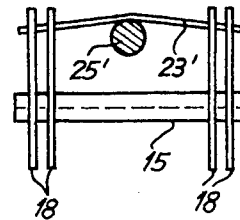


Fig. 6



SCREWLESS ELECTRICAL QUICK-CONNECTION TERMINAL

BACKGROUND OF THE INVENTION

The present invention relates to a new and improved construction of screwless electrical quick-connection terminal or terminal block with at least one recess for introducing at least one electrical conductor.

In such type connection terminals or terminal blocks there are arranged in known manner within an insulated housing a contact element which at least partially delimits or bounds the aforementioned recess, at least one clamping slide having an opening and displaceable transverse to the conductor infeed or introduction direction for the recess, and a spring member which cooperates with such clamping slide. This spring member strives to force the clamping slide into a position where its opening is transversely displaced with respect to the cross-section of the recess and thus the free width of the recess is reduced in size.

A connection terminal or terminal block of this type permits displacing the clamping slide against the action of the spring member in such a fashion that its opening comes into alignment with the cross-section of the recess. Then, one or a number of electrical conductors can be introduced into the opening of the clamping slide. Thereafter by releasing the clamping slide the thus introduced conductor can be pressed against the contact element by means of the clamping slide owing to the action of the spring member. As a result, the conductor is fixedly retained in the connection terminal and there is established an electrical contact between the conductor and the contact element. The advantages which can be realized with this type of connection terminal reside in the fact that the connection and release of the conductor can be undertaken quickly, without any great effort, and clamping of the conductor, realized by the action of the spring, cannot be unintentionally released, for instance due to jarring.

The known constructions of such type screwless connection terminals or terminal blocks are, however, associated with a number of drawbacks which are intended to be overcome by the teachings of the present invention.

SUMMARY OF THE INVENTION

Accordingly, it is a primary objective of the instant invention to provide a screwless electrical quick-connection terminal or terminal block of the previously mentioned type which is designed in such a manner that with relatively simple constructional expenditure there is realized a faultless clamping of the conductor which is to be connected and a good electrical contact is established between the conductor and the contact element of the connection terminal, even then when in one and the same recess for introducing the conductors there are simultaneously present more than a single conductor, and even if such conductors have different diameters.

A further significant object of the present invention relates to a connection terminal which is relatively simple and inexpensive to manufacture.

Now in order to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the invention contemplates constructing the clamping slide in the form of a plate member arranged at least approxi-

mately perpendicular to the direction of introduction of the conductors into the recess, hereinafter sometimes simply referred to as the "introduction direction of the recess." The contact element piercingly extends through the opening of the clamping slide-plate member, and at least one edge of the opening of the clamping slide-plate member, which edge extends parallel to the direction of displacement of such clamping slide-plate member, is displaceably guided in a transverse groove of the contact element.

Two oppositely situated parallelly extending edges of the opening of the clamping slide-plate member can be advantageously displaceably guided in two oppositely disposed transverse grooves of the contact element. Further, the contact element can be advantageously provided with a groove or notch which in cross-section possesses a substantially V-shaped configuration, the lengthwise direction of this V-shaped groove extending parallel to the introduction direction of the recess and the flanks of the V-shaped portion of the groove each form a partial boundary for the recess. The opening of the clamping slide-plate member can thus possess two marginal or edge portions which extend in V-shaped fashion towards one another and which are arranged opposite to the V-flanks of the V-shaped groove of the contact element. The direction of displacement of the clamping slide-plate member under the influence of the spring member can advantageously coincide with the depth direction of the V-shaped groove of the contact element. This constructional form of connection terminal or terminal block renders possible the selective positive clamping of a number of electrical conductors of the same or different diameter, also only a single conductor having a relatively small diameter. A particularly good clamping action and electrical contact can be realized if at least two similar clamping slide-plate members are arranged adjacent one another in parallelism and are displaceably guided in the same or in separate transverse grooves of the contact element. Furthermore, the parallel juxtapositioned clamping slide-plate members can be subjected to the action of a common resilient or spring member.

The connection terminal can possess two aligned recesses, each of which serves for the introduction of at least one electrical conductor. For each of the aforementioned recesses there is provided at least one clamping slide-plate member and such clamping slide-plate members can be displaceably guided in separate transverse grooves of a common contact element. It is thus possible to associate with all of the clamping slide-plate members a common flexible spring or resilient element, for instance a wound leg spring or spiral spring or a blade spring.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be better understood and objects other than those set forth above, will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawing wherein:

FIG. 1 is a schematic longitudinal sectional view through a preferred constructional form of screwless electrical quick-connection terminal or terminal block with two aligned recesses, each of which serves for the introduction of at least one electrical conductor;

FIG. 2 is a front view of the connection terminal depicted in FIG. 1, as viewed from the left side thereof;

FIG. 3 illustrates significant details of the inventive connection terminal, partially in front view and partially in cross-sectional view, taken substantially along the line III—III of FIG. 1, the showing being on a somewhat enlarged scale;

FIG. 4 is a cross-sectional view of the connection terminal depicted in FIG. 3, taken substantially along the line IV—IV thereof;

FIG. 5 is a cross-sectional view of the connection terminal depicted in FIG. 4, taken substantially along the line V—V thereof; and

FIG. 6 illustrates on a smaller scale parts of a modified embodiment of connection terminal in a view analogous to the showing of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the drawings, the connection terminal or terminal block depicted in FIGS. 1 and 2 will be seen to embody a substantially flat insulated housing 10 which is provided at two opposite flat faces of such housing, namely to the left and right of the illustration of FIG. 1, with a respective recess 11 for introducing at least one electrical conductor, such as the conductors 12, 13 and 14 specifically depicted in FIGS. 1 and 3. Both of the recesses 11 are arranged at the insulated housing 10 so as to be in substantial alignment with one another. A contact element 15 formed of metal and having the shape of a profiled rod is located internally of the housing 10 and extends by means of both of its end portions 15a into each neighboring aligned recess 11. Contact element 15 possesses a continuous lengthwise extending groove or channel 16 having a substantially V-shaped cross-sectional configuration, as best seen by referring to FIGS. 2 and 3. The lengthwise direction of this V-shaped groove 16 extends parallel to the conductor infeed or introduction direction for the recess 11, and both of the V-flanks 16a of such V-shaped groove 16 form a respective partial boundary or delimiting wall for the associated space of the corresponding recess 11 serving to receive the conductors 12, 13 and 14.

Now as best seen by referring to FIG. 5 each end portion 15a of the contact element 15 is provided with two opposed lateral transverse grooves or groove means 17 serving to guide clamping slide-plate members 18 arranged substantially perpendicular to the lengthwise direction of the contact element 15 and to the conductor-introduction direction for the recesses 11. As shown particularly well in FIGS. 2, 3 and 4 the clamping slide-plate members 18 each possess a respective opening or window 19 through which piercingly extends the contact element 15. More specifically, it will be also observed that two oppositely situated parallel extending marginal edges 20 of the opening 19 for each clamping slide-plate member engage in the oppositely directed or opposed transverse grooves 17 of the contact element 15, as particularly well illustrated in FIGS. 3 and 5. Hence the clamping slide-plate members 18 are displaceably guided in the lengthwise direction of the edges 20 of the openings 19, the direction of displacement coinciding with the depth direction of the V-shaped groove 16 of the contact element 15. Each two immediately parallel juxtapositioned clamping slide-plate members 18 engage with the same transverse grooves 17, as shown in FIGS. 1, 4 and 5. The opening or window 19 of each clamping slide-plate

member 18 possesses two marginal edge portions 21 arranged inclined towards one another in a substantially V-shaped configuration and which are inclined opposite to the inclination of the V-flanks 16a of the V-shaped lengthwise extending groove 16 of the contact element 15.

Continuing, it is also to be understood that the clamping slide-plate members 18 are each equipped with a bore 22 through which engages a flexible spring or resilient element 23 formed of steel wire, as best recognized from FIGS. 3 and 4. Now FIG. 1 illustrates the manner in which the central portion of the spring 23 possesses one or a number of windings or coils 24 surrounding a pin-shaped portion 25 of the housing 10. The end portions of the spring 23 form approximately linearly extending legs 23a which strive to upwardly pivot in the showing of FIG. 1, and thus tend to displace the clamping slide-plate members 18 with respect to the contact element 15 such that the V-shaped arranged edge portions 21 of the openings 19 of the clamping slide-plate members 18 move towards the V-flanks 16a of the V-shaped groove 16 of the contact element 15, in order to reduce in size the inner width of the free opening between the edge portions 21 and the flanks 16a of the groove 16 as viewed in the lengthwise direction of the contact element 15. Also by referring to FIG. 1 it will be recognized that the spring 23 is conjointly associated with each pair of clamping slide-plate members 18 arranged at each end portion 15a of the contact element 15.

The flexible spring 23 and the clamping slide-plate members 18 are housed in suitable hollow spaces or compartments 26, 27 and 28 of the insulated housing 10. The upper ends of the clamping slide-plate members 18 as seen in FIG. 1 are accessible from the outside through the hollow spaces or compartments 28 by means of a rod-shaped auxiliary device or tool 29, for instance a screw driver, in order that the clamping slide-plate members 18 can be displaced against the action of the spring 23 during such time as electrical conductors 12, 13, 14 or the like are to be introduced into the connection terminal or released therefrom. The hollow spaces or compartments 26 and 27 as well as the non-visible hollow space which contains the contact element 15 can be open towards the one flat side of the housing 10 in order to render possible installation of the components 15, 18 and 23. The mentioned partially open flat face of side of the housing 10 can then be provided with a cover plate 30 (FIG. 2) which closes-off the hollow compartments and covers the internal components 15, 18 and 23 of the connection terminal. However it is equally possible to omit the use of a cover-plate 30, especially in those cases where two or more of the described connection terminals or terminal blocks are intended to be arranged in direct side-by-side arrangement in a row in known manner.

In a manner well known in this particular art the housing 10 is equipped with resilient elastic legs 31 which enable clamping the connection terminal or terminal block with a suitable conventional profile rail or mounting bar. Furthermore, a number of grooves 32 having undercut flank portions are likewise formed in conventional manner at the outside of the housing 10 and which serve for selectively receiving indicating tags or marking shields 33 or the like.

With the benefit of the foregoing description of the inventive connection terminal there will be next con-

sidered the use and mode of operation thereof which is as follows: In the event it is desired to introduce one or a number of electrical conductors, such as the conductors 12, 13, 14 and the like into one of the recesses 11 of the connection terminal or terminal block, then initially the rod-shaped tool 29, i.e., the screw driver for instance, is placed into the open mouth of the relevant hollow compartment 28 and the two immediately adjacently arranged clamping slide-plate members 18 are pressed deeper into the housing 10 against the action of the spring 23, in other words downwardly in the showing of FIG. 1. As a result these clamping slide-plate members 18 are displaced with regard to the contact element 15 in such a manner that the V-shaped arranged edge portions 21 of the openings 19 move away from the flanks 16a of the V-shaped groove or channel 16 of the contact element 15. As a result the openings 19 are brought into alignment or coincidence with the cross-section of the relevant recess 11. Now, it is possible to introduce the electrical conductor or conductors 12, 13 and 14 which have been bared of their insulation into the open recess 11 and thereafter to release the pressure exerted via the rod-shaped tool 29 upon the clamping slide-plate members 18. Under the action of the spring 23 the clamping slide-plated members 18 are displaced back in such a manner that the V-shaped arranged edge portions 21 of the openings 19 move closer to the flanks 16a of the V-shaped groove 16 until the conductor or conductors 12, 13, 14 are pressed against the flanks 16a of the V-shaped groove 16 by the edge portions 21 of the openings or windows 19, and thus, the conductor or conductors are fixedly clamped.

The opposed V-like arrangement of the flanks 16a of the groove 16 and the edge portions 21 of the openings 19 of the clamping slide-plate members 18 has the advantage that two or three electrical conductors of the same or different diameter can be clamped practically as good and positively as a single conductor of large or also small diameter. In FIG. 3 there is illustrated, for instance, the situation where three conductors 12, 13 and 14 are clamped. FIG. 2 illustrates that it is still possible to fixedly clamp a single conductor of small diameter.

The introduction of one or a number of conductors into the other recess 11 of the connection terminal can take place similar to the above-described procedures. Each leg of the spiral spring 23 is elastically flexible independently of the other leg, so that both recesses 11 of the connection terminal can be also manipulated individually and independently of one another.

The variant embodiment of connection terminal depicted in FIG. 6 differs from the above-described construction, firstly in that instead of using a spiral spring 23 with a wound central portion 24 there is provided a blade spring 23' supported by its central portion upon a pin-shaped carrier or support element 25' of the housing. A further difference resides in the fact that the clamping slide-plate members 18 which, in each instance form a pair, are guided in separate transverse grooves of the contact element 15, so that the clamping slide-plate members 18 possess a certain spacing from one another. The remaining construction of this embodiment of connection terminal can be the same as that considered for the first embodiment discussed above in connection with FIGS. 1 to 5.

Both constructional embodiments of connection terminal, in contrast to the conventional screwless con-

nection terminals, possess the advantage that the clamping slides 18 constructed as plate members produce a better electrical contact with the clamped conductors and the clamped conductor or conductors are also secured much better against being pulled out of the connection terminal than was possible when employing the previously known constructions of clamping slides. The aforementioned advantage is realized by the features that the clamping marginal or edge portions 21 of the openings 19 of the relatively thin clamping slide-plate members 18 tend to conform much better to the momentary shape of the conductor and to come into much snugger contact therewith and also tend to somewhat penetrate into the material of the conductor so that larger contact surfaces prevail. As a result sliding out of the once-clamped conductor is also partially form-lockingly prevented or at least rendered more difficult. The described constructional embodiments of inventive connection terminals or terminal blocks also especially tend to distinguish themselves by virtue of their relatively simple construction and their simplicity in fabrication and assembly.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims.

Accordingly, what is claimed is:

1. A screwless electrical quick-connection terminal comprising an insulated housing provided with at least one recess for the introduction of at least one electrical conductor, a contact element at least partially bounding said recess arranged in said insulated housing, at least one clamping slide having an opening for the introduction of a conductor, said clamping slide being arranged to be displaceable substantially transverse to the direction of introduction of the conductor into said recess, a spring formed of wire with a coil portion secured to said housing by pin means cooperating with said clamping slide said spring including a leg portion extending from said coil portion in a direction substantially perpendicular to the direction of displacement of said clamping slide and moveably engaging said clamping slide to force said clamping slide into a position wherein the opening thereof is transversely displaced with regard to the cross-section of the recess, thus reducing the free width of said recess for fixedly clamping a conductor therein, said clamping slide comprising a plate member disposed at least approximately perpendicular to the conductor-introduction direction for said recess and including aperture means for cooperatively engaging said spring leg portion, said contact element extending through the opening of said clamping slide-plate member, said contact element having transverse groove means, said opening of said clamping slide-plate member being bounded by marginal edges, and wherein at least one marginal edge of said opening which extends parallel to the direction of displacement of said clamping slide-plate member is displaceably guided in said transverse groove means of said contact element.

2. The connection terminal as defined in claim 1 wherein said contact element is provided with a further transverse groove means situated opposite the first mentioned transverse groove means, and wherein two opposite substantially parallel extending edges of said opening of the clamping slide-plate member are dis-

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placeably guided in said two oppositely situated transverse groove means of said contact element, at least two similar planar clamping slide plates with aligned boxes for receiving said spring leg portion arranged directly behind one another and conjointly displaceably guided in the same transverse grooves of said contact element, said spring leg portion engaging said bores of both clamping slide plates.

3. The connection terminal as defined in claim 1, wherein said contact element possesses a groove which possesses a substantially V-shaped cross-sectional configuration, the lengthwise direction of said V-shaped groove extending substantially parallel to the conductor-introduction direction for the recess, said V-shaped groove having V-flanks each of which form a partial boundary for said recess, and wherein the direction of displacement of said clamping slide-plate member under the influence of said spring coincides with the depth direction of said V-shaped groove said opening of said clamping slide-plate member possesses two edges which extend towards one another in a substan-

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tially V-shaped manner and which are inclined opposite to the V-flanks of said V-shaped groove of said contact element.

4. The connection terminal as defined in claim 1 wherein said housing is provided with an additional recess, both of said recesses being in substantial alignment with one another, each of said recesses serving for the introduction of at least one electrical conductor, at least one such clamping slide-plate member being provided for each recess, said contact element being common to both recesses, said contact element having separate transverse groove means, and each of said clamping slide-plate members being displaceably guided in one of the separate transverse groove means of said common contact element, said spring having a second leg portion which protrudes from said coil in opposite direction to said first mentioned leg portion, each of said leg portions cooperatively engaging at least one of the clamping slides.

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