Jan. 20, 1953 J. C. MACY 2,626,168

ELECTRICAL CONNECTOR

Filed June 28, 1946 4 Sheets-Sheet 1

Fig. 1.

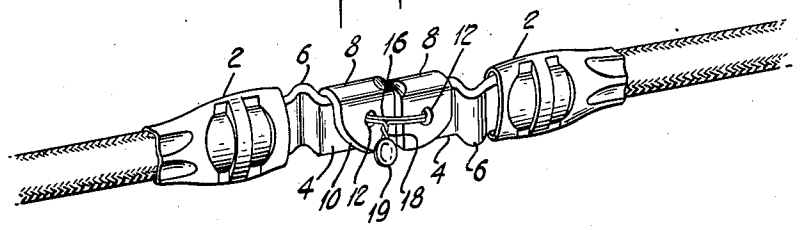


Fig. 2.

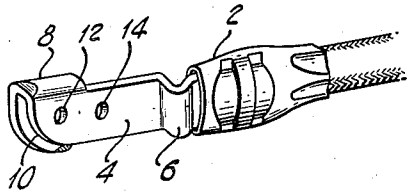


Fig. 3.

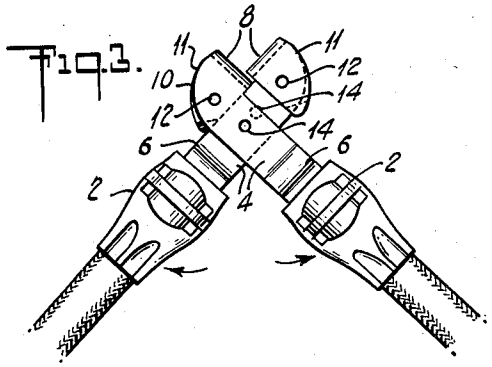


Fig. 4.

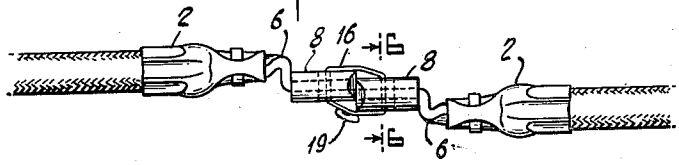


Fig. 5.

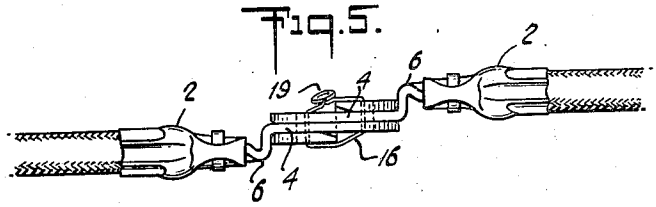
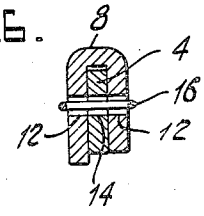


Fig. 6.



INVENTOR
JAMES C. MACY.

BY
Blair, Curtis & Hayward
ATTORNEY

Jan. 20, 1953 J. C. MACY 2,626,168

ELECTRICAL CONNECTOR

Filed June 28, 1946 4 Sheets-Sheet 2

Fig. 7.

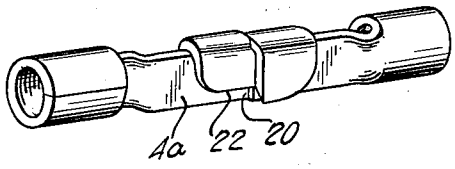


Fig. 8.

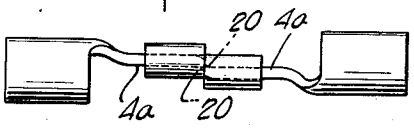


Fig. 9.

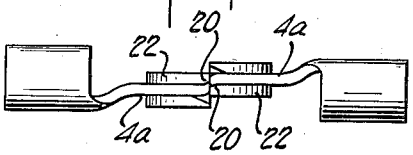


Fig. 10.

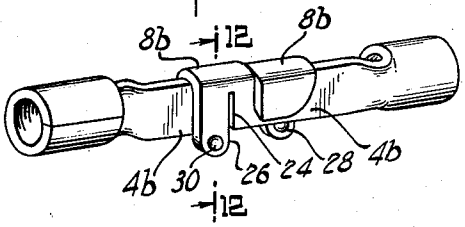


Fig. 11.

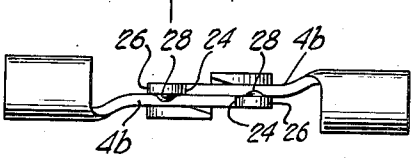


Fig. 12.

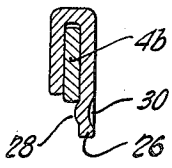


Fig. 13.

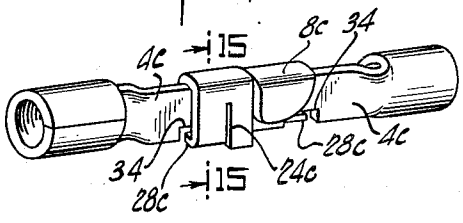


Fig. 14.

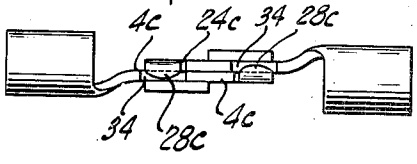
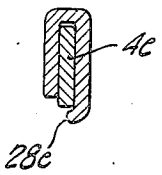


Fig. 15.



INVENTOR
JAMES C. MACY.

BY
Blair, Curtis & Hayward
ATTORNEY

Jan. 20, 1953 J. C. MACY 2,626,168

ELECTRICAL CONNECTOR

Filed June 28, 1946 4 Sheets-Sheet 3

Fig. 16.

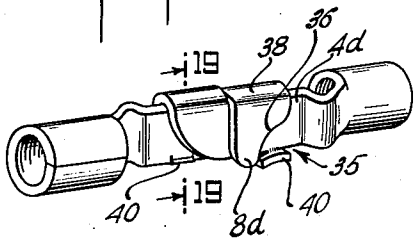


Fig. 17.

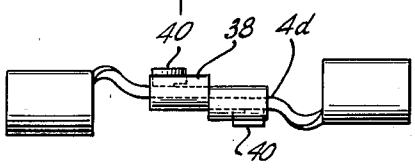


Fig. 19.

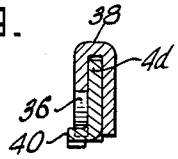


Fig. 18.

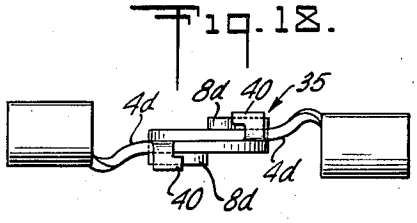


Fig. 20.

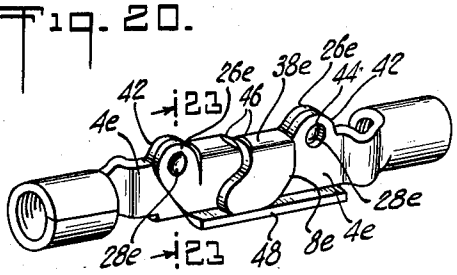


Fig. 21.

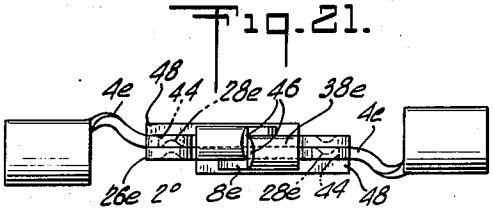


Fig. 23.

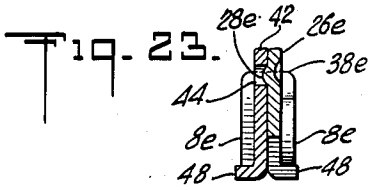


Fig. 22.

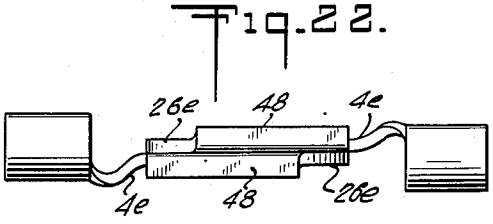


Fig. 24.

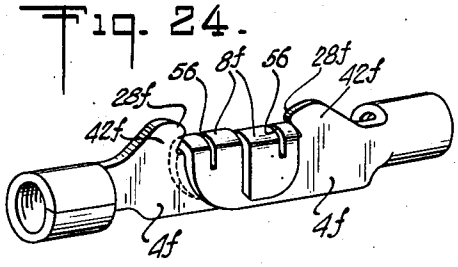


Fig. 25.

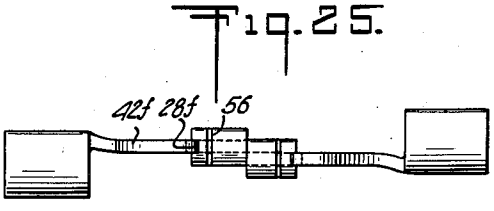
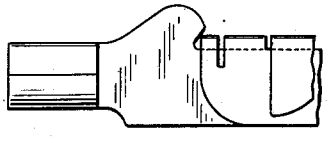


Fig. 26.



INVENTOR
JAMES C. MACY.

BY
Blair, Curtis & Hayward
ATTORNEY

Jan. 20, 1953 J. C. MACY 2,626,168

ELECTRICAL CONNECTOR

Filed June 28, 1946 4 Sheets-Sheet 4

Fig. 27.

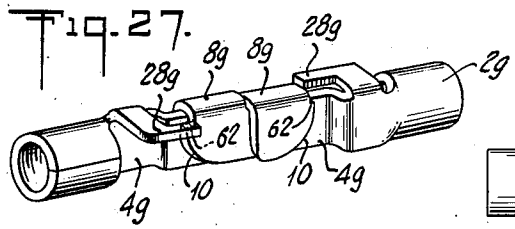


Fig. 28.

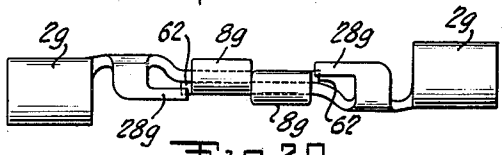


Fig. 30.

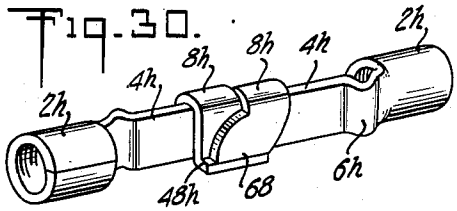


Fig. 29.

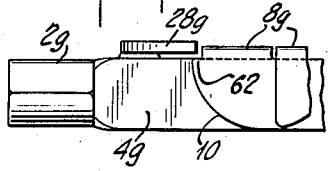


Fig. 31.

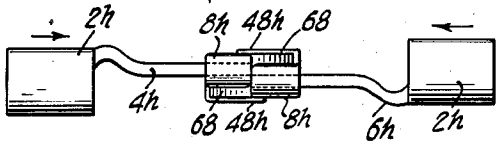


Fig. 32.

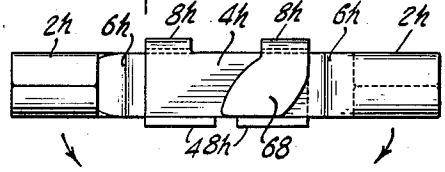


Fig. 33.

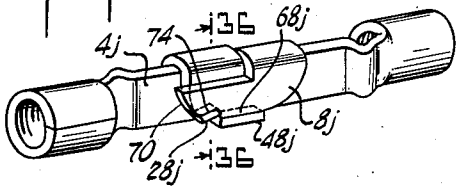


Fig. 34.

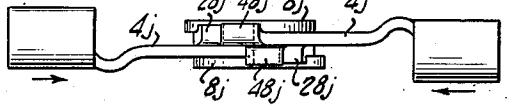


Fig. 35.

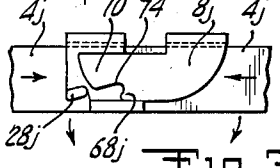


Fig. 36.

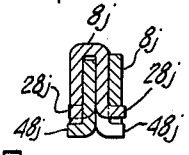


Fig. 37.

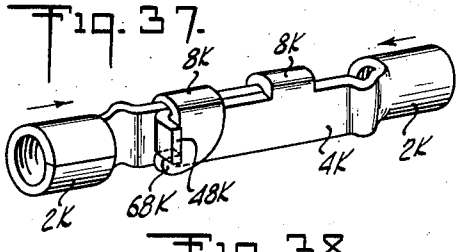


Fig. 38.

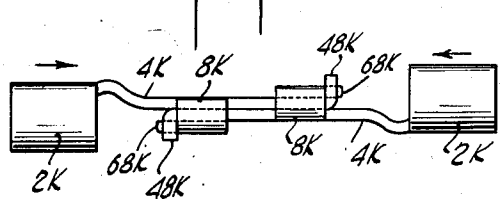
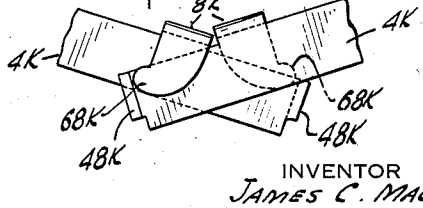


Fig. 39.



INVENTOR
JAMES C. MACY.

BY
Blair, Curtis & Hayward
ATTORNEY

Patented Jan. 20, 1953 2,626,168

UNITED STATES PATENT OFFICE

2,626,168

ELECTRICAL CONNECTOR

James C. Macy, Cranford, N. J., assignor to Aircraft-Marine Products, Inc., Harrisburg, Pa., a corporation of New Jersey

Application June 28, 1946, Serial No. 679,947

1 Claim. (Cl. 287—76)

1

This invention relates to connectors for wires, cables, cords and the like and has for its general object improvements in connectors of the type in which interengaging members can quickly be brought into connecting relation to each other and preferably almost as quickly disconnected when desired.

More particularly the invention relates to connectors of the type in which a pair of interengaging terminal members, each having means for connection to a wire, cable, cord or the like, are provided with the elements of two knife switches, that is, each comprises a blade portion and a clip portion integral with said blade portion extending therefrom back across said blade portion and spaced therefrom a distance slightly less than the thickness of said blade portion, whereby the connectors can be interconnected by inserting a portion of one between the blade and clip portions of the other. This type of connector is described more fully in the copending application of William S. Watts, Serial No. 530,296, filed April 10, 1944, now Patent No. 2,478,143, dated August 2, 1949 and also in my copending applications Serial No. 530,317, filed April 10, 1944, and Serial No. 558,002, filed October 10, 1944, now Patent No. 2,416,335, dated August 25, 1947, of which the present application is a continuation-in-part.

In connectors of the knife-disconnect type aforementioned, connection is made by bringing the two interengaging terminal members into an angular relation to each other such that the blade part of each can be inserted into the clip part of the other and then rocking them on each other into a position in which the blade edges are substantially parallel. To disconnect these connectors they must again be moved into their aforementioned angular relation to each other. To prevent their accidental movement into this angular relation to each other, whereby they might accidentally become disconnected, a tube or sleeve, which may be of resilient material and which may also be of insulating material, is sometimes slipped over the connection after it has been made.

The clips and blades of the respective interengaging members of which the connector of said copending applications is made up are so arranged that the members cannot be disconnected by a lengthwise pull or thrust, but must be brought into the angular relation above referred to before disconnection can be made. Under normal conditions of use, the chance of accidental disengagement of the interengaging members

2

of the connectors shown in said copending application is negligible, but under special conditions there may be a possibility of the wires to which the connectors are attached being brought into such angular relations to each other that accidental disconnection might take place.

A general object of the present invention, therefore, is to provide such an interlock between the members of a knife-disconnect type connector as to resist any tendency of the members to move into the angular relation to each other necessary to effect disconnection thereof.

Since connectors of the type to which the invention generally relates are intended primarily for use in places where it is desirable not only to make a quick and easy connection but also occasionally to make a correspondingly quick and easy disconnection without injuring or destroying the connector, the invention aims particularly to provide means which will resist the movement of the members of a connector of the quick connect and disconnect type hereinabove referred to into such angular relation to each other that they may be disconnected but which, however, is so constructed that ready disconnection of the members, without injury thereto, may be effected when so desired.

With the foregoing and other objects in view the invention aims to provide a connector of the knife-disconnect type above described, comprising counterpart terminals forming when connected two closed slidable, pressed contacts similar to the contacts found in knife switches, and said terminals individually being provided with a ferrule, the blade or "knife" member extending from said ferrule and a clip member for contacting and pressing the other knife blade, said parts being constructed to interlock against separation by a lengthwise pull thereon; and by the present invention there is now provided additional interlocking means on the respective terminals so arranged as to be brought into such interlocking relation, when said interengaging members are in their extended interengaged relation, and thereafter to resist relative angular displacement of said members.

With a simple knife-disconnect type connector without locking means on a flexible conductor, connection is secure against any axial thrust, and for all practical purposes the frictional engagement of the connector is sufficient so that the wire bends and absorbs lateral stresses without releasing the connectors. The condition most likely to cause separation of curved clips such as are shown in my copending application, is an

axial thrust on the wires sufficient to buckle the connection to its separating angle, and at the same time a lateral stress sufficient to start the buckling. It is important, therefore, that the locking means shall not be released by a mere axial thrust or lateral stress which may be transmitted through the wire.

With this type of connector, I have found that interlocking means of the snap lock type afford adequate protection against accidental angular relative displacement of the parts if the snap lock resists forces greater than will be transmitted by the wire in the conditions of actual use; or a positive interlock may be provided as more fully hereinafter set forth.

When the form of connector shown in the copending application of William S. Watts, hereinabove identified, in which some relative lengthwise movement of the interengaged blades and clips is permitted, is used in places where liability to thrust lengthwise of the connection is negligible, advantage is taken of the capacity for lengthwise relative movement of the interengaged blades and clips to provide readily disengageable means for positively preventing relative angular displacement of the blades and clips when the connector is in its extended condition; but, in order to prevent separation by buckling, as above described, such locking movement should be by thrust and not by pull.

An important additional feature of the invention, in most embodiments thereof, is that the means for resisting angular displacement of the interengaging terminal members can be formed as integral parts of said members which do not interfere substantially with the normal connecting and disconnecting operations thereof.

A further important feature of the invention is that the means for resisting angular relative displacement of the interengaging terminal members is so constructed as not to bend the clip or blade beyond its elastic limit, thereby to insure good electrical conductivity in the connection.

Other objects, important features and advantages of the invention, to which attention has not hereinabove specifically been directed, will appear hereinafter when the following description and claim are considered in connection with the accompanying drawings.

In this specification and the accompanying drawings I have shown and described a preferred embodiment of my invention and various modifications thereof; but it is to be understood that these are not intended to be exhaustive or limiting of the invention but, on the contrary, are given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify and adapt it in various forms, each as may be best suited to the conditions of a particular use.

In the drawings:

Figure 1 is a perspective view of a connector embodying my invention having through-and-through means for interlocking the interengaging members against accidental movement into such angular relation to each other that they might become disconnected;

Figure 2 is a perspective view of one of the interengageable members of the connector in its disengaged relation;

Figure 3 is a side elevation of the two interengaging members showing the position into

which they must be brought to effect either interengagement thereof or disengagement thereof;

Figure 4 is a plan view of the assembly shown in Figure 1;

Figure 5 is an inverted plan view of the assembly shown in Figure 1;

Figure 6 is a section on the line 6—6 of Figure 4;

Figure 7 is a perspective view of a connector having each of the interengaging members so modified as to provide a snap lock for locking them against accidental angular displacement after they have been brought into interengaging relation to each other;

Figure 8 is a plan view of the assembly shown in Figure 7;

Figure 9 is an inverted plan view of the assembly shown in Figure 7;

Figure 10 is a perspective view of another modification of a connector embodying the present invention in which the clip of each of the counterpart connectors is so modified as to provide a snap lock snapping over the edge of the blade of the other counterpart connector, without danger of distorting the contact members or relieving contact pressure;

Figure 11 is a bottom plan view of the assembly shown in Figure 10;

Figure 12 is a section on the line 12—12 of Figure 10;

Figure 13 is a perspective view of another assembled connector embodying the invention in which a clip of each of the counterpart connectors is modified to provide a snap lock adapted to hook over the edge of the blade of the other member to prevent accidental angular displacement of the interengaging members;

Figure 14 is a bottom plan view of the assembly shown in Figure 13, and

Figure 15 is a section on the line 15—15 of Figure 13;

Figure 16 is a perspective view of another assembled connector in which the snap lock, instead of being formed by a clip member is formed by a modification of the blade part of one or both counterpart connectors;

Figure 17 is a plan view of the assembly shown in Figure 16;

Figure 18 is an inverted plan view of the assembly shown in Figure 16;

Figure 19 is a section on the line 19—19 of Figure 16;

Figure 20 is a perspective view of an assembled connector in which both the clip part of each of the interengaging members and the blade part are modified to resist accidental angular movement of the interengaged parts;

Figure 21 is a plan view of the assembly shown in Figure 20;

Figure 22 is an inverted plan view of the assembly shown in Figure 20, and

Figure 23 is a section on the line 23—23 of Figure 20;

Figure 24 is a perspective view of an assembled connector in which both the clip part of each interengaging member and the blade part of each interengaging member are so modified as to cooperate to effect a snap locking of the parts in their assembled relation as shown in this figure;

Figure 25 is a plan view of the assembly shown in Figure 24;

Figure 26 is a detail side elevation of a part of the assembled connector;

Figure 27 is a perspective view of an assembled

connector in which the snap lock for resisting accidental angular displacement of the interengaging members is formed as an offset from the neck between the ferrule and blade portions of each counterpart terminal;

Figure 28 is a plan view of the assembly shown in Figure 27;

Figure 29 is a detail side elevation of part of the assembly shown in Figure 27;

Figure 30 is a perspective view of an assembled connector in which means for interlocking the interengaging members against accidental angular movement into disconnecting relation is arranged to be brought into operation by a lengthwise pull on the two members after the blade portion of each member has been inserted in the clip portion of the other;

Figure 31 is a plan view of the assembly shown in Figure 30, and

Figure 32 is a view in side elevation before the counterpart terminals have been pulled to the final interlocked relation shown in Figures 30 and 31;

Figure 33 is a perspective view of still another assembled connector of the type in which the interlocking against accidental angular displacement is brought about by a longitudinal pull on the two interengaging members after the blade portions of each have been inserted in the clip portions of the other;

Figure 34 is a bottom plan view of the assembly shown in Figure 33;

Figure 35 is a detail side elevation of two of the interlocking parts prior to the final locking pull;

Figure 36 is a section on the line **36—36** of Figure 33;

Figure 37 is a perspective view of still another form of connector in its assembled condition in which the interlocking is effected by a lengthwise pull on the interengaging members after the blade portion of each member has been inserted in the clip portion of the other;

Figure 38 is a plan view of the assembly shown in Figure 37, and

Figure 39 is a detail view showing the parts in an angular relation to each other substantially halfway between their interengaged and their disengaged relations.

In the embodiment of the invention shown in Figures 1 to 6 inclusive the counterpart connector terminals, which are shown in Figure 1, are of the type shown in my copending application Serial No. 530,317 hereinabove referred to and comprise two terminals, each of which is the counterpart of the other and each of which comprises a ferrule **2**, a tongue or blade portion **4** extending from one side of said ferrule but bodily offset to bring the respective ferrules of the two terminals into alignment when the connector is assembled as shown in Figure 1. This leaves a bent-over or shoulder portion **6** which may be arranged to extend over the outer end of the ferrule if desired. The blade portion **4** of the terminal has an integral lateral extension bent over the end thereof to form the clip **8**, the blade portion **4** of each terminal being received between the blade and clip portions of the other terminal in the assembled connection.

It is a characteristic of a particular form of connector shown in Figures 4 and 5 of my copending application, Serial No. 530,317, that the width of the clip **8** is very slightly more than the distance between the inner edge of the clip and the shoulder or abutment **6**, so that, when

the parts are in the assembled relation shown in Figure 1, each clip will be substantially gripped between the clip of the other terminal and the shoulder **6** thereof, and thus will be held resiliently against disconnection. The end of the blade **4** and/or the corresponding end of the clip **8** (depending upon which direction the bend **6** turns from blade **4**) is curved as shown at **10** so that it can cam against the shoulder **6** of the other connector to bring the parts into the intended relation when they are swung from a position substantially perpendicular to each other, as shown in Figure 3, to their substantially aligned relation; and this curve extends through a point **11** of maximum length of the blade and/or clip substantially below the upper edge. This point **11** causes resilient deflection of the metal in fold **6** by which the parts are held against accidental disalignment.

It is desirable that the terminals be made so that this resilient locking occurs without inelastic deformation; but it is an advantage of the device that the distortion produced is not such as will impair the electrical contact in the knife disconnect connection. If, therefore, the space from **6** to **8** is too short, the first connection will result in lengthening this (ordinarily by bending at **6**) to the required dimension. Likewise, if the fit is too loose it is possible to shorten by bending more sharply at **6**, after which the first connection will, again, give the correct dimension.

From the foregoing description it will be seen that the connector members, when interengaged to form the connection shown in Figure 1, cannot be separated either by a direct thrust longitudinally of the connection or by a direct pull longitudinally of the connection and that the only way they can be separated is to be brought into the angular relation shown in Figure 3. If the engagement of point **11** with bend **6** is made sufficient so that the force required for disalignment is greater than the force required to bend the wires **3**, the connection is secure for all practical purposes against accidental disconnection; but in some cases it is desired to make it secure also against tampering.

To prevent movement into the angular relation required for disconnect is one of the principal objects of the present invention. This object is doubly attained in the form of the invention shown in Figures 1 to 6 first as described above, and secondly against tampering by so drilling holes through the clips and through the blades that, when the parts are in the assembled condition shown in Figure 1, the hole **12** through each clip (the clip here being considered as including also the cooperative part of the blade) will be in register with a hole **14** in the other blade. This will permit the use of a tie **16**, such as a wire, cord, staple or pin, etc., here shown as a wire run twice through the registering holes and having its ends twisted into interlocking relation to each other as shown at **18**; and, if desired, sealed with a coined metal or pressed plastic seal **19**. With the tie **16** in position, as shown in Figures 1, 4, 5 and 6, it will be seen that the assembly shown in Figure 1 is positively locked against angular movement of the parts thereof toward the position shown in Figure 3. If desired this tie **16** may be made of such soft material, e. g., plastic or soft metal, that it will shear with a force reasonably applied for separating the connection but greater than would be accidentally applied under conditions of ordinary service.

In the form of the invention shown in Figures 7 to 9, inclusive, each of the blade portions 4*a* is so modified in its construction that a portion 20 thereof can be bent out of line with the remainder of the blade to form a snap lock, each portion 20 snapping beneath and behind the cut-back edges of the other blade when the parts are in the assembled relation shown in Figures 7, 8 and 9. From an inspection of Figure 7 it will be seen that the blade 4*a*, there shown, has its lower edge cut back throughout a part of its length, as shown at 22, and particularly where it forms one side of the clip. The blade 4*a* may be slit above and in line with this cut-back edge 22 to facilitate bending of the corners 20 over one another, but this is not ordinarily necessary. As shown in Figure 9, when the corners 20 are engaged they tend to prevent angular relative movement of the parts of the assembled connection into the position shown in Figure 3, but this is readily done if the parts 20 are sprung back, thus overcoming their latching action.

It will be evident that such bending as occurs during latching is not such as will impair the contact of the knife disconnect, but nevertheless it is advantageous to have the portions 20 bent so little that only elastic flexure occurs and no permanent distortion.

In the form of the invention shown in Figures 10, 11 and 12, each of the clips 8*b* is modified in that a part 26 thereof which, as illustrated, is formed by the cooperating opposed portion of the blade, is separated from the adjacent part of the blade 4*b* by a slot 24. A rounded lateral extension on 26 reaches below the lower edge of the blade 4*b* a sufficient distance to permit formation of a rounded projection 28 therein, as, for example, by indenting the opposite side of the extension 26, as shown. This projection 28, as will be seen from Figure 11, snaps beneath the lower edge of the blade 4 of the other cooperating member when said blade is inserted in the clip. The projection 28 thus serves as a snap lock, resisting any tendency to accidental angular displacement of the two members of the connection. Because the projection 28 is on a separated finger 26, the distortion necessary for latching does not impair the pressure contact of the connection.

In the modification shown in Figures 13, 14 and 15, the blank may be substantially of the form of that from which the connector shown in Figure 10 is made but, instead of forming a latch by indenting the extension 26 at 30 to form the projection 28, the end of extension 26 itself is shown as bent under at 28*c* to form a snap lock. A notch 34 may be formed in the lower edge of the blade 4*c* to receive the catch 32.

In the modified form of snap lock shown in Figures 16 to 19 inclusive the snap part of the latch, instead of being formed, as in Figures 10 to 15 inclusive, so that it latches beneath the bottom edge of the blade of the counterpart connector when the two interengaging members are assembled, is here shown as being formed with a latch 35 on the blade member 4*d* and bent to the opposite side thereof so that it can cooperate with the free end of the clip on the counterpart terminal. In this form of the latch mechanism the clip 8*d* is shown as cut away at 36 to provide a nose-like end which cooperates in the latching action with the latch 35. As shown particularly in Figure 18, the latch 35 is formed with an undercut in a lateral extension from the blade 4*d*, this extension being bent up at right angles to provide a spring tongue 40 extending beside the blade 4*d*. The latch 35, including spring tongue 40 and latch 35, as shown in Figures 16, 17 and 18 are placed beneath the clip 8*d* so that, when pushed down by the nose-like end of the clip 8*d*, the forces imposed on the blade 4*d* and clip 8*d* are edgewise with little or no tendency to bend these members away from their parallel contacting relation. The elastic yield, by which release of the latch is secured, is thus mainly in compression of the clips and tensile stretch in the blade; and transverse bending is substantially limited to the latch 35 and the attached side or fold 38 which is attached to blade 4*d*.

In Figures 20 to 23, inclusive, is shown a modification of the latch type of interlock, to resist relative angular movement of the connector members. In this embodiment of the invention the latch members are formed as extensions both from the lower side edges and the ends of the blade members 4*e*, engaging respectively under the lower edge of the clip 8*e* and in a hole or depression 30*e* in the finger 26*e* of a counterpart connector.

Fingers 26*e* on the ends and ears 42 on the sides of blade 4*e* have projections 28*e* and recesses 44 formed thereon, respectively, to engage the counterpart connector as shown. The ears 42 are spaced from the clip 8*e* a distance sufficient to permit the other clip 8*e* of the counterpart connector to come between this ear and said first-mentioned clip. The ear thus serves as a thrust resisting shoulder for the clip 8*e* when the parts are assembled as shown in Figure 20. Thus the parts are secured against relative movement by either a pull or a thrust, while the rounded projection 28*e* when snapped into the opening 44 will offer sufficient resistance to prevent accidental angular displacement of the two members of the connection, but will yield to a force applied transversely so as to swing the connectors about a line of contact at 46. To allow such swinging without excess clearance between 8*e* and 42 the edges of the clips 8*e* may be rounded or bevelled at 46 as shown in Figures 20 and 21.

The clip 8*e* in this case is shown with a peculiar form designed to cooperate with the shelf 48 on the blade 4*e* of the counterpart connector to give a snap latching like that of clip 8*d* in Figure 16. When the connection is made or broken, the bottom of clip 8*e* pushes down on shelf 48 stretching blade 4*e* transversely, compressing clip 4*e* and, if necessary, rolling slightly the folded portion 38*e* where the clip 8*e* is attached to its blade 4*e*.

In the form of the invention shown in Figures 24 to 26, inclusive, each of the clips 8*f* is slotted at 56 to a depth sufficient to permit a slight movement of the portion on the endward side of the slot 56 toward the portion on the inside, thus permitting the clips, as they are swung into the position shown in Figure 24, to spring past the projecting nose-like ends 28*f* of upward and outward extensions 42*f* of the blades 4*f*. The snapping of the clips 8*f* into the positions shown in Figure 24 effectively latches them against accidental angular displacement while permitting their separation by a direct transverse force sufficient to be more than accidental.

In the form of the invention shown in Figures 27 to 29, inclusive, each of the clips 8*g* is notched on its outer end edge to provide a ledge 62 which cooperates with a latch member 28*g* extending

lengthwise of the blade 4g or ferrule 2g. The parts are so proportioned that, as the cam edge 10 on the end of the blade portion of each clip rides over the end of the latch member 28g, it will spring it back very slightly until the ledge 62 moves past the end of the latch member 28g when the latch member 28g will come into the position shown in Figure 27 with its end engaging above the ledge 62 and therefore serving to hold the connector parts against angular displacement.

The forms of the invention heretofore described, with the exception of that shown in Figures 1 to 6, inclusive, are of the snap latch type. In Figures 30 to 39, inclusive, are shown interlocking means that require, in addition to an angular movement of the clips and blades into engagement with each other, also a relative longitudinal movement thereof, after the ferrules have come into alignment, in order to effect the locking against angular movement.

In the form of the invention shown in Figures 30 to 32, inclusive, it will be noted that each of the clips 8h is spaced a considerable distance from the shoulder 6h so that a considerable relative longitudinal movement of the clips over the blades may take place after the blades have been inserted in the clips and the ferrules 2h brought into substantial alignment. This permits the use of a clip 8h having a straight lower edge 68 on a portion extended back beyond the attachment of the clip 8h to blade 4h so as to cooperate with an outturned flange 48h on the blade 4h of the other connector member to lock the connectors against swinging relative to each other. After the blades have been inserted in the clips by the usual angular movement, e. g. as shown in Figure 3, so that they are initially in the position shown in Figure 32, a longitudinal relative movement, that is, a pulling lengthwise on the two connector members, slides the clip edges 68 over the ledges or shelves 48h bringing them into the relation shown in Figures 30 and 31. It will be seen that when the clip edges 68 and the ledges 48h are in this relation the parts are positively locked against relative angular movement and that angular movement can only take place after the two ferrules have first been pushed toward each other to bring the parts again into the position shown in Figure 32.

In Figures 33 to 36, inclusive, is shown a modification of the type of interlocking shown in Figures 30 to 32 just described. In the form shown in Figures 33 to 36, inclusive, each connector is provided with a shelf 48j; and an extended toe 68j on clip 8j; and is provided with a further rearward extension 70 which is provided with an undercut notch 74. An inclined lug 28j is formed on the end of each cooperating blade 4j, and so related to the other parts that, when the connector is pulled from the relation shown in Figure 35 to that of Figure 33, lug 28j snaps under the nose 70 into the undercut notch 74. This latching is, again, an edgewise stress which does not distort the blade so as to impair electrical contact. At the same time the sliding engagement of the edge 68j on the ledge 48j insures positive locking of the parts against any tendency to move angularly in either direction.

In the form of the invention shown in Figures 37 to 39, inclusive, the clips 8k, instead of being located at the ends of the blades 4k, as in the embodiments of the invention heretofore described, are located intermediate between the ends of the blades. Each clip 8k is provided, on the edge thereof which is nearest the ferrule 2k, with an extension 68k adapted to cooperate with an outturned end 48k of the blade of the counterpart connector member when the clips and blades have first been brought into engaging relation to each other and then pulled longitudinally to bring the end 48k against the clips 8k and above extension 68k. The angular relation of the parts during engagement and separation is shown in Figure 39.

As will be evident from the foregoing, one of the most important features of the invention is, broadly, to add to a knife disconnect device of the type which is connected and released only by transverse movement supplemental means to prevent such transverse movement from occurring by buckling when subjected to a more or less axial push. Means such as represented in Figures 1–6 of course prevent movement in any direction within the limits of the shear strength of the fastening 16. In the examples shown in Figures 7–29 inclusive, the parts are held aligned by a resilient detent which is easily released by a directly applied transverse force, but readily resists the tendency to buckle, because the transverse movement of any force applied through the flexible wire is small so long as the connector parts are coaxial. Figures 30–39 similarly operate on the principle of holding the parts in coaxial relation, but instead of a resilient detent rely upon parts which slide together axially. Figures 20 to 23 and 33 to 36 illustrate the fact that such expedients may be combined to make assurance doubly sure. Thus in Figure 20, two resilient detents are used on each terminal making four in all, any one of which may hold if the others should have been bent out of shape or otherwise damaged by careless use or abuse. In Figure 33 the parts 68j and 48j present response to a transverse stress until the parts have first been pushed together and the detent 28j—70 prevents such pushing together until a substantial axial force is applied.

What is claimed is:

Two connector terminals in engaging relation each of the type having means for engagement with a wire cable cord and the like, each terminal having a blade portion extending from said means and a clip portion integral with said blade portion extending therefrom across one face thereof at a distance when unstressed less than the thickness of the blade portion adjacent to the clip whereby when said two such terminals are interconnected the blade portion of one is inserted between said blade and clip portions of the other, the improvement that comprises each terminal having three holes therein, the first in the clip portion, the second in the adjacent blade portion substantially opposite the one in the clip portion, and third, also in the blade portion but at a point thereon where the clip of a counterpart terminal is received, and a discardable tie located in the holes of each terminal when the terminals are in interengaging relation.

JAMES C. MACY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,225,127	Heath	May 8, 1917
2,356,014	Wade et al.	Aug. 15, 1944