Feb. 27, 1951 J. C. MACY 2,543,415

CONNECTOR

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Fig. 1.

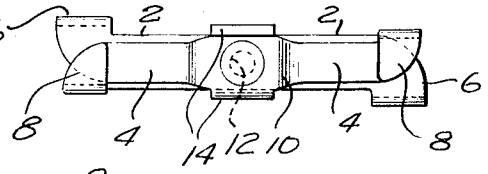


Fig. 2.

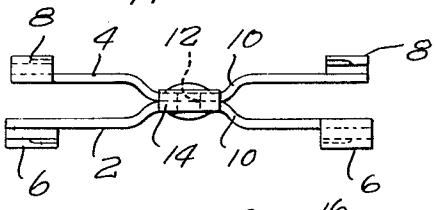


Fig. 3.

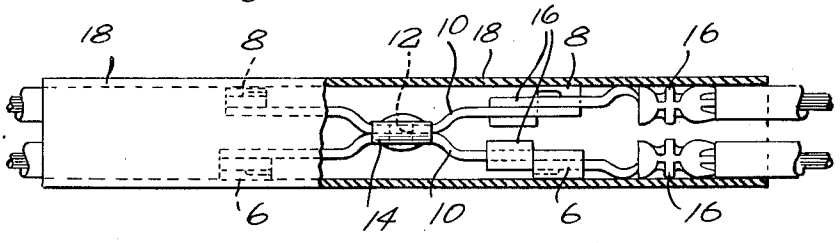


Fig. 4.

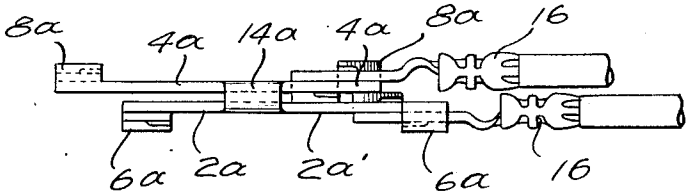


Fig. 5.

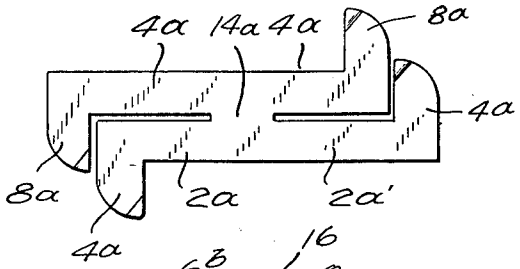


Fig. 6.

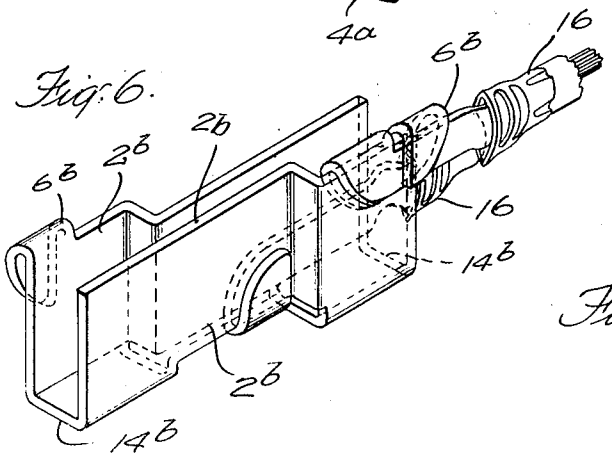
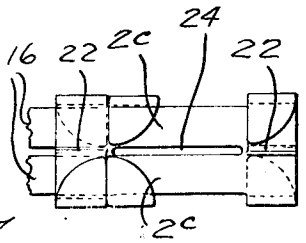


Fig. 7.



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Fig. 9.

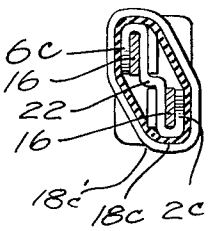


Fig. 8.

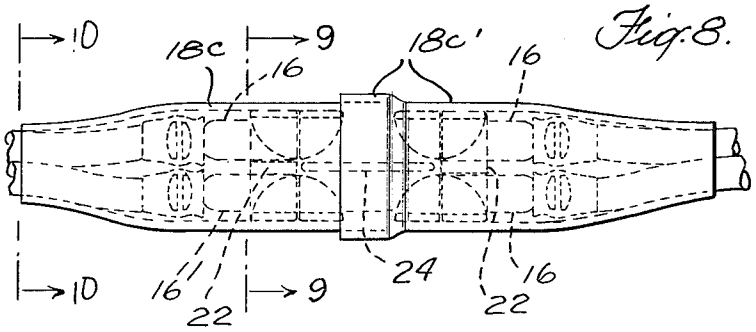


Fig. 10.

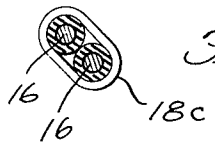
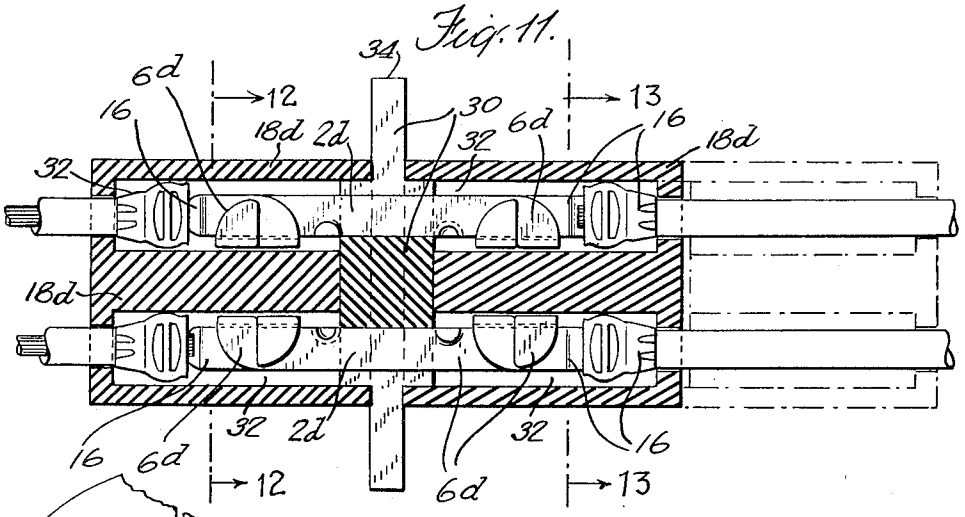


Fig. 11.



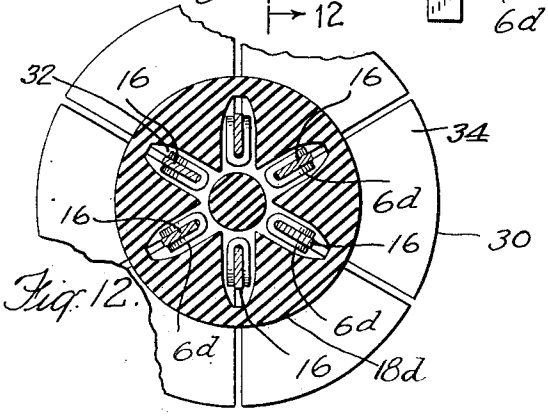


Fig. 12.

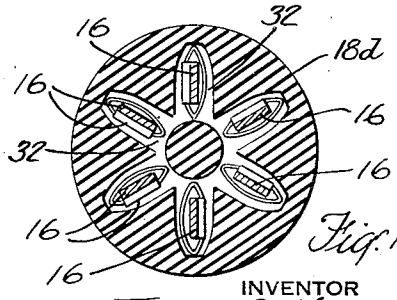


Fig. 13.

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UNITED STATES PATENT OFFICE

2,543,415

CONNECTOR

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Application October 12, 1944, Serial No. 558,326

2 Claims. (Cl. 173—328)

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This invention relates to multiple connectors and particularly to multiple connectors of the knife disconnect type.

As more fully disclosed in the copending application of William S. Watts, Serial No. 530,296, now Patent No. 2,478,143, filed April 10, 1944, and the application of James C. Macy, Serial No. 530,317, filed April 10, 1944, terminal connectors of the knife disconnect type have, as characteristic features, a blade part engageable between a similar blade part and cooperating clip of a counterpart terminal. These terminal connectors are usually so constructed, with the clips and the blades formed so that when two such terminals are brought together at right angles with their blade portions face to face and are then swung into alignment, each blade makes a wiping pressure contact between the clip and the blade of the other terminal, while its clip, engaging the clip of the other terminal, holds against axial disengagement.

The present invention aims particularly to provide a multiple connector for use with conductors having terminal connectors of the aforementioned knife disconnect type. The invention also has as one object the provision of a multiple connector which is economical of weight, material and space. The invention further aims to provide a multiple connector for use with conductors having terminal connectors of the knife disconnect type which has its various counterpart connectors so arranged that when the various wires, or other members carrying the counterpart connectors, are engaged with the multiple connector, the entire assembly may be locked against disengagement by a sheath which advantageously may be made of tubular insulation, which serves not only to insulate the connections and to lock them in their connected relation, but also to protect them against physical injury.

Other objects of the invention, to which reference has not been specifically made hereinabove, will be referred to hereinafter or will be apparent when the following description and claims are considered in connection with the accompanying drawings.

Although in this specification and the accompanying drawings I am showing and describing a particular example and various modifications thereof, it should be understood that these are not intended to be exhaustive or limiting of the invention, but on the contrary are chosen and presented for purposes of illustration and in order to explain the principles of the invention and the practical employment of those principles in applying the invention to practical use, and thus to so fully instruct others skilled in this art that they will be enabled readily to modify and to select and substitute alternatives, each as may be best suited to the particular conditions of any given application or use.

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In the drawings,

Figure 1 is a view in side elevation of a four-way connector having the blade portions offset between the two knife blades;

Figure 2 is a plan view of the same taken from beneath;

Figure 3 is a view similar to Figure 2, but showing the connector associated with additional parts;

Figure 4 is a plan view of a modified connector embodying the invention;

Figure 5 is a plan view of the blank from which the connector of Figure 4 is made;

Figure 6 is a perspective view of another embodiment of the invention;

Figure 7 is a view in side elevation of another embodiment of the invention;

Figure 8 is a view similar to Figure 7 but with the insulating sheath in place;

Figure 9 is a section taken on line 9—9 of Figure 8;

Figure 10 is a section taken on line 10—10 of Figure 8;

Figure 11 is a view in longitudinal section of another embodiment of the invention;

Figure 12 is a section taken on line 12—12 of Figure 11; and

Figure 13 is a section taken on line 13—13 of Figure 11.

Referring to the connector shown in Figure 1, this is made of a pair of two-way connector blades connected together to form the four-way connector as shown. It will be seen that the blade portions 2 and 4, designed to enter clips in the counterpart terminal connectors of electrical conductors to be connected thereto, have integrally formed thereon the clips 6 and 8, respectively, designed to receive the blade parts of the counterpart terminal connectors of the electrical conductors to be connected thereto. To permit connection of two of said two-way interconnectors to each other to form a practicable four-way interconnector having the clip-entering edges of its blades parallel, an offset 10 is provided in the integral connection between the blades 2 and 4, this offset being in a plane parallel to that in which the blades 2 and 4 lie. Although this offset, as shown, is common to the two blades 2 and 4, it may also be considered as constituting

a separate offset from each blade; and this would be true in fact if, for example, one of the blades is cut off to give a three-way connector.

The offset is provided with a central rivet-receiving hole 12 and with an integral lip 14 on one edge, this lip 14 being parallel to the clip-entering edges of the blades 2 and 4 and having its narrow dimension equal to the thickness of the offset 10, whereby, when two of the inter-connectors are riveted together, as shown in either Figure 1 or 2, the lips 14 will overlie the respective free edges and thus insure positive parallelism of the blades 2 and 4 of the respective connectors.

As shown particularly in Figure 1, it will be seen that the clips at opposite ends of the blades open in opposite directions with respect to the longitudinal axis of the connector and the laterally adjacent clips likewise open in opposite directions with respect to the longitudinal axis of the assembled structure. The advantage of this is that it permits convenient connection of the same standard design of counterpart connector 16 with each of the blades. As shown these clips all "look" to the outside. Although this is not necessary to the invention it reduces the required spacing between laterally adjacent connectors; this permits the use of a smaller tubular sheath 18 of insulation to enclose the assembly, as shown in Figure 3, than would otherwise be possible. It will further be seen that, by arranging the connectors so that their blades are in parallel planes and by arranging all of the blades so that their lateral clip-engaging edges are parallel, a most compact knife-disconnect type connector has been provided. This arrangement also permits simple locking of all of the connectors in their assembled condition by means of a single tubular sheath of insulation.

In Figures 1 and 2 my invention is illustrated with a connector made up of two units, one of which has clips of smaller size than the other, adapted to connect with smaller counterpart terminals. It will be understood that this is illustrative of the adaptability of the present invention to variations for meeting requirements of different uses. Obviously the blades may be all the same size or of different sizes, as required, without departing from the scope of the present invention.

In Figure 4 is shown another variation from the design as illustrated in Figures 1 and 2, wherein the several connector blades are all integral parts of a single stamping, being jointed and held in proper spaced relation by an integral saddle 14a.

In this embodiment of the invention the ends of the blades 2a and 2a' are staggered so as to permit stamping out of the ears on the blank as shown in Figure 5. This has the further advantage that the clips of the counterpart terminal connectors are likewise staggered and are, therefore, received edge-to-edge in the space between the blades 2a and 2a'. Thus the over-all dimensions of the connector can be reduced to a minimum and moreover the spacing of the blades may be such (slightly less than the thickness of the blades 2a or 2a') that the clips of the counterpart connectors which enter into this spacing are resiliently engaged on both sides by both blades. Likewise, as indicated on the right hand end of Figure 4, the crimped ferrules of the counterpart terminal connectors 16 are staggered so that the thicker portions of the terminal connectors interfit with narrower parts of the adjacent terminals.

This again is important for the reduction in lateral dimension of the connector.

In the connector shown in Figure 4, as in the connector shown in Figure 1, the counterpart connectors must be swung in opposite directions for engagement or release with adjacent clips 2a, and thus the mounting of an insulating sheath over the connector would securely lock the terminal connectors in engagement.

In Figure 6 another type of integral multiple connector is shown. In this case the two blade elements 2b are connected by saddles 14b at the ends; and between these saddles 14b the bottom of the channel is slotted out. Clips 6b are formed on opposite corners as shown, whereby counterpart connectors can be engaged with the upper corners. Each blade member 2b is bent inward near the inner edge of the saddle 14b and at a distance beyond the clip 6b about equal to the width of the clip. With this arrangement, counterpart terminals may be inserted vertically into the slot between the saddles 14b with their clips extending outward under the edges of the blade members 2b, respectively. When the terminal connector 16 is then swung down to the horizontal position, as shown in Figure 6, the blade 2b is engaged between the clip and blade of the counterpart connector 16.

In Figures 7 to 10, inclusive, there is shown still another multiple connector embodying the invention and again made from an integral stamping. In this case, top and bottom blade portions 2c are integrally connected at their ends through the offset portions 22 and separated between their ends by the longitudinal slot 24. It will be observed that at the opposite ends the offset is in opposite directions, so that at each end the blade is offset at top and bottom in the direction in which the clip 6c "looks." The slot 24 is a convenient method of manufacture, but is not essential; and the offset portion may extend throughout the entire length, if desired, tapering toward the middle and extending toward opposite sides near the opposite ends.

In the mounting of the connectors upon and their disengagement from this multiple connector they are swung toward one another, rather than away from one another as in Figures 1 to 4. As will be readily appreciated, however, this difference does not affect the result that a sheath which holds the wires together prevents their disengagement and thus securely locks the connector.

In Figures 8, 9 and 10, I have shown a modified type of sheath which, instead of being of uniform diameter, fits over the connector and connection. This sheath is made of two parts telescoped together, each tapered from a diameter just sufficient to receive the insulated wires to a larger diameter adapted to slip over the connector and connection, and as shown one side is further enlarged near its end to receive the larger end of the other part and thus securely to enclose and insulate the connector. When the connection is made or is to be disengaged, the respective halves of the sheath are slid back along the wires far enough to provide slack for bending them to opposite sides; and when the engagement is made the halves are slipped together and held in the position shown by their frictional engagement with the wire. A further advantage of this type of sheath is that the small end may be fitted to the wire so that, after the terminals are applied, they cannot be withdrawn and thus any danger of losing them is avoided.

In Figures 11 to 13, I have shown a multiple connector in which the several blades are not electrically interconnected. In this case double ended knife blade connectors with clips 6*d* are fitted in radial arrangement into a central block 30, which serves, at the same time, to insulate the blades 2*d* from one another and to hold them in the desired spaced and radial arrangement. The knife blades may be molded in place as disclosed in my application Serial No. 631,031, filed November 27, 1945. As shown, each of the clips 6*d* opens outwardly, and thus, as will be evident, each terminal connector 16 with its wire must be swung outwardly to an approximately normal position with respect to the axis of the connector for engagement and disengagement. Molded multiple socket insulating blocks or sheaths 18*d*, each formed with sockets 32 adapted to receive respectively the several counterpart connectors 16, are mounted on the connector wires and drawn up against the block 30. These serve to prevent the swinging away of the terminals and thus lock them securely on the multiple connector.

In the example shown in these figures, a flange 34 is provided on the block 30 by which it may be readily mounted on a partition, bulkhead or instrument panel, etc.

It will be observed that in every case in the drawings all of the clips are turned so that they may be engaged by, and engage, a single standard counterpart terminal, such as is now commercially available. If right and left-hand connectors are available, that is to say some with clips turned to the right and some with clips turned to the left, the problem of multiple connector design is somewhat simplified. For example, in the embodiment illustrated in Figure 7, the reversal of the offset from end to end would not be necessary if right hand connectors could be used at one end and left hand connectors at the other. In the embodiment illustrated in Figure 6, additional connections could be made at the corners and at the opposite sides of the slot which would be suitable for connection with opposite hand connectors, and, as will be obvious, numerous variations would be possible in connectors similar to those shown in Figures 1 through 5.

The knife-disconnect type connection referred to above and utilized in the present invention is more particularly described and broadly claimed in copending applications Serial Nos. 530,296, now Patent No. 2,478,143, and 530,317, filed April 10, 1944. The present invention is an improvement within the scope of the inventions disclosed in said prior applications.

I claim:

1. A multiple connector comprising a plurality of connector blades arranged in closely spaced relationship along substantially parallel axes and each having a counterpart engaging clip near one end extending from an edge portion of the blade, block means supporting said blades in said spaced relationship, a removable insulator defining a surface extending substantially parallel with respect to said axes and overlying the one end of each blade and spaced closely adjacent thereto, and said blades being disposed with said edge portion of each on the far side from said insulator; whereby when a counterpart connector is assembled in connection with a connector blade the insulator forms a stop which prevents sufficient movement of the counterpart connector with respect to the connector blade to permit disassembly of the connection-forming parts.

2. A multiple connector which comprises a plurality of connector pieces of the type having a blade and a clip extending from one edge near the end of the blade over the face of the blade and spaced therefrom a distance less than the thickness of the blade, a spacer block in which said connector pieces may be replaceably secured in positions such that connection and disconnection of members having counterpart connectors with and from different ones of said connector pieces requires swinging said members through a relatively wide angle with respect to one another, and removable insulating means overlying said members and normally confining them within an angle too narrow to permit disconnection.

JAMES C. MACY.

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