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Barrett, Jr. et al.

[11] **3,836,938**

[45] **Sept. 17, 1974**

[54] **SAFETY ELECTRICAL PLUG RELEASE MECHANISM**

[75] Inventors: **James H. Barrett, Jr.,** 3863 Surrey Rd., Toledo, Ohio 43615; **Lee R. Marcussen,** Toledo, Ohio

[73] Assignee: **said Barrett, by said Marcussen**

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[21] Appl. No.: **288,522**

[52] **U.S. Cl.** ..... **339/45 R,** 339/49 R, 339/91 R

[51] **Int. Cl.** **H01r 13/54**

[58] **Field of Search** 339/45, 46, 47–49, 339/65, 66, 91, 176, 184

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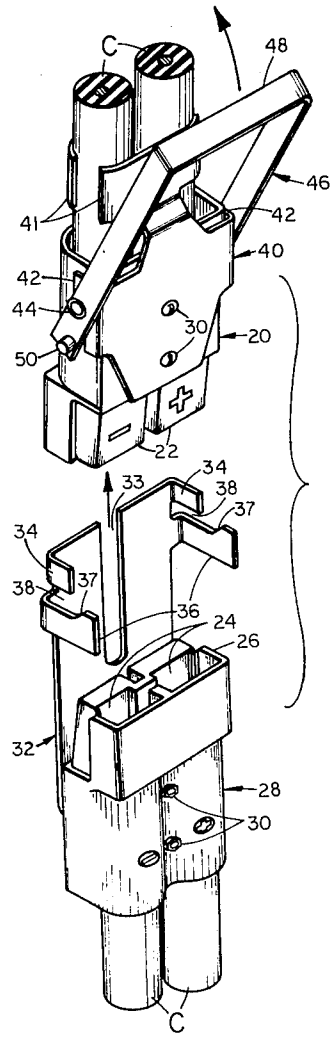
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Primary Examiner—Bobby R. Gay
Assistant Examiner—Terrell P. Lewis

[57] **ABSTRACT**

A lever operated safety connect-and-disconnect mechanism for a pair of telescopic electrical cable terminal connectors comprising a guide means attached to one of the connectors projecting beyond the entrance thereof and having a pair of slotted flanges and a lever means connected and pivoted to the other connector having a pair of trunnion pins for fitting into the slots of the flanges of the guide means, whereby oscillation of the lever moves the two connectors into and out of engagement. The improvement in this mechanism resides in means for preventing jamming, over-riding, and breakage of the connectors and insuring their operation by providing stops, wedges and/or additional pin means on the guide means and lever means.

24 Claims, 12 Drawing Figures



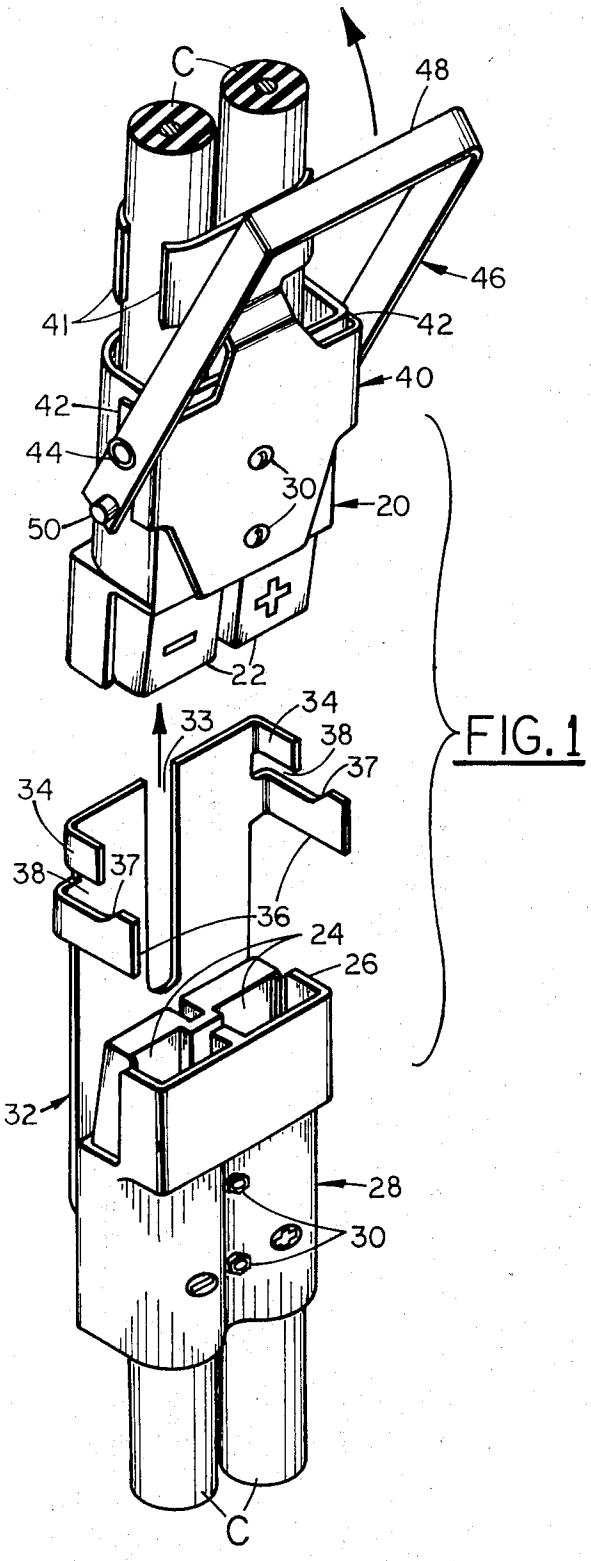

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FIG. 1

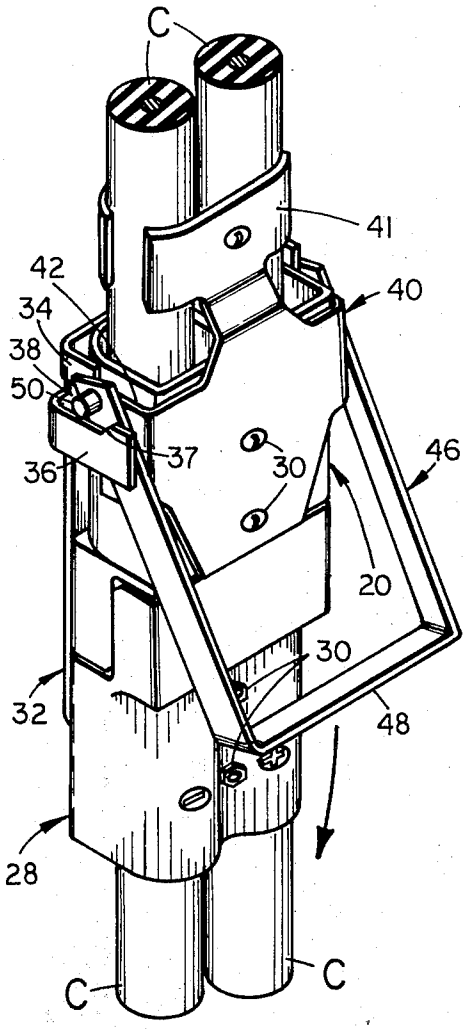

C
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FIG. 2

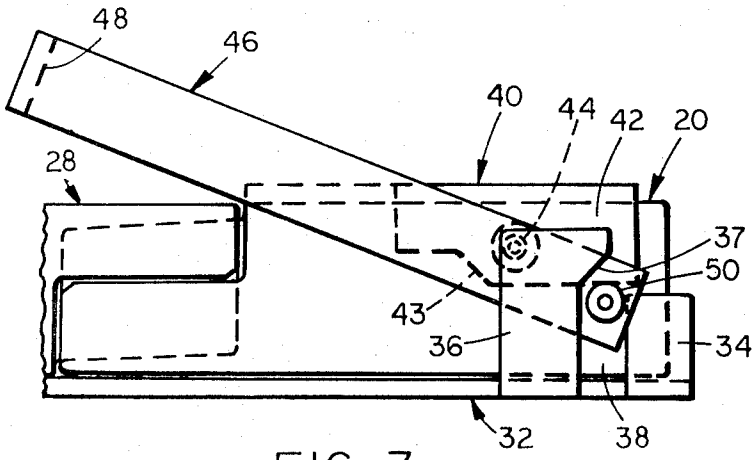


FIG. 3

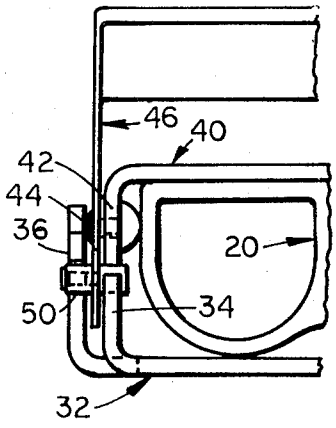


FIG. 4

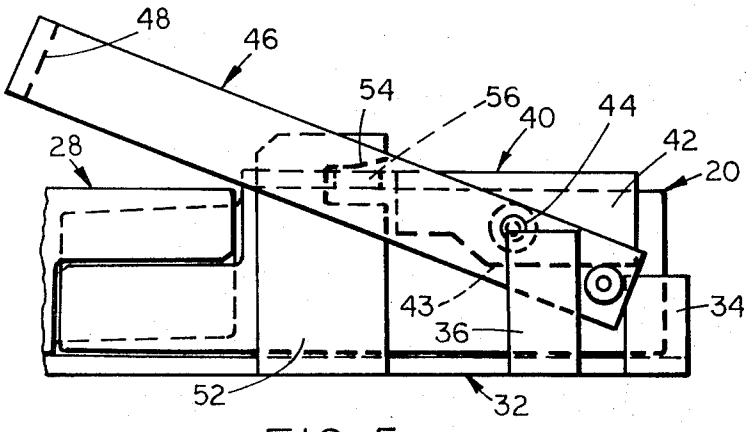


FIG. 5

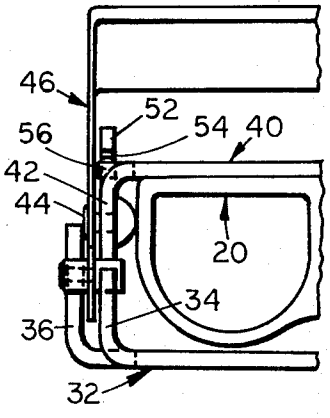


FIG. 6

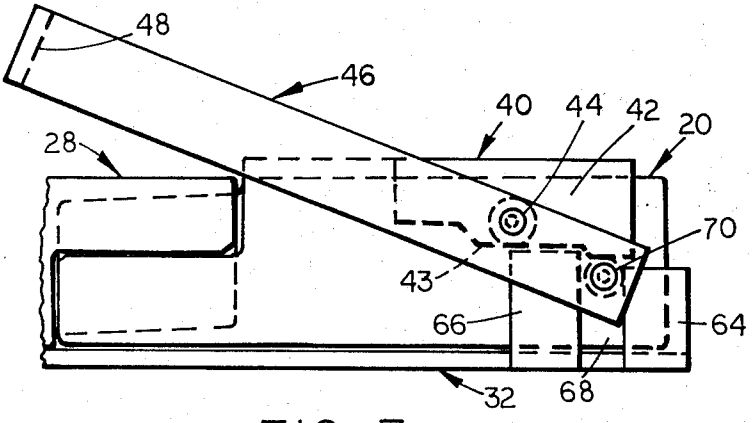


FIG. 7

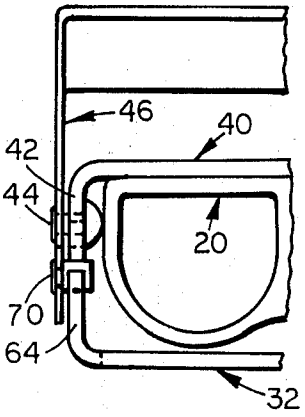


FIG. 8

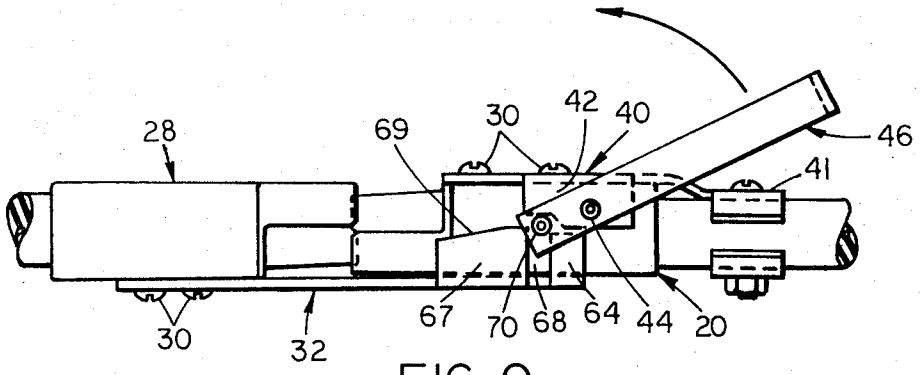


FIG. 9

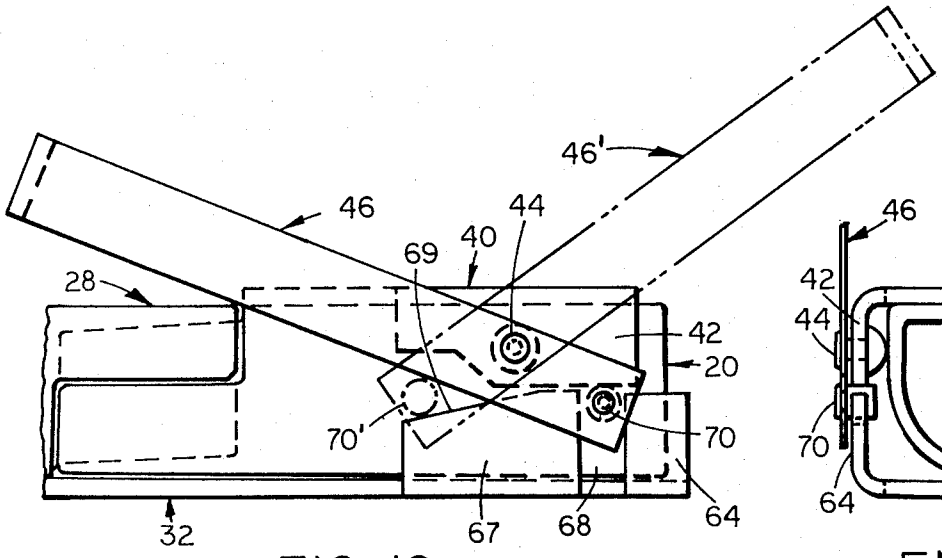


FIG. 10

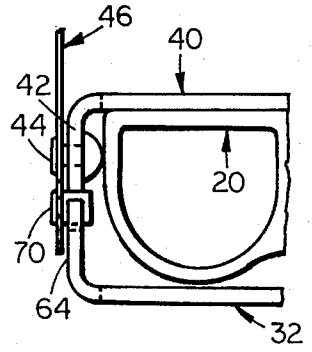


FIG. 11

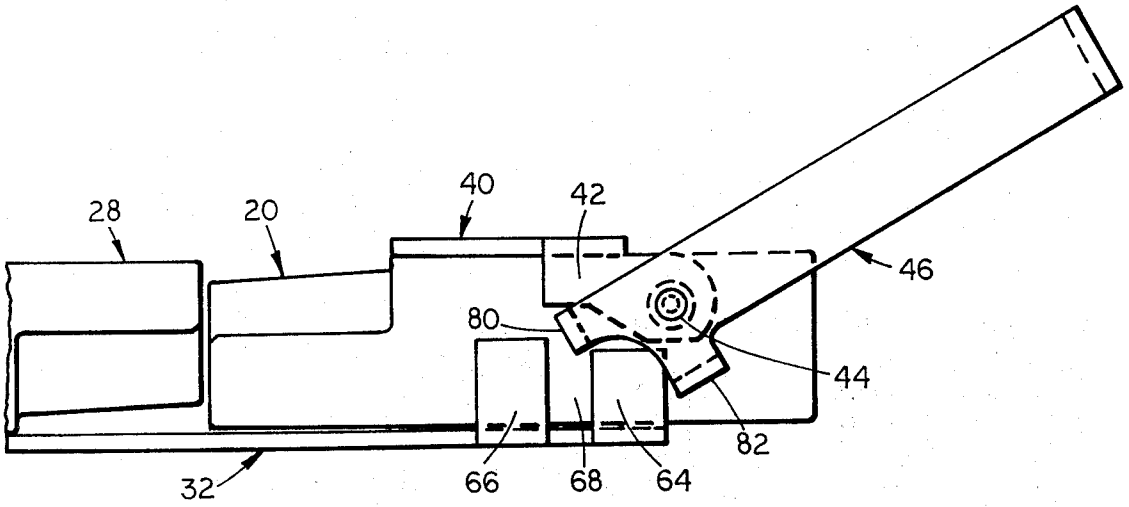


FIG. 12

SAFETY ELECTRICAL PLUG RELEASE MECHANISM

BACKGROUND OF THE INVENTION

Quick safety connect-and-disconnect means for electrical terminal connectors comprising guide means with slotted flanges and lever means with trunnion pins to fit in the slotted flanges are known, but improper operation of these devices could and often causes jamming and breaking of the connectors by wedging them apart, not inserting the trunnions in their proper slots, and/or over-riding the slots, all of which cause either bad connections or prevent quick release of the connectors thereby defeating the primary purpose of the safety mechanism.

SUMMARY OF THE INVENTION

The terminal sockets to which the safety connect-and-disconnect device of this invention is adapted, comprise a pair of interfitting non-conducting plastic housings for one or more and preferably two electrical cables connected to electrical contact terminals inside the housings. These sockets are formed so that they telescope or nest together and the terminals therein are in wiping electrical contact with each other. Such sockets are used, for example, in the electrical cable conductors to and from batteries for lift trucks, and for the charging of these batteries. Thus it is important that such high current conducting connectors are properly insulated and can be quickly disconnected in case of a short circuit or other failure of the electrical system to prevent further damage. Thus a manually operated lever safety means has been provided which has a mechanical advantage for readily breaking such connections.

This safety lever means comprises a guide means that is anchored by bolts or the like to one of the pair of nesting sockets. The guide means projects in front of the open end of the socket and supports a pair of slots that act as journals for trunnion means or pins which are located on a bail shaped lever connected to the other socket of the pair. Thus when the trunnion pins are fitted into the slots and the bail shaped lever is oscillated, the pins cause the two sockets to move toward and away from each other. However, if these slots are over-ridden by the trunnion pins when the two connectors are placed together, or if the trunnion pins are placed on the wrong side of the flanges having the slots, jamming and even breakage of the sockets can occur, preventing their quick release. Also the mechanisms which are attached to the plastic sockets may be provided with extensions for guiding and clamping the ends of the cables, to further insure the proper operation of the safety device, and to prevent the cables from being pulled from their sockets.

The improvements of this invention which are directed to means for insuring the proper operation of the safety lever mechanism for these sockets comprise one or more of the following features: First of all, each of the flanges or lugs that form the slots for the trunnion pins are provided with different length sides so that the trunnion pins when being slid toward the slots as the two sockets are aligned, will be stopped by the longer flange or side of the slots in which the pins are journalled. Another way of insuring proper engagement of the trunnion pins in their journalled slots is to

provide trunnion pins which extend outwardly on both sides of each end of the bail lever and to offset the flanges or lugs forming the two sides of each slot, so that one lug acts as a stop for one pin extension and the other lug acts as a bearing for the other pin extension to force the two sockets together. Still another way is to provide the longer lugs or flanges with an overhanging or hook portion. Also one of the lugs or flanges forming the slot which acts as the stop may be wider and/or tapered, so that if the trunnion pin over-rides its top it will not lock behind it and prevent the sockets from being pulled apart or separated. In addition to these features additional flanges or hook means may be provided on the guide means which engage wedges or projections on the means for mounting the lever means, so that once the two socket members start to connect with each other they cannot be moved laterally to break their sockets, either by an outside force or by the operation of the lever means. This hook means also prevents the lever means from being operated if its trunnion pins are not properly journalled in the slots. Still further, additional trunnion pins, may be provided on the lever means to engage both sides of one of the slot forming flanges.

Accordingly, it is a primary object of the present invention to provide means on such quick lever operated safety mechanism for such electrical terminal connectors to prevent them from becoming jammed or overriding their proper positions and/or breaking the housings of the connectors when the lever for operating them is not trunnioned in the proper slots. Thus, it is an object of this invention to insure positive and direct aligned connection and disconnection of such socket connectors.

BRIEF DESCRIPTION OF THE DRAWINGS

The above mentioned and other features, objects, and advantages, and a manner of obtaining them are described more specifically below by reference to embodiments of this invention shown in accompanying drawings, wherein:

FIG. 1 is a perspective view of a pulled apart pair of telescoping cable connecting sockets for industrial battery terminals having a lever operated safety device to connect-and-disconnect the sockets improved to have special shaped slots for the trunnion pins according to one embodiment of the present invention;

FIG. 2 is a perspective view similar to FIG. 1 showing the two sockets in their connected position;

FIG. 3 is an enlarged side elevational view of the safety device connectors shown in FIG. 2 with the cables removed and part of one of the sockets broken away;

FIG. 4 is a right end view of the connectors shown in FIG. 3 with half of the sockets broken away;

FIG. 5 is a side elevation view similar to FIG. 3 of another embodiment of this invention having a hook means for preventing lateral movement of the sockets once they are engaged;

FIG. 6 is a right end view of FIG. 5 with half of the sockets broken away;

FIG. 7 is a side elevational view similar to FIGS. 3 or 5 of still another embodiment of this invention in which the trunnion pin projects only from one side of the lever means;

FIG. 8 is a right end view of the embodiment shown in FIG. 7 with half of the sockets broken away;

FIG. 9 is a side elevational view of a further embodiment of this invention, similar to FIG. 7 but showing a different shaped stop lug or flange for the slot;

FIG. 10 is an enlarged side elevational view of the central portion of the embodiment shown in FIG. 9, and showing the lever in an erroneous but non-locking position in dotted lines;

FIG. 11 is a right end elevational view of FIG. 10 with half of the sockets broken away; and

FIG. 12 is a side elevational view of still a further embodiment of this invention wherein an additional trunnion type means is provided on the lever to bracket one of the two lugs that form the slot for the other trunnion means.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Referring first to the embodiment shown in FIGS. 1 through 4 there is shown in FIGS. 1 and 2 the ends of two pair of insulated electrical cables C, one of which pair is connected into a plastic connector or housing socket 20 having a pair of hollow sockets ends 22 in which are located metal conductor terminals that electrically contact with similar metal conductor terminals 24 in the socket ends 26 of a similar plastic having socket 28. These two sockets 20 and 28 fit together when aligned as shown in FIG. 2 to wipingly electrically connect their terminals 24 in their socket ends 22 and 26.

Attached to one of the pair of sockets 28, such as by rivets, screws or bolts and nuts 30, is a guide means 32 which extends beyond the entrance of the socket ends 26 and near its outer end has two pairs of spaced lugs or flanges 34 and 36 between which are slots 38. In this particular embodiment, the flanges 34 are offset inwardly with respect to the flanges 36, as best shown in FIG. 4. The plate or guide means 32 may be provided also with a longitudinal central slot 33 to permit a non-interfering space for bolts 30.

Connected to the other socket 20 of the pair is a lever plate or supporting means 40 which also may be attached thereto by means of rivets, screws, or bolts and nuts 30. This supporting plate 40 is provided with a pair of side flanges 42 for journalling the pivots 44 in the sides of a bail shaped lever 46. The lower edges 43 (see FIG. 3) of these flanges 42 are contoured to slide over the outer ends of flanges 34. Near the outer ends of the two sides of the bail or U-shaped lever 46, and closer to the pivot 44 than the cross connection or handle portion 48 of the lever 46, are provided trunnion pins 50 which extend outwardly from both sides of the lever 46 and fit into and/or are journalled between the two lugs or flanges 34 and 36 in the slots 38.

In order to operate the improved quick release safety connecting device of this invention, the lever 46 is placed in the position shown in FIG. 1 and the two sockets 20 and 28 are then moved toward each other in alignment until the inwardly projecting portions of the trunnion pins 50 pass over the tops or ends of the shorter flanges 34, and the outwardly projecting portions of the trunnion pins 50 engage against and are stopped by the edge of the longer flanges 36. In order to prevent these pins 50 from over riding the flanges 36, these flanges 36 may also be provided with the hooked extensions 37. Once the trunnion pins 50 are in contact with the flanges 36, no further engagement of the sockets 20 and 28 can be made without moving the lever 46 around its pivots 44 in the direction of the arrow shown in FIG. 2, which causes the inwardly extending trunnion pins 50 to move down into the slots 38 and push against the inside of flanges 34 to force the two sockets 20 and 28 into complete engagement and to hold them in that position (see FIGS. 2 and 3). By offsetting the flanges 34 from the flanges 36, there is no obstruction by the flanges 34 with the outwardly extending portions of the trunnion pins 50 which could stop or prevent further movement of the socket 20 toward socket 28, or to prevent their outwardly extending portions of pins 50 from being caught on the front edge of the shorter flanges 34.

When the device in its connected position shown in FIGS. 2 and 3 is to be quickly disconnected, the bail or handle portion 48 of the lever 46 is grabbed and pulled in the direction of the arrow shown at the top of FIG. 1. This movement causes the trunnion pins 50 to push against the inside of the flanges 36 in slot 38 to pull the two sockets 20 and 28 apart, and then when the bail lever 46 is in the position as shown in FIG. 1, there is no further obstruction of pins 50 by the flanges 34 so that the socket 20 may be completely separated from the socket 28 as shown in FIG. 1.

In FIGS. 5 and 6 there is shown an additional feature for a quick release safety device, shown adapted to the embodiment in FIGS. 1 through 4. This additional feature comprises an additional pair of flanges 52 on the guide means 32, which have wedge shaped hook means 54 for cooperating with a pair of outwardly projecting side flanges or lugs 56 on the inner end of plate 40 on the other socket 20. Thus, when sockets 20 and 28 are in their connected position as shown in FIG. 5, they are hooked from lateral movement so that there is no possibility of pulling on the bail 48 of the lever 46 at right angles to the center lines of the sockets to break them. In this embodiment the higher flanges 36 do not have the additional hook means 37, as shown in the previous embodiment.

Another embodiment of this invention is disclosed in FIGS. 7 and 8 in which the pair of lugs or flanges 64 and 66 on the outwardly extending end of the guide means 32 are not offset but in alignment with each other as shown in FIG. 8. However the inner flange 66 is larger than the outer flange 64, so that the trunnion pins 70 can pass over the end of the flange 64, fit into the slot 68 and be stopped by the inner edge of the larger flange 66, so as to insure the movement of pins 70 into slots 68. Particularly in this embodiment the lower edge 43 of the flange 42 must be contoured and/or stepped to fit over the outer ends of both flanges 66 and 68 (see FIG. 7). An additional feature, which herein is shown adapted to the embodiment of FIGS. 7 and 8, is shown in FIGS. 9, 10 and 11 wherein the longer lug or flange 67, corresponding to large flange 66, is shown to be much wider and to have a tapering or sloping end 69, against which the trunnion pin 70 can ride, if it slides over the end of this longer flange 67. Thus as long as this pin 70 rides on the edge 69, it cannot lock behind the flange 67 so as to prevent release of the sockets (see the dotted line position 46' of the lever 46 and its trunnion pin 70' shown in FIG. 10).

A still further embodiment of this invention is shown in FIG. 12 wherein the lugs or flanges 64 and 66 with slots 68 between them are similar to those shown in the embodiment in FIGS. 7 and 8, but the lever 46 is pro-

vided with a pair of trunnion means **80** and **82** angularly spaced about the pivots **44** of each leg of the lever **46.** These trunnion means **80** and **82** may be formed by flanged means at the end of each leg of the lever **46** as shown, or by pins as in the other embodiments previously described. The trunnion means **80** are guided into the slots **68** and are prevented from over-riding these slots by the trunnion means **82** that contact the outside edge of the outer flanges **64,** thus the flanges **64** are bracketed by the trunnion means **80** and **82.**

Although the different embodiments show different structural means and ways for assuring the proper operation of the safety lever connector of this invention, many of these different ways and features may be incorporated in the other embodiments, or added thereto without departing from the scope of this invention. For example, any one of the embodiments may be provided with or without the clamping flanges **41** on the plates **32** and/or **40** for the ends of the cables C as shown on plate **40** in FIGS. **1, 2,** and **9.** Furthermore, the additional wedge shaped hooking flanges **52** shown in the embodiment of FIGS. **5** and **6** may be added to and employed with any one of the other embodiments. Similarly, the widened flange **67** shown in the embodiment of FIGS. **9** and **10** may be incorporated in the other embodiments, if desired, as can the hook means **37** disclosed in the embodiment of FIGS. **1** through **4** be added to the longer flanges **36, 66,** and/or **67** in FIGS. **5, 7** and **9,** respectively. Also the additional trunnion means **82** shown in the embodiment of FIG. **12** may be added to the ends of the levers **40** shown in the other embodiments.

Thus, any one or more of the different improvements described may be combined with the lever operated safety connector and disconnector device for further assuring the proper operation of the device, without departing from the scope of this invention, and it should be clearly understood that this description is made only by way of example and not as a limitation to the scope of this invention.

We claim:

1. A pair of telescopic electrical connector sockets having insulated housings comprising:

A. a lever means pivoted to one housing and having trunnion means,

B. a flat plate attached to one side of one of said sockets and extending in the telescoping direction beyond the end of said one socket, said plate having a pair of inner and a pair of outer parallel lugs extending from its opposite edges near its outer end, said lugs forming parallel slots between the inner and outer lug of each pair for engaging said trunnion means, whereby oscillatory and longitudinal movement of said lever means engages and disengages and separates said sockets, respectively, and

C. means on said housings for insuring said engagement of said trunnion means in the slots formed by said parallel lugs.

2. A pair of connector sockets according to claim **1** wherein said lever means is a bail shaped lever means.

3. A pair of connector sockets according to claim **1** wherein said means for insuring said engagement of said trunnion means in said slots comprises the extension of the ends of said inner lugs beyond the ends of said outer lugs to act as stops for said trunnion means.

4. A pair of connector sockets according to claim **3** wherein said extension of the end of said inner lugs includes a hook means extending partly over the open ends of said slots.

5. A pair of connector sockets according to claim **1** wherein said means for insuring said engagement of the said trunnion means in said slots comprises an additional trunnion means on said lever for engaging the outer edge of the outer lugs.

6. A pair of connector sockets according to claim **1** wherein the inner pair of lugs is sufficiently wide so as to prevent said trunnion means from over-riding their outer ends.

7. A pair of connector sockets according to claim **1** wherein said insuring means comprise said pairs of lugs being offset with respect to each other, and said trunnion means projecting on both sides of said lever means with its projection on one side engaging one pair of said lugs and its projection on the other side engaging the other pair of said lugs.

8. A pair of connector sockets according to claim **1** including means fastened to said housings for preventing transverse movement of said housings when said housings are in their connected position.

9. A pair of connector sockets according to claim **8** wherein said means for preventing transverse movement comprises a hook means on one of said housings and lugs on said other housing engageable with said hook means.

10. A quick release safety cable connector comprising:

A. a pair of interfitting electrical terminal sockets surrounded by nesting insulated housings,

B. engaging means attached to one of said housings comprising a flat plate attached to one side of one of said sockets and extending in the telescoping direction beyond the end of said one socket, said plate having a pair of inner and a pair of outer parallel lugs extending from its opposite edges near its outer end, said lugs forming parallel slots between the inner and outer lug of each pair, and

C. a pivoted lever means attached to the other of said housings, and having trunnion means engageable in said slots between said lugs for moving said sockets towards and away from their nesting engagement position as said lever means is oscillated from one of its limiting positions to the other, and for separating said sockets, and

D. means to insure engagement of said trunnion means in said slots between said lugs wherein said inner pair of lugs are larger than said outer pair of lugs.

11. A connector according to claim **10** wherein said insuring means comprises an extension on inner pair of lugs to act as a stop for said trunnion means.

12. A connector according to claim **10** wherein said insuring means comprises a hook means on inner pair of lugs.

13. A connector according to claim **10** wherein said insuring means comprises one of said pair of lugs being offset with respect to the other said pair of lugs, and trunnion means extending on both sides of said lever means with its extension on one side engaging said one pair of lugs as a stop and its extension on the other side engaging said other pair of lugs as a journalling means

for moving said sockets toward and away from each other.

14. A connector according to claim **10** including means for preventing transverse movement between said housings when said housings are in their nested position.

15. A connector according to claim **14** wherein said preventing means comprises hook means attached to one of said housings and lug means attached to other said housings engageable with said hook means.

16. A pair of connector sockets according to claim **10** wherein said inner pair of parallel lugs is sufficiently wide so as to prevent said trunnion means from overriding their outer ends.

17. An improved safety make-and-release means for connecting and disconnecting a pair of electrical connector sockets in insulated interfitting housings, comprising:

A. guide means attached to one of said sockets having a pair of slotted flanges, one on each side of and in front of said one socket, one side of each of which slots is longer than the other side to act as a stop, and wherein the sides of said slots are offset with respect to each other, and

B. a bail shaped lever means attached to the other socket of said pair and being pivoted on opposite sides of said other socket, and having trunnion means which fit in the slots of said slotted flanges of said guide means, said trunnion means extending on both sides of said lever means, with the extended trunnion means on one of said lever means engaging one side of said slots and with the extended trunnion means on the other side of said lever means engaging the other side of said slots, whereby movement of said sockets towards each other engages said trunnion means against said longer side of said slots, and then movement of said lever means moves said trunnion means into said slots and further moves said sockets towards each other into electrical contact, and opposite movement of said lever means disconnects said sockets and said contact.

18. A safety means according to claim **17** wherein said longer sides of said slots include hook means extending at least partly over the open end of said slots.

19. A safety means according to claim **17** wherein said means attached to said sockets include means for clamping electrical cables at the other end of said sockets from their interfitting ends.

20. A pair of connector sockets according to claim **17** including means fastened to said housings for preventing transverse movement of said housings when said housings are in their connected position.

21. An improved safety make-and-release means for connecting and disconnecting a pair of electrical connector sockets in insulated interfitting housings, comprising:

A. guide means attached to one of said sockets having a pair of slotted flanges, one on each side of and in front of said one socket, one side of each of which slots is longer than the other side to act as a stop, and including a flange having a wedged shaped slot, and another means attached to the other said socket including a lug for fitting into said wedge-shaped slot for preventing transverse movement of said sockets when said sockets are in their connecting position, and

B. a bail shaped lever means attached to the other socket of said pair and being pivoted on opposite sides of said other socket, and having trunnion means which fit in the slots of said slotted flanges of said guide means, whereby movement of said sockets towards each other engages said trunnion means against said longer side of said slots, and then movement of said lever means moves said trunnion means into said slots and further moves said sockets towards each other into electrical contact, and opposite movement of said lever means disconnects said sockets and said contact.

22. An improved safety make-and-release means for connecting and disconnecting a pair of electrical connector sockets in insulated interfitting housings, comprising:

A. guide means attached to one of said sockets having a pair of slotted flanges, one on each side of and in front of said one socket, one side of each of which slots is longer than the other side to act as a stop, and

B. a bail shaped lever means attached to the other socket of said pair and being pivoted on opposite sides of said other socket, and having trunnion means which fit in the slots of said slotted flanges of said guide means, and wherein said lever means includes additional trunnion means for engagement with the outside of said slotted flanges to act as a stop means, whereby movement of said sockets towards each other engages said trunnion means against said longer side of said slots, and then movement of said lever means moves said trunnion means into said slots and further moves said sockets towards each other into electrical contact, and opposite movement of said lever means disconnects said sockets and said contact.

23. In a pair of telescopic electrical connector sockets having insulated housings; including:

A. a lever means pivoted to one housing and having trunnion means, and

B. two pairs of parallel lugs fastened to the other housing forming slots between the lugs of each pair for engaging said trunnion means, each pair of said parallel lugs being aligned toward and away from connectors of said sockets, whereby oscillatory movement of said lever means engages and disengages said sockets, the improvement comprising:

C. means on said housings for insuring said engagement of said trunnion means in the slots formed by said lugs, said insuring means comprising additional trunnion means on said lever for engaging the outer edges away from the lugs.

24. In a pair of telescopic electrical connector sockets having insulated housings including:

A. a lever means pivoted to one housing and having trunnion means, and

B. a pair of parallel inner and outer lugs fastened to the other housing forming slots for engaging said trunnion means, whereby oscillatory and longitudinal movement of said lever means engages and disengages and separates said sockets, respectively, the improvement comprising:

C. means on said housings for insuring the engagement of said trunnion means in the slots formed by said parallel lugs comprising an additional trunnion means on said lever for engaging the outer edge of the outer lugs.

* * * * *