

[72] Inventor **Bernard Edward Shlesinger, Jr.**
3906 Bruce Lane, Annandale, Va. 22003
 [21] Appl. No. **812,988**
 [22] Filed **Apr. 3, 1969**
 [45] Patented **July 27, 1971**

2,128,004 8/1938 Lombard..... 24/73.7 UX
 2,045,590 6/1936 Emery..... 339/229
 2,570,753 10/1951 Berg..... 339/276 (T)
 3,388,369 6/1968 Zalmans..... 339/276 (T) X
 3,416,122 12/1968 Kinkaid..... 339/276 X

FOREIGN PATENTS

1,077,821 8/1967 Great Britain..... 24/73.7

Primary Examiner—Ian A. Calvert

Attorney—Shlesinger, Arkwright and Garvey

[54] **DEFORMABLE ELECTRICAL CONNECTOR FOR CLAMPING CONDUCTORS**
38 Claims, 24 Drawing Figs.

[52] U.S. Cl..... **339/266 R,**
339/270 R, 339/276 R

[51] Int. Cl..... **H01r 5/08,**
H01r 7/20

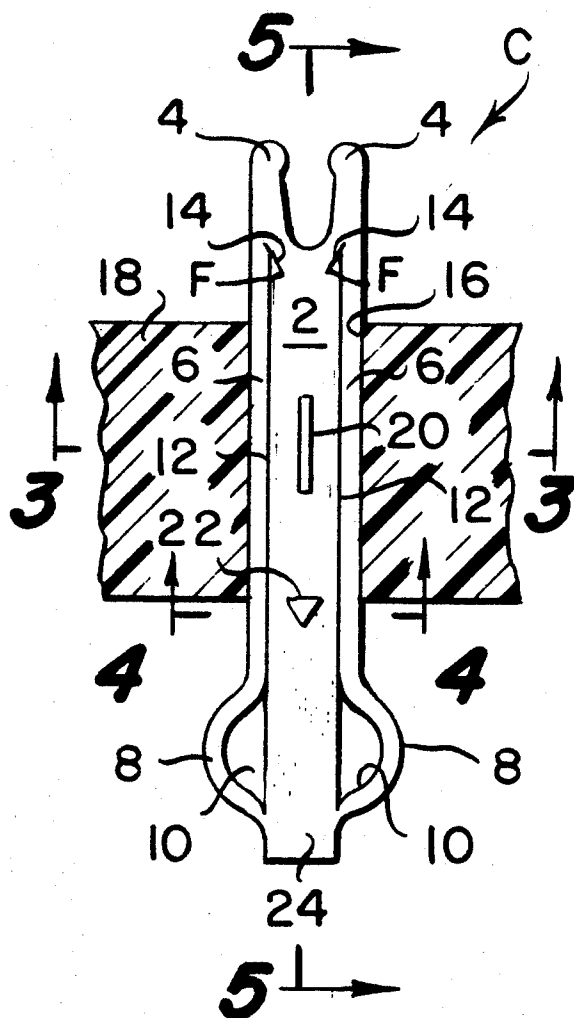
[50] Field of Search..... **339/276 T,**
229, 230, 263, 266, 270, 273; 24/73.7

[56] References Cited

UNITED STATES PATENTS

920,407 5/1909 Wachtel..... 339/270 UX
 1,594,055 7/1926 Filkins..... 339/270 X
 2,014,638 9/1935 Scofield..... 339/270 X

ABSTRACT: A deformable electrical connection for clamping conductors and the like comprising a body member having a pair of normally rigid nonmovable spaced opposed jaws formed therein and in which at least one of the jaws is deformable in a direction towards the other of the jaws. The body member supports a lever against one of the jaws for applying a closing force to the one jaw to deform it in the direction of the other jaw when the closing force is applied to the one jaw to thereby permanently clamp a conductor between the jaws.



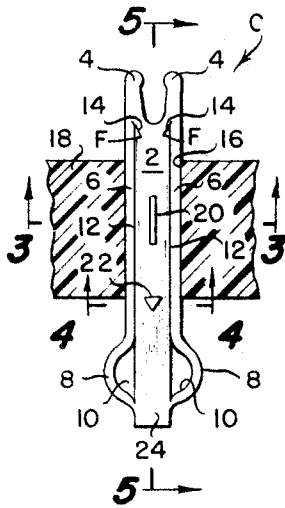


Fig. 1

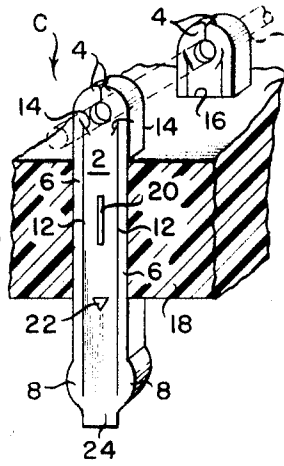


Fig. 2

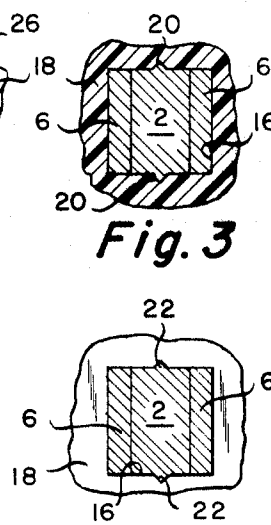


Fig. 3

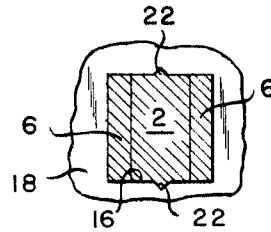


Fig. 4

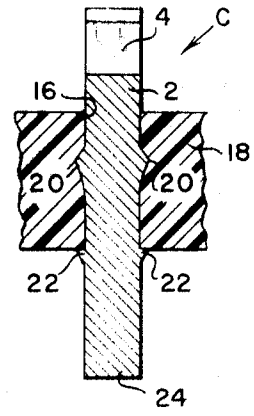


Fig. 5

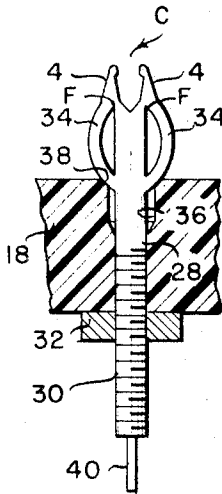


Fig. 6

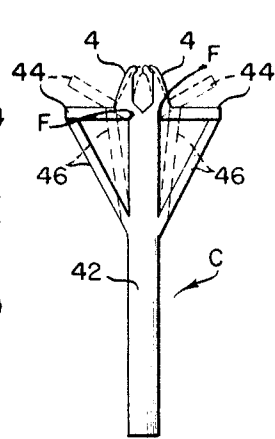


Fig. 7

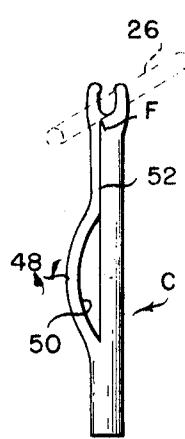


Fig. 8

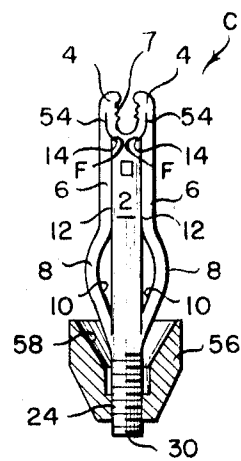


Fig. 9

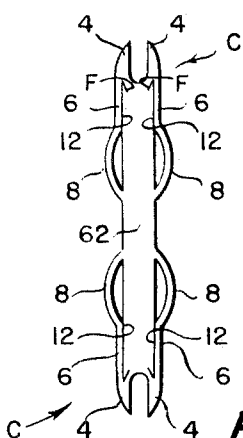


Fig. 10

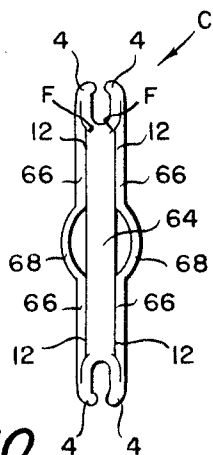


Fig. 11

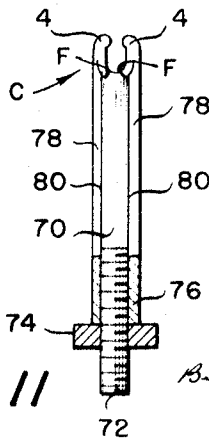


Fig. 12

INVENTOR

Bernard J. ...

BY

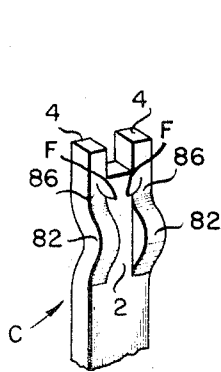


Fig. 13

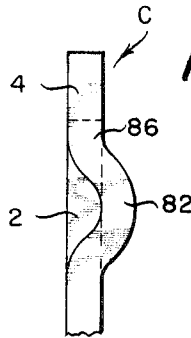


Fig. 14

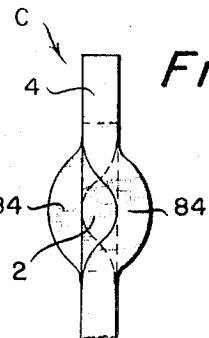


Fig. 16

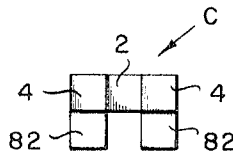


Fig. 15

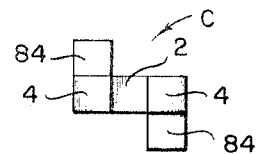


Fig. 17

Fig. 18

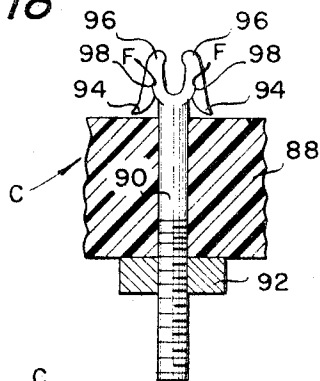


Fig. 19

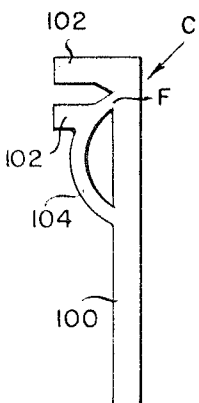
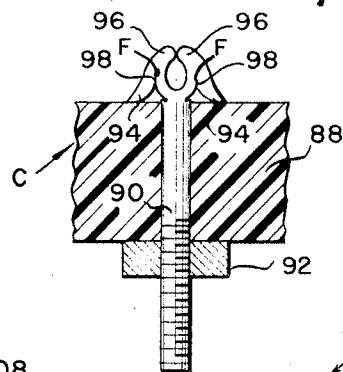


Fig. 20

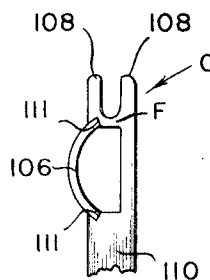


Fig. 21

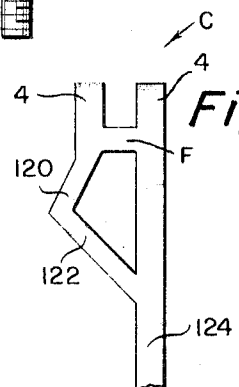


Fig. 23

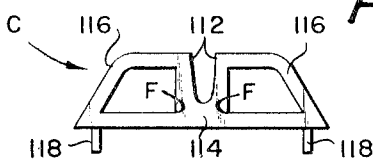


Fig. 22

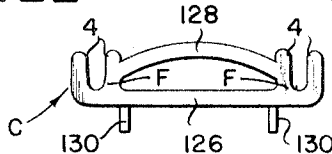


Fig. 24

INVENTOR

Bernard Edward
Thies, Jr.

DEFORMABLE ELECTRICAL CONNECTOR FOR CLAMPING CONDUCTORS

HISTORICAL BACKGROUND, OBJECTS AND SUMMARY

This invention relates to deformable clamp-type connectors which have in the past required special tooling such as disclosed in Kinkaid 3,416,122 for crimping the connectors into clamping engagement with the conductors. Usually the jaws of the connectors have been engaged directly by the tool. Such use of the tool on the jaws has at times produced malformation to the jaws, injury to closely related components and clamping difficulties because of limited space within which to work such as poor clamping action, poor connection, etc.

It is therefore an object of this invention to provide a connector which avoids all of the above problems and which is self-clamping.

It is a further object of this invention to provide a connector having clamping jaws permanently deformed in clamping engagement that can be actuated from a remote position thus avoiding contact with the jaws themselves.

Another object of this invention is to provide a clamping connector which is inexpensive to manufacture and simple in construction.

Still a further object of this invention is to provide a clamping connector which provides at all times a positive locking pressure on the conductor clamped.

A further object of this invention is to provide a clamping connector that enables the clamping of multiple conductors.

Still another object of this invention is to provide a connector which can be operated by the use of a simple pair of pliers thus avoiding the necessity of having to design or use expensive tools for operating.

To summarize, this invention involves a connector having a pair of deformable jaws which are closed by the lever principle which permits the lever to operate in conjunction with a fulcrum which can in most instances be provided in the connector itself. The lever not only acts to force the jaws together, but also serves as a special locking mechanism to prevent the jaws from reopening.

These and other objects and advantages of the invention will be apparent from a study of the following description and claims.

In the accompanying drawings which illustrate by way of example the various embodiments of this invention:

FIG. 1 is an enlarged fragmentary cross-sectional view of the connector positioned initially in a panel board or the like;

FIG. 2 is the connector of FIG. 1 after clamping and shown holding a conductor (dotted lines);

FIG. 3 is an enlarged cross-sectional view of the connector taken along the lines 3-3 in FIG. 1 and viewed in the direction of the arrows;

FIG. 4 is an enlarged cross-sectional view of the connector taken along the lines 4-4 in FIG. 1 and viewed in the direction of the arrows;

FIG. 5 is a cross-sectional view of the connector taken along the lines 5-5 in FIG. 1 and viewed in the direction of arrows;

FIGS. 6 to 12 are front elevational views of additional modifications of this invention;

FIG. 13 is a perspective view of still another modification of this invention;

FIG. 14 is a side elevation view of the modification illustrated in FIG. 13;

FIG. 15 is a top plan view of the modification illustrated in FIG. 13;

FIGS. 16 and 17 are side elevational and top plan views respectively of another modification of this invention similar to that illustrated in FIG. 13 but having opposed bows to the pair of levers;

FIGS. 18 and 19 are fragmentary cross-sectional views of still another modification of this invention showing the open and clamp positions respectively;

FIGS. 20 to 24 are front elevational views of additional modifications of this invention.

FIGURES 1 THRU 5

In FIG. 1 the electrical connector comprises a body member C having a central shank 2. The body member C is provided with a pair of jaws 4. The jaws are formed and integral with the body member and in spaced relation to each other. A pair of levers 6 extend downwardly of the shank 2 and are integrally connected to the jaws 4. The bases of the levers 6 are provided with bows 8. The jaws 4 may include gripping teeth 7 (FIG. 9). The bottoms of the bows 8 are integrally connected to the central shank 2. It is to be noted that the bows 8 provide open areas 10 for purposes hereinafter described. The levers 6 may be formed by cutting through the body member C or by forming slots or weakened areas such as score lines and the like 12. It is to be noted in FIG. 1, that the slots 12 are further weakened in the area of the jaws 4 by additional slots or score lines 14 the base of which provides hinge or fulcrum F. The electrical connector body as shown in FIG. 1 is inserted into an opening 16 in the panel board 18 or the like. It is obvious that the connector can be used for many different purposes and need not necessarily be inserted in a panel board.

The body member C is provided with a locking wedge surface 20 for engagement with the sidewalls of the slot 16 as best illustrated in FIGS. 3, 4 and 5. A stop member 22 is provided also in the body member C. The locking wedge 20 permits the body member of the electrical connector C to be readily inserted into the panel board but makes it difficult to remove. The stop member 22 limits the depth of insertion. The shank 2 at its remote end is provided with a post 24 which may be of any desired length for purposes of making a connection thereto, such as by wire-wrap or by clip connection etc.

The body member itself may be of various cross-sectional configurations such as round, hexagonal, square or the like.

OPERATION

In operation of the invention illustrated in FIGS. 1 thru 5, when the body member C is inserted into the panel board fully up to its stop 22, a pliers or like tool is applied in the area of the bows 8 and the bows are flattened against the shank 2 as best illustrated in FIG. 2. The flattening of the bows 8 as best illustrated in FIG. 2 applies a lever force on the levers 6 and against the jaws 4 causing them to be forced together around the electrical conductor 26. The flattening of the bows 8 in effect provides a locking action against the jaws 4 maintaining a locking action on the electrical conductor 26.

The body member C may be made entirely of metal or it may be made of a plastic material which is coated with a conductor material, or it may be made of a conductive plastic or the like.

It is obvious that the levers 6 be of sufficient strength so that they will apply the lever force to the jaws 4 and not collapse before the completion of the closing action. The material from which the body member is made, may be of a difficulty deformable metal or conductive plastic or the like. This is so that the jaws 4 will not open after the clamping pressure has been applied to the bows 8.

FIGURE 6

In FIG. 6, the body member C is provided with a shank 28 which is provided with a threaded end 30 for receiving a forcer nut 32. Adjacent the jaws 4 and extending from the shank 28 are a pair of bowed lever arms 34. The jaws pivot about fulcrum F.

The forcer nut draws the body member C downwardly into the opening 36 in the panel board 18. It is to be noted that the upper portion of the opening 36 is provided with cam shoulders 38 for the purpose of camming the bowed lever arms 34 inwardly as the forcer nut 32 is threaded onto the threaded end 30 of the shank 28. In so doing, the bowed lever arms 34 are collapsed against the sides of the shank 28 thereby causing

3

the jaws 4 to come together and grip any conductor which is inserted therebetween. The shank 28 is provided with a binding post 40 for electrical connection in a manner as heretofore mentioned with regard to post 24.

FIGURE 7

In FIG. 7, the body member C is provided with a shank 42. Adjacent the jaws 4 are a pair of lever arms 44 which extend outwardly therefrom. A second pair of lever arms 46 are also provided for engagement with the lever arms 44. When the lever arms 46 are collapsed against the sides of the shank 42, they force the lever arms 44 upwardly thereby closing the jaws 4 about an electrical conductor which has been put therebetween. The final position of the jaws 4 is illustrated by the dotted lines in FIG. 7. It is to be noted that the lever arms 44 and the second pair of lever arms 46 are not connected at their ends in order to provide a sliding action therebetween.

FIGURE 8

FIG. 8 is a slight modification of the body member C as illustrated in FIG. 1 with the exception that instead of there being two levers, there is only one lever 48. The lever 48 is bowed so as to provide an opening 50. The slotted or weakened area 52 is provided in the same manner as are slots or score lines 14 as illustrated in FIG. 1 for example.

FIGURE 9

FIG. 9 is a connector similar to that illustrated in FIG. 1 with the exception that there are provided additional weakened areas such as slots or score lines 54. These score lines may be added as desired in order to enable the levers 6 to better operate against the jaws 4 when crimp pressure is applied to the bows 8 of the levers.

It should be noted that the bows 8 in FIG. 9 are placed a substantial distance from the jaws 4 whereas the bows 34 in FIG. 6 are placed closely to the jaws 4. Suitable score lines could also be provided for the structure illustrated in FIG. 6. It should also be pointed out that the post end portion 24 in FIG. 9 may also be threaded as at 30 for providing a nut 56 having a cam surface 58 for the purpose of applying a camming pressure to the bows 8 to thus operate the jaws 4 for closing action. It will be noted that the nut has a recess 60 for the purpose of permitting the cam surfaces 58 to operate against the bows 8 as the nut is threaded down on the threaded end 30.

FIGURES 10 and 11

FIG. 10 shows a pair of connector body members C secured in opposed relation by a shank 62. It will be noted that they are individually operated.

FIG. 11 shows a slightly different configuration in which the shank 64 connects two pairs of jaws 4 which are operable by means of a single pair of levers 66 having central bows 68. The usual slots or weakened area 12 are provided. In this modification, the clamping pressure applied to the bowed area 68 will function to close both pairs of jaws 4 simultaneously.

FIGURE 12

FIG. 12 shows the electrical connector body member C as having a shank 70 with a threaded end 72. A nut 74 applies pressure to a thrust washer ring 76. The washer ring abuts the levers 78 which are straight and have no bows therein and which are free at their ends to bear against the thrust washer ring 76. The usual slots or weakened areas 80 are provided. When the nut 74 applies thrust pressure to the washer ring 76, the levers 78 in turn apply closing pressure to the jaws 4.

FIGURES 13 THRU 17

In FIG. 13, the jaws 4 are closed by flattening the bows 82 of the levers 86. In FIG. 13 it will be noted that the bows 82 project outwardly from the same side of the electrical connector body member C. The planes of the bows 82 are perpendicular

4

to the plane in which the jaws 4 lie. This can best be seen in FIGS. 14 and 15.

In FIG. 16, the bows 84 lie in planes perpendicular to the plane in which the jaws 4 lie but the bows clamping curved in opposite directions as illustrated in FIGS. 16 and 17 rather than in the same direction as the bows 82 as shown in FIG. 13.

Flattening of the bows 82 or 84 into the plane of the jaws 4 causes the jaws 4 to come together in clamping action so as to engage any conductor which may have been placed between the jaws 4.

FIGURES 18 AND 19

In FIGS. 18 and 19, the panel board 88 is provided with openings for receiving the electrical connector body member C. The shank 90 is threaded and a nut 92 causes the connector member C to be drawn downwardly so that the levers 94 bear against the top surface of the panel board 88. Upon pressure engagement with the top surface, the levers force the jaws 96 to close. It will be noted that weakened areas such as 98 are provided to permit ease in operation so that good positive clamping pressure can be obtained. FIG. 19 shows the closed position of the clamping jaws 96.

FIGURES 20 THRU 24

FIG. 20 shows a further embodiment in which the shank 100 is provided with jaws 102 which are transverse to the longitudinal axis of the shank 100. The lever bow 104 connects to one of the jaws 102 as well as to the shank 100.

FIG. 21 provides a removable bowed lever 106. It will be noted that the lever 106 operates against the jaws 108 which are integral with the shank 110. The operation in both FIGS. 20 and 21 is substantially the same as that described in previous FIGS. The bowed levers 104 and 106 are flattened out against the shank 100 and 110 respectively. This as earlier described causes the jaws to come together for the purpose of grasping a conductor. Lever 106 is held compressed on notches 111.

FIG. 22 provides jaws 112 that are perpendicular to the longitudinal axis of the connector body member C. The shank 114 of the connector extends in a horizontal plane as illustrated in the drawings and is perpendicular to the jaws 112. Extending between the shank 114 and the top of the jaws 112 are a pair of bowed levers 116. The electrical connector body member C is provided with lugs 118 which are used for positioning the electrical connector body member in proper position in a panel board not shown.

In FIG. 23, the jaws 4 are closed by causing the integrally connected levers 120 and 122 to collapse against the side of the shank 124. It will be noted that the levers 120 and 122 are angularly disposed with respect to each other.

In FIG. 24, the shank is substantially parallel to the bowed lever 128 which connects two pairs of jaws 4 mounted on either end of the shank 126. Lugs 130 are provided for the purpose of locating the connectors on the panel boards in the proper relationship. It will be obvious in FIG. 24 that the depression of the bowed lever 128 in the direction of the shank 126 will cause the inner jaw members 4 of each pair of jaws to deform in the direction of the outer jaws 4. If an electrical conductor is laid between each pair of jaws 4, a crimping or clamping pressure will be placed on the conductors when the bowed lever arm 128 is flattened against the shank 126.

Lugs 130 are also provided for positioning purposes as heretofore described.

While this invention has been described in connection with different embodiments thereof, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art of which the invention pertains, and as may be applied to the essential features herein-before set forth and as fall within the scope of the invention or the limits of the appended claims.

I claim:

1. A deformable electrical connector for clamping conductors and the like comprising:
 - a. a body member of permanently deformable material including a substantially nonflexible shank
 - b. a pair of normally rigid nonmovable spaced opposed jaws connected to said shank
 - c. at least one of said jaws being permanently deformable in a direction toward the other of said jaws
 - d. said body member supporting a permanently deformable lever against said at least one of said jaws and movable relative to said shank
 - e. said lever having one end terminating in a fulcrum integral with said body member
 - f. said lever extending from said at least one deformable jaw adjacent said shank, and
 - g. means movable relative to said shank on said body member for applying a constant force to said lever to maintain said jaws in claiming engagement with a conductor when said means have been moved relative to said shank.
2. A deformable electrical connector as in claim 1 and wherein:
 - a. said lever is an arm extending from said at least one of said jaws.
3. A deformable electrical connector as in claim 2 and wherein:
 - a. said arm extends transversely to the longitudinal axis of said body member.
4. A deformable electrical connector as in claim 2 and wherein:
 - a. said arm extends in a direction parallel to the longitudinal axis of said body member.
5. A deformable electrical connector as in claim 2 and wherein:
 - a. the shortest distance between said at least one of said jaws and said fulcrum is less than the length of said lever arm.
6. A deformable electrical connector as in claim 5 and wherein:
 - a. said lever arm has a portion extending parallel to the longitudinal axis of said body.
7. A deformable electrical connector as in claim 2 and wherein:
 - a. said body member in the area where said lever member is supported against said at least one of said jaws includes a structurally weakened area for forming a hinge about which said at least one of said jaws pivots when said lever applies a closing force against said at least one of said jaws.
8. A deformable electrical connector as in claim 2 and wherein:
 - a. said lever is a separate part of said electrical connector.
9. A deformable electrical connector as in claim 2 and wherein:
 - a. said lever has a bow therein.
10. A deformable electrical connector as in claim 2 and wherein:
 - a. said jaws are offset from the longitudinal axis of said body member.
11. A deformable electrical connector as in claim 2 and wherein:
 - a. said jaws are axially aligned with the longitudinal axis of said body member.
12. A deformable electrical connector as in claim 2 and wherein:
 - a. said jaws are transverse to the longitudinal axis of said body member.
13. A deformable electrical connector as in claim 2 and including:
 - a. a second lever bearing against said first mentioned lever.
14. A deformable electrical connector as in claim 2 and wherein:
 - a. said electrical connector includes a lever forcing member.

15. A deformable electrical connector as in claim 14 and wherein:
 - a. said lever forcing member is a nut, and
 - b. said body member is threaded to receive said nut.
16. A deformable electrical connector as in claim 14 and wherein:
 - a. said forcing member includes a sleeve seated on said body member.
17. A deformable electrical connector as in claim 2 and wherein:
 - a. said fulcrum for said lever arm is integral with said body member and said lever arm.
18. A deformable electrical connector as in claim 2 and wherein:
 - a. said fulcrum for said lever arm is a stop on said body member against which said lever arm rests.
19. A deformable electrical connector as in claim 2 and including:
 - a. one of said lever arms extending from each of said jaws.
20. A deformable electrical connector as in claim 19 and wherein:
 - a. said lever arms are transverse to the longitudinal axis of said body member.
21. A deformable electrical connector as in claim 19 and wherein:
 - a. said lever arms each have one end terminating in a fulcrum integral with said body member.
22. A deformable electrical connector as in claim 19 and wherein:
 - a. said lever arms lie in the same plane as said jaws.
23. A deformable electrical connector as in claim 22 and wherein:
 - a. said lever arms are bowed in diverse directions.
24. A deformable electrical connector as in claim 19 and wherein:
 - a. said lever arms lie in a plane transverse to the plane of said jaws.
25. A deformable electrical connector as in claim 24 and wherein:
 - a. said lever arms are bowed in the same direction.
26. A deformable electrical connector as in claim 24 and wherein:
 - a. said lever arms are bowed in diverse directions.
27. A deformable electrical connector as in claim 19 and wherein:
 - a. said body member includes a second pair of said jaws spaced on said body member from said first mentioned pair.
28. A deformable electrical connector as in claim 27 and wherein:
 - a. said second pair of jaws and said first mentioned pair of jaws have the same lever arms.
29. A deformable electrical connector as in claim 27 and wherein:
 - a. said second pair of jaws includes a second pair of jaws includes a second pair of lever arms independent of said other lever arms.
30. A deformable electrical connector as in claim 2 and wherein:
 - a. said body includes a second pair of jaws spaced on said body member from said first mentioned pair, and
 - b. said pairs of jaws being transverse to the longitudinal axis of said body member.
31. A deformable electrical connector as in claim 30 and wherein:
 - a. said lever arm is single and operates both pairs of said jaws.
32. A deformable electrical connector as in claim 1 and wherein:
 - a. said lever forms an opening between it and said body member.
33. A deformable electrical connector as in claim 32 and wherein:
 - a. said opening is in the upper portion of said body member.

7

8

34. A deformable electrical connector as in claim 32 and wherein:

a. said opening is the center portion of said body member.

35. A deformable electrical connector as in claim 32 and wherein:

a. said body member has upper and lower portions, and

b. said opening is in said lower portion of said body member, and

c. said jaws are in said upper portion of said body member.

36. A deformable electrical connector as in claim 1 and

wherein:

a. said lever has a bow therein.

37. A deformable electrical connector as in claim 36 and wherein:

a. said bow lies in the plane of said jaws.

38. A deformable electrical connector as in claim 36 and wherein:

a. said bow lies in a plane transverse to the plane of said jaws.

15

20

25

30

35

40

45

50

55

60

65

70

75

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,596,236 Dated July 27, 1971

Inventor(s) Bernard Edward Shlesinger, Jr.

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

In Claim 1, line 19, change "claiming" to --clamping--.

Signed and sealed this 25th day of January 1972.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents