

Aug. 23, 1966

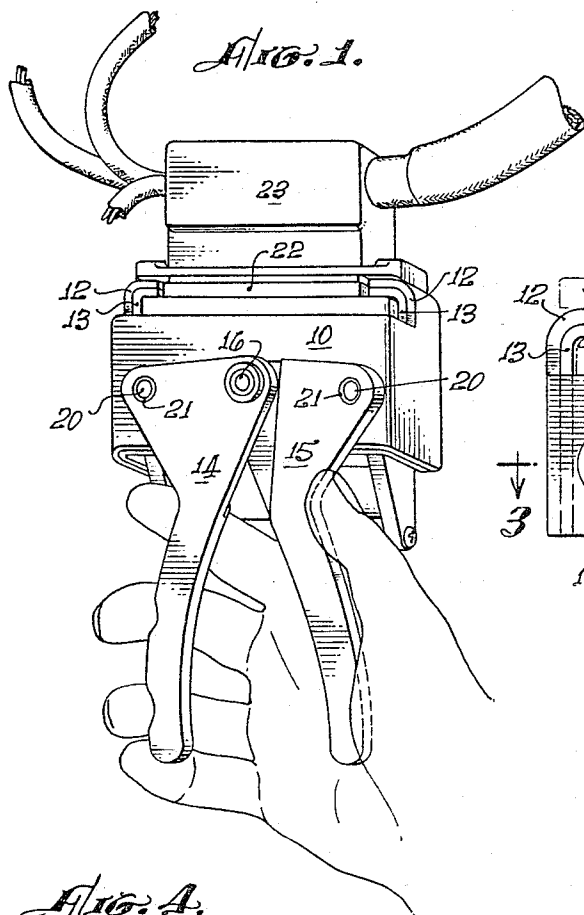
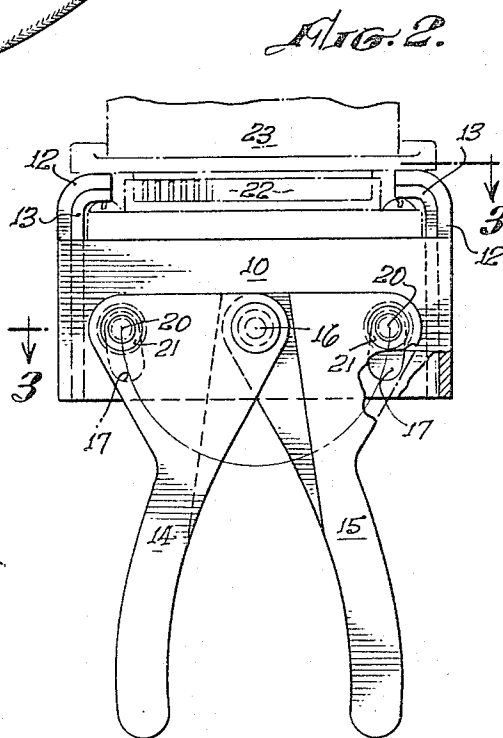
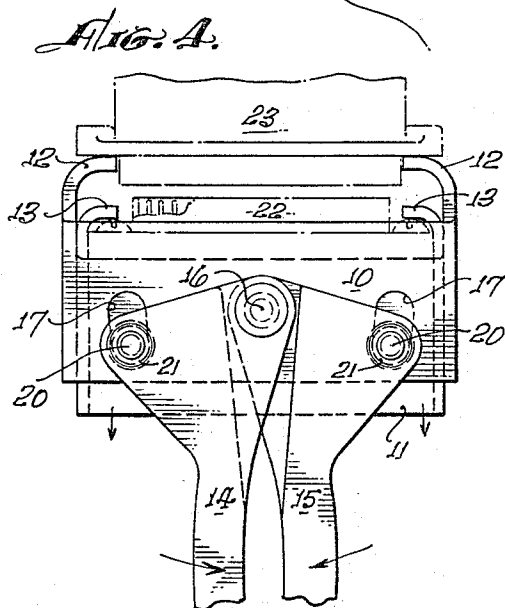
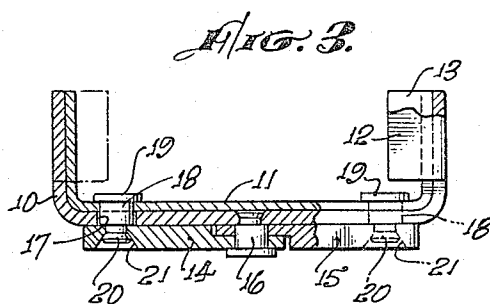
M. A. STUHLER

3,267,565

MULTIPLE CONNECTOR TOOL

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2 Sheets-Sheet 1



INVENTOR.

MARTIN A. STUHLER,

By

John W. Haywood

ATTORNEY.

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Fig. 5.

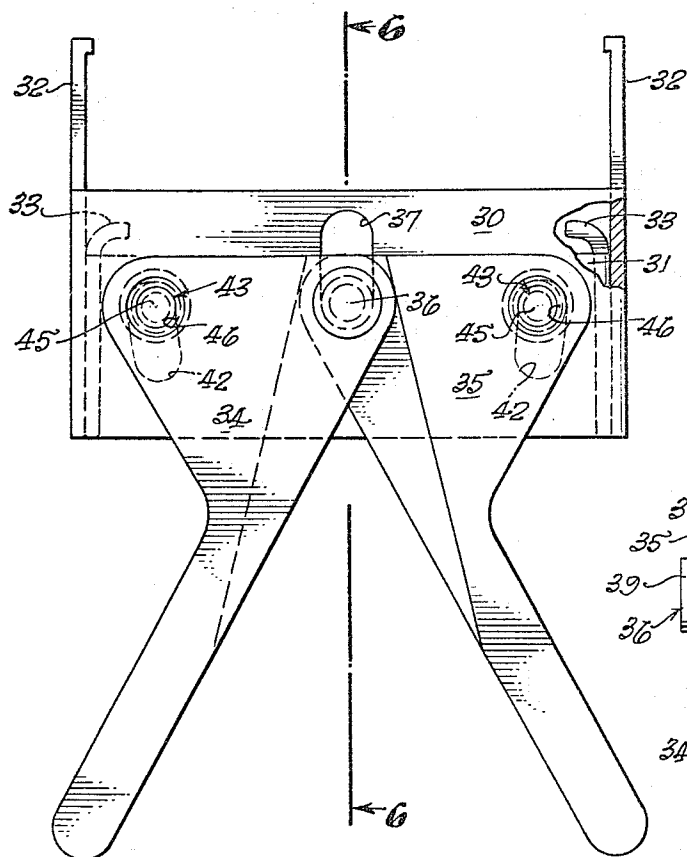
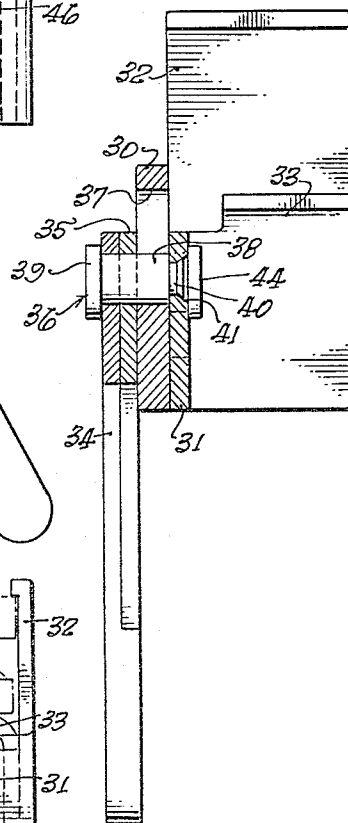
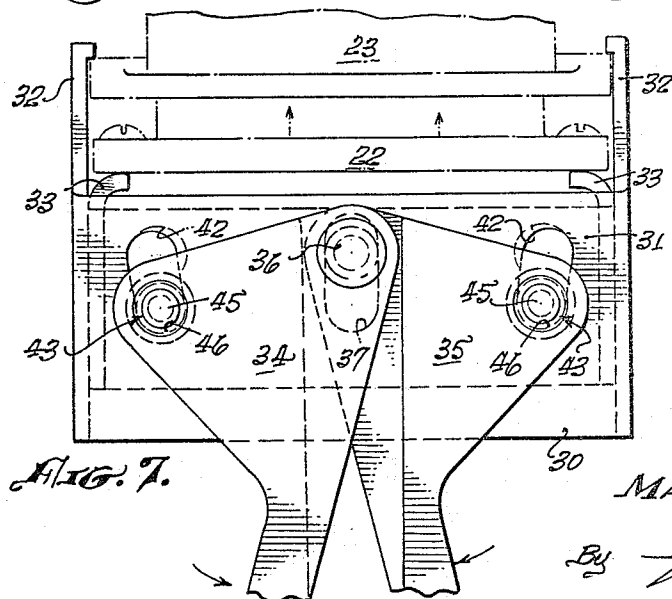


Fig. 6.



INVENTOR.

MARTIN A. STUHLER,

By *John H. Wood*
ATTORNEY.

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3,267,565

MULTIPLE CONNECTOR TOOL

Martin A. Stuhler, Lemon Grove, Calif., assignor to
General Dynamics Corporation, Pomona, Calif.,
a corporation of Delaware

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12 Claims. (Cl. 29-206)

This invention relates to electrical equipment, and more particularly to tools for simultaneously and quickly connecting or disconnecting multiple electrical connectors.

The art of multiple electrical connectors is old and replete with patents covering designs used in many industries such as transportation, electric power generation and transmission, industrial and business machines, and aircraft, military and space vehicles. A problem arises when the electrical connectors are designed to carry relatively large electrical currents and the number of circuits joined by the connector increases as our technology becomes more complex. The higher the electrical load carried by the circuits, the larger the current-carrying part of the connector must be made. The mating contacts, whether they be pins and sockets or blades and spring clips, are made larger in size and with a tighter fit to provide a good electrical path between the joined conductors so as to avoid areas of high resistance in the circuits which might result in electrical arcing and premature failure. With the tighter fit, it becomes increasingly difficult to connect or disconnect the mating components without damage to the contacts.

Also, in some electrical arts, particularly in communications, where a great many individual circuits must be made and broken frequently, it is customary, in order to save space, to enclose the wires, insofar as it may be feasible, in cables. At the end of such a cable will be arranged a multiple-terminal contact member or plug. A cooperating female terminal member, which may correspond in size to the plug, but may be in the form of a large board, is adapted to receive the plug, and thus make the various circuits. The terminals of the plug and the cooperating receiving member are so shaped and arranged that only proper circuits can be made, it being impossible to insert the plug improperly. Again, each male terminal member of the plug must fit snugly within its cooperating female terminal member. It is thus necessary to insert the male member properly and the friction load is such that removal is difficult, and thus sometimes results in loose, bent, or twisted terminals which require careful repair before the plug is again fit for use.

Therefore, it is an object of this invention to provide simple mechanical means for readily connecting or disconnecting electrical connectors.

Another object of the invention is to provide mechanical tools for connecting or disconnecting electrical connectors wherein the force applied thereto may always be in a line substantially parallel to the length of the male terminal members.

Another object of the invention is to provide means whereby a multiplicity of electric conductors may be simultaneously and quickly connected or disconnected.

Other objects of the invention will become readily apparent from the following description and accompanying drawings wherein:

FIG. 1 is a perspective view of an embodiment of the invention illustrating it as a disconnect or separation tool;

FIG. 2 illustrates the FIG. 1 tool in its inactivated position;

FIG. 3 is a partial cross-sectional view of the FIG. 1 tool taken along the line 3-3 of FIG. 2;

FIG. 4 illustrates the activated position of the FIG. 1 tool;

FIG. 5 is a plan view of an embodiment of the invention

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illustrating it as a connect or installation tool with portions thereof being cut away;

FIG. 6 is a cross-sectional view taken along the line 6-6 of FIG. 5; and

FIG. 7 is a view of the FIG. 5 tool illustrating its direction of movement.

Broadly, the invention relates to tools for installing or separating the two halves of an electrical connector structure. The structure of the tools comprises two jaw members, one inside the other, with each jaw member having a pair of intumed flanges, and a pair of plier-like handles pin-hinged to the jaw members. In the case of the installing tool, the jaw and handle coupling is such that the inner jaw flange pair is longitudinally spaced from the outer jaw flange pair when the handles are open, with the inner jaw member sliding within the outer member to bring the respective flanges together as the handles are closed, thereby squeezing the connector halves held between the inner and outer flange pairs together with a steady parallel acting force. When coupled as a separating tool, the jaw flanges are adjacent one another when the handles are open, with the inner jaw member sliding longitudinally within the outer member to separate the respective flanges, and the connector halves coupled therewith, as the handles are closed, again with a steady parallel acting force.

Referring now to the drawings, FIGS. 1-4 illustrate an embodiment of the invention wherein the separation tool structure consists of a pair of jaw members 10 and 11, each comprising a pair of jaws 12 and 13, respectively; and a pair of plier-like handle members 14 and 15 attached to and hinged for movement about outer jaw member 10 via a pin 16 which extends therethrough (see FIG. 3). Outer jaw member 10 is provided with a pair of arcuate or kidney-shaped slots or apertures 17 through which the body portion of pins 18 extend. Pins 18 have head portions 19, which abut against inner jaw member 11, and reduced diameter end portions 20, which are swaged or expanded in countersunk apertures 21 in handles 14 and 15 (see FIG. 3). Pin 16 is of essentially the same configuration as described with respect to pins 13. Note that the construction of handles 14 and 15 is essentially the same except for the countersink of aperture 21 being on opposite sides and the handles being reversely mounted.

In operation, the FIGS. 1-4 tool is used by applying a squeezing pressure to the handles 14 and 15, which move the inner jaw member 11 and jaws 13 with respect to outer jaw member 10 and jaws 12, forcing apart a male member or plug 22 and a female member or receiver 23 of a multi-pin electrical connector (see FIG. 4). Male and female members 22 and 23 are forced apart with a steady and evenly distributed parallel pressure, thereby separating the connector without bending or breaking the pins of the male member 22, the parallel pressure being applied in a line substantially parallel to the length of the male terminal members or pins. The parallel pressure created by the tool is due to the cam-like action or movement of pins 18 within slots 17, pins 18 being fixed to handles 14 and 15 and abutted against inner member 11 so that as the handles are moved toward each other the pins 18 move through slots 17, thus carrying inner member 11 without movement of outer member 10 on which handles 14 and 15 pivot due to the connection of pin 16.

FIGS. 5-7 illustrate an embodiment of the invention wherein the installation tool structure consists of a pair of jaw members 30 and 31, each comprising a pair of jaws 32 and 33, respectively; and a pair of plier-like handle members 34 and 35 attached to and hinged for movement about jaw members 30 and 31 via a pin 36. Outer jaw member 30 is provided with a slot 37 within which a body portion 38 of pin 36 is adapted to move upon move-

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ment of handle members 34 and 35. As shown in FIG. 6, pin 36 also includes a head 39, which abuts against handle member 34, and a reduced diameter end portion 40 which is swaged or expanded in a countersunk aperture 41 in inner jaw member 31. Inner jaw member 31 is provided with a pair of arcuate or kidney-shaped slots or apertures 42 through which pins 43, which interconnect handles 34 and 35 with inner jaw member 31, move upon movement of the handles. Pins 43 include head portions 44, which abut against inner jaw member 31, body portions, which extend through handles 34 and 35 and outer jaw member 30, and reduced diameter end portions 45, which are swaged or expanded in countersunk apertures 46 in handles 34 and 35 which are essentially the same configuration as aperture 41 in inner jaw member 31.

In operation, the FIGS. 5-7 tool is used by applying a squeezing pressure to the handles 34 and 35, which move the inner jaw member 31 and jaws 33 with respect to outer jaw member 30 and jaws 32, pulling together male member or plug 22 and female member or receiver 23 (see FIG. 7). As with the FIGS. 1-4 tool, male and female members 22 and 23 are pulled together with a steady and evenly distributed pressure parallel with respect to the length of the male terminal members or pins. This parallel pressure is created due to the cam-like action or movement of pins 43 within slots 42 of jaw member 31 and the movement of the pivot point of handles 34 and 35 due to the pin 36 moving in slot 37 of jaw member 30. As handles 34 and 35 are squeezed together pins 43 move downwardly, as shown in FIG. 7, in slots 42 while the handle pivot point or pin 36 moves upwardly in slot 37, thereby providing movement of jaws 32 and 33 toward each other which movement forces or pulls male member 22 into proper contact alignment with female member 23.

It has thus been shown that the present invention provides simple and effective tools for connecting or disconnecting male and female members of a multi-pin connector without damage thereto.

Although particular embodiments have been illustrated and described, modification will become apparent to those skilled in the art, and it is intended to cover in the appended claims all such modifications as come within the spirit and scope of the invention.

What I claim is:

1. A tool adapted for connecting and disconnecting multi-pin electrical connectors comprising a first member slidably positioned within a second member, each of said first and second members being provided with jaw-like portions, a pair of handle members pivotally connected to one of said first and second members, one of said first and second members being provided with a pair of slots extending therethrough, and pin means connecting the other of said first and second members to said handle members, said pin means being adapted to move within said slots of said one member to allow movement between said first and second members upon movement of said handle members.

2. The tool defined in claim 1, wherein said slots are of an arcuate configuration.

3. The tool defined in claim 1, wherein said handle members are pivotally connected to said second member, and wherein said pair of slots are in said second member, whereby movement of said handle members toward each other moves the jaw-like portions of said first member in a direction away from the jaw-like portions of said second member.

4. The tool defined in claim 3, wherein said pair of slots are of a kidney-shaped configuration.

5. The tool defined in claim 1, wherein said handle members are pivotally connected to said first member,

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wherein said pair of slots are in said first member, and wherein said second member is additionally provided with another slot within which the pivotal connection between said handle members and said first member is adapted to move, whereby movement of said handle members toward each other moves the jaw-like portions of said first member in a direction toward the jaw-like portions of said second member.

6. The tool defined in claim 5, wherein said pair of slots are of a kidney-shaped configuration.

7. A tool adapted for connecting and disconnecting multi-pin electrical connectors comprising: a first member having a body portion and a pair of flange portions, said flange portions each having a protruding member with end portions extending toward one another; a second member having a body portion and a pair of flange portions, said flange portions each having a protruding member with end portions extending toward one another; said first member being positioned between said flange portions of said second member and adapted to move with respect thereto; handle members pivotally connected to one of said first and second members, one of said first and second members being provided with at least one pair of slot-like apertures, and means interconnecting the other of said first and second members with said handle members, said means being adapted to move within said slot-like apertures to allow movement between said first and second members upon movement of said handle members.

8. The tool defined in claim 7, wherein said slot-like apertures are of an arcuate configuration.

9. The tool defined in claim 7, wherein said handle members are pivotally connected to said second member, and wherein said slot-like apertures are in said second member, whereby movement of said handle members in a direction toward each other moves said end portions of said first member in a direction away from said end portions of said second member.

10. The tool defined in claim 9, wherein said slot-like apertures are of a kidney-shaped configuration.

11. The tool defined in claim 7, wherein said handle members are pivotally connected to said first member, wherein said slot-like apertures are in said first member, and wherein said second member is additionally provided with another aperture within which the pivotal connection between said handle members and said first member is adapted to move, whereby movement of said handle members toward each other moves said end portions of said first member in a direction toward said end portions of said second member.

12. The tool defined in claim 11, wherein said slot-like apertures are of a kidney-shaped configuration.

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JOHN F. CAMPBELL, *Primary Examiner*.

THOMAS H. EAGER, *Examiner*.