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Anderson

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[54] **GANG CONNECTOR ASSEMBLY FOR TELEPHONE CABLE TERMINAL BOARD**

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[52] **U.S. Cl.** .....**200/51 R,** 179/175 R, 179/96, 339/150 B

[51] **Int. Cl.**.....**H01h 13/70**

[58] **Field of Search**.. 179/175 R, 96; 339/151 B, 150 B; 200/51 R

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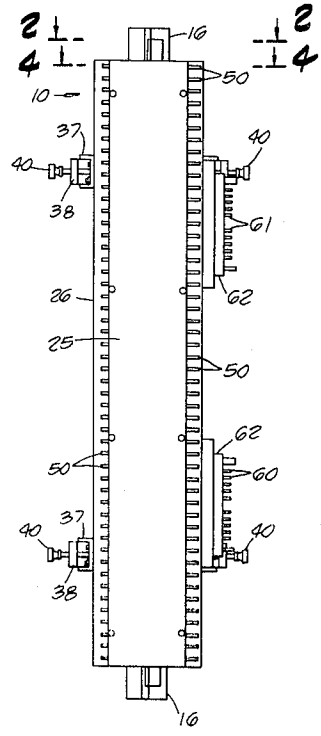
Primary Examiner—H. O. Jones

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[57] **ABSTRACT**

A gang connector assembly readily telescoped over the front of a telephone cable terminal board to make a separate connection to each terminal strip of the board. For this purpose the connector has a separate, resilient, conductive strip positioned to have multi-pronged wiping contact with each wire terminal strip carried by a terminal board. Additionally the connector is equipped with one or more pairs of manually adjustable clamps engageable with the opposite sides of a terminal board structure to clamp it in its installed position and readily released when the servicing operation has been completed.

9 Claims, 6 Drawing Figures



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SHEET 1 OF 2

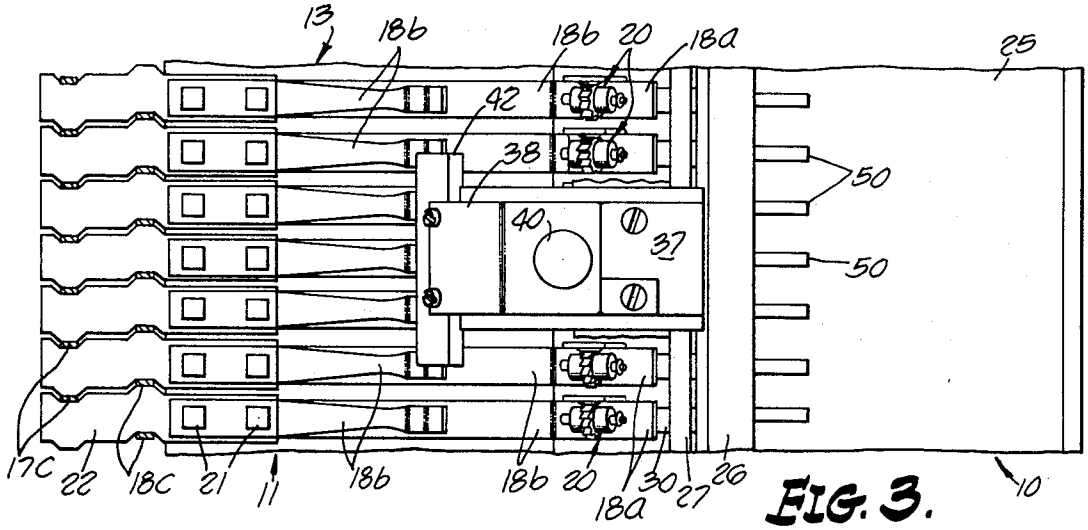


FIG. 3.

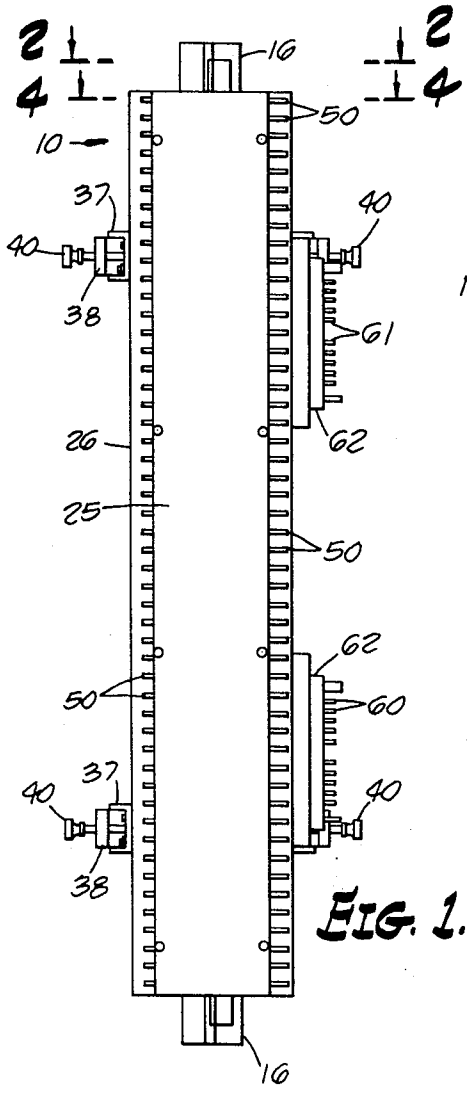


FIG. 1.

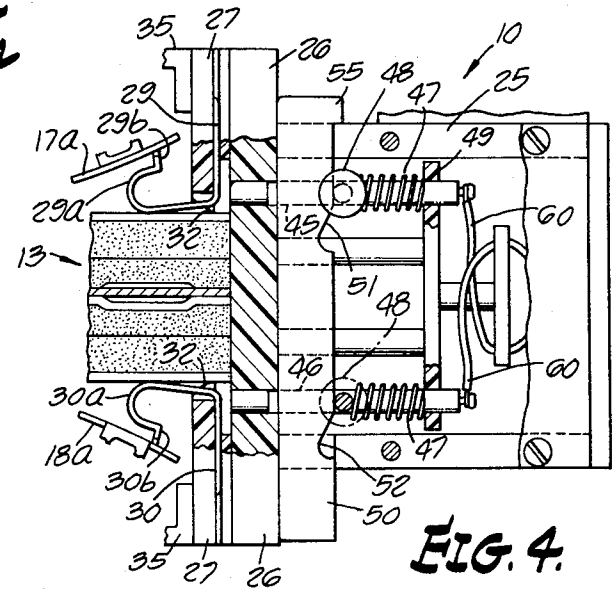


FIG. 4.

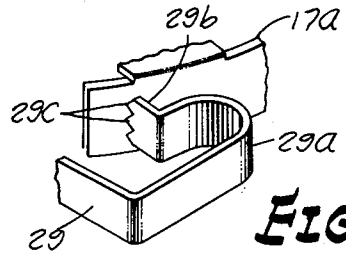


FIG. 5.

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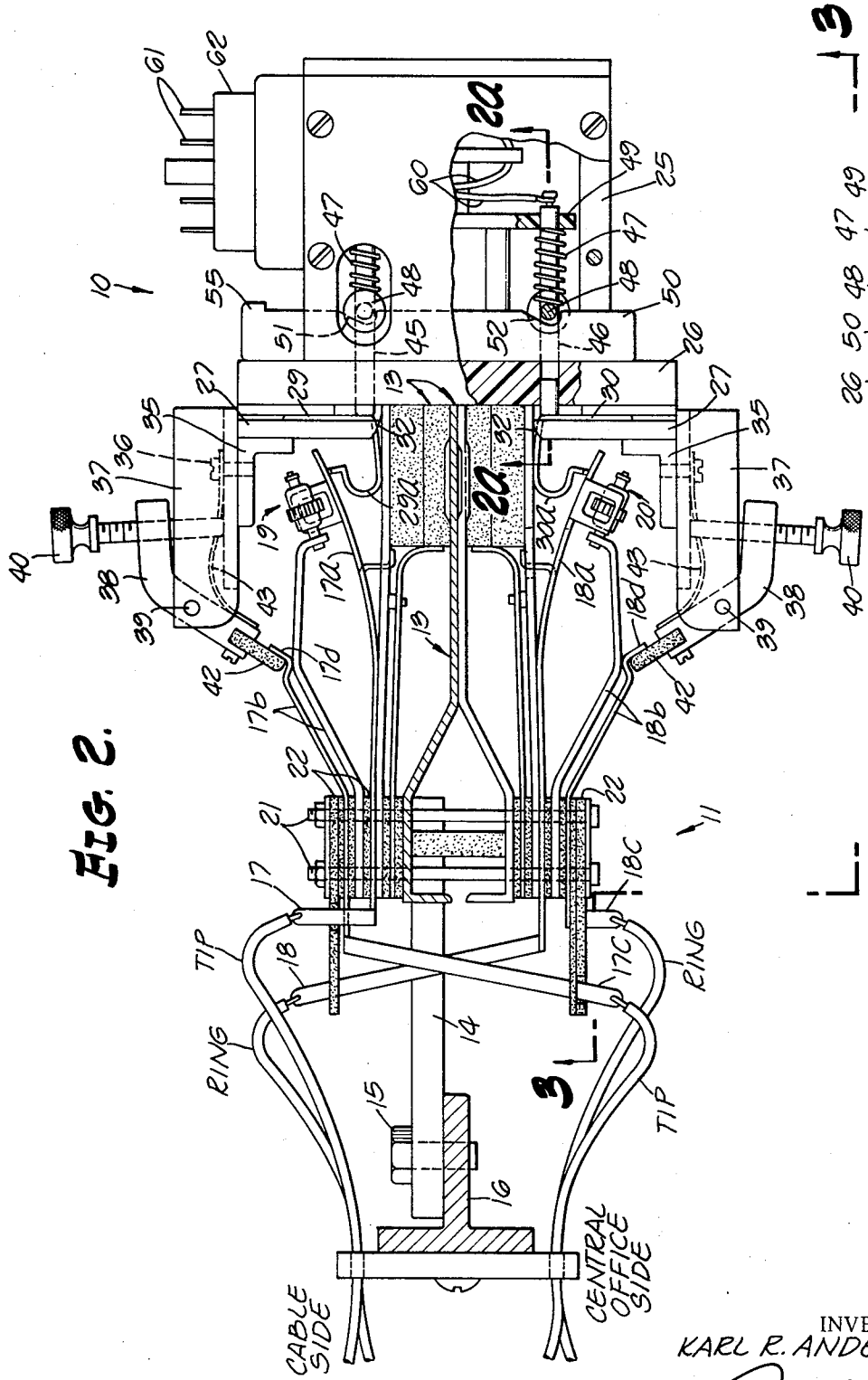


FIG. 2.

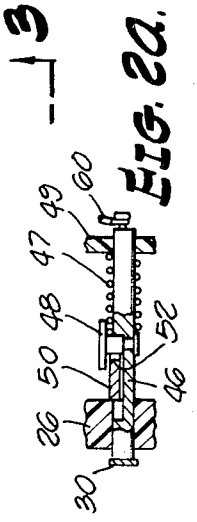


FIG. 2a.

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GANG CONNECTOR ASSEMBLY FOR TELEPHONE CABLE TERMINAL BOARD

This invention relates to multi-conductor gang connector assembles, and more particularly to an improved gang connector readily telescoped over the front face of one conventional type of telephone cable terminal board and including provision for selectively connecting each cable conductor to testing or other servicing equipment.

One conventional type of telephone cable terminal board in wide use presents unusual and peculiar servicing problems. This is due to the special construction of the board and the fact that the line protector devices are arranged in two rows between outwardly projecting pairs of resilient fingers having their inner ends anchored to the base of the board. The two rows of fingers and the line protectors supported therein are separated from one another by a divisional partition further complicating the problem of providing gang connector means capable of being coupled to these strips in gang fashion to provide reliable, positive electrical connections. Additionally, there is a lack of rigid structure engageable by the gang connector assembly and to which the latter assembly may be temporarily anchored while checking and testing operations are in progress.

Owing to the foregoing problems it has been customary and necessary for service personnel to manually manipulate test probes and hold these probes in contact with individual terminal strips of this type of terminal board while other personnel operate test equipment and receive oral advices from the probe operators as to which cable conductors are then ready for test. Needless to say this is a laborious time-consuming operation requiring a minimum of two operators and preferably additional liaison crew members to relay operating information and to monitor and supervise the test work.

It is the primary object of the present invention to provide an improved, rugged, highly reliable gang connector assembly connectable as a unit to any selected terminal board of a central office main frame and firmly clampable thereto by a limited number of readily operated clamps. The gang connector is then connected by flexible service or patch cabling to the test equipment and embodies simple easily operated contactor switches for connecting and disconnecting each cable conductor individually to the test equipment. For these purposes the gang connector assembly includes a rigid main body having reciprocable pairs of contactors operable to separately connect the test equipment to each of any selected pair of cable conductors. Access is also provided to any selected pair of ring and tip conductors in circuit with central office equipment and the line protector devices. These contactors are movable into and out of contact with individual resilient contactor strips one free end of which has multiple sharp edged teeth positioned to cut through any foreign matter or coating present on a respective terminal strip of the terminal board. To facilitate assembly of the connector to the board, the rear of the gang connector is provided with a guide channel mating snugly over the outer edge of the terminal board partition dividing the rows of terminal strips from one another. This assures the accurate telescopic assembly of the connector over the front of the terminal board following which pairs of clamps along either side of the gang connector are adjusted to pivot clamping jaws into engagement with relatively strong and rigid portions of the terminal board.

Accordingly it is a primary object of this invention to provide an improved simple, rugged gang connector assembly designed for telescopic assembly over the front of a telephone cable terminal board of the type having line protector devices mounted between the outstretched ends of the line protector mounting strips.

Another object of the invention is the provision of a gang connector assembly having rows of resilient curvate contactors having sharply serrated outer ends positioned to slidingly engage juxtaposed terminal strips of a telephone cable terminal board and which gang connector is equipped with means selectively operable to separately connect a cable conductor and the corresponding central office conductor to conductor servicing equipment.

Another object of the invention is the provision of a gang connector assembly having rows of resilient fingers projecting from its rearward face between pairs of adjustable clamping jaws operable to clamp the assembly firmly in place over the front of a telephone cable terminal board.

These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawing to which they relate.

Referring now to the drawing in which a preferred embodiment of the invention is illustrated:

FIG. 1 is a front elevational view of a preferred embodiment of the invention gang connector assembly secured in place over the front of a terminal board;

FIG. 2 is a cross sectional view taken along line 2—2 on FIG. 1 with parts broken away to show internal constructional details;

FIG. 2*a* is a fragmentary view taken along line 2*a*—2*a* on FIG. 2;

FIG. 3 is a fragmentary view taken along broken line 3—3 on FIG. 2;

FIG. 4 is an end view partly in section and taken generally along line 4—4 on FIG. 1 showing a typical pair of contactors held out of contact with the associated resilient contact strips; and

FIG. 5 is a fragmentary perspective view of a single one of the resilient contactors and the associated terminal strip of the terminal board.

Referring initially more particularly to FIGS. 1 and 2, the gang connector assembly, designated generally 10, is shown telescoped over the front and clamped to a multi-pair terminal board 11 of a well known conventional type. The terminal board there shown serves 50 pairs of cable conductors all of which terminate on two rows of terminal strip ends arranged along one side of the terminal board (FIG. 2). Terminal board 11 has a long main body comprising a divider partition mounted on brackets 14 clamped by cap screws 15 to a T-shaped structural support member 16 of the central office main frame assembly. Member 16 is common to a plurality of similar terminal boards 11, not shown, but arranged in end-to-end relation along frame member 16.

All incoming pairs of cable wires, including a tip conductor and a ring conductor, are connected to the ends of terminal strips 17,18 located along one side of the

terminal board. The other end 17*a* of the tip terminal comprises a long, resilient strip having its outer end diverging away from one side of partition 13 and in firm contact with one end of a well known type of line protector device 19 having its other end connected to and supported by the end of the longer one of a pair of terminal strips 17*b*. The shorter one of the terminal strips 17*b* crosses the rear side of the terminal board and is connected at 17*c* to a tip wire extending to switch gear in the central office as is well known to persons skilled in telephone facilities.

The incoming cable ring wire of each cable pair is connected to end 18 of a terminal strip which crosses the rear side of the terminal board and its free end 18*a* flares outwardly away from the opposite side of partition 13 similarly to the outer end 17*a* of the tip terminal strip. A tip line protector device 20 is supported between the outer end of resilient terminal strip 18*a* and the longer one of a pair of strips 18*b*. The shorter one 18*c* of these strips is connected at 18*c* to the central office ring conductor.

From the foregoing it will be appreciated that all of the incoming pairs of ring and tip wires are arranged along one side of the board and that the protectors 19 for the tip wires are likewise arranged along this same side of the board, whereas the ring protectors 20 are arranged in a row along the opposite side of the board and of partition 13.

All of the terminal strips are rigidly anchored to partition 13 by means of through bolts 21 which are held out of contact with the terminals themselves by plaques and sleeves of insulation material 22 using techniques well known to this art. Since the construction of telephone cable terminal boards is well known and forms no part of the present invention, further details of this structure need not be described.

Referring now to FIGS. 2 and 4, it will be understood that gang connector assembly 10 is generally rectangular in cross section and extends the full length of terminal board 11. The shoe includes separate contactors for making individual contact with each of the 50 pairs of incoming wires and to the connection of these wires to the central station equipment. The hollow rigid main body 25 of the assembly is suitably constructed of nonconductive material and includes a broad rear base 26. Clamping strips 27 of insulation serve to anchor separate rows of contactor strips 29,30 of resilient conductive material to the rear of the assembly. Each of these highly resilient strips terminates in a U-shaped portion 29*a*,30*a*, the free end 29*b*,30*b* of which has a plurality of sharp edged serrations 29*c*,30*c*, best shown in FIG. 5. These serrations are positioned to wipe across and dig through any coating, oxide, or the like, present on the adjacent end of terminal strips 17*a*,18*a* as the assembly is telescoped into its installed position over the front of a terminal board. As is best shown in FIG. 4, the inner edges 32 of the contactor anchor strips 27 are rounded and terminate closely beside the adjacent lateral edges of the terminal board partition 13 and cooperate with the rounded bight portion 29*a*,30*a* of the contactor strips in guiding the gang connector into assembly position astride the forward edge of partition 13. The opposite lateral faces of this partition are formed of insulation material and provide back up means for the longer legs for the U-shaped portions of the contactors 29,30 as the latter are forced forwardly into the V-shaped gaps between the opposite faces of the partition and the two rows of strips 17*a*,18*a*.

Rigidly secured to each of the clamping strips 27 is a bracket 35 extending the full length of the connector assembly and at intervals therealong there is secured by screws 36, a mounting bracket 37 for a clamping jaw 38. These jaws are pivotally supported on pins 39 in brackets 37 and are equipped at their outer ends with thumbscrews 40 bearing against the base of brackets 37 to pivot the inner ends of the jaws against the opposite sides of the terminal strips 17*b*,18*b* respectively of the terminal board. Preferably the inner ends of the clamping jaws are fitted with non-conductive strips 42 positioned to seat against ends 17*d*,18*d* of the terminal strips. It will therefore be recognized that gang connector 10 is clamped in place by tightening thumbscrews 40 along its opposite sides so as to pivot the inner ends of the clamping jaws 38 into firm seating engagement with seat 17*d*,18*d* and that it can be released for withdrawal from the terminal board by loosening thumbscrews 40. The jaws then can pivot outwardly away from the terminal board under the urging of the leag springs 43.

The main body 25 of the gang connector encloses a separate pair of reciprocally supported metallic contactors 45,46 (FIGS. 2 and 4) supported directly opposite one another along the opposite sides of the gang connector with their outer end extending through base 26 in position to contact a respective one of the strips 29,30. Contactors 45,46 are urged outwardly by encircling compression springs 47 having one end bearing against a shouldered rivet 48 and the other end bearing against a strip of insulation material 49 suitably anchored to the interior of the gang connector. The large head of the shouldered rivets 49 holds a strip of insulation material 50 loosely captive against the side of the contactors 45,46. The upper edge of strips 50 is provided with a pair of cammed notches 51,52.

When strips 50 are shifted to the left as to the position shown in FIG. 2, the shanks of rivets 48 seat in the deeper end of notches 51,52 thereby allowing the contactors 45,46 to be pressed outwardly by springs 47 to their extended position wherein they seat firmly against contact strips 29,30 to make electrical contact therewith. However, when strips 50 are shifted to the left as viewed in FIG. 2, the inclined portions of notches 51,52 underride the shouldered rivets 48 and lift each of the associated contactor pins 45,46 upwardly out of contact with strips 29,30.

It will be observed from FIGS. 1 and 2 that strips 50 project beyond the opposite lateral sides of the gang connector, and that the left hand end, as viewed in FIG. 2, has an outwardly projecting stop tang 55 engageable with the side of the housing thereby limiting the movement of the strip to the right. Movement of the strip to the left is limited by the deep end of the notches 51,52 engaging the side of rivets 48.

The inner ends of each of the contactors 45,46 is connected by insulated wires 60 to a separate terminal pin 61 of any suitable separable cable connector, male half 62 of which is secured to the exterior side wall of the gang connector housing. A patching cable, not shown, having a mating coupling provided with female

sockets for pins **61** is readily connectable to connector **62** and having its other end connected to suitable instrumentation commonly used to test and perform servicing operations on terminal board **11**.

It will be understood that the gang connector assembly is connected to any selected one of the terminal boards **11** in the manner described in detail above. Thereafter any suitable patching cable, not shown, is connected between the test equipment and connectors **62** of the connector assembly. The operating strips **50** of the gang connector are then operated individually and shifted to the right or to the left enabling the operator of the test equipment to check the tip and ring wires of each pair of cable conductors individually and in turn in a manner well known by those familiar with telephone cable test equipment. During the assembly of the gang connector to the terminal board the rounded surfaces **32** of the inner ends of clamping strips **27,27** guide the gang connector into position aided by the rounded advance ends **29***a*,**30***a* of the contactor strips. These U-shaped ends are highly resilient and the serrated ends **29***c* are hardened and sharpened so as to dig into the adjacent ends of terminal strips **17***a*,**18***a* as the gang connector is telescoped into its installed position on the terminal board. A coating oxide, or other foreign material on the terminal strip **17***a*,**18***a* is readily penetrated by the serrated edges **29***c* thereby assuring multiple firm electrical contacts. As will be recognized the operation of control strips **50** for each pair of contactor pins **45**,**46** enables the test operator to make and break contact with any selected pair of cable conductors and with any related pair of central office conductors at any time without disturbing the position of the gang connector assembly.

While the particular gang connector assembly for telephone cable terminal board herein shown and disclosed in detail is fully capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that it is merely illustrative of the presently preferred embodiment of the invention and that no limitations are intended to the detail of construction or design herein shown other than as defined in the appended claims.

I claim:

1. A gang connector assembly adapted to make simultaneous contact with a multiplicity of terminal strips arranged in separate rows along either side of a telephone terminal board, said connector assembly having an elongated main body reciprocally supporting two rows of contactors, two rows of resilient conductive strips having curled free ends extending along one exterior side of said main body with a portion of each positioned in the path of movement of a respective one of said reciprocal contactors, the free ends of said resilient strips being positioned to have wiping contact with the rear face of a juxtaposed conductive strip attached to a respective one of the terminal strips on said terminal board as said connector assembly is shifted bodily toward the front of said terminal board, and means carried by said main body and including manually adjustable means for clamping said connector assembly to said terminal board with each of said resilient strips in firm contact with a related adjacent one of said terminal strips.

2. A gang connector assembly as defined in claim **1** characterized in that the free ends of said resilient strips in said two rows face away from one another and toward the adjacent surface of a respective one of said terminal strips.

3. A gang connector assembly as defined in claim **1** characterized in that the free ends of said resilient strips is provided with a plurality of hardened sharp pointed edges adapted to scratch and cut through poorly conductive surface conditions on said terminal strips as said connector assembly is being telescoped into assembled position along the front of a terminal board.

4. A gang connector assembly as defined in claim **1** characterized in that said means for clamping said connector assembly to a terminal board comprises jaw means mounted along the opposite lateral sides of said main body and including pivoting clamping jaw means thereon engageable with juxtaposed surfaces along the opposite lateral sides of a terminal board and effective to hold said connector assembly releasably in place thereon with each of said resilient strips in contact with a respective one of said terminal strips.

5. A gang connector assembly as defined in claim **1** characterized in that the rear face of said main body facing toward the front of said terminal board includes abutment means positioned to engage a fixed front portion of a terminal board and cooperating therewith to position said resilient strips accurately opposite a respective one of said terminal strips.

6. A gang connector assembly as defined in claim **1** characterized in that the rear side of said connector assembly is channeled between said two rows of said terminal strips and sized to telescope over the front edge of partition means projecting outwardly along the front of said terminal board thereby to position said connector assembly accurately between said rows of terminal strips.

7. A gang connector assembly as defined in claim **1** characterized in that said clamping means includes a plurality of pairs of pivotally supported clamping members with the clamping members of each pair mounted on said main body along the opposite side thereof.

8. A gang connector assembly as defined in claim **7** characterized in the provision of spring means effective to urge said clamping members away from one another, and thumb screw means for pivoting said clamping members toward one another and into engagement with juxtaposed portions of the opposite lateral sides of a terminal board.

9. A gang connector assembly as defined in claim **1** characterized in that said resilient strips are U-shaped with one leg secured to said main body and the other leg having an outturned tang at the free end thereof, said tang having a plurality of sharp edges positioned to bite into the surface of a juxtaposed one of the terminal strips of said terminal board as said connector assembly is moved bodily toward and against the front of a terminal board.

* * * * *