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[54] ELECTRICAL CONNECTOR ASSEMBLY

[72] Inventors: Willard E. Graddy; Willis H. Anderson, both of Anderson, Ind.

[73] Assignee: General Motors Corporation, Detroit, Mich.

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[58] Field of Search.....339/62, 63, 75, 92, 198

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Primary Examiner—Joseph H. McGlynn

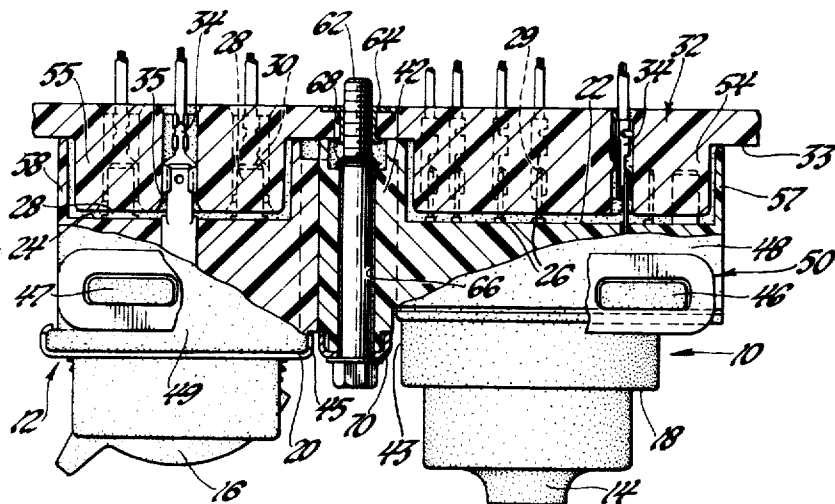
Attorney—W. E. Finken and R. L. Phillips

[57]

ABSTRACT

An electrical connector assembly is disclosed wherein a pair of joined connector members are clamped to a third electrical connector member. The paired connector members have a first joint therebetween which prevents relative movement between the members in all but two directions and a second joint between the members and a joint member which prevents relative movement between the paired connector members in the other two directions. The joined pair of connector members are clamped to the third connector member by a fastener which cooperates with the joint member of the second joint.

2 Claims, 3 Drawing Figures



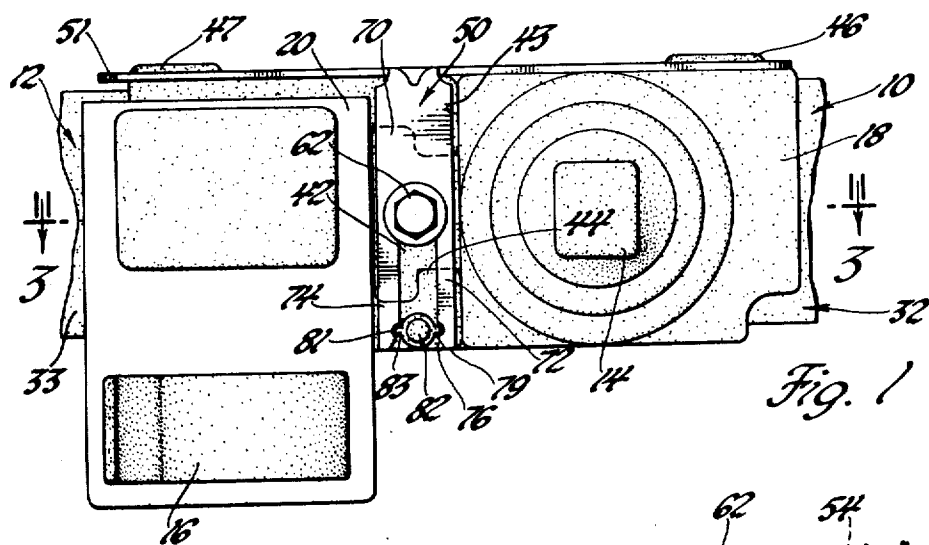


Fig. 1

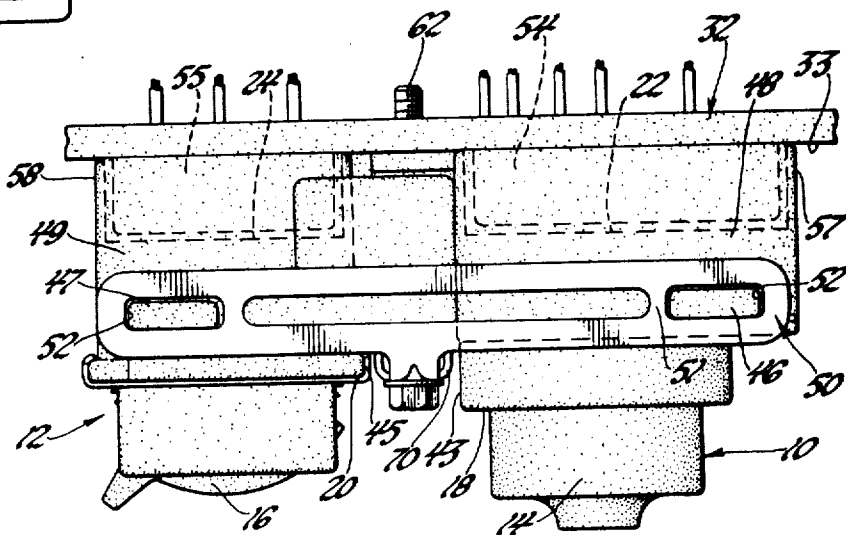
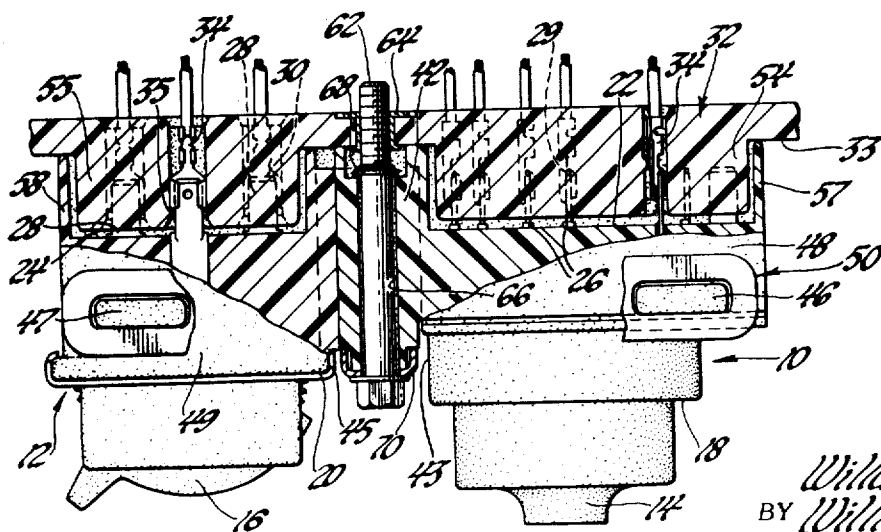


Fig. 2



ELECTRICAL CONNECTOR ASSEMBLY

The present invention relates to electrical connectors and more particularly to electrical connectors which are clamped together to make an electrical connection.

It is common practice to assemble electrical connectors by manually aligning the terminals of one member with the mating terminals of another member and exerting the force required to mate the terminals. Where a large plurality of electrical terminals are to be mated, a large force can be required to mate the connector members because of the cumulative effect of the forces required to mate the individual terminals. Under some conditions, the space available for mounting switches is limited and the connector members involved cannot be mounted separately. Under other conditions, such as assembly line operations, the time available for assembly is insufficient to permit individual assembly of the connector members. It is, therefore, desirable under some conditions to assemble two connector members simultaneously to a third connector member. Where a large mating force is required and a pair of connector members are to be joined simultaneously to a third connector member, considerable dexterity and effort is required. A misapplication of the mating force and failure to engage all terminals simultaneously will produce a cantilevering effect which results in distortion and breakage of the terminals.

The electrical connector, according to the present invention, comprises a pair of joined connector members which are clamped to a third connector member to make electrical connections. The paired connector members have two joints therebetween which prevent relative movement. The first joint is a tenon and mortise joint integral with the connector members and which prevents relative movement therebetween in all but two directions. The second joint comprises joint projections integral with the paired connector members and a joint member which receives the joint projections to prevent relative movement between the paired connector members in the other two directions. The two joints position the electrical terminals of the paired connector members with respect to one another to provide for alignment of the terminals with those of the third connector member and for the terminals of the paired connector members to simultaneously engage the terminals of the third connector member when the paired connector members are clamped to the third connector member. The terminals of the paired connector members and the third connector member are aligned by the reception of a bolt, which extends through the tenon of the first joint, within a threaded recess in the third connector member and the reception of alignment projections of the third connector member within complementary shaped alignment flanges on the paired connector members. The joint member includes an extension which cooperates with the bolt to provide for clamping of the joined connector members to the third connector member.

An object of the present invention is to provide a new and improved electrical connector.

Another object is to provide an electrical connector wherein a pair of connector members are joined to prevent relative movement therebetween and are clamped to a third connector member by a clamp including a member used to join the paired connector members.

Another object is to provide an electrical connector assembly wherein the electrical terminals of a pair of connector members are simultaneously engaged with the terminals of a third connector member when the joined connector members are clamped to the third connector member.

Another object is to provide an electrical connector assembly wherein the joining of a pair of connector members to prevent relative movement therebetween positions the terminals of the joined connector members and provides for the simultaneous engagement of the terminals of the joined connector members with the terminals of a third connector member when the joined connector members are clamped to the third connector member.

Another object is to provide an electrical connector assembly wherein a pair of connector members are first joined to prevent relative movement therebetween in all but two directions, joined secondly to prevent relative movement therebetween in those two directions, and clamped to a third connector member with the electrical terminals of the joined connector members simultaneously engaging the terminals of the third connector members.

These and other objects of the invention will become more fully apparent from the following description and drawing wherein:

FIG. 1 is a side elevation of a connector assembly according to the present invention;

FIG. 2 is a plan view of an electrical connector assembly according to the present invention; and

FIG. 3 is a partial section view taken along line 3—3 in FIG. 1.

Referring to FIG. 1, a pair of connector members 10 and 12 have conventional manual switches 14 and 16 located on the front sides 18 and 20 for opening and closing the electric circuits, not shown, of electrical devices, such as electric windshield washer and wiper units in automobiles. Referring to FIGS. 2 and 3, connector members 10 and 12 have flat backsides 22 and 24 from which pluralities of male electrical terminals 26 and 28 project perpendicularly. The ends 29 of terminals 26 lie in a plane parallel to backside 22, and the ends 30 of terminals 28 similarly lie in a plane parallel to backside 24. A third connector member 32 has a flat face side 33 with a plurality of female electrical terminals 34 extending perpendicularly therethrough for receiving the male electrical terminals 26 and 28 of connector members 10 and 12. Further, the front ends 35 of terminals 34 lie in a plane parallel to face side 33.

According to the present invention, connector members 10 and 12 have a first joint therebetween comprising a T-shaped tenon 42 which is integral with side 43 of connector member 10. The first joint further comprises a mortise 44 formed in side 45 of connector member 12 in a complementary T-shape to tenon 42 for receiving the tenon 42 to make the joint. The tenon 42, as shown in FIG. 1, projects perpendicularly from side 43 and, as shown in FIG. 3, extends vertically thereon in a direction perpendicular to the plane of the ends 29 of terminals 26. Mortise 44, as shown in FIG. 1, is formed through side 45 in a perpendicular fashion, as shown in FIG. 3, and extends vertically therethrough in a direction perpendicular to the planes of ends 30 of terminals 28. When tenon 42 is received within mortise 44, the resulting interlocked relationship prevents all

relative movement between connector members 10 and 12 except in the two directions perpendicular to the planes of the ends 29 and 30 of terminals 26 and 28. The first joint also positions terminals 26 and 28 in an adjacent manner with respect to each other to provide for aligning terminals 26 and 28 with terminals 34, as described in more detail later.

The connector members 10 and 12 have a second joint comprising rectangular joint projections 46 and 47, as shown in FIGS. 1 and 2, which project from top-sides 48 and 49 equidistant from and in a direction parallel to the planes of the ends 29 and 30 of terminals 26 and 28. The second joint further comprises a T-shaped joint member 50, as shown in FIG. 1, with an upper flat section 51, as shown in FIG. 2, having a pair of holes 52 with a common bisecting line and which are shaped complementary to joint projections 46 and 47. The holes 52 of the joint member 50 receive joint projections 46 and 47, thereby preventing relative movement between connector members 10 and 12 in the two directions perpendicular to the planes of the ends 29 and 30 of terminals 26 and 28. Further, the second joint positively places the ends 29 and 30 of terminals 26 and 28 in a common plane by virtue of the aligned relationship of holes 52 and the equidistant relationship of joint projections 46 and 47 with the plane of the ends 29 and 30 of terminals 26 and 28. The second joint thereby provides for the simultaneous engagement of terminals 26 and 28 with terminals 34 upon clamping of the connector members 10 and 12 to the third connector member 32, which is later described in more detail.

Referring to FIG. 3, first alignment of terminals 26 and 28 with terminals 34 is made by a bolt 62 engaging a threaded insert 64 in the third connector member 32. The bolt 62 is located within a hole 66 which extends endwise through tenon 42 and is maintained freely rotatable therein by a lock washer 68. As shown in FIG. 3, the threaded insert 64 is located between alignment projections 54 and 55 and extends through the face side 33 of the third connector 32.

Now referring to FIGS. 2 and 3, terminals 26 and 28 are further aligned for engagement with terminals 34 by the reception of alignment projections 54 and 55 within alignment flanges 57 and 58. All of the terminals 34 are located in the alignment projections 54 and 55 which are rectangular in shape and project perpendicularly from the face side 33 of the third connector member 32. The alignment flanges 57 and 58 extend around the peripheries of backsides 22 and 24 and project perpendicularly therefrom in a manner complementary to the shape of alignment projections 54 and 55.

The T-shaped joint member 50 of the second joint, as shown in FIG. 1, includes a dual-pronged extension 70 which projects perpendicularly downward from the center of the upper section 1 and is located against the face side end of the first joint. The dual-pronged extension 70 engages bolt 62 between its prongs 72 and 74 which have their inward facing sides 76 inclined from their ends 79 to a pair of locking slots 81. A detent 82 is located below the face side end of mortise 44 on connector member 12 and is vertically aligned with bolt 62, as shown in FIG. 1. The detent 82 has a pair of locking projections 83 which project oppositely

therefrom to cooperate with the inclined sides 76 of prongs 72 and 74 and eventually locate within locking slots 81, thereby providing a locking joint to lock joint member 50 in engagement with joint projections 46 and 47 and bolt 62.

Connector members 10 and 12 are clamped to the third connector member 32 by the cooperation of bolt 62 with threaded insert 64 and extension 70 of joint member 50.

To assemble the connector assembly, tenon 42 is slidably engaged with mortise 44, thereby preventing relative movement between members 10 and 12 in all but two directions. Bolt 62 is inserted through hole 66 of tenon 42 and maintained therein by the application of lock washer 68. Joint member 50 is then slidably engaged with bolt 62 and joint projections 46 and 47. The joint projections 46 and 47 are received within holes 52 of flat section 51 which serves to position the ends 29 and 30 of terminals 26 and 28 in a common plane. After the dual pronged extension engages bolt 62 and before joint projections 46 and 47 are received within holes 54, inclined sides 76 of prongs 72 and 74 engage locking projections 83 of detent 82, and prongs 72 and 74 are deflected outward. After the inclined sides 76 have passed locking projections 83, prongs 72 and 74 spring inward and receive locking projections 83 within locking slots 81, thereby locking joint member 50 in engagement with joint projections 46 and 47 and bolt 62. The thus joined members 10 and 12 are then manually positioned on the third connector member 32 with bolt 62 being received within threaded insert 64 and alignment projections 54 and 55 being received within alignment flanges 57 and 58, thereby aligning terminals 26 and 28 with terminals 34 and positioning the common vertical plane of ends 29 and 30 of terminals 26 and 28 in a parallel relationship with the plane of ends 35 of terminals 34. The bolt 62 in cooperation with threaded insert 64 and extension 70 is then utilized to clamp connector members 10 and 12 to third connector member 32, during which terminals 26 and 28 simultaneously engage with terminals 34.

The foregoing disclosure relates to only one embodiment of the invention which may be modified within the scope of the appended claims.

What is claimed is:

1. In an electrical connector assembly, the combination comprising a first connector member having first electrical terminal means, a second connector member having second electrical terminal means, a third connector member having third electrical terminals means for making electrical connections upon aligned engagement with said first and second electrical terminal means, first joint means integral with said first and second connector members for preventing relative movement therebetween in all but two directions and for positioning said first electrical terminal means with respect to said second electrical terminal means to provide for alignment of said first and second electrical terminal means with said third electrical terminal means, second joint means including a joint member engageable with portions of said first and second connector members for preventing relative movement between said first and second connector members in said two directions and for positioning said first electrical terminal means with respect to said second electrical

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cal terminal means to provide for simultaneous engagement of said first and second terminal means with said third terminal means when said first and second connector members are clamped to said third connector member, a portion of said second joint means being located between said first and second connector members, the joined first and second connector members and said third connector member having first and second alignment means for aligning said first and second electrical terminal means with said third electrical terminal means, and one of said alignment means and said joint member having means for clamping said joined first and second connector members to said third connector member.

2. In an electrical connector, the combination comprising first and second connector members having electrical terminals projecting therefrom with ends lying in planes, a third connector member having electrical terminals with ends lying in a plane for making electrical connections upon aligned engagement with said electrical terminals of said first and second connector members, first joint means for preventing relative movement between said first and second connector members in all but two directions perpendicular to said planes and for positioning said terminals of said first and second connector members adjacently with respect to each other to provide for alignment with said terminals of said third connector member, said first joint means comprising a tenon and mortise joint integral with said first and second connector members and extending in a direction perpendicular to said planes, second joint means for preventing relative movement between said first and second connector members in said two directions perpendicular to said planes and for positioning said terminals of said first and second connector members with respect to each other to provide for simultaneous engagement with said terminals of said third connector member, said second joint means comprising a joint projection projecting from each of said first and second connector members an equal

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distance from and in a direction parallel to said planes, said second joint means further comprising a joint member having a pair of holes complementary to said joint projections and positioned relative to each other for receiving said joint projections and placing said ends of said terminals of said first and second connector members in a common plane, first and second alignment means for aligning said terminals of said first and second connector members for engagement with said terminals of said third connector member, said first alignment means comprising a freely rotatable bolt extending endwise through said tenon to be received within a threaded insert in said third connector member, said second alignment means comprising alignment flanges projecting perpendicularly from said first and second connector members and enclosing said terminals of said first and second connector members, said second alignment means further comprising a pair of alignment projections on said third connector member shaped complementary to said alignment flanges for reception therein, locking joint means for locking said joint member to said first and second connector members, said locking joint means comprising a dual pronged projection extending from said joint member and engaging said bolt, said prongs having inward facing sides inclined from the ends of said prongs, said inward facing sides having the inclines terminate at a pair of locking slots, said locking joint means further comprising a detent having a pair of locking projections extending oppositely therefrom, said detent being aligned with said bolt to cooperate with said inclined surfaces to deflect said prongs outward as said joint member receives said joint projections and engages said bolt to provide for said inclined surfaces to pass said detent and for said locking projections to be received in said locking slots, and said first alignment means and said dual pronged extension to cooperate for clamping said first and second connector members to said third connector member.

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