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Hansen et al.

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[54] RECEPTACLE FOR SNAP-IN MOUNTING OF CONNECTORS

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[51] Int. Cl. H01r

[58] Field of Search ... 317/101 CM, 101 DH; 339/17, 339/121, 126, 128, 119, 22, 176 MP, 125; 211/41, 13, 26

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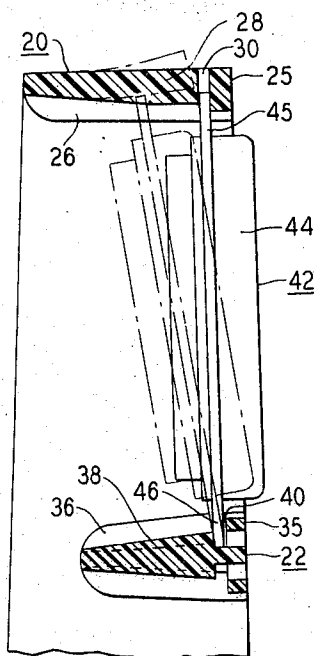
Attorney—R. J. Guenther and Edwin B. Cave

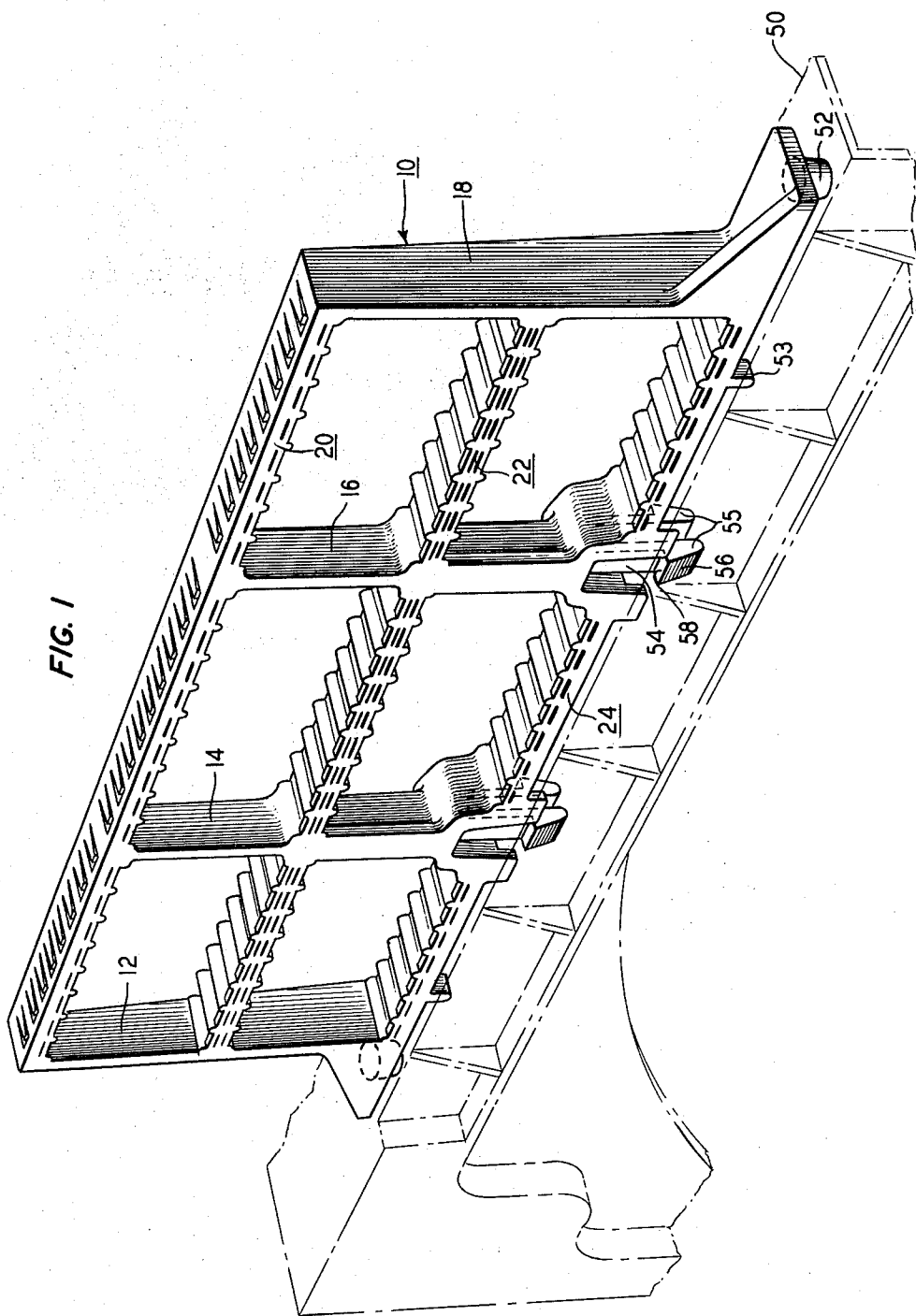
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ABSTRACT

A receptacle for mounting connectors including a pair of opposed flange portions and a plurality of contacts intermediate the flange portions. The receptacle includes a pair of spaced parallel walls between which the connector is positioned, each wall including elements defining a slot for accommodating the end of one of the flange portions of the connector. The slot elements of one of the walls includes an integral cantilever beam that is deflected as the connector is being inserted, the beam returning to its undeflected position when insertion is completed to secure the connector in place.

2 Claims, 11 Drawing Figures





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FIG. 4

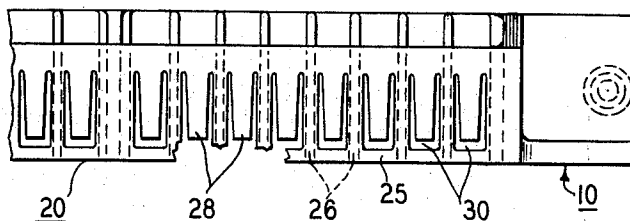


FIG. 5

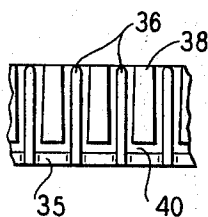


FIG. 2

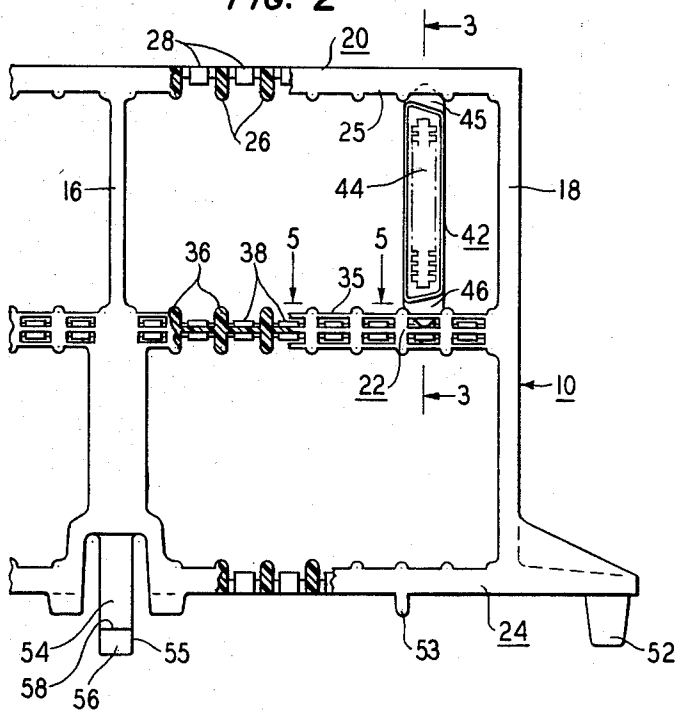


FIG. 3

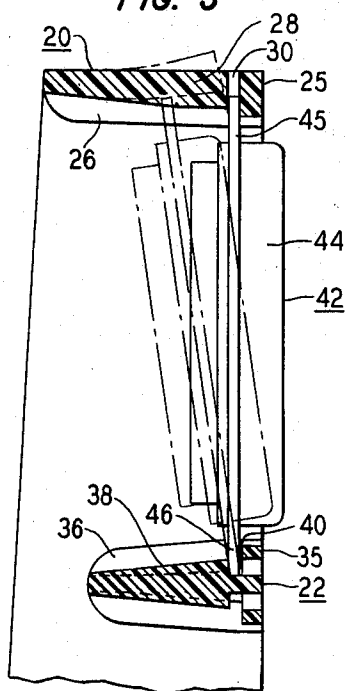


FIG. 6

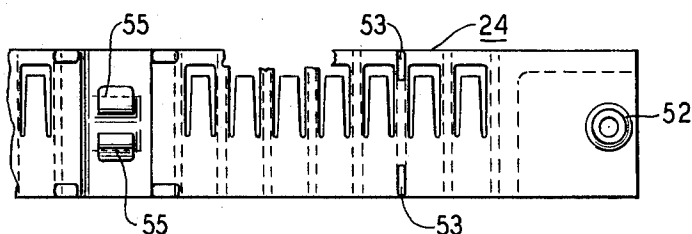


FIG. 8

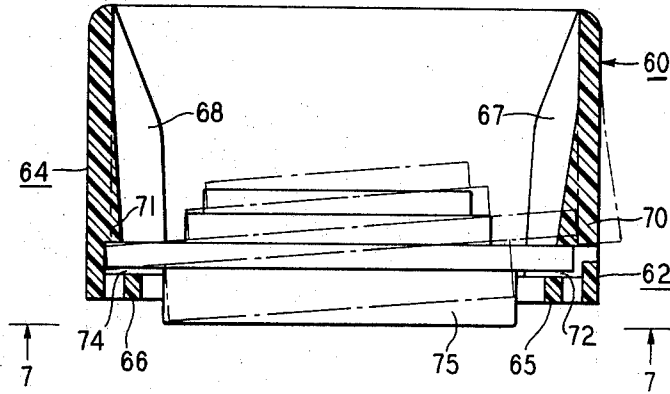


FIG. 7

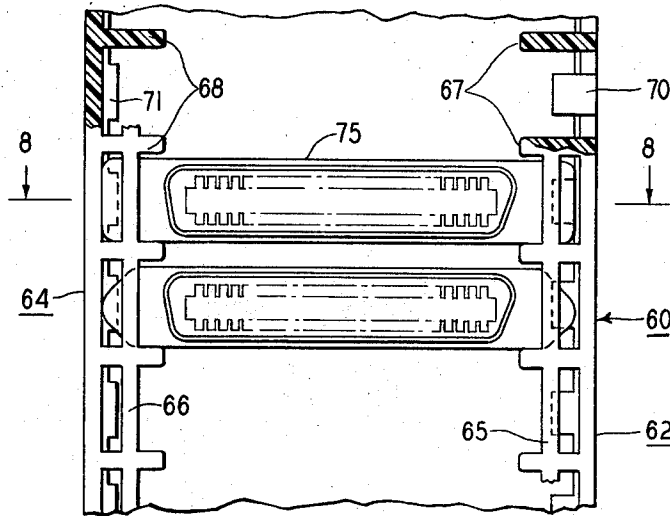


FIG. 11

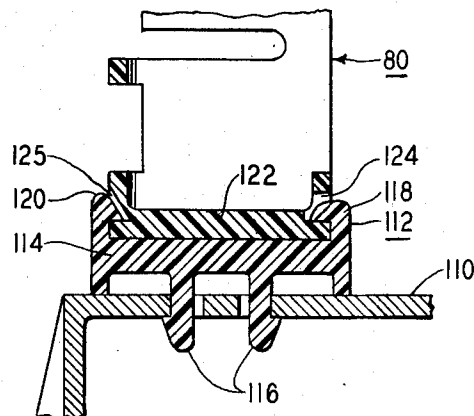


FIG. 10

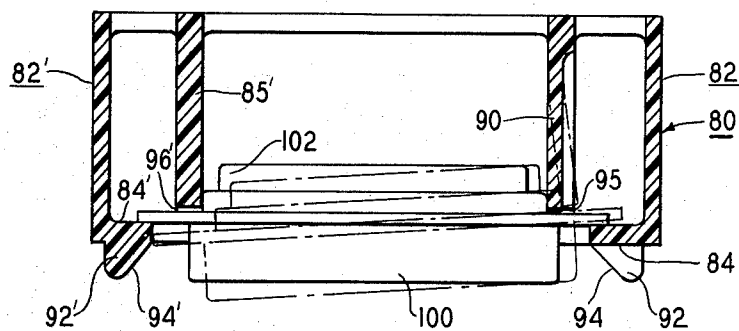
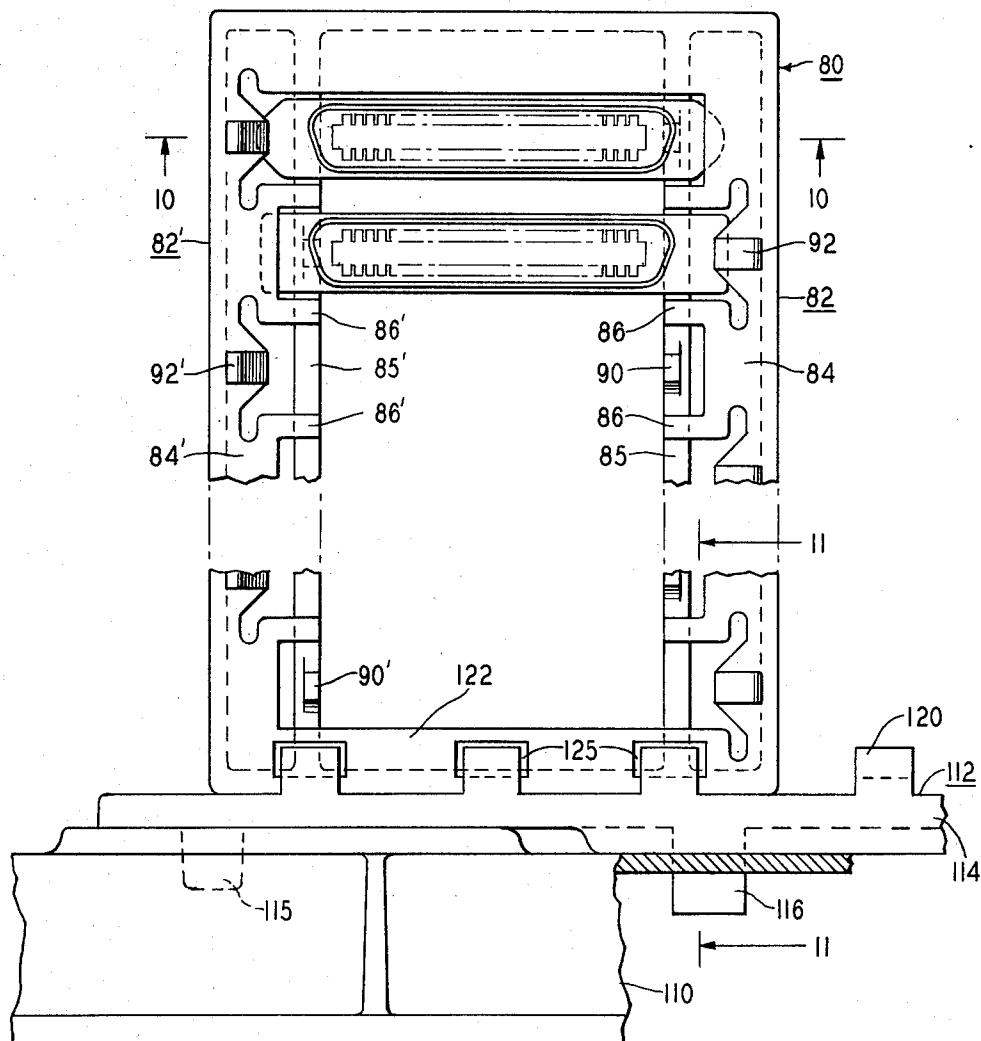


FIG. 9



RECEPTACLE FOR SNAP-IN MOUNTING OF CONNECTORS

FIELD OF THE INVENTION

This invention relates to support structures for electrical equipment and within that field to a receptacle for the snap-in mounting of electrical connectors.

DESCRIPTION OF THE PRIOR ART

Multi-contact connectors, such as those for interconnecting cables or for engaging printed wiring boards, are commonly provided with a pair of mounting flanges extending on opposite sides of the contacts. Usually, each of the flanges is provided with a hole, and the connector is secured to a receptacle by threading a fastener through the hole and into an associated hole in the receptacle. This approach is so widespread that equipment designers appear to use it without giving full thought to the many manufacturing steps that it entails.

First, the receptacle must be provided with complementary holes to those in the connector, and these holes often require additional treatment such as tapping.

Second, the fasteners must be individually handled in conjunction with tools of some sort.

Third, the connector must be juxtapositioned with respect to the receptacle so that the holes in the flanges are aligned with the complementary holes in the receptacle.

Fourth, the tool must drive each fastener into position while this alignment is maintained.

Fifth, if for any reason the connector needs to be changed, the fasteners must be removed and the second, third, and fourth steps repeated with respect to the new connector.

While each of these steps is not very consequential when taken alone, it is clear that the totality does result in an expenditure of materials, labor and equipment that is significant. And, of course, when not just a few, but thousands of connectors are involved, it is apparent that if several of these steps can be eliminated, a substantial monetary savings is achieved.

SUMMARY OF THE INVENTION

The receptacle of the present invention permits the mounting of a flanged connector thereon without the use of either tools or fasteners. The receptacle includes a pair of spaced parallel walls between which a connector is positioned. Each wall includes a slot for accommodating the end of one of the flange portions of the connector, the slots facing and being in line with one another.

Each slot has front, rear, and side surfaces, and the rear surface of one of the slots comprises the free end of a cantilever beam that extends normal to the front surface. The front and rear surfaces of both slots are spaced apart a distance slightly greater than the thickness of the associated flange so as to limit the movement of the connector in a direction perpendicular to its face. In addition, the side surfaces are spaced apart a distance slightly greater than the width of the accommodated end of the associated flange so as to limit the lateral movement of the connector.

In two of the disclosed embodiments of the receptacle, the connector is inserted from the rear of the

receptacle by first tilting the connector to insert one of the flanges into the slot opposite to the cantilever beam. Then the other end of the connector is moved forward, causing the flange at the other end to engage the cantilever beam and deflect it away from the opposing slot. This deflection continues until the flange moves forward of the cantilever beam, whereupon the beam returns to its undeflected position and captures the connector within the slots.

In a third embodiment, the connector is inserted from the front of the receptacle by first tilting the connector to insert one of the flanges into the slot including the cantilever beam and to place the terminal portion at the rear of the connector in engagement with the beam. Then the other end of the connector is moved rearward, causing the flange at the other end to engage a cam in front of the opposing slot. The cam deflects the connector and thereby the cantilever beam away from the opposing slot until the flange moves into the slot. The cantilever beam thereupon returns to its undeflected position and captures the connector within the slots.

Thus the connector is secured in place quickly and easily without the use of jigs, fixtures, tools, or fasteners. In addition, the connector is provided with a degree of freedom that permits it to move to adjust to dimensional variations in the mating device. Furthermore, the connector can be removed just as easily as it is inserted by merely deflecting the cantilever beam outwardly and then tilting the connector in the same direction from which it was inserted. The resultant savings in time, material, and equipment with this arrangement is apparent.

DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a first embodiment of the receptacle of the present invention with a supporting structure shown in phantom;

FIG. 2 is a front view showing a portion of the receptacle with a flanged connector in place and parts broken away for greater clarity;

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2 showing the flanged connector in phantom being inserted into the receptacle and in full line in place in the receptacle;

FIG. 4 is a view taken along line 4—4 of FIG. 2 showing the top of the receptacle;

FIG. 5 is a view taken along line 5—5 of FIG. 2 showing one of the interior walls of the receptacle;

FIG. 6 is a view taken along line 5—5 of FIG. 2 showing the bottom of the receptacle;

FIG. 7 is a front view showing a portion of a second embodiment of the receptacle with flanged connectors in place and parts broken away for greater clarity;

FIG. 8 is a sectional view taken along line 8—8 of FIG. 7 showing a flanged connector in phantom being inserted into the receptacle and in full line in place in the receptacle;

FIG. 9 is a front view of a third embodiment of the receptacle shown mounted on a supporting structure;

FIG. 10 is a sectional view taken along line 10—10 of FIG. 9 showing a flanged connector in phantom being inserted into the receptacle and in full line in place in the receptacle; and

FIG. 11 is a sectional view taken along line 11—11 of FIG. 9 showing the means for mounting the receptacle on the supporting structure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Referring to FIG. 1 of the drawing, a first embodiment of the receptacle of this invention indicated by the reference character 10, includes upright walls 12, 14, 16, and 18, and top, middle, and bottom walls 20, 22, and 24. The top, middle, and bottom walls extend orthogonal to the upright walls and thereby subdivide the receptacle into six rectangular cells, the front and backs of which are open.

As seen from FIGS. 2, 4, and 6, the top and bottom walls 20 and 24 are basically the same, while as seen from FIGS. 2 and 3, the middle wall 22 is essentially symmetrical about a bisecting line extending along its length. Thus, an examination of the cell bounded by the top wall 20, the upright walls 16 and 18, and the upper half of the middle wall 22 serves to describe all of the cells.

As shown in FIGS. 2, 3, and 4, the top wall 20 includes a ledge 25 at the forward end thereof, and a plurality of spaced ribs 26 extend perpendicular to the ledge. Both the ledge 25 and the ribs 26 extend toward the middle wall 22, and the extremities of the ribs are tapered. The wall 20 also includes a cantilever beam 28 between each pair of adjacent ribs 26, the fixed end of the beam being at the rear of the wall. The cantilever beam 28 extends forwardly perpendicular to the ledge 25, and the free end of the beam is spaced from the ledge.

The ledge 25 in combination with each adjacent pair of ribs 26 and the cantilever beam 28 therebetween define a slot 30, the front surface of which is the rear surface of the ledge, the side surfaces of which are the facing sides of the ribs, and the rear surface of which is the free end of the cantilever beam. Since the extremities of the ribs 26 are tapered, the side surfaces of each slot 30 diverge at the entrance of the slot.

Referring now to FIGS. 2, 3, and 5, the middle wall 22 is similar to the top wall 20 in that it has a ledge 35 at the front end thereof and a plurality of spaced ribs 36 extending perpendicular to the ledge. The ledge 35 is directly beneath and extends toward the ledge 25, while the ribs 36 are aligned with and extend toward the ribs 26, the extremities of the ribs 36 being tapered in the same manner as the ribs 26. In addition, the middle wall 22 includes a boss 38 intermediate each adjacent pair of ribs 36, and the front surface of the boss is spaced from the rear surface of the ledge 35.

The ledge 35 in combination with each adjacent pair of ribs 36 and the boss 38 define a slot 40, the front surface of which is the rear surface of the ledge, the side surfaces of which are the facing sides of the ribs, and the rear surface of which is the front surface of the boss. Since the extremities of the ribs 36 are tapered, the side surfaces of each slot 40 also diverge at the entrance of the slot.

The slots 40 of the middle wall 22 are in general alignment with and face the slots 30 of the top wall 20, and each pair of opposing slots in conjunction with the associated cantilever beam 28 cooperate to secure an individual flanged connector 42 therebetween. As

shown in FIGS. 2 and 3, the connector 42 includes a linear contact portion 44 in which a plurality of spaced contacts are mounted. The connector 42 also includes tapered mounting flanges 45 and 46, respectively, extending from each end of the contact portion 44, the flanges extending in opposite directions from one another.

The ends of the flanges 45 and 46 respectively are accommodated by an opposed pair of slots 30 and 40, and there is a particular relationship between each of the slots and the flange accommodated thereby. The distance between the front and rear surfaces of each slot is slightly greater than the thickness of the associated flange so as to limit the forward and rearward movement of the connector 42. In addition, the distance between the side surfaces at their narrowest point is less than the width of the associated flange portion at its widest point, and the distance between the entrance of the slot 30 and the entrance of the opposing slot 40 is less than the distance between the ends of the flanges 45 and 46. Thus, the tapering surfaces of the flanges 45 and 46 respectively engage the diverging side surfaces of the slots 30 and 40, and the side surfaces serve to limit both the lateral and longitudinal movement of the connector 42.

The flanges 45 and 46 are typically identical in which case the slots 30 and 40 are identical and the flanges can be placed in either slot. However, in some situations it may be desirable that the connector 42 be oriented in a particular manner. In this case the flanges 45 and 46 differ from one another and the slots 30 and 40 are modified to conform to an individual flange so that the connector 42 can only be mounted on the receptacle 10 in the proper orientation.

The connector 42 is mounted on the receptacle 10 from the rear by first inserting one of the flanges into the slot opposite to the cantilever beam 28 and then moving the other flange into the slot adjacent to the cantilever beam. Thus, the connector 42 is tilted so that the flange 46 is forward of the flange 45. The flange 46 is then placed in the slot 40 and the flange 45 is moved forwardly, causing it to engage the cantilever beam 28. As the forward movement of the flange 45 continues, the cantilever beam 28 is deflected away from the opposing boss 38. This deflection continues until the flange 45 moves into the slot 30, whereupon the cantilever beam 28 returns to its undeflected position and secures the connector 42 in place. To remove the connector 42, it is only necessary to manually deflect the cantilever beam 28 out of the path of the flange 45, and then tilt that end of the connector rearwardly.

The receptacle 10 is itself snapped into place on a supporting structure 50 such as that shown in phantom in FIG. 1. The lower wall 24 of the receptacle 10 includes depending bosses 52 and tongues 53 for locating the receptacle on the supporting structure 50. In addition, the lower wall 24 includes depending pairs of tines 54 for latching the receptacle 10 in place. The tines 54 have lips 55 at the free ends thereof and each lip includes an inclined surface 56 and a flat latching surface 58.

The receptacle 10 is mounted on the supporting structure by placing the bosses 52, tongues 53, and tines 54 in registration with complementary openings in the supporting structure 50 and then pressing the

receptacle downward. The tines 54 in each pair are deflected toward one another by the engagement of the inclined surfaces 56 of the lips 55 with the sides of the openings, and in this deflected condition the lips are able to move through the openings. Then as the bottom wall 24 of the receptacle 10 engages the supporting structure 50, the inclined surfaces 56 of the lips 55 move beyond the sides of the openings, and the tines 54 return to their undeflected position. The latching surfaces 58 of the lips 55 move beneath the supporting structure 50 and secure the receptacle 10 thereto.

Referring to FIGS. 7 and 8, a second embodiment of the receptacle of this invention indicated by the reference character 60 is similar to the receptacle 10 in that it includes a pair of spaced parallel walls 62 and 64 respectively having ledges 65 and 66 at the forward ends thereof and ribs 67 and 68 respectively extending perpendicular to the ledges. The ledges 65 and 66 and the ribs 67 and 68 are respectively aligned with and extend toward one another. The wall 62 also includes a cantilever beam 70 between each pair of adjacent ribs 67, the fixed end of the beam being at the rear of the wall. The cantilever beam 70 extends forwardly perpendicular to the ledge 65 and the free end of the beam is spaced from the ledge. The wall 64 includes a boss 71 intermediate each adjacent pair of ribs 68 and the front surface of the boss is spaced from the rear surface of the ledge 66.

The ledge 65 in combination with each adjacent pair of ribs 67 and the cantilever beam 70 therebetween define a slot 72, the front surface of which is the rear surface of the ledge, the side surfaces of which are the facing sides of the ribs and the rear surface of which is the free end of the cantilever beam. Similarly, the ledge 66 in combination with each adjacent pair of ribs 68 and the boss 71 define a slot 74, the front surface of which is the rear surface of the ledge, the side surfaces of which are the facing sides of the ribs, and the rear surface of which is the front surface of the boss.

The slots 72 and 74 are in general alignment with and face one another and cooperate to secure flanged connectors 75 therebetween. The front and rear surfaces of each slot 72 and 74 are spaced apart a distance slightly greater than the thickness of the associated flange so as to limit the forward and rearward movement of the connectors 75. The side surfaces of each slot 72 and 74, however, are spaced apart a distance that is slightly greater than the width of the flanges. Thus, the side surfaces serve to limit the lateral movement of the connectors 75 but do not limit the longitudinal movement of the connectors. Rather, the slots 72 and 74 both include bottom surfaces, and the bottom surfaces of opposing pairs of slots are spaced slightly farther apart than the distance between the ends of the flanges so as to limit the longitudinal movement of the connectors 75. As seen in the drawing, with this arrangement the receptacle 60 is able to accommodate connectors 75 having either tapered or rectangular flanges.

The receptacle 60 also differs from the receptacle 10 in that the walls 62 and 64 extend vertically rather than horizontally so that the connectors 75 are accommodated on their sides. In addition, the receptacle 60 only has a single pair of walls rather than the tandem arrangement of the receptacle 10. Irrespective of these

differences, however, the connectors 75 are mounted on and removed from the receptacle 60 in the same manner as described with respect to the receptacle 10.

Turning now to FIGS. 9 and 10, a third embodiment of the receptacle of this invention, indicated by the reference character 80, includes a pair of spaced parallel walls 82 and 82'. The walls 82 and 82' respectively include ledges 84 and 84' at the forward ends thereof and partitions 85 and 85' extending along the lengths thereof, the front surfaces of the partitions being spaced from the rear surfaces of the ledges. In addition, the walls 82 and 82' respectively include a plurality of spaced parallel ribs 86 and 86' extending intermediate the ledges 84 and 84' and the partitions 85 and 85'. Furthermore, between alternate pairs of ribs 86 and 86', the partitions 85 and 85' respectively have forwardly extending cantilever beams 90 and 90', and intermediate these pairs of ribs, the ledges 84 and 84' respectively have forwardly extending cams 92 and 92', the cams respectively including inclined surfaces 94 and 94'. Thus, the walls 82 and 82' are identical except that they are offset from one another so that the cantilever beams 90 are aligned with the cams 92' and the cams 92 are aligned with cantilever beams 90'.

With respect to the wall 82, the ledge 84 in combination with each cantilever beam 90 and the ribs 86 on either side thereof define a slot 95, the front surface of which is the rear surface of the ledge, the side surfaces of which are the facing sides of the ribs, and the rear surface of which is the free end of the cantilever beam. In addition, the ledge 84 in combination with the partition 85 and each adjacent pair of ribs 86 between which there is no cantilever beam 90 define a slot 96, the front surface of which is the rear surface of the ledge, the side surfaces of which are the facing sides of the ribs, and the rear surface of which is the front surface of the partition. The corresponding elements of the wall 82' define slots 95' and 96'.

The slots 95 and 96 of the wall 82 are in general alignment with and face the slots 96' and 95' respectively of the wall 82', and each pair of opposed slots in conjunction with the associated cantilever beam 90 or 90' and the associated partition 85 or 85' serve to secure an individual flanged connector 100 having a rearwardly extending contact portion 102. The distance between the front and rear surfaces of each slot is slightly greater than the thickness of the associated flange so as to limit the forward and rearward movement of the connector 100. In addition, the distance between the side surfaces of each slot is slightly greater than the width of the associated flange so as to limit the lateral movement of the connector 100. Finally, the distance between the interior surface of the cantilever beam 90 or 90' and the opposed interior surface of the partition 85 or 85' is slightly greater than the distance between the ends of the contact portion 102 so as to limit the longitudinal movement of the connector 100.

The connector 100 is mounted on the receptacle 80 from the front by inserting one of the flanges in the slot adjacent to the cantilever beam and then moving the other flange into the opposed slot. Thus, as shown in FIG. 10, the connector 100 is tilted so that one flange extends into the slot 95 adjacent to the cantilever beam 90 and the other flange is positioned adjacent to the

inclined surface 94' of the cam 92'. This results in one end of the contact portion 102 of the connector 100 being positioned adjacent to the interior surface of the cantilever beam 90. The other flange is thereafter pressed against the inclined surface 94', resulting in the simultaneous rearward and rightward movement of the connector 100. The contact portion 102 deflects the cantilever beam 90 away from the partition 85' and this deflection continues until the other flange moves rearward of the ledge 84'. The cantilever beam 90 thereupon returns to its undeflected position moving the connector 100 leftward. The flanges are thereby captured within the slots 95 and 96, and the contact portion 102 is captured between the interior surface of the cantilever beam and the opposing interior surface of the partition 85'.

As shown in FIGS. 9 and 11, several receptacles 80 are mounted on a supporting structure 110 by means of a bracket 112. The bracket 112 includes a base portion 114 having bosses 115 and pairs of tines 116 depending therefrom. The bosses 115 serve to locate the bracket 112 on the supporting structure 110 and the tines 116 serve to secure the bracket to the supporting structure in the same manner as described with respect to the bosses 53 and tines 55 of the receptacle 10 in FIG. 1. In addition, the base portion 114 has a multiple of upstanding holding fingers 118 spaced along one side and a multiple of upstanding detent fingers 120 spaced along the other side opposite to the holding fingers. The holding fingers 118 and detent fingers 120 interact with a bottom wall 122 having a multiple of spaced openings 124 and recesses 125 on opposite sides thereof.

Each receptacle 80 is mounted on the bracket 112 by first positioning the bottom wall 122 thereof so that the holding fingers 118 of the bracket 112 extend into the openings 124, and then pressing the bottom wall down against the base portion 114 of the bracket. The detent fingers 120 are initially deflected away from the holding fingers 118 and then move into the recesses 125 to secure the receptacle 80 to the bracket 112.

Although three embodiments of the invention have been shown and described, it will be understood that they are but illustrative and that various modifications may be made therein without departing from the scope

and spirit of this invention as defined in the appended claims.

What is claimed is:

1. A receptacle for a connector including a pair of tapered flange portions extending from opposite ends of a contact portion, the receptacle comprising:

a pair of spaced parallel walls between which a connector is positioned, each wall including a slot for accommodating the end of one of the flange portions of the connector, the slots facing and being in line with one another, and each slot having front, rear and side surfaces, the front and rear surfaces being spaced apart a distance slightly greater than the thickness of the associated flange portion so as to limit the forward and rearward movement of the connector, the side surfaces being spaced apart a distance slightly greater than the width of the accommodated end of the associated flange portion, and the side surfaces being spaced apart a distance less than the width of the associated flange portion at its widest point, the sides of opposing slots cooperating to limit both lateral and longitudinal movement of the connector, the rear surface of one of the slots comprising the free end of a cantilever beam that extends transverse to the front surface of the slot, the cantilever beam being deflected as the connector is inserted into or removed from the receptacle.

2. A receptacle for a connector including a pair of spaced flange portions and a plurality of contacts intermediate the flange portions, the receptacle comprising:

a pair of walls defining an opening of a size to provide access to the contacts of the connector, each wall including elements defining a slot for accommodating one of the flange portions of the connector, the slot elements of one of the walls including an integral cantilevered beam that is deflected as the connector is inserted into or removed from the receptacle, the slot elements of each wall including side surfaces that are spaced apart a distance less than the width of the associated flange portion at its widest point, the sides of opposed slots cooperating to limit the longitudinal movement of the connector.

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