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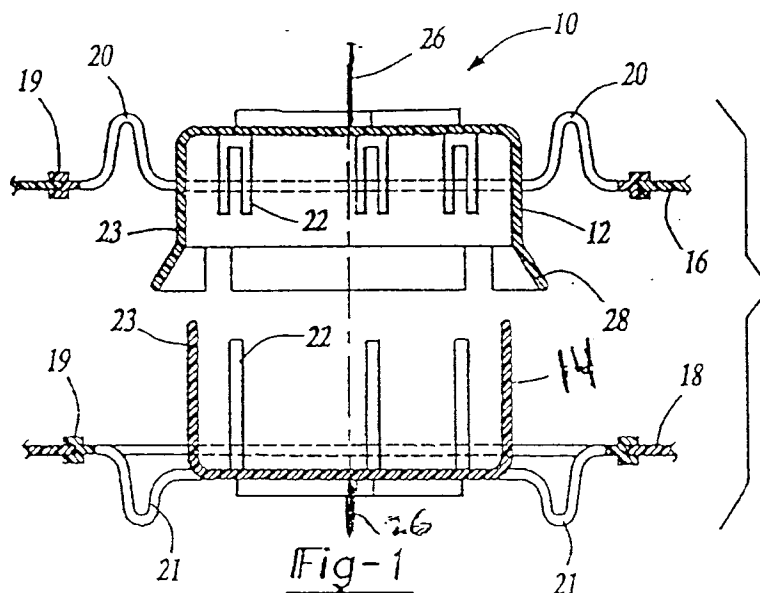
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(54) Self aligning electrical connector

(57) Several self aligning electrical connectors assemblies are disclosed. The assemblies include two halves which are connected together and in which at least one member is movable relative to the other during

connection. Spring members bias the two members to a desired position to ensure the two members are held in a desired position after connection, and returned from any position of movement that may have occurred during the connection.



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Description

BACKGROUND OF THE INVENTION

[0001] This invention relates to self aligning electrical connector assemblies having spring members that allow for relative adjustment of the connector halves.

[0002] In vehicle assembly applications, electrical connector halves must be connected to complete the electrical connection. Often the electrical connector halves provide electrical connections between two component surfaces, and are inserted into the component surfaces after the component surfaces have been manufactured, but before the component surfaces are attached. Frequently, one or both halves of the electrical connector assembly are either inaccessible or not visible when the two component surfaces have been attached. As an example, one half of an electrical connector assembly may be located in the surface of a door panel and must be connected to the other half of the electrical connector assembly in a trim panel, without visual alignment assistance. Other applications include connecting a switch cover to a switch.

[0003] Historically, the electrical connector assembly halves have been rigidly fixed in each component surface. Great care must be taken in the placement and orientation of the halves of the connector assembly in the components to ensure that the connectors halves will be in alignment when the components are being connected to each other. These factors can make it difficult and time consuming to mass produce high quality components having mating connector halves.

[0004] More recently, electrical connector assemblies that are self aligning have been proposed. These electrical connector assemblies have generally allowed movement of one of the connector halves relative to the other to thereby adjust the relative positions of the two.

[0005] Other connectors are snapped into openings and held by spring fingers. The springs have free ends abutting the periphery of the openings. These connector halves have not always provided acceptable control over the position of the halves. It is desirable to provide a connector assembly which can be rapidly and reliably aligned on a component surface even when that surface is not visible.

SUMMARY OF THE INVENTION

[0006] The present invention provides a connector assembly that has connector halves biased to a desired location after they are connected. The connector halves are received in openings and mount portions secure the halves in the openings in some embodiments. Spring members integrally connect the mount portions to the connectors. That is, the springs do not have free ends and thus are more accurately received at a desired location.

[0007] The spring members permit independent

movement of the connector halves within their respective components and allow the connector halves to move into alignment with each other as the first and the second components are being brought together. The spring members assist in biasing the halves toward a desired position even after the connection.

[0008] In one embodiment at least one connector half includes a first piece and a second piece. The first piece includes a lockplate portion having a pair of juxtaposed spring members and a first component having an access hole located between the spring members. The second piece has a connector portion having electrical connections and a pair of projections extending from opposite sides of the connector portion. An upwardly projecting tab is mounted on the free end of each projection. The second piece is adapted to be slidably received between the spring members and the first component to thereby hold the second piece against the first piece and to align the electrical connections of the connector portion with the access hole.

[0009] The second half of the electrical connector assembly includes a first housing having a set of electrical connections compatible with the electrical connections in the connector portion. After the first piece and the second piece of the first half are assembled together the electrical connections of the second half may be inserted through the access hole into the electrical connections to provide an electrical connection between the first and second halves of the electrical connector assembly. The spring members again hold the first half connector portion and the second half, at a desired position.

[0010] These and other features and advantages of this invention will become more apparent to those skilled in the art from the following detailed description of the presently preferred embodiment. The drawings that accompany the detailed description can be described as follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

Figure 1 is a cross sectional side view of a self aligning electrical connector assembly designed according to a first embodiment of the invention;

Figure 2 is a side view of a self aligning electrical connector assembly designed according to a second embodiment of the invention;

Figure 3A is a top plan view of one half of a self aligning electrical connector assembly designed according to a third embodiment of the invention; Figure 3B is a cross sectional side view along line 3B-3B as shown in Figure 3A;

Figure 4A is a cross sectional side view along line 4A-4A as shown in Figure 4B of a first piece of one half of a self aligning electrical connector assembly designed according to a fourth embodiment of the

invention;

Figure 4B is a top plan view of the Figure 4A embodiment;

Figure 5A is a top plan view of a second piece of the second half of a self aligning electrical connector assembly designed according to the fourth embodiment of the invention;

Figure 5B is a one side view of the connector half shown in Figure 5A;

Figure 5C is a second side view of the connector half; and

Figure 6 is a partial cross sectional side view of the first half and the second half of a self aligning electrical connector assembly assembled together.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0012] As shown in Figure 1, a first embodiment electrical connector assembly has a first half 12 and a second half 14 mounted within a first component 16 and a second component 18, respectively. Mount portions 19 mount the halves within the components 16 and 18. The second housing 14 is sized to fit into the first housing 12. A plurality of spring members 20 connect a connector portion 23 of first half 12 to the mount portion 19. Spring members 20 are integrally formed between portions 19 and 23 of first half 12. A plurality of spring members 21 connect the connector portion 23 of second half 14 to mount portion 19. Again spring members 21 are integrally formed with the mount and connector portions 19 and 23. Electrical connectors 22, shown schematically, are located in the connector portions 23. Wires 26 extend to controls, etc. In the embodiment shown, the first half 12 also includes an outwardly flared rim 28 on its connector portion 23.

[0013] Spring members 20 and 21 permit independent movement of the first and second halves 12 and 14 in several directions. These directions include movements perpendicular to the plane of the first and second components 16 and 18 respectively and movements parallel to the plane of the first and second components 16 and 18 respectively. The resiliency of the material, size, and shape of spring members 20 and 21 determine the distance of the desired movement of the first and second halves 12 and 14. In Figure 1, the first and second spring members 20 and 21 are substantially U-shaped to facilitate movement in several directions.

[0014] In operation, first and second components 16 and 18 are preassembled, and connector halves 12 and 14 are mounted to the components. When components 16 and 18 are brought together in general alignment during an assembly operation the rim 28 of the first half 12 connector portion 23 contacts the exterior of the second half 14 connector portion and the first and second halves 12 and 14 are guided into alignment with each other. Spring members 20 and 21 allow the adjustment, but still bias and hold the connector portions at a desired

position. Connectors 22 are brought into alignment and engagement with each other. As will be understood by those of ordinary skill in the art there are many variations on this embodiment. Rim 28 can be discontinuous as shown in Figure 1 or it could be continuous.

[0015] In all of the embodiments of this invention, the components could be any type component. Examples, include door frames and trim panels, an electrical switch and associated cover, or other possible component combinations. If the component itself is relatively small, than the mount portion could be eliminated and the spring could merge integrally into the entire component. In such systems, for purposes of interpreting the claims of this application, the term "mount portion" is the area where the spring is connected to the remainder of the component.

[0016] Figure 2 shows a second embodiment, having a cylindrical first half 30 and a cylindrical second half 32. First half 30 and second half 32 are mounted in a first component 34 and a second component 36 respectively similar to the first embodiment. Spring members also connect portions of the first and second halves 30 as in the first embodiment. First half 30 includes a continuous outwardly flared rim 38 and the second half 32 includes an inwardly flared rim 40. The first and second halves 30 and 32 each also include mating electrical connectors (not shown) The electrical connectors within the first and second halves 30 and 32 are electrically connected to wires 42 and 43.

[0017] Figure 3A is a top plan view of one half of a third embodiment electrical connector assembly. By means of spring members 48, a connector portion 44 is connected to a mount portion 46, which is mounted to component 47.

[0018] Figure 3B shows another view of this embodiment.

[0019] Preferably portions 44, 46 and spring members 48 are integrally molded. Connectors 50 are located in portion 44, and connected to wires 52. The spring members 48 are both tapered in this view, and U-shaped in a view similar to the Figure 1 view. The housing of the other half of the connector assembly (not shown) would preferably be of the same shape as the portion 44 except that it would have external dimensions to interfit with this half.

[0020] Figures 4-6 show another embodiment. Figure 4A is a cross-sectional embodiment view of a first piece of a first half 59 of a self aligning electrical connector 60. Spring member 58 is connected to a component 61 at a connection portion 64. An access hole 68 will receive a connection portion 70 of the first half, as explained below. A connector seat 72 is located between a pair of spring members 58 and surrounds access hole 68. One end of spring members 58 is integral with connection portion 64 and the spring members 58 project to an opposed end.

[0021] Figure 4B is a top view of the first half 59. As shown, there are two spaced spring members 58.

[0022] In Figure 5A a top plan view of a second piece 86, of the first half 59. Second piece 86 includes a connection portion housing 88 with connectors 94. Wires 96 communicate to connector 94. Projections 90 entered from opposite sides of housing 88. A tab 92 projects upwardly from the unattached end of each projection 90.

[0023] Figure 5B is a side elevation view of second piece 86. In Figure 5C is another side elevation view of the second piece 86. As can be seen, projections 90 include a tapered shoulder 102.

[0024] Figure 6 is a cross sectional side view of the assembled self aligning electrical connector assembly. Spring members 58 each have a ramped portion 104 and a retention shoulder 106. To assemble the self aligning electrical connector the second piece 88 is placed with the tapered shoulders 102 of the projections 90 facing the ramped portion 104 of the spring members 58. Then the second piece 88 is moved from right to left as shown by line 108. Initially, this movement forces the spring members 58 away as the ramped portion 104 moves up the tapered shoulder 102. As the movement continues a side 100 of the second piece 88 enters the connector seat 72. When the retention shoulder 106 passes the projection 90 allowing the spring members 58 to spring toward opening 68. The retention shoulders 106 and tabs 92 bias the connector portion of the second piece 88.

[0025] As shown a second half 110 is connected to a component 112. The second half 110 is brought into alignment with the first half second piece 88 and the electrical connections are made. This will occur as the components 61 and 112 are being brought together. The spring members 58 hold the second piece or the connector portion 88 into a desired position as it is brought in connection with the second half 110. In this embodiment, the springs 58 are integrally formed with the connection portion 64. Connectors 80 of the second half 110 of the connector assembly are inserted through the mating access hole 68 and into the connectors 94 of portion 88 to complete the electrical connection between wires 82 and 96.

[0026] The foregoing description is exemplary rather than limiting in nature. Variations and modifications to the disclosed embodiment will become apparent to those skilled in the art and do come within the scope of this invention. Accordingly, the scope of legal protection afforded this invention can only be determined by studying the following claims.

Claims

1. A vehicle component and electrical connector assembly comprising:

a first vehicle component receiving a first electrical connector half having an electrical con-

necter portion, a mount portion connecting said first electrical connector half to said first component, and a spring member fixed to said mount portion and biasing said electrical connector portion to a position within said first component;

a second vehicle component receiving a second electrical connector half adapted to fit into said first connector half;

said spring member permitting movement of said first and said second halves respectively, as said connector halves are connected.

2. An assembly as recited in Claim 1, wherein said second half also has a spring member biasing an electrical connector portion.
3. An assembly as recited in Claim 1, wherein said spring member has a tapered shape.
4. An assembly as recited in Claim 1, wherein said spring member is also integrally connected to said connector portion.
5. An assembly as recited in Claim 4, wherein there are a plurality of spring members connecting said mount portion to said connector portion.
6. An assembly as recited in Claim 1, wherein there are spring members on opposed sides of said connector portion and said spring members have a generally U-shape extending away from said connector portion in a direction away from said second electrical connector half.
7. An assembly as recited in Claim 1, wherein said first electrical connector portion is unconnected to said spring member.
8. An assembly as recited in Claim 7, wherein said first electrical connection portion has projections and a tab extending beyond said projections in a direction away from said second half, said projection being received under said spring members, and said tab preventing movement of said first half beyond said spring members.
9. An assembly as recited in Claim 8, wherein there are a pair of said spring members on opposed sides of said first half, said spring members biased away from said second half by said projections.
10. An electrical connector comprising:

a first half including a mount portion for securing said first half to a component, a plurality of spring members fixed to said mount portion, and a connection portion biased to a desired

position by said spring members; and
 a second connector half, said second connector half and said first connector half having electrical connections which are brought into mating connection with each other, with said spring members holding said first half at a desired position after said electrical connections have been brought into mating connection. 5

11. An electrical connector assembly as recited in Claim 10, wherein said second half also includes spring members biasing said second half to a desired position. 10

12. An electrical connection as recited in Claim 10, wherein there are a plurality of spring members on opposed sides of said first half. 15

13. An electrical connector as recited in Claim 10, wherein said spring members are also fixed to said first half connector portion. 20

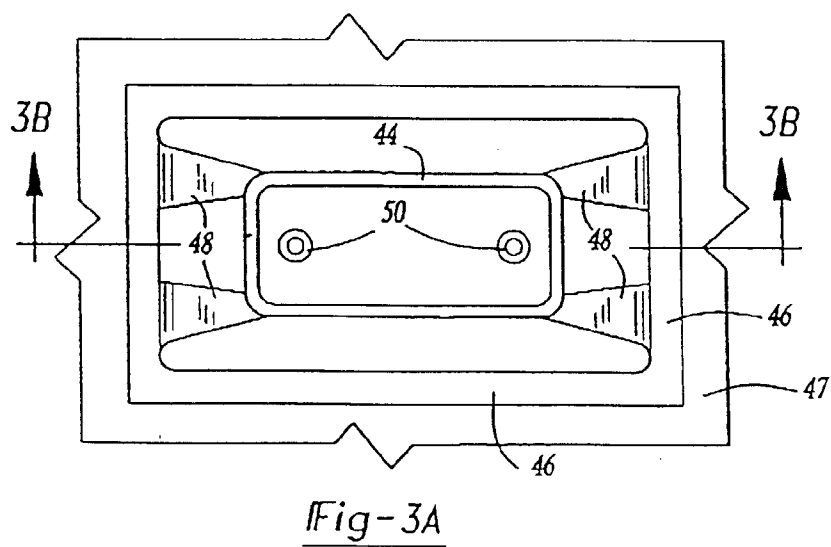
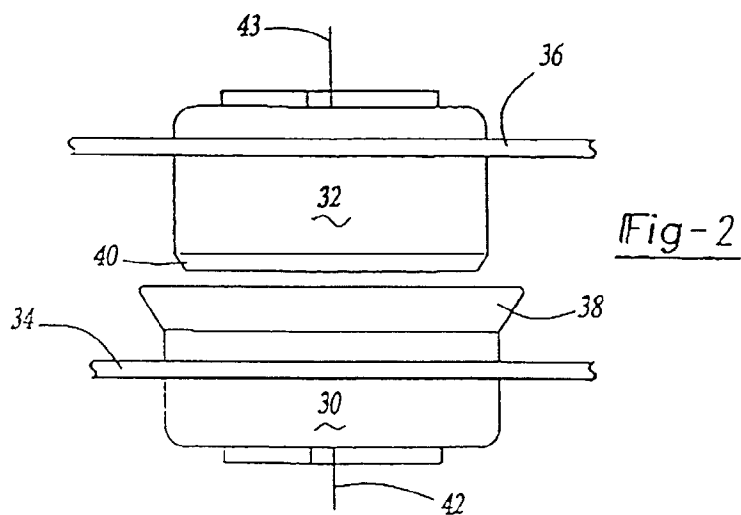
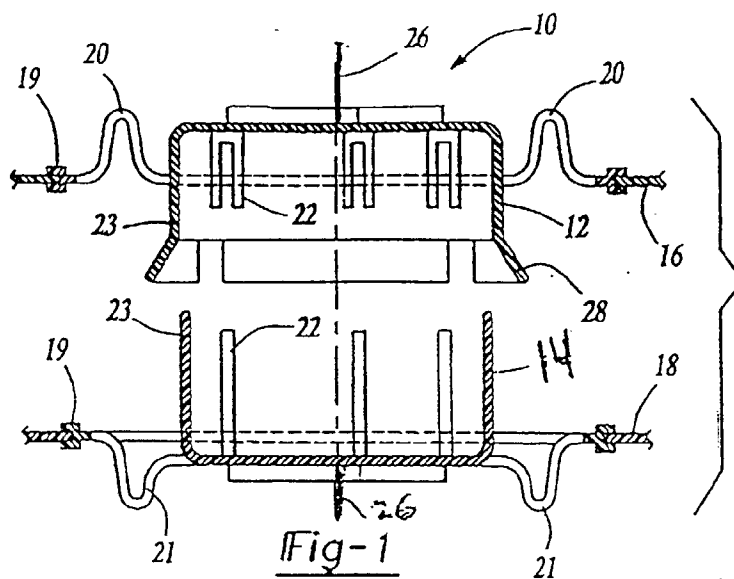
14. An electrical connection as recited in Claim 10, wherein said spring members are separate from said connector portion of said first half. 25

15. A vehicle component and electrical connector assembly comprising:

a first vehicle component receiving a first electrical connector half having electrical connector portion, said component having a mount portion mounting a first piece of said first electrical connector half, and spring members being connected to said mount portion, said electrical connector portion being a separate second piece, said spring members holding said electrical connector portion against a surface of said first vehicle component; 30
 a second vehicle component receiving a second electrical connector half interfitted into said connector portion of said first connector half, said spring member permitting movement of said first connector half connection portion relative to said second connector half. 40
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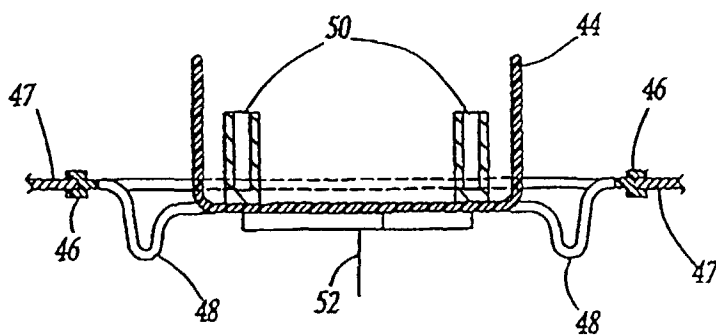


Fig-3B

