

United States Patent

Teagno et al.

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[54] PCB HINGED POD CONNECTOR

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[56]

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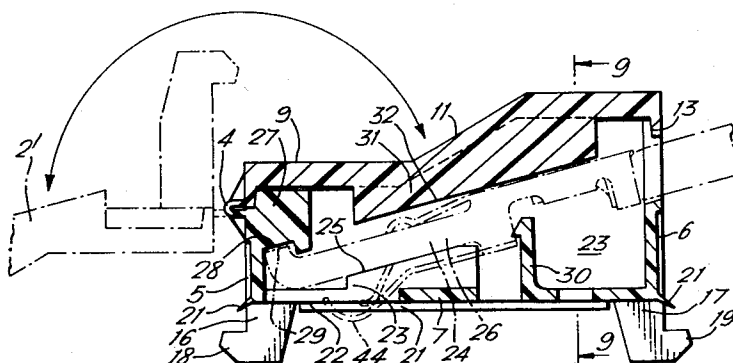
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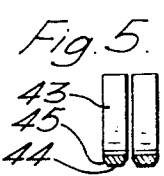
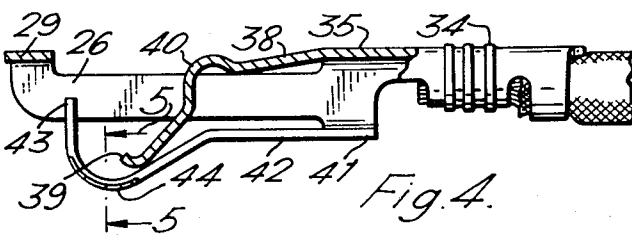
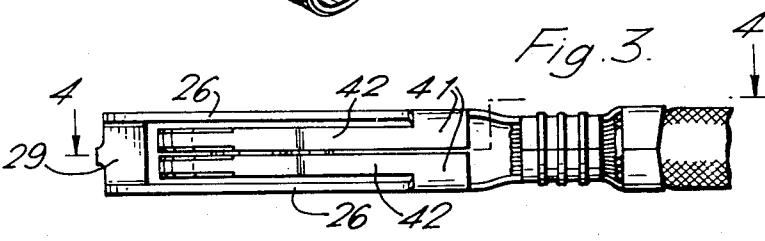
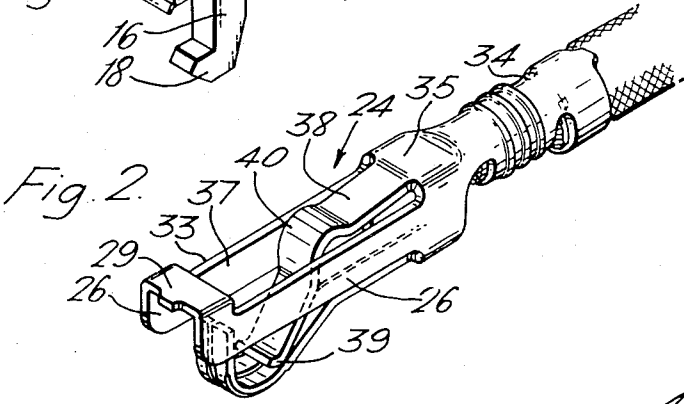
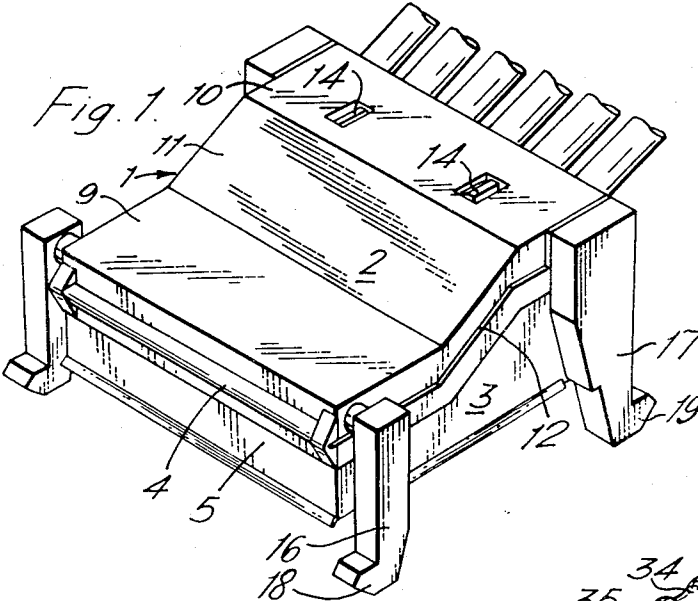
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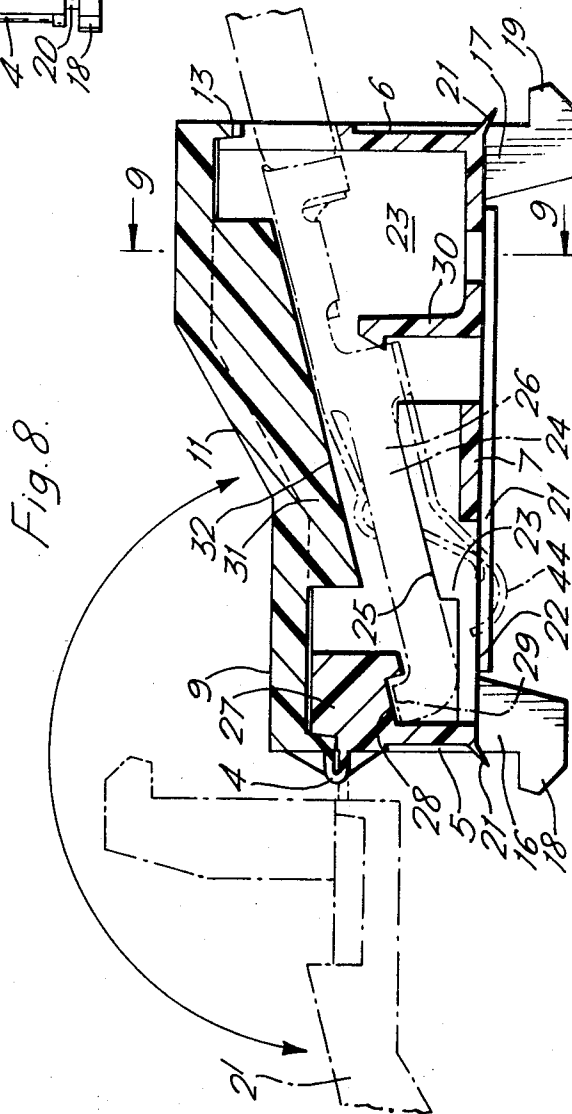
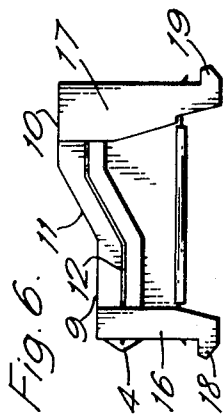
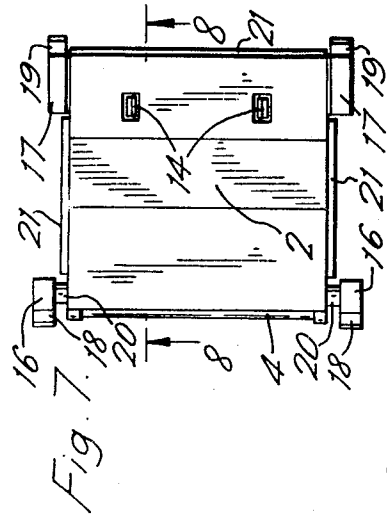
ABSTRACT

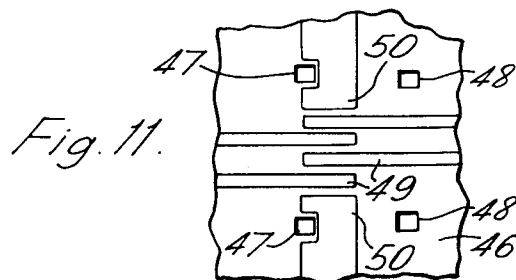
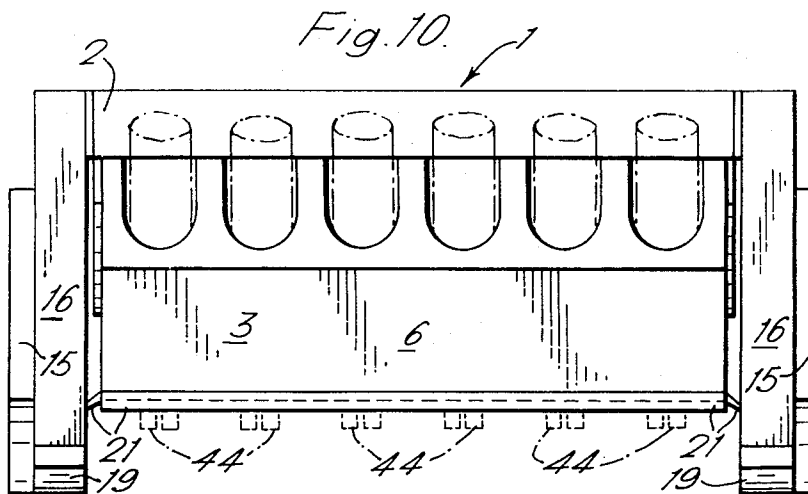
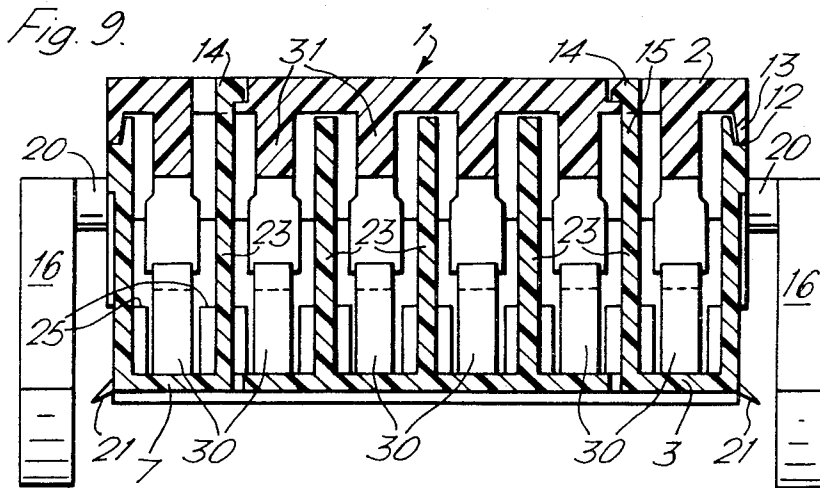
An electrical connector assembly for effecting releasable connection to a printed circuit board according to the present invention comprises the use of resilient insulating material and at least one contact releasably mounted in the housing, and the housing being formed with feet projecting below the floor of the housing for penetrating apertures in and engaging the underside of the circuit board.

10 Claims, 11 Drawing Figures









PCB HINGED POD CONNECTOR

This invention relates to connector assemblies and housings and contacts for such assemblies which are useful for effecting releasable electrical connection to printed circuit boards.

Generally, connections are made at edges of printed circuit boards by printed circuit edge connectors. There have been proposals to effect connections remote from the board edges at holes formed in the board. In these proposals a connector formed with a headed projection is plugged into the hole and rotated to lock the head. The rotation brings contacts in the connector into engagement with respective conductors on the board. This requires that the board conductors are terminated in circular array around the aperture. Difficulties are found in practice due to manufacturing problems and wear on the conductors and there has been a demand for an improved form of connector for commercial use which it is the object of the invention to satisfy.

An electrical connector assembly for effecting releasable connection to a printed circuit board according to the present invention comprises the use of resilient insulating material and at least one contact releasably mounted in the housing, and the housing being formed with feet projecting below the floor of the housing for penetrating apertures in and engaging the underside of the circuit board, at least two of the feet being spaced apart in a linear sense along the floor of the housing, one of the spaced feet being resiliently secured to the housing and resiliently movable relative to the housing in the linear sense, the other of the spaced feet being relatively rigidly secured to the housing, the contact having a contact portion projecting through an aperture in the floor of the housing.

The invention also includes a housing for use in the assembly the housing being formed with feet projecting below the floor of the housing for penetrating apertures in and engaging the underside of the circuit board, at least two of the feet being spaced apart in a linear sense along the floor of the housing, one of the spaced feet being resiliently secured to the housing and resiliently movable relative to the housing in the linear sense, the other of the spaced feet being relatively rigidly secured to the housing.

The invention moreover includes a contact for use in the assembly which comprises a wire connecting portion and a contact portion, the contact portion being of inverted channel form having a wire connecting portion at an end of the web of the channel, sides of the channel at the end adjacent the wire connecting portion having lower projections inwardly turned generally parallel to the channel web, the intumed portions having spring tongue extensions extending forwardly along the channel in closely spaced side-by-side relationship, free end portions of the tongues being bent initially away from the channel web at an inclination and then towards the channel web presenting arcuate convex contact portions directed outwardly of the channel.

These and other objects, features, and advantages of the present invention will be understood in greater detail from the following description and accompanying drawings.

FIG. 1 is a perspective view of a connector assembly according to the invention;

FIG. 2 is a perspective view of a contact for use in the assembly of FIG. 1;

FIG. 3 is a plan view of the contact of FIG. 2;

FIG. 4 is a partly sectioned elevation of the contact taken on line 4—4 of FIG. 3;

FIG. 5 is a fragmentary section taken on line 5—5 of FIG. 4;

FIG. 6 is a side elevation of the assembly of FIG. 1;

FIG. 7 is a plan view of the assembly of FIG. 1;

FIG. 8 is a sectional elevation taken on line 8—8 of FIG. 7.

FIG. 9 is a sectional view taken on line 9—9 of FIG. 8 viewed in the direction of the arrows;

FIG. 10 is an end view taken from the righthand of FIG. 9; and

FIG. 11 is a fragmentary plan view of part of a printed circuit board adapted to receive the connector assembly of FIG. 1.

Referring to the drawings, the invention comprises a unitary molding 1 of resilient insulating material having a lid portion 2 and a body portion 3 integrally joined by a hinge 4. The housing 1 is rectangular as seen in plan view, (see FIG. 8) FIG. 7, and the hinge 4 extends across one end 5 which is less deep as seen in side view than the opposite end 6. The base 7 of the housing is flat but the upper surfaces 8 of lid portion 2 is stepped between flat parallel end surface portions 9 and 10 by an inclined surface portion 11 sloping upwardly from the shallower end 5 to the deeper end 6. Marginal mating portions of the lid 2 and body 3 meet along a seam 12 following the general contour of the lid surface portions 9, 11 and 10. At the seam 12 the lid 2 and body 3 have suitable overlapping portions such as 13, as seen in FIG. 8 and the lid 2 is releasably secured in its closed condition by latch heads 14 on arms 15 extending internally from the floor of the body 3 through suitable apertures in the lid. On disengagement of latch heads 14 the lid 2 may be swung about hinge 4 to the position shown fragmentarily in phantom in FIG. 8 at 2'.

The lid 2 is provided at the opposite ends with pairs of legs 16, 17 arranged to project below the body 3 when the lid is closed and formed at their extremities with feet 18, 19. Each pair has a leg 16 or 17 on each of the opposite sides of the assembly, the legs 17 at the deeper end 6 being stiffly connected to the lid 2 and disposed adjacent the sides of the body 3, and the legs 16 being resiliently connected to the lid by stand-off projections 20. The projections 20 extend outwardly from opposite sides of the lid adjacent the hinge 4 to space the legs 16 apart by a greater amount than legs 17. The projections 20 serve as pivots about which the feet 18 can be displaced by resilient torsional flexure of the projections. The pairs of feet 18 and 19 extend in respective opposite directions beyond the ends 5 and 6 of the body and have upper generally coplanar shoulders spaced below the underside of the body to accommodate a printed circuit board.

The housing is formed at its underside with narrow flexible peripheral flaps 21 extending around the body between the four legs 16 and 17 in outwardly and downwardly inclined manner for engaging the printed circuit board as a dust seal. At the end 5 the underside of the housing is formed with six contact apertures 22 spaced between the sides of the body by dividing walls 23 arranged internally of the body to separate and support the various contacts 24. As can be seen from FIG. 9, the two outer dividing walls 23 are each formed integrally with a respective one of the arms 15. The walls 23 are formed with upwardly facing shoulders 25 inclined downwardly towards the apertures 22, the shoulders 25 of facing sides of adjacent walls 23 being arranged to support side flanges 26 of the contact as will be described. At end wall 5, the housing is formed internally with a projection 27 bridging the width of the housing and between adjacent dividing walls 23 having downwardly facing pockets 28 for receiving contact ends 29. The housing body 3 is formed internally with resilient hook members 30 projecting upwardly from the floor at respective spaces between adjacent dividing walls 23 and arranged to engage the rear of a contact portion of respective contacts.

The lid 2 of the housing is formed on its underside with a projection 31 having a lower surface 32 inclined upwardly towards the end wall 6 and away from the apertures 22 for engaging upper sides of the contacts and holding them against shoulders 25. The projection is slotted as seen in FIG. 9 to receive upper edges of the dividing walls 23 in overlapping manner.

Each contact 24 as shown in FIGS. 2 and 3 to 5, comprises a contact portion 33 and a wire connection portion 34 integrally formed from sheet metal. The contact portion is generally of inverted channel section and the connecting portion of inverted U-form comprising a wire crimping ferrule and an insulation support ferrule. The web of the channel section is cut away between a transition portion 35 and the leading portion 29 at an aperture 37 which extends a short distance down the channel sides 26. An integral spring tongue 38 formed from metal from the apertured region 37 extends forwardly from

transition portion 35 of the channel web and downwardly at an inclination between the sides 26 to a free end 39 projecting below the sides 26 at a location intermediate web portions 35 and 29. Tongue 38 is initially sloped forwards at a shallow downward inclination to an upwardly convex arcuate transition section 40 and then downwardly at a steeper inclination to the free end 39 which is bent up at a radius to present a curved lower side.

Below the transition web portion 35, parts of the channel sides project downwards beyond forward portions of the channel sides 26 and lower marginal portions 41 are turned inwards generally parallel to web portion 35 and each extending across almost one half of the channel width. The turned in portions are extended forwardly in spaced parallel manner as contact springs 42 each being of rectangular strip form as seen in plan and of similar form in side view. The springs 42 are cantilevered from the portions 41 and their forward ends 43 extend beyond the free end 39 of spring 38. As seen in FIG. 4, the springs 42 initially extend from portions 41, generally parallel with web portion 35 to a location adjacent transition section 40 of spring 38 where springs 42 are bent downwards to extend forwardly at an inclination past leading end 39 of spring 38 and then upwardly in arcuately downwardly convex manner at 44 to leading end portions 43 which extend upwardly generally perpendicular to and spaced rearwardly of forward web portion 29. Extremities of end portions 43 are disposed between side walls 26 at the forward end of the contact. The arcuate portions 44 present lower contact faces which as seen in FIG. 5 have side edges 45 swaged.

In assembling a contact into the housing 1, the contact is crimped at section 34 to a conductor wire. The housing lid 2 is opened to the 2' position and the contact inserted into an appropriate cavity spaced between adjacent dividing walls 23. The leading web portion 29 is positioned in forward pocket 28 and the contact pivoted about the leading end, clockwise as seen in FIG. 8 to engage the turned in portions 41 with the head of latch arm 30. At this condition, lower edges of channel sides 26 engage respective wall shoulders 25 to support the contact portion 33 at a rearward and upward inclination at which the conductor wires emerge from the wall 6. The arcuate contact portions 44 project through the aperture 22, below the floor of the housing body 3.

On closing the lid 2 by rotation clockwise about hinge 4 from the 2' position of FIG. 8, the latch heads 14 engage appropriate lid shoulders to secure the lid in closed condition. The internal projection lower surface 32 of the lid 2 engages the contact transition web portion 35 and the base of the ferrule section 34 to hold the contact 26 securely against the support shoulders 25.

In use, the connector housing 1 is releasably secured to a printed circuit board 46, FIG. 11 at four apertures 47, 48. Apertures 47 of one pair are spaced apart by an amount corresponding to the spacing of feet 18 and of a size to admit insertion of the feet 18 through the apertures. The apertures 48 are similarly spaced and sized in relation to feet 19 but the pair of apertures 47 is spaced from the pair of apertures 48 by a distance less than the spacing between the pairs of feet 18 and 19. To assemble the connector housing 1 to the board 46, the feet 18 are initially positioned in apertures 47 with the housing lower base 7 inclined relative to the board 46. The housing 1 is pushed towards the apertures 47 to flex arm projections 20 in torsion until feet 19 register with apertures 48. The housing is then pivoted about feet 18 and apertures 47, clockwise as seen in FIG. 8, to allow feet 19 to penetrate apertures 48 and emerge below the board. The housing 1 is then released and moved to the right, as seen in FIG. 8, to engage the feet 19 under the board 47.

As can be seen in FIG. 11, the board 46 is formed with an array of six spaced contact strips 49,50 extending between the pairs of apertures 47,48 and during the assembly of the housing 1 to the board, as described above, the conductive strips 49 are engaged by respective contact portions 44. Initial engagement takes place after feet 18 have penetrated apertures

47 and the housing has been moved clockwise about feet 18. This causes an upward force on the contact parts 44 and flexure of the spring tongues 42 against cantilever spring 38 giving a progressively increasing contact force which is essentially low. On movement of the housing to the left by torsional flexure of projections 20, the contact portions 44 engage the conductive strips 49,50 with a low pressure wiping movement. On insertion of the feet 19 into apertures 48, contact pressure is increased and there follows a reverse wiping movement at higher contact pressures, the contact portions 44 eventually coming to rest on a previously wiped clean contact area.

As the housing is closed onto the board, the flaps 21 engage the board and are flexed outwardly. The flaps 21 in operation serve to protect the contact areas against ingress of dust.

Apart from the advantageous contact wiping, it is apparent that pull out forces on the contact 26 are resisted by the housing lid 2, the legs 16,17 and the feet 18,19. The contacts cannot be removed from the housing 1 without removing the housing from the panel 46. Pull out forces are in the reverse sense to that required for release of feet 19 from apertures 48. Under foreseeable operational forces, the feet 19 must be disengaged before the feet 18 by movement in a reverse direction to the pull out forces.

It is of advantage in many applications that the conductor wires extend from the housing at an inclination away from the board.

I claim:

1. An electrical connector assembly for effecting releasable connection to a printed circuit board, which comprises a housing of resilient insulating material and at least one contact releasably mounted in the housing, in which the housing is formed with feet projecting below a floor of the housing for penetrating apertures in and engaging the underside of the circuit board, at least two of the feet being spaced apart in a linear sense along the floor of the housing, one of the spaced feet being resiliently secured to the housing and resiliently movable relative to the housing in the linear sense and the other of the spaced feet being relatively rigidly secured to the housing, the contact having a contact portion projecting through an aperture in the floor of the housing, and in which the housing is formed with a lid integrally secured by a hinge to a body of the housing, the feet being formed on legs extending from the lid.

2. An assembly as claimed in claim 1, in which the body is formed with latch means arranged releasably to latch the lid to the body.

3. An assembly as claimed in claim 1, in which the lid is formed internally with a projection or respective projections arranged to engage and hold the or each contact against movement away from the floor of the housing.

4. An assembly as claimed in claim 1, in which the floor of the housing is formed on its underside with peripheral flaps arranged resiliently to engage the circuit board around the contact or contacts and act as a dust seal.

5. An assembly as claimed in claim 1, in which the housing is of generally rectangular form as seen in plan looking towards the floor, the lid being formed with two pairs of legs, one pair of each of the opposite housing ends, the hinge being formed at an end adjacent one of the pairs, the legs of each pair being disposed one on each of the opposite sides of the housing, the legs of the pair at the hinge end being stood off from sides of the lid by respective projections flexible in torsion about an axis transverse to the linear sense, the legs adjacent the hinge end being spaced apart by an amount greater than the legs of the pair at the other end of the housing.

6. An assembly as claimed in claim 5, in which the housing floor is formed with a contact aperture or a row of contact apertures at the end adjacent the hinge and the resilient legs, and is formed at the other end with a cable entry for the contact or contacts.

7. An electrical connector assembly for effecting releasable connection to a printed circuit board, which comprises a housing of resilient insulating material and at least one contact

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releasably mounted in the housing, in which the housing is formed with feet projecting below a floor of the housing for penetrating apertures in and engaging the underside of the circuit board, at least two of the feet being spaced apart in a linear sense along the floor of the housing, one of the spaced feet being resiliently secured to the housing and resiliently movable relative to the housing in the linear sense and the other of the spaced feet being relatively rigidly secured to the housing, the contact having a contact portion projecting through an aperture in the floor of the housing, and wherein said contact comprises a wire connecting portion and a contact portion, the contact portion being of inverted channel form having the wire connecting portion at an end of the web of the channel, in which sides of the channel at the end adjacent the wire connecting portion have lower projections which are turned inwards generally parallel to the channel web, the inturned portions having spring tongue extensions extending forwardly along the channel in closely spaced side-by-side relationship, free end portions of the tongues being bent initially away from the channel web at an inclination and then towards the channel web to present arcuate convex contact

6

portions directed outwardly of the channel.

8. An assembly as claimed in claim 7, in which the extremities of the free ends of the spring tongues are generally perpendicular to the web of the channel, and are disposed between channel side portions.

9. An assembly as claimed in claim 7, in which the web of the channel is apertured between a portion adjacent the wire connecting portion and a remote leading end portion, metal from the aperture forming a support spring extending in cantilever fashion from the channel web at the wire connecting portion, between the channel sides at an inclination towards the contact springs, the free end of the support spring arranged to engage the contact springs on their flexure towards the channel web.

10. An assembly as claimed in claim 9, in which the support spring is formed intermediate its ends with an arcuately bent transition section projecting in convex manner towards the aperture in the channel web and adapted on operation flexure of the support spring to engage a lid part of the housing to resist flexure away from the housing floor.

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