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ELECTRICAL CONNECTOR HAVING STABILIZING MEANS AND FREE-FLOATING CONTACT SECTION

Filed Jan. 19, 1967 Sheet 1 of 2

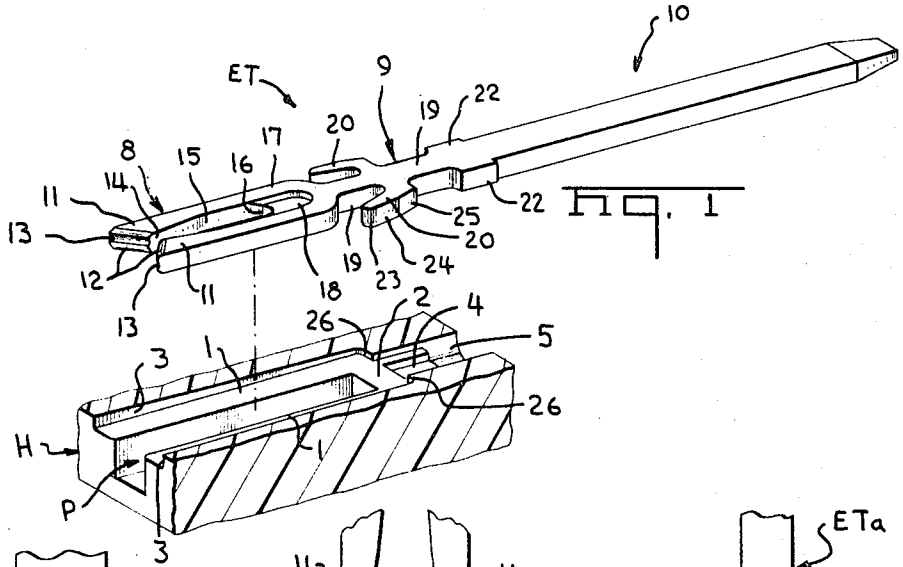

Fig. 1

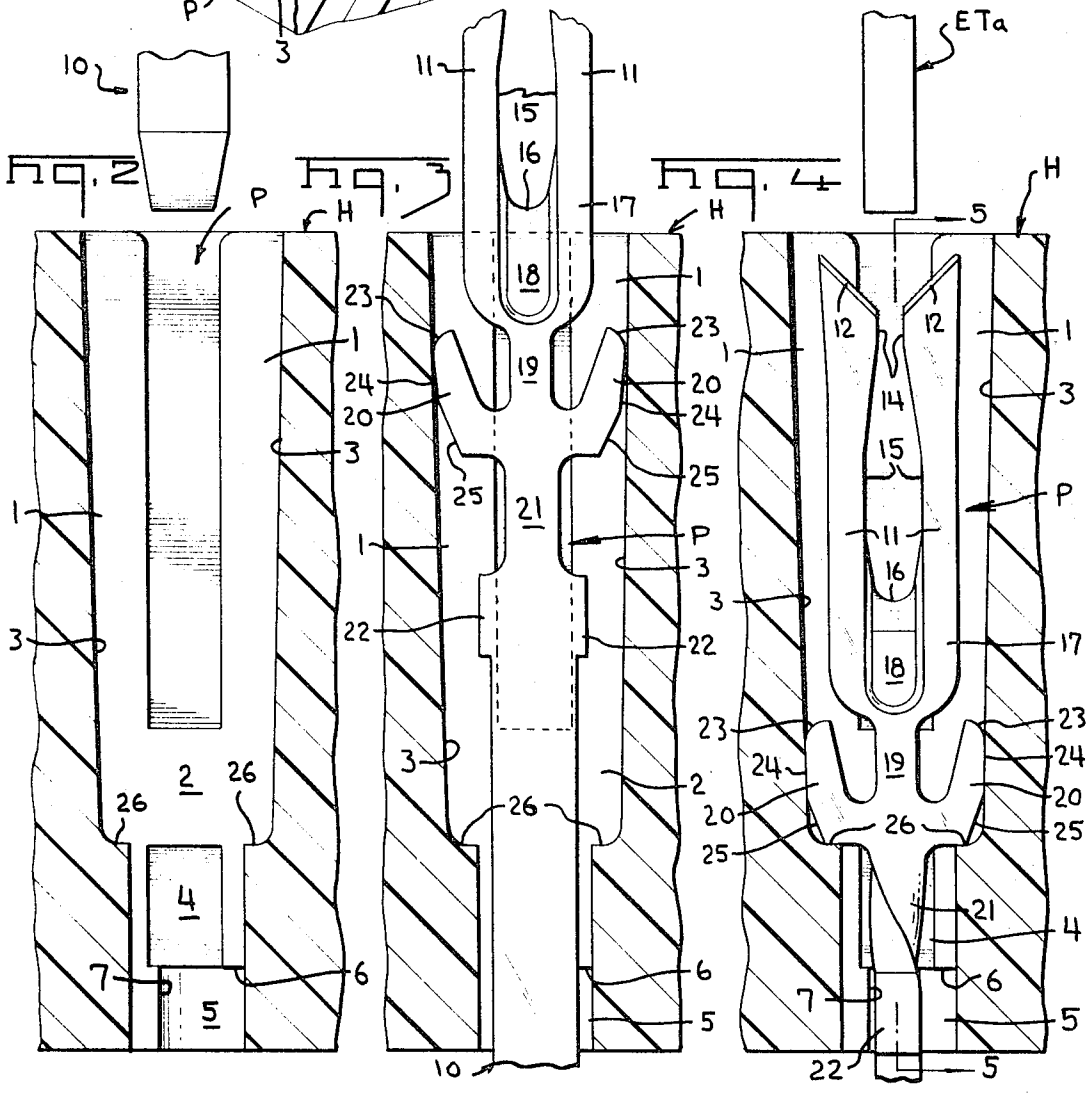

Fig. 2 Fig. 3 Fig. 4

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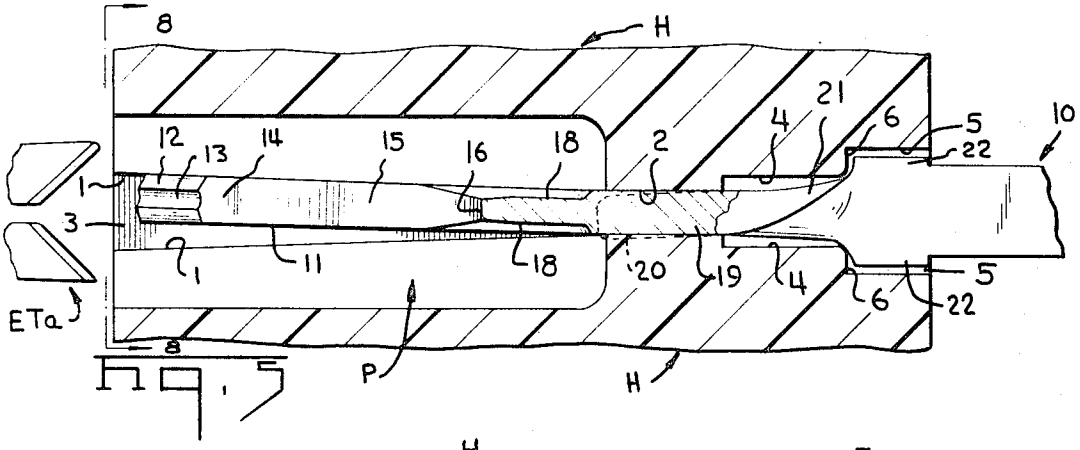

FIG. 5

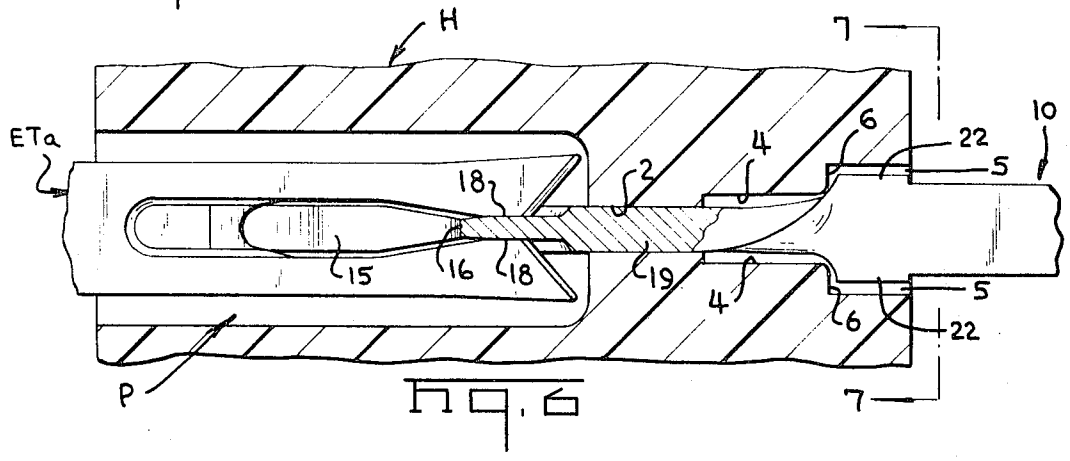

FIG. 6

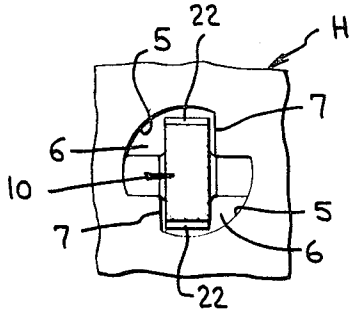

FIG. 7

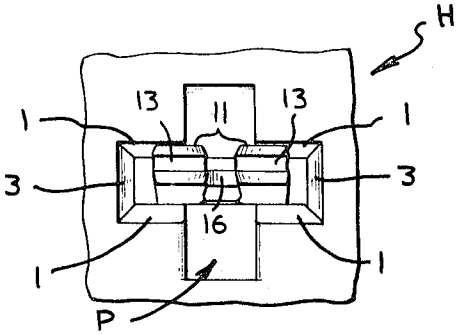

FIG. 8

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3,444,504

ELECTRICAL CONNECTOR HAVING STABILIZING MEANS AND FREE-FLOATING CONTACT SECTION

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U.S. Cl. 339—64 13 Claims

ABSTRACT OF THE DISCLOSURE

An electrical connector comprises a contact section and a securing section disposed in a passageway of a dielectric housing with the securing section and the passageway including means to secure the connector in position and ear means engageable with surfaces of the passageway to permit freedom of movement of the contact section for mateable alignment with another electrical connector.

This invention relates to electrical connectors and more particularly to electrical connectors having stabilizing means and free-floating contact sections.

Heretofore electrical connectors have been secured in passageways of a housing and the electrical connectors have been freely movable to the extent of being sloppy whereby alignment with a mating electrical connector has created alignment problems and hence improper mating between the mateable electrical connectors as well as problems with respect to properly terminating a post section of the electrical connectors. Frequently, when misalignment between mateable electrical connectors occurs, the electrical connectors can be damaged when the connectors are forced into engagement, insertion forces between the misaligned connectors is increased and improper engagement is effected between the misaligned connectors which effects the electrical conductivity therebetween. Electrical connectors have also been secured in passageways of a housing to the extent that they are stabilized therein so that the posts are maintained in alignment to receive electrical connections applied by automatic wiring machinery, but no provision is provided to permit the contact sections of the electrical connectors to be free floating so that the contact sections can properly mate with misaligned mateable electrical connectors.

An object of the invention is to provide an electrical connector ithat is stabilized in a passageway of a housing and has a free-floating contact section to mate with a misaligned contact section of a mateable electrical connector.

Another object of the invention is the provision of an electrical connector that has stabilizing arms adjacent the contact section to stabilize the electrical connector in a passageway of a housing.

A further object of the invention is to provide tapered surfaces in a passageway of a housing against which stabilizing means of an electrical connector resiliently engage.

An additional object of the invention is the provision of securely positioning an electrical connector in a passageway of a housing so that a post section can be terminated properly.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there is shown and described an illustrative embodiment of the invention;

it is to be understood, however, that this embodiment is not intended to be exhaustive nor limiting of the invention but is given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

The foregoing and other objects are achieved by a preferred embodiment of an electrical connector comprising, in combination, a dielectric housing and an electrical contact member, the dielectric housing having a passageway extending therethrough with opposing tapered surfaces, the contact member having a contact section, a securing section and a conductor-receiving section, stabilizing members extending outwardly from the contact member adjacent the securing section and in engagement with the opposing tapered surfaces, a reduced section between the contact section and the securing section to permit the contact section to be movable relative to the securing section in a free-floating manner to mate with a misaligned complementary electrical contact, and means on the securing section and in the passageway securing at least the contact section and the securing section of the electrical contact in the passageway and maintain the stabilizing members resiliently against the opposing tapered surfaces thereby stabilizing the conductor-receiving section in a substantially fixed position.

In the drawings:

FIGURE 1 is an exploded perspective cross sectional view of a housing member and an electrical terminal;

FIGURES 2 through 4 illustrate the positioning of the electrical terminal within a passageway of the housing;

FIGURE 5 is a view taken along lines 5—5 of FIGURE 4;

FIGURE 6 is a view simiilar to FIGURE 5 with the electrical terminals in electrical engagement;

FIGURE 7 is a view taken along lines 7—7 of FIGURE 6; and

FIGURE 8 is a view taken along lines 8—8 of FIGURE 5.

Turning now to the drawings, there is illustrated a dielectric housing H which is conventionally molded from any suitable dielectric material. Housing H illustrates a single passageway P but it is to be understood that housing H can have one or more passageways. An electrical terminal ET fits in passageway P.

Passageway P has a cross-shaped section defining opposing slots. One of the slots has tapered surfaces 1 which taper toward the longitudinal axis of the passageway from the entrance of the passageway to an inner receiving section 2. The same slot also has other tapered surfaces 3 which taper inwardly from the entrance of the passageway to a point about midway of inner receiving section 2. Opposed recesses 4 are located in section 2 and these recesses in section 2 communicate with arcuate sections 5. Inner surfaces 6 are located at the junctions of recesses 4 and sections 5 and stop surfaces 7 extend inwardly from the end of housing H to inner surfaces 6. Stop surfaces 7 are disposed on opposite sides of a plane passing through the longitudinal axis of passageway P and in spaced relationship thereto as well as extending parallel therewith.

Electrical terminal ET is similar in construction to the electrical terminal disclosed in U.S. patent application, Ser. No. 534,744, filed Mar. 16, 1966 and it comprises a contact section 8, a securing section 9 and a conductor-engaging section 10. The electrical terminal is susceptible to mass production by automatic machinery and is conveniently formed by shaping a sheet metal blank or strip of a suitable electrically conductive metal such as brass,

bronze or the like in successive forming steps. The metal is sufficiently hard and resilient to impart to the connection area a spring-like character.

Contact section **8** includes fork members **11** having beveled surfaces **12** at the free ends thereof which act as guide means to guide contact section **8** into mating engagement with the contact section of a like electrical terminal ET*a* as illustrated in FIGURES 4 through 6. Of course, contact section **8** can mate with other fork-type electrical terminals such as that disclosed in U.S. Patent No. 2,828,474 or the like as well as with blades of the type disclosed in U.S. Patent No. 3,215,975. Electrical terminals ET*a* are generally mounted on a printed circuit board or a mounting member; however, housing H and electrical terminals ET could be mounted on a printed circuit board in the manner of U.S. Patent No. 3,215,975. The electrical connector of the present invention is therefore susceptible to numerous uses that need not be described.

Channels **13** are formed in beveled surfaces **12** so that at the initial points of contact between contact section **8** and a complementary contact section of another electrical terminal less contact area is provided which therefore defines wear points that will lend long life to the electrical terminal. The wear point concept is an important feature of the invention when the electrical terminal or the contact section thereof is plated with precious metals.

The inner surface of each fork member **11** is provided with a contact surface **14** which is generally parallel with the longitudinal axis of the contact section and a generally arcuate surface **15** which merges into a radiused inner end **16**, which is part of bridge **17** connecting fork members **11** together. Each fork member from beveled surfaces **12** to inner end **16** defines a generally sinusoidal configuration. U-shaped contact channels **18** are disposed in each side of bridge **17** and the outer ends of contact channels **18** form inner end **16**. The walls of contact channels **18** are beveled and, as can be discerned from FIGURES 5 and 6, channels **18** from inner end **16** to about one-third the depth thereof are beveled to facilitate the movement of the outer contact surfaces of electrical terminal ET*a* along contact channels **18**. Contact section **8** of electrical terminal ET therefore defines outer and inner contact-engaging areas when electrically mating with contact sections of the same configuration or similar thereto such as the type disclosed in U.S. Patent No. 2,828,474 or the like. Contact section **8** is connected to securing section **9** via blade section **19**.

Securing section **9** includes ears **20** extending outwardly from each side of a reduced section **21** adjacent blade section **19**. Lugs **22** extend outwardly from each side of reduced section **21**. Ears **20** have radiused surfaces **23** which merge into tapered surfaces **24** which in turn merge into tapered surfaces **25**. Ears **20** are bent outwardly from the plane containing blade section **19** as illustrated in FIGURE 5.

Conductor-engaging section **10** preferably takes the form as illustrated in the drawings whereby a connection can be made thereto by means of a connector disclosed in U.S. Patent No. 3,239,918 by connecting a wire thereto, by means of conventional wire-wrapping techniques, by welding a wire thereto or by soldering a wire thereto. Conductor-engaging section **10** can take any other suitable form to terminate a conductive member thereto as desired.

In assembly, electrical terminal ET is inserted into passageway P of housing H with conductor-engaging section **10** being threaded into passageway P until the inner surfaces of ears **20** which are adjacent tapered surfaces **25** are brought against surfaces **26** whereupon conductor-engaging section **10** is rotated 90° with respect to contact section **8** causing reduced section **21** to be twisted as illustrated in FIGURES 4 through 7 thereby securing the electrical terminal within the passageway. Conductor-engaging section **10** is twisted until lugs **22** engage inner surfaces **6** to secure the electrical terminal in position and stop surfaces **7** to assure the correct angular disposition of conductor-engaging section **10** with respect to the rear surface of housing H so that conductor-engaging section **10** will be properly aligned to receive terminations applied by automatic terminating equipment. The inner ends of lugs **22** are preferably radiused so that scoring of the edges of inner surfaces **6** is minimized. Also, the twist that occurs in reduced section **21** and the position of lugs **22** with respect to stop surfaces **7** stabilize conductor-engaging section **10** in an aligned position for termination by automatic terminating equipment.

The action of ears **20** as the electrical terminal is being threaded into passageway P is according to the following: Tapered surfaces **24** engage tapered surfaces **3** of the passageway and tapered surfaces **24** move along tapered surfaces **3** as the electrical terminal is being moved into the passageway causing ears **20** to be moved inwardly toward the longitudinal axis of the passageway. When the electrical terminal has been secured in position in the passageway, ears **20** are resiliently biased against surfaces **3** thereby aiding in the stabilization of conductor-engaging section **10** and blade section **19** permits contact section **8** to be free floating so that it can move relative to tapered surfaces **1** and **3** thereby permitting contact section **8** to effectively mate with a misaligned electrical terminal without damage thereto or therebetween.

In order to achieve proper contact pressures at both outer contact surfaces of fork members **11** when contact section **8** is mating with a misaligned electrical terminal, it is necessary that the flexural strength of the contact section about blade section **19** be substantially less than the flexural strength of either fork member **11**. This is essential and provides a contact section having the advantages of a fixed securing section with a self-aligning free-floating contact section capable of properly mating with a misaligned electrical terminal. With blade section **19** providing freedom of movement of the contact section, a permanent set of the fork members is precluded. Thus, there is obtained orientation in normal planes when the contact section mates with the same contact section, similar contact sections, blades or the like. The disposition of electrical terminals ET in housing H in aligned rows, staggered aligned rows or the like provides modular expandability, system interchangeability and grid system flexibility.

Since ears **20** extend outwardly from blade section **19**, contact section **8** is biased towards a tapered surface **1** as illustrated in FIGURE 5, but in view of the free floating concept of the contact section provided by blade section **19**, contact section **8** is readily alignable with mating contact section of another electrical terminal.

It will, therefore, be appreciated that the aforementioned and other desirable objects have been achieved; however, it should be emphasized that the particular embodiment of the invention, which is shown and described herein, is intended as merely illustrative and not as restrictive of the invention.

The invention is claimed in accordance with the following:

1. An electrical connector comprising, in combination, a dielectric housing and an electrical contact member, the dielectric housing having a passageway extending therethrough, said passageway having opposing tapered surfaces, the contact member having a contact section, a securing section and a conductor-receiving section disposed in said passageway, stabilizing members extending outwardly from the contact member adjacent the securing section and in engagement with the opposing tapered surfaces, a blade section between the contact section and the securing section to permit the contact section to be movable relative to the securing section in a free-floating manner to mate with a misaligned complementary electrical contact, and means on the secur-

ing section and in the passageway securing at least the contact section and the securing section of the electrical contact in the passageway and maintaining the stabilizing members resiliently against the opposing tapered surfaces thereby stabilizing the conductor-receiving section in a substantially fixed position.

2. An electrical connector according to claim 1 wherein said stabilizing members have radiused surfaces merging into beveled surfaces in engagement with said opposing tapered surfaces.

3. An electrical connector according to claim 1 wherein said passageway includes other opposing tapered surfaces, said stabilizing members being directed away from a longitudinal axis of said contact member and biasing said contact section toward one of said other opposing tapered surfaces.

4. An electrical terminal comprising a contact section, an intermediate section and a conductor-engaging section, a blade section connecting said contact section to said intermediate section, unitary resilient ear means extending outwardly from said intermediate section adjacent said blade section and toward an insertion end of said contact section for engagement with surfaces of a housing passageway to stabilize the electrical terminal therein, said blade section having a flexural strength weaker than said contact section thereby permitting said contact section to be free floating relative to said intermediate section thereby permitting said contact section to mate with a misaligned complementary contact section.

5. An electrical terminal according to claim 4 wherein said ear means have outer radiused surfaces merging with beveled surfaces.

6. An electrical terminal according to claim 4 wherein said ear means extend away from a longitudinal axis of the electrical terminal.

7. An electrical terminal according to claim 4 wherein said contact section includes fork members having opposing surfaces defining a generally sinusoidal configuration.

8. An electrical terminal according to claim 4 wherein said contact section includes fork members provided with beveled surfaces at free ends thereof with channels disposed in the beveled surfaces.

9. An electrical terminal according to claim 4 wherein said contact section includes fork members and a bridge section at the inner ends thereof, said bridge section having channels with the outer ends of said channels having beveled surfaces.

10. An elecrical connector comprising, in combination, a dielectric mounting member and an electrical terminal; said mounting member having an opening provided with a first section and a second section, said first section communicating with opposed tapered surfaces, said second section having locking surfaces and stop surfaces, said stop surfaces being disposed on opposite sides of a plane extending through a longitudinal axis of said opening; said electrical terminal including a contact section, a securing section, a conductor-engaging section and resilient ear means, said electrical terminal being disposed in said opening with said securing section being located in said sections and said ear means being disposed against sad tapered surfaces, said ear means in engagement with said tapered surfaces limiting movement of said electrical terminal in said opening in one direction, said conductor-engaging section being twisted with respect to said contact section so that a portion of said securing section is disposed in said first section and another portion of said securing section is disposed in said second section adjacent said locking surfaces and said stop surfaces thereby limiting movement of said electrical terminal in said opening in a direction opposite to the first-mentioned direction and moving said ear means toward a longitudinal axis of said opening thereby stabilizing said electrical terminal in said opening.

11. An electrical connector according to claim 10 wherein said resilient ear means are disposed at an angular disposition away from a longitudinal axis of said electrical terminal.

12. In an electrical connector, an insulating housing having a preformed passageway extending therethrough, an electrical contact inserted in said passageway, said housing and contact being arranged for relative movement along an axis into engagement with a mating connector, said contact including a contact section, a securing section, and a conductor-receiving section, said contact section having spring elements resiliently flexible towards and away from each other laterally of said axis to engage a complementary contact in the mating connector, said securing section coacting with said housing to provide a rigidly fixed base for said contact section and conductor-receiving section, resilient ear means provided by said securing section and in engagement with surfaces of said passageway thereby stabilizing said conductor-receiving section, and a blade section intermediate said contact section and said securing section and having a flexural strength substantially less than each of said spring elements to give said contact section a free-floating action with respect to the complementary contact.

13. An electrical terminal comprising a contact section, an intermediate section and a conductor-engaging section, a blade section connecting said contact section to said intermediate section, said contact section including fork members having opposing surfaces defining contact-engaging surfaces, unitary resilient ear means extending outwardly from said intermediate section adjacent said blade section for engagement with surfaces of a housing passageway to stabilize the electrical terminal therein, said blade section having a flexural strength weaker than either of said fork members thereby permitting said contact section to be free floating relative to said intermediate section thereby permitting said contact section to mate with a misaligned complementary contact section.

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U.S. Cl. X.R.

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