

SPECIFICATION

Title of Invention

Electrical Connector and Contact Therefor

Detailed Description of Invention

(Field of Invention)

The present invention relates to an electrical connector and a contact therefor, more specifically to an electrical connector for retaining a contact having vertically and horizontally oriented barbs offset in the direction of insertion, and also a contact for such electrical connector.

(Prior Art)

It is conventional to secure a contact in a cavity of an insulating housing by the provision of barbs along both side edges of such contact for interference fitting between the barbs and the inner wall of the cavity. For example, disclosed in JP-A-6-150999 is an electrical connector 100 having contact retention feature as illustrated in FIG. 14.

Inserted into cavities 102 in the electrical connector 100 are contacts 110 each having barbs 104, 106 which engage isolation walls between adjacent cavities 102, 104 in such a manner that the barbs 104, 106 bite into the isolation walls 112 to cause a stress.

(Problem to Be Solved by the Invention)

Since it is typical to cause a stress in isolation walls by the barbs, it is typical to have a thick enough isolation wall, thereby providing the necessary strength, which makes it difficult to dispose contacts closer together (or high density). In the above mentioned prior art, the barbs 104, 106 are offset to each other for effectively avoiding stress concentration in the isolation walls. However, there is a certain limit in the magnitude of available retention force.

In consideration of the foregoing, the present invention intends to provide an electrical connector having a large contact retention force without causing unreasonably large stress that reduces the strength due to crack and the like of the housing and a contact to be used therefor.

It is another object to provide a contact which is simple in construction and has a large retention force when inserted into a housing.

(Means to Solve the Problem)

The electrical connector according to the present invention comprises contacts having barbs to be inserted into and retained by the barbs in plural rows of cavities in an insulating housing and is characterized in that the barbs comprise first barbs extending into isolation walls between upper and lower rows of cavities and second barbs extending into isolation walls between adjacent cavities in the same row and offset in the axial direction from the first barbs.

The contact according to the present invention has a tab-like contact portion at one end and a U-shaped portion at the other end portion along the longitudinal direction, wherein barbs are formed at the side edges of the contact portion and free ends of the U-shaped portion.

It is preferable that the isolation walls between the upper and lower rows of cavities in the housing are thicker than the isolation walls between adjacent cavities in the same row.

The cavities engaging horizontal barbs are preferably open at one side in vertical direction. The barbs are preferably sawtooth shape.

(Embodiment)

Now, one preferred embodiment of the present invention will be described in detail by reference to the accompanying drawings.

Illustrated in FIGs. 1, 2, 3 and 4 are perspective, front, plan and rear views of the electrical connector 1 according to the present invention, respectively. Reference is made hereunder to FIGs. 1-4 to describe the electrical connector 1. An insulating housing 2 is made from any suitable plastic material and has a rectangular flange 4 and a mating portion 6 extending forwardly from the flange 4. The mating portion 6 is formed with a mating recess 8 for receiving signal tab contacts (simply referred to as contact below) 70 (see FIGs. 8 and 9) and cavities 10 for receiving power receptacle contacts (not shown). The cavities 10 extend the housing 2 from its mating face 12 to the rear end.

The mating portion 6 is formed with a slot 14 for receiving an isolation wall of a matable connector (not shown) between two rows of vertical cavities 10. Also, the mating portion 6 is formed with key grooves 16a, 18a, 18b in the side walls 16, 18 in the direction of insertion/extraction of the connector 1 for keying the matable connector. The flange 4 is formed with a circular opening 22 and an oval opening 24 at both ends thereof. The flange 4 is mounted on a panel (not shown) by bolts after aligning first the circular opening 22 with a mounting hole in the panel, then aligning the oval opening 24 with another mounting hole in the panel. The oval opening 24 is adapted to absorb any tolerance of the mounting holes in the panel.

As best shown in FIGs. 1 and 2, disposed in the mating recess is a plate portion 26 for disposing the signal contacts 70 on both surfaces thereof. There are formed a plurality of channels 28 on both surfaces of the plate portion 26 for disposing the contacts 70 therein. Shape of the contacts 70 and the way of retaining them will be described in detail hereinafter. Rectangular openings 32 in FIG. 2 are formed for core pins of a molding die

for making latch arms 30 which are described hereinafter.

Now, reference is made to FIGs. 5 and 6 to describe the mounting portion of the contact 70. FIG. 5 is a magnified front view of the area circled by a chain line in FIG. 2. A plurality of isolation walls 52 are disposed at a predetermined space on the plate portion 26 having a leading end portion 26a and tapered portions 26b, 26e in continuous form with the leading end portion 26a. A taper 52a is formed near the end of each isolation wall 52 for cooperating with the tapers 26a, 26e for guiding the matable connector. Channels 28 are formed between isolation walls 52 with the bottom surface 26d of the plate portion 26.

Each of the contacts 70 is disposed at the bottom of each channel 28. Cavities 54 are formed extending the bottom wall 36 of the mating recess 8 in alignment with the surface 26d of the plate portion 26. The contacts 70 are adapted to pass through the cavities 54. The contacts 70 are maintained in position by the sidewalls 52b of the isolation walls 52 overlapping the both side edges 79 of the contacts 70 (see FIG. 8).

Illustrated in FIG. 6 is a partial magnified rear view of the area circled by the chain line in FIG. 4. The contacts 70 are seen in the cavities 46 of □-shape in cross section. Each contact 70 is formed with barbs 76a, 76b (collectively represented by 76 in FIG. 8) at the free end 77 of the U-shaped contact portion for interference fitting with the inner face of the respective cavity 46 (see FIG. 8). The barbs 76 will be described hereinafter in detail.

Illustrated in FIG. 7 is a longitudinal cross section view along the line 7-7 in FIG. 2. The plate portion 26 extends from substantially the center of the bottom wall 36 of the mating recess 8 toward the mating face 12. The leading end portion 26a of the plate portion 26 is relatively thin and is coupled to the relatively thick base 26c through the taper 26b. The channels 28 are formed in the base 26c in which the contacts 70 are disposed.

The contacts 70 are latched by the channels 28 and the bottom wall 36 and extend rearwardly therethrough. The housing 2 is formed with an opening 38 at the rear end thereof for receiving a separate connector (not shown). Portions of the contacts 70 exposed to the mating recess 8 and the opening 38 are contact portions 74, 77 for being electrically connected to the

matable connector. There is formed a latch arm 30 in the opening 38 extending rearwardly from the bottom wall 36. An inwardly extending projection 30a is formed at the front end of the latch arm 30 for engaging and retaining a connector to be inserted. A gap 42 is provided behind the projection 30a between the inner surface 44 of the opening 38 to allow the latch arm 30 to deflect.

Now, construction or shape of the contacts 70 will be described by reference to FIGs. 8 through 10. FIG. 8 is a plan view of two contacts 70 inter-coupled by a carrier 72. FIGs. 9 and 10 are front and side views of such contacts, respectively.

FIGs. 8 and 9 are first referred. The contact portion 74 is a planar and has a slightly wider front portion 74a, a coupling portion 74b at substantially center portion coupled to the carrier 72 and two sawtooth barbs (second barbs) 78a, 78b at the side edges 79. The barbs 78a, 78b are collectively referred to as the barbs 78. The contacts 70 are sheared from the carrier 72 along shear lines C before being used in the electrical connector. The contact portion 77 is formed in U-shape and two sawtooth barbs 76a, 76b (first barbs 76) are formed at the free end portions of the contact portion 77 toward the front of the sheet of drawing as shown in FIG. 9. Apparently, the barbs 76 and 78 are offset in the axial or longitudinal direction of the contact 70. A guide taper 76c is formed at the rear end of the contact portion 77. The barbs 78a, 78b are formed to extend horizontally while the barbs 76a, 76b are formed to extend vertically. FIG. 10 is a side view as seen from the direction of an arrow A in FIG. 9 and clearly shows U-shape portion of the contact portion 77.

Now, illustrated in FIG. 11 is a magnified partial cross section view of the retention portions as surrounded by a chain line in FIG. 7. The barbs 76a, 76b of the contact portion 77 engage the inner wall of the cavity 46 in the bottom wall 36. In the present embodiment, the cavities 46, 46' are formed in two (upper and lower) rows and the contacts 70 are disposed in the cavities so that the barbs 76a, 76b in the upper and lower rows of cavities face to each other. The isolation walls 37 between upper and lower rows of contacts in electrical connectors are normally thicker than the isolation walls 52 between adjacent cavities in the same row. As a result, the contact 70 is secured at the bottom wall portion by the barbs 76a, 76b biting deeply into the isolation walls 37 because the barbs 76a, 76b extend vertically toward

the isolation walls 37 between the vertical cavities 46, 46', thereby not engaging the isolation walls 52 between horizontal cavities 46. Since the isolation walls 37 in the vertical direction are sufficiently thick as compared to the isolation walls 52 between the horizontally adjacent cavities, engagement or retention is strong enough and assures the contacts without causing cracks in the bottom wall 36 due to stress of the relatively large barbs 76a, 76b. On the other hand, the barbs 78a, 78b engage the channel 28 in the plate portion 26, which will be described hereinafter by reference to FIGs. 12 and 13.

Illustrated in FIG. 12 is a cross section view along the line 12-12 in FIG. 2 while FIG. 13 illustrated a magnified partial cross section view surrounded by a chain line in FIG. 12. Retention of the contacts 70 will be described by reference to FIGs. 12 and 13. In FIG. 12, the cavities 10 for the power contacts are shown without the contacts. Disposed in the cavities 46, 54 are the contacts 70. The contact 70 in the cavity 46 or the bottom wall 36 engages the inner surface of the cavity 46 but engages slightly by the barbs 78a, 78b in the cavity 54 in the channel 28 so that no excessive stress is caused.

As apparent from these figures, thin isolation walls 52 enable the contacts 70 to be disposed closely to one another, thereby achieving high density. In the particular embodiment, the width of the isolation walls 52 is sufficiently smaller than that of the contact 70.

Although the present invention has been described in detail on the preferred embodiment, it should be understood that the present invention is not restricted only to such embodiment and that various modifications can be made depending on particular applications or needs.

(Advantages of the Invention)

The electrical connector according to the present invention features the retention of the contact by the first barbs extending in the vertical isolation walls between upper and lower rows and the second barbs extending in the isolation walls between adjacent cavities in the same row, thereby exhibiting the following advantages.

Any stress concentration in the isolation walls between the adjacent

cavities is effectively avoided while providing sufficient retention force of the contacts. This assures high density arrangement of the contacts and compact electrical connectors with reliable electrical connection without causing any crack in the housing.

The contact according to the present invention comprises the tab-shaped contact portion at one end and the U-shape portion in the longitudinal direction at the other end to have the barbs along the side edges and the free ends, respectively. The construction is relatively simple and easy to make. Additionally, the contact can be retained in the housing with a large retention force.

Brief Description of Drawings

- (FIG. 1) A perspective view of the electrical connector according to the present invention.
- (FIG. 2) A front view of the electrical connector in FIG. 1.
- (FIG. 3) A plan view of the electrical connector in FIG. 1.
- (FIG. 4) A rear view of the electrical connector in FIG. 1.
- (FIG. 5) A magnified partial front view of the portion surrounded by a chain line in FIG. 2.
- (FIG. 6) A magnified partial rear view of the portion surrounded by a chain line in FIG. 4.
- (FIG. 7) A longitudinal cross section view along the line 7-7 in FIG. 2.
- (FIG. 8) A plan view of the tab contacts according to the present invention coupled one another by a carrier.
- (FIG. 9) A front view of the tab contact in FIG. 8.
- (FIG. 10) A side view seen from the direction of an arrow A in FIG. 8.

(FIG. 11) A magnified partial cross section view of the retention portion as surrounded by a phantom line in FIG. 7.

(FIG. 12) A cross section view along the line 12-12 in FIG. 2.

(FIG. 13) A magnified partial cross section view of the portion surrounded by a phantom line in FIG. 12.

(FIG. 14) A cross section view of prior art connector.

(Description of Reference Numerals)

1	-----	electrical connector
2	-----	insulating housing
37,52	-----	isolation walls
46, 46', 54	-----	cavities
70	-----	tab contact
74	-----	contact portion
76a, 76b	-----	barbs (first barbs)
78a, 78b	-----	barbs (second barbs)
79	-----	side edges



Claim for Patent

- (1) An electrical connector including a plurality of contacts having barbs to be retained in plural rows of cavities in an insulating housing, characterized in that:

said barbs comprise first barbs extending into isolation walls between upper and lower rows of cavities and second barbs extending into isolation walls between adjacent cavities in the same row but offset from said first barbs in the axial direction.

- (2) A contact for an electrical connector, comprising:
a tab-like contact portion at one end and a generally U-shaped portion in the longitudinal direction at the other end, wherein barbs are formed at both side edges of said contact portions and free ends of said U-shaped portion.