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24 MAY 2002

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SPECIFICATION

TERMINAL RETENTION SYSTEM

Field of the Invention

5 This invention generally relates to the art of electrical connectors and, particularly, to a connector having terminals retained by an overmolded housing.

Background of the Invention

10 Generally, a typical electrical connector includes an insulating or dielectric housing defining some form of mating configuration for mating the connector with a complementary mating connector or other connecting device. For example, the connector housing may define a male or plug connector, or the connector housing may define a female or socket connector. The
15 dielectric housing may be a stand-alone component, or it may be adapted for mounting on a printed circuit board, in a panel or in association with other mounting structures.

20 One or more conductive terminals are mounted on or in the connector housing. The terminals can have a very wide range of configurations depending on the use of the connector. However, the terminals typically have contact portions for engaging the contact portions of terminals in the complementary mating connecting device.
25 One type of terminal is a stamped and formed terminal of sheet metal material, and such terminals may have a contact leg or blade of flat sheet metal material.

30 Some form of retention system must be employed to hold the terminals on or in the connector housing. The retention systems also vary widely. The terminals may be press-fit into terminal-receiving cavities, or the terminals may have latching portions for latching with complementary latches on the connector housing. One form of retention system involves overmolding a plastic



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housing about portions of the terminals to rigidify and hold the terminals on the housing.

One problem with overmolded terminals as described above concerns retaining the terminals on the housing when the housing does not completely embrace portions of the terminals. In other words, the dielectric housing may be of molded plastic material and have a mating portion defining a generally planar mating face of the connector. The terminals, such as stamped and formed sheet metal terminals, may have contact legs with faces generally flush with the mating face of the overmolded housing. Such terminals have a tendency to pull out of the housing, because the housing does not encapsulate portions of the terminals. For instance, a stamped and formed terminal may have a contact leg or blade which simply is embedded in the overmolded housing, with a contact face of the blade flush with the mating face of the housing, and the blade has no positive retention means to prevent it from pulling out of the housing during use. The present invention is directed to solving these problems in an electrical connector which includes a dielectric housing overmolded about metal terminals.

Summary of the Invention

An object, therefore, of the invention is to provide an electrical connector with a new and improved terminal retention system.

In the exemplary embodiment of the invention, the connector generally includes a dielectric housing having a mating portion with a mating face. At least one conductive terminal has a contact portion with a contact face exposed at the mating face of the housing. A retention tab is formed on the contact portion remote from the contact face and is embedded in the housing to prevent the contact portion from pulling away from the mating face of the housing.

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As disclosed herein, the housing is of molded plastic material, and the mating portion has a generally planar mating face. The terminal is a stamped and formed sheet metal terminal at least partially overmolded by the housing. The contact face of the terminal is generally flush with the mating face of the housing. The remote face of the terminal is embedded in the molded plastic material of the housing. Side edges of the terminal extend between the contact face and the remote face. One of the retention tabs projects outwardly from each side edge of the terminal, spaced inwardly of the mating face of the housing, whereby the retention tabs are encapsulated by the molded plastic material of the housing.

The terminals herein are configured to have elongated contact legs defining the contact faces thereof. The retention tabs comprise retention flanges running longitudinally along opposite edges of the contact legs. In fabrication, the retention flanges are stamped from the opposite edges of the contact legs.

Another feature of the invention is that each terminal includes a distal end bent at an angle to the contact leg. The distal end has a generally arrowhead configuration embedded in the molded plastic material of the housing.

A further feature of the invention is that the bent distal end defines an elbow with the contact leg. The inside of the elbow has an enlarged pocket filled with the molded plastic material of the housing.

Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

Brief Description of the Drawings

The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its
5 objects and the advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

10 FIGURE 1 is a top plan view of an electrical connector embodying the concepts of the invention;

 FIGURE 2 is a side elevational view of the connector;

15 FIGURE 3 is an end elevational view of the connector;

 FIGURE 4 is a bottom plan view of the connector;

20 FIGURE 5 is a fragmented vertical section, on an enlarged scale, taken generally along line 5-5 of Figure 1;

 FIGURE 6 is a fragmented section taken generally along line 6-6 of Figure 5;

 FIGURE 7 is a fragmented side elevational view looking in the direction of arrow "B" in Figure 5;

25 FIGURE 8 is a vertical section taken generally along line 8-8 of Figure 1;

 FIGURE 9 is a fragmented plan view of the distal ends of a plurality of the terminals after a stamping operation;

30 FIGURES 10A-10C are sequential views illustrating the stamping of the retention flanges of the terminals;

 FIGURE 11 is an enlarged side elevational view of one of the terminals; and

35 FIGURE 12 is a plan view of a blank of sheet metal material from which the terminals are stamped and formed.

5Detailed Description of the Preferred Embodiment

Referring to the drawings in greater detail, and first to Figures 1-4, the invention is embodied in an electrical connector, generally designated 1, which
5 mounts a plurality of terminals, generally designated 2. The terminals have contact portions 3 defining contact faces exposed along opposite sides of a socket 5 as best seen in Figure 1. The socket is adapted for receiving a complementary mating connecting device inserted
10 thereinto. The opposite sides of the socket define generally planar mating faces 5a. The socket is defined by a dielectric housing 4 of molded plastic material. The housing defines a mating end 6.

Housing 4 of connector 1 has a bottom face 4b
15 as seen best in Figures 3 and 4 for surface mounting on a printed circuit board. Terminals 2 have feet 7 for connection, as by soldering, to appropriate circuit traces on the printed circuit board. Feet 7 of terminals 2 are generally flush with bottom 4b of housing 4 as best
20 seen in Figure 3.

Figure 11 shows one of the terminals 2. The terminals are stamped and formed of sheet metal material. The terminals include the contact portion or leg 3, along with solder foot 7. The contact leg defines a contact
25 face 3a and a back or remote face 3b. A distal end 3c of the terminal is bent generally at a right-angle to contact leg 3 to define an elbow 3d. An enlarged pocket 3e is formed at the inside of the elbow. As will be seen in greater detail hereinafter, retention tabs or flanges
30 8 extend along the outside edges of remote face 3b of contact leg 3a as well as the remote or inside face of distal end 3c.

Figures 5-7 show various views of how terminals 2 are overmolded within the plastic material of molded
35 dielectric housing 4. Turning first to Figure 5, it can be seen that plastic material 4c is disposed within enlarged pocket 3e behind elbow 3d of each terminal.

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This interiorly captured plastic material contributes to retaining the terminal on the housing.

Figure 6 best shows that contact faces 3a of terminals 2 are generally flush with the generally planar mating face 5a within socket 5 of molded plastic housing 4. Side edges 3f extend between contact face 3a and back or remote face 3b of each terminal. It can be seen that the remote face 3b of each terminal is completely embedded within the molding plastic material of housing 4.

Still referring to Figure 6, it can be seen that retention tabs or flanges 8 are remote from contact face 3a of each terminal and, therefore, remote from mating face 5a of the molded plastic housing. The retention flanges project outwardly from side edges 3f of the terminals and are completely surrounded by the molded plastic material of the housing to securely retain the terminals on the housing. In essence, retention flanges 8 project outwardly from the rear corners of the terminals between back or remote faces 3b and side edges 3f of the terminals.

Figures 10A-10C show sequential views of how retention flanges 8 are preferably formed from contact legs 3 of terminals 2. Turning first to Figure 10A, it can be seen that contact leg or blade 3 is positioned over a pair of forming dies 9 having sharp edges 10. The forming dies are fixed to the top of an anvil or other support structure. The contact blade is positioned between the forming dies and a press 12, with mating face 3a of the contact blade facing the press.

Turning to Figure 10B, press 12 is forced downwardly in the direction of arrow "A" to cause sharp edges 10 of forming dies 9 to cut into remote face 3b of the contact blade at the edges thereof, as press die 12 engages mating face 3a of the contact blade. Basically, the sharp cutting edges 10 of forming dies 9 are effective to shear portions 13 of the contact blade at

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the corners of the contact blade between the side edges thereof and the back or remote face 3b.

5 The sheared contact leg or blade then is moved to a spreading station as shown in Figure 10C where contact blade 3 is positioned on top of a pair of spreading blocks 14 fixed to the top of an anvil or other support structure 15. A press 16 is forced downwardly in the direction of arrow "B", and the sheared portions 13 (Fig. 10B) are spread outwardly as shown in Figure 10C to form the outwardly projecting retention flanges 8 described above and shown most clearly in Figure 6.

10 Figures 9 and 12 show that a plurality of terminals 2 are stamped and formed from a continuous length of sheet metal material 18. As seen best in Figure 9, distal ends 3c are stamped with arrowhead configurations as indicated at 20. The location of the arrowhead configurations 20 relative to the remainder of the terminals is shown in Figures 5 and 11. Distal ends 3c of the terminals are embedded in the plastic material at the top of end face 6 of housing 4 as best seen in Figures 1, 2 and 7. The distal ends are overmolded within the molded plastic material at end face 6, and the arrowhead configurations of the distal ends further prevent the terminals from pulling out of the plastic material of the housing.

25 It will be understood that the invention may be embodied in other specific forms without departing from the spirit or central characteristics thereof. The present examples and embodiments, therefore, are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.

8CLAIMS

1. An electrical connector (1), comprising:
a dielectric housing (4) of molded plastic
material, with a mating portion (5) having a generally
planar mating face (5a); and

5 at least one stamped and formed sheet metal
terminal (2) at least partially overmolded by said
housing, the terminal including a contact face (3a)
generally flush with the mating face (5a) of the housing,
a remote face (3b) embedded in the molded plastic
10 material of the housing, side edges (3f) extending
between the contact face and the remote face, and at
least one retention tab (8) projecting outwardly from
each side edge (3f) spaced inwardly of the mating face
(5a) of the housing whereby the retention tabs are
15 encapsulated by the molded plastic material of the
housing.

2. The electrical connector of claim 1 wherein
the contact face (3a) of said terminal (2) extends along
an elongated contact leg (3) of the terminal, and said
20 retention tabs comprise retention flanges (8) running
longitudinally along opposite edges (3f) of the contact
leg (3).

3. The electrical connector of claim 2 wherein
said retention flanges (8) are stamped from the opposite
25 edges (3f) of the contact leg (3).

4. The electrical connector of claim 1 wherein
said terminal (2) includes a contact leg (3) defining
said contact face (3a) and a distal end (3c) bent at an
angle to the contact leg, the distal end having a
5 generally arrowhead configuration embedded in the molded
plastic material of the housing (4).

5. The electrical connector of claim 1 wherein
said terminal (2) includes a contact leg (3) defining
said contact face (3a) and a distal end (3c) bent at an
10 angle to the contact leg at an elbow (3d), the inside of
the elbow having an enlarged pocket (3e) filled with the
molded plastic material of the housing (4).

6. The electrical connector of claim 5 wherein
said distal end (3c) of the terminal (2) has a generally
15 arrowhead configuration embedded in the molded plastic
material of the housing (4).

7. The electrical connector of claim 1 wherein
said mating portion of the housing comprises a socket (5)
for receiving a complementary mating connection device,
20 said mating face (5a) is on the inside of the socket, and
including a plurality of said terminals (2) having
contact faces (3a) spaced along the mating face (5a) of
the socket (5).

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8. An electrical connector (1), comprising:
a dielectric housing (4) of molded plastic
material and having a mating portion including a socket
(5) for receiving a complementary mating connecting
5 device, with a generally planar mating face (5a) on the
inside of the socket; and

a plurality of stamped and formed sheet metal
terminals (2) having elongated contact legs (3)
overmolded in the mating face (5a) of the housing (4),
10 each contact leg of each terminal having a contact face
(3a) generally flush with the mating face of the housing,
a remote face (3b) embedded in the molded plastic
material of the housing, side edges (3f) extending
between the contact face (3a) and the remote face (3b),
15 and a pair of retention flanges (8) running
longitudinally along the opposite side edges (3f) of the
contact leg and projecting outwardly from the side edges
spaced inwardly of the mating face (5a) of the housing
whereby the retention flanges (8) are encapsulated by the
20 molded plastic material of the housing (4).

9. The electrical connector of claim 8 wherein
said housing (4) has an end face (6) at an angle to said
mating face (5a), and said terminals (2) include distal
ends (3c) bent at angles to the contact legs (3) thereof,
25 the distal ends (3c) having generally arrowhead
configurations embedded in the molded plastic material of
the end face (6) of the housing (4).

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10. The electrical connector of claim 8
wherein said housing (4) has an end face (6) at an angle
to the mating face (5a) of the housing, and said
terminals (2) have distal ends (3c) bent at angles to the
5 contact legs (3) of the terminals to define elbows (3d),
the insides of the elbows having enlarged pockets (3e)
filled with the molded plastic material of the housing.

11. The electrical connector of claim 10
wherein said distal ends (3c) of the terminals (2) have
10 generally arrowhead configurations embedded in the molded
plastic material at the end face (6) of the housing (4).

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12. An electrical connector (1), comprising:
a dielectric housing (4) having a mating
portion (5) with a mating face (5a); and

5 at least one conductive terminal (2) having a
contact portion (3) with a contact face (3a) exposed at
the mating face (5a) of the housing (4) and a retention
tab (8) remote from the contact face (3a) and embedded in
the housing to prevent the contact portion (3) from
pulling away from the mating face (5a) of the housing
10 (4).

13. The electrical connector of claim 12
wherein said contact portion comprises an elongated
contact leg (3) of the terminal, and said retention tab
comprises a retention flange (8) running longitudinally
15 of the contact leg.

14. The electrical connector of claim 12
wherein said terminal (2) includes a contact leg (3)
defining said contact face (3a) and a distal end (3c)
bent at an angle to the contact leg, the distal end
20 having a generally arrowhead configuration embedded in
the housing (4).

15. The electrical connector of claim 12
wherein said terminal (2) includes a contact leg (3)
defining said contact face (3a) and a distal end (3c)
25 bent at an angle to the contact leg at an elbow (3d), the
inside of the elbow having an enlarged pocket (3e) filled
with the material of the housing (4).

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16. The electrical connector of claim 15 wherein said distal end (3c) of the terminal (2) has a generally arrowhead configuration embedded in the material of the housing (4).

5 17. The electrical connector of claim 12 wherein said mating portion of the housing comprises a socket (5) for receiving a complementary mating connection device, said mating face (5a) is on the inside of the socket, and including a plurality of said
10 terminals (2) having contact faces (3a) spaced along the mating face (5a) of the socket (5).