

Description

This invention pertains to electrical terminals employed in connector assemblies and to connector assemblies employing same.

Electrical terminals which are loaded in the rearward end of a housing are commonly provided with locking lance retention means to prevent removal of the terminals once installed in the housing.

The present invention is an improvement over electrical terminals having struck out locking lances which engage the housing in which the terminal is mounted. An example of this arrangement is given in US-A-3, 706,954. The terminal therein has a canted locking lance which is struck out at a given angle to extend in a rearward direction. The terminal is slidably mounted in a cavity of a dielectric housing, through a rearward end of the housing. A top wall of the housing has a window formed therein communicating with the terminal receiving cavity. When the terminal is fully inserted in the cavity, the locking lance engages a window edge which is received between the lance and the terminal body, to prevent withdrawal of the terminal from the housing cavity. The lance, which is struck out from the terminal body is sufficiently resilient to be collapsibly deflected by the housing wall during initial stages of terminal insertion, and thereafter to resume its outward deflection upon entering the housing window. An interior corner or edge of the housing adjacent the window is trapped between the terminal body and the free end of the lance.

With increasing miniaturization of electrical components, electrical terminals have not only been reduced in size, but also the thickness or gauge of the metal stock from which they are formed is also being reduced. As a result, under certain circumstances, the locking lance construction has resulted in certain undesirable effects. For example, increasing miniaturization has required a reduction in the housing wall thickness in which the lance-receiving window is formed. During attempted withdrawal of the terminal from the connector housing, the locking lance has been observed to project beyond the top surface of the housing wall. Thus, when completed conductor assemblies are placed back to back, with adjacent aligned window portions, the risk of shorting the circuits of one connector to those of the adjacent connector is present.

With the corresponding reduced wall thickness in the connector housing, damage to the window edge during loading of the terminal and spring back of the lance, a rounding deformation of the edge has been observed. Thus, the free end of the lance can more easily cam across the deformed edge allowing easier withdrawal of the terminal from

the housing cavity.

The present invention is accomplished in an electrical terminal for mounting in a dielectric housing including a terminal receiving cavity having a longitudinally extending wall having a window formed therein with an edge, said terminal including a body having a rearwardly canted locking lance and extending at a given angle therefrom, said lance having a free end that is adapted to be received in said window when the terminal is fully inserted in said cavity whereby said window edge is adapted to engage the free end of the lance to prevent withdrawal of said terminal from said housing cavity, the lance having first and second lance portions defined by bifurcation of the free end of the lance and extending from said terminal body at different angles, whereby said window edge is adapted to be received between said two lance portions, said first lance portion engaging said rear window edge and said second lance portion engaging said longitudinally extending cavity wall to prevent withdrawal of said terminal from said housing cavity.

The present invention also comprehends a connector assembly comprising a dielectric housing including a terminal receiving cavity having a window formed therein with an edge and a terminal as defined in the immediately preceding paragraph mounted in said cavity with said window edge wedged between said two lances to prevent withdrawal of said terminal from said housing cavity.

Preferably, said window extends from an external surface of said housing to said terminal receiving cavity.

One way of carrying the present invention into effect will now be described by way of example with reference to drawings which show one specific embodiment.

In the drawings, wherein like elements are referenced alike,

FIG. 1 is a perspective view of a terminal according to the present invention shown mounted in a connector housing to form a connector assembly of the present invention;

FIG. 2 is a cross section view taken along the lines 2-2 of Fig. 1;

FIG. 3 is a partial view of Fig. 2 shown in greater detail; and

FIG. 4 is a perspective view of the terminal illustrating the lance structure.

Referring now to the drawings, and particularly to Fig. 1, a connector assembly 10 is shown comprising a dielectric housing 20 having a terminal receiving cavity 30 formed therein. An upper housing wall 40 has a lance-receiving window 44 formed therein. As can be seen most clearly in the cross sectional view of Fig. 3, window 44 defines an interior corner 46 formed between a contiguous

window edge surface 48 and an interior housing surface 50 which faces cavity 30. Window edge surface 48 extends between interior cavity surface 50 and an external surface 52 of housing top wall 40. Housing 20 has a forward mating end 60 and a rearward terminal loading end 64.

A terminal 70 is received in cavity 30, being slidably inserted through an opening 64 of the rearward housing end. Terminal 70 includes a forward mating end 72 and rearward conductor engaging end 74. A conventional insulation displacing slot 76 is formed between the adjacent knife-like edges 78 of formed wire engaging walls 80. The forward mating end 72 is shown as a pin-receiving member although it could take any known or suitable terminal engaging portion, e.g. it could comprise a pin-like member or a blade-like member.

The leading end 72 of terminal 70 is inserted through the rear opening 64 of housing 20 into cavity 30 until its forward motion is stopped when terminal leading end 72 contacts the restricted forward end wall 61 of housing mating end 60. To maintain terminal 70 captive within housing 20, a canted locking lance 90 extends from the body of terminal 70 at a given angle therefrom. As can be seen most clearly in Figs. 2 and 3, lance 90 opens or extends in a rearward direction, toward the rear end wall portion of housing 20. Lance 90 has a free end that is bifurcated or forked to define an upper leg or lance portion 94 that is received in window 44 and engages window edge surface 48 when terminal 70 is fully inserted in cavity 30. A lower leg or lance portion 100 extends at a shallower angle than the first lance portion 94. As shown in the enlarged cross section of Fig. 3, window edge surface 48, corner 46 and a portion of inner wall surface 50 is received in the fork-like area between the two legs or lance portions 94, 100 to prevent withdrawal of terminal 70 from housing cavity 30.

As will be appreciated by those skilled in the art, the terminal retention arrangement being described constitutes an improvement over a single locking lance. As terminal 70 is slidably inserted in housing cavity 30, lance 90 (having a predetermined amount of resilience), is downwardly deflected upon engaging inner housing surface 50, with upper leg or lance portion 94 frictionally engaging inner surface 50 until, upon entering window 44, it is free to resume its original outward deflection. It is possible, owing to the relative geometry of terminal 70, top wall 40, and the material compositions thereof, that upon entering window 44, the upper leg portion 94 of lance 90 might tend to "round-off" or otherwise deteriorate the corner 46 of top housing wall 40. With a portion of window edge surface 48 and corner 46 thus deteriorated, a rounded camming surface is presented to upper leg portion 94, thus reducing the terminal's reten-

tion force. With the present arrangement, second lance portion 100 also engages inner housing surface 50 to augment the retention force of the terminal.

With the increasing trend toward miniaturization, the overall size of housing 20 and terminal 70 is reduced, and the thickness of those members is also diminished. Difficulties with conventional designs have been experienced with terminal material thicknesses less than 0.38 mm (0.015 inches), or lance-retaining housing wall thicknesses less than 0.38 mm (0.015 inches). Recently, top wall 40 is made very thin, and accordingly window edge surface 48 is greatly reduced in length. As a result of the terminal being made from a thinner material, a different failure mode has recently been exhibited by such conventional locking lances. When a terminal is subjected to failure from high pullout forces, the locking lance is deflected to a greater angle from the terminal body, and, owing to the thinner housing wall construction, is able to penetrate beyond the outer surface of the housing, thus presenting the possibility of making contact with an adjacent circuit member. In particular, if such connectors are paired side by side, the circuits of one connector could possibly contact the circuits of an adjacent connector during terminal pullout.

These difficulties are overcome with the present arrangement wherein the use of a second locking portion 100 reduces the risk of shorting is further reduced, since second locking lance portion 100 prevents lateral displacement of terminal body portion 71 toward interior housing surface 50 and movement of lance portion 94 beyond the housing wall.

Also, the double locking lance construction of the present invention provides a more secure engagement with the window edge and corner 46 because resilient engagement of lance portion 100 against housing wall 50 prevents camming and downward deflection of lance 90 during application of a pullout force to terminal 70.

As can be seen in Fig. 4, second portion 100 is conveniently formed by bifurcating lance 90, and bending the second lance portion 100 at a shallower angle than the first lance portion 94. Thus, locking lance 90 can be conveniently and inexpensively formed by modifying present terminal designs.

Claims

1. An electrical terminal (70) for mounting in a dielectric housing (20) including a terminal receiving cavity (30) having a window (44) formed therein with an edge (48), said terminal (70) including a body having a canted first locking lance (94) at a given position and ex-

window edge surface 48 and an interior housing surface 50 which faces cavity 30. Window edge surface 48 extends between interior cavity surface 50 and an external surface 52 of housing top wall 40. Housing 20 has a forward mating end 60 and a rearward terminal loading end 64.

A terminal 70 is received in cavity 30, being slidably inserted through an opening 64 of the rearward housing end. Terminal 70 includes a forward mating end 72 and rearward conductor engaging end 74. A conventional insulation displacing slot 76 is formed between the adjacent knife-like edges 78 of formed wire engaging walls 80. The forward mating end 72 is shown as a pin-receiving member although it could take any known or suitable terminal engaging portion, e.g. it could comprise a pin-like member or a blade-like member.

The leading end 72 of terminal 70 is inserted through the rear opening 64 of housing 20 into cavity 30 until its forward motion is stopped when terminal leading end 72 contacts the restricted forward end wall 61 of housing mating end 60. To maintain terminal 70 captive within housing 20, a canted locking lance 90 extends from the body of terminal 70 at a given angle therefrom. As can be seen most clearly in Figs. 2 and 3, lance 90 opens or extends in a rearward direction, toward the rear end wall portion of housing 20. Lance 90 has a free end that is bifurcated or forked to define an upper leg or lance portion 94 that is received in window 44 and engages window edge surface 48 when terminal 70 is fully inserted in cavity 30. A lower leg or lance portion 100 extends at a shallower angle than the first lance portion 94. As shown in the enlarged cross section of Fig. 3, window edge surface 48, corner 46 and a portion of inner wall surface 50 is received in the fork-like area between the two legs or lance portions 94, 100 to prevent withdrawal of terminal 70 from housing cavity 30.

As will be appreciated by those skilled in the art, the terminal retention arrangement being described constitutes an improvement over a single locking lance. As terminal 70 is slidably inserted in housing cavity 30, lance 90 (having a predetermined amount of resilience), is downwardly deflected upon engaging inner housing surface 50, with upper leg or lance portion 94 frictionally engaging inner surface 50 until, upon entering window 44, it is free to resume its original outward deflection. It is possible, owing to the relative geometry of terminal 70, top wall 40, and the material compositions thereof, that upon entering window 44, the upper leg portion 94 of lance 90 might tend to "round-off" or otherwise deteriorate the corner 46 of top housing wall 40. With a portion of window edge surface 48 and corner 46 thus deteriorated, a rounded camming surface is presented to upper leg portion 94, thus reducing the terminal's reten-

tion force. With the present arrangement, second lance portion 100 also engages inner housing surface 50 to augment the retention force of the terminal.

With the increasing trend toward miniaturization, the overall size of housing 20 and terminal 70 is reduced, and the thickness of those members is also diminished. Difficulties with conventional designs have been experienced with terminal material thicknesses less than 0.38 mm (0.015 inches), or lance-retaining housing wall thicknesses less than 0.38 mm (0.015 inches). Recently, top wall 40 is made very thin, and accordingly window edge surface 48 is greatly reduced in length. As a result of the terminal being made from a thinner material, a different failure mode has recently been exhibited by such conventional locking lances. When a terminal is subjected to failure from high pullout forces, the locking lance is deflected to a greater angle from the terminal body, and, owing to the thinner housing wall construction, is able to penetrate beyond the outer surface of the housing, thus presenting the possibility of making contact with an adjacent circuit member. In particular, if such connectors are paired side by side, the circuits of one connector could possibly contact the circuits of an adjacent connector during terminal pullout.

These difficulties are overcome with the present arrangement wherein the use of a second locking portion 100 reduces the risk of shorting is further reduced, since second locking lance portion 100 prevents lateral displacement of terminal body portion 71 toward interior housing surface 50 and movement of lance portion 94 beyond the housing wall.

Also, the double locking lance construction of the present invention provides a more secure engagement with the window edge and corner 46 because resilient engagement of lance portion 100 against housing wall 50 prevents camming and downward deflection of lance 90 during application of a pullout force to terminal 70.

As can be seen in Fig. 4, second portion 100 is conveniently formed by bifurcating lance 90, and bending the second lance portion 100 at a shallower angle than the first lance portion 94. Thus, locking lance 90 can be conveniently and inexpensively formed by modifying present terminal designs.

Claims

1. An electrical terminal (70) for mounting in a dielectric housing (20) including a terminal receiving cavity (30) having a window (44) formed therein with an edge (48), said terminal (70) including a body having a canted first locking lance (94) at a given position and ex-



tending at a given angle to the body, said lance (94) having a free end that is adapted to be received in said window (44) when the terminal (70) is fully inserted in said cavity (30) whereby said window edge (48) is adapted to be received between said lance (94) and body to prevent withdrawal of said terminal (70) from said housing cavity (30), characterized by a second lance (100) adjacent to, and extending at a shallower angle than, said first lance (94), whereby said window edge (48) is adapted to be wedged between said two lances (94,100) to prevent withdrawal of said terminal (70) from said housing cavity (30).

2. The terminal of claim 1 wherein the terminal (70) is stamped from a metal blank having a thickness no greater than 0.38 mm (0.015 inches).
3. A connector assembly (10) comprising a dielectric housing (20) including a terminal receiving cavity (30) having a window (44) formed therein with an edge (48) and a terminal (70) as claimed in claim 1 or 2 mounted in said housing cavity (30) with said window edge (48) wedged between said two lances (94,100) to prevent withdrawal of said terminal (70) from said housing cavity (30).
4. A connector assembly as claimed in claim 3 in which said window (44) extends from an external surface of said housing (20) to said terminal receiving cavity (30).
5. A connector assembly of claim 3 or 4 in which the housing portion immediately adjacent the window edge (48) has a thickness no greater than 0.38 mm (0.015 inches).

Revendications

1. Borne électrique (70) destinée à être montée dans un boîtier diélectrique (20) comportant une cavité (30) pour la réception de la borne, une fenêtre (44) étant formée dans cette cavité et ayant un bord (48), la borne (70) comprenant un corps ayant une première languette de verrouillage (94) inclinée, située dans une position donnée et s'étendant suivant un angle donné par rapport au corps, cette languette (94) ayant une extrémité libre qui est adaptée de manière à venir se loger dans la fenêtre (44) lorsque la borne (70) est totalement insérée dans la cavité (30), le bord (48) de la fenêtre étant adapté de manière à venir se loger entre la languette (94) et le corps afin d'empêcher l'extraction de la borne (70) à par-

tir de la cavité (30) du boîtier, caractérisée en ce qu'elle comprend une seconde languette (100) voisine de la première languette (94) et s'étendant suivant un angle plus faible que celui de la première languette (94), de façon que le bord (48) de la fenêtre soit adapté de manière à venir se coincer entre les deux languettes (94,100) afin d'empêcher l'extraction de la borne (70) à partir de la cavité (30) du boîtier.

2. Borne suivant la revendication 1 caractérisée en ce que la borne (70) est estampée à partir d'un flan métallique ayant une épaisseur qui n'est pas supérieure à 0,38 millimètre (0,015 pouce).
3. Ensemble connecteur (10) comprenant un boîtier diélectrique (20) présentant une cavité (30) pour la réception d'une borne, ayant une fenêtre (44) formée dans cette cavité avec un bord (48), et une borne (70) suivant la revendication 1 ou 2, montée dans la cavité (30) du boîtier de telle façon que le bord (48) de la fenêtre soit coincé entre les deux languettes (94,100), afin d'empêcher l'extraction de la borne (70) à partir de la cavité (30) du boîtier.
4. Ensemble connecteur suivant la revendication 3 caractérisé en ce que la fenêtre (44) s'étend à partir d'une surface externe du boîtier (20), en direction de la cavité (30) pour la réception de la borne.
5. Ensemble connecteur suivant l'une quelconque des revendications 3 ou 4 caractérisé en ce que la portion du boîtier qui est immédiatement adjacente au bord (48) de la fenêtre a une épaisseur qui n'est pas supérieure à 0,38 millimètre (0,015 pouce).

Patentansprüche

1. Elektrischer Anschluß (70) zur Anbringung in einem dielektrischen Gehäuse (20) mit einem Anschlußaufnahmeraum (30) mit einem Fenster (44), das in diesem mit einem Rand (48) gebildet ist, wobei der Anschluß (70) einen Hauptteil mit einer schrägen ersten Verriegelungslanze (94) in einer gegebenen Position und einer Ausrichtung in einem gegebenen Winkel zu dem Hauptteil aufweist und die Lanze (94) ein freies Ende besitzt, das geeignet ist, in dem Fenster (44) aufgenommen zu werden, wenn der Anschluß (70) vollständig in den Raum (30) eingeführt ist, wodurch der Fensterrand (48) geeignet ist, zwischen der Lanze (94) und dem Hauptteil aufgenommen zu werden, um ein



Herausziehen des Anschlusses (70) aus dem Gehäuseraum (30) zu verhindern, gekennzeichnet durch eine zweite Lanze (100) angrenzend an und in einer Ausrichtung mit einem schwächeren Winkel als die erste Lanze (94), wodurch der Fensterrand (48) geeignet ist, zwischen den beiden Lanzen (94,100) verkeilt zu werden, um ein Herausziehen des Anschlusses (70) aus dem Gehäuseraum (30) zu verhindern.

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2. Anschluß nach Anspruch 1, bei dem der Anschluß (70) aus einem Metallrohling mit einer Dicke ausgestanzt ist, die nicht größer ist als 0,38 mm (0,015 Zoll).

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3. Verbindereinrichtung (10), bestehend aus einem dielektrischen Gehäuse (20) mit einem Anschlußaufnahme­raum (30) mit einem Fenster (44), das in diesem mit einem Rand (48) gebildet ist, und einem Anschluß (70), nach Anspruch 1 oder Anspruch 2, angebracht in dem Gehäuseraum (30) mit zwischen den beiden Lanzen (94,100) verkeiltem Fensterrand (48), um ein Herausziehen des Anschlusses (70) aus dem Gehäuseraum (30) zu verhindern.

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4. Verbindereinrichtung nach Anspruch 3, bei der sich das Fenster (44) von einer äußeren Oberfläche des Gehäuses (20) zum Anschlußaufnahme­raum (30) erstreckt.

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5. Verbindereinrichtung nach Anspruch 3 oder 4, bei der der unmittelbar an den Häuserand (48) angrenzende Gehäusebereich eine Dicke besitzt, die nicht größer ist als 0,38 mm (0,015 Zoll).

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