

Description

This invention relates to an electrical connector assembly according to the preamble of claim 1.

There are many electrical connectors available of a type having a locking mechanism by which male or female terminals of the connector are locked in a connector housing. The locking mechanism defines a fully inserted position of a terminal and prevents the terminal from backing out of a dielectric connector housing opposite its direction of insertion. Many such locking mechanisms are provided in the form of resilient latch arms which lockingly engage the terminals. Often, the resilient latch arms are integrally molded with the dielectric housing for pivoting in a cantilevered fashion. In a known connector assembly of the precharacteristic kind (EP-A 0 108 608), the male connector comprises a housing having side walls which are adapted to enter the space around the mating end of the female terminal so as to lock the resilient locking arm of the female connector. This locking mechanism necessarily is somewhat bulky and does not lend itself to miniaturization.

Problems with locking mechanisms of the character described above are becoming increasingly prevalent due to the ever-increasing miniaturization of electrical connectors and their respective housings and terminals. In fact, the miniaturization of such electrical connectors has reached a point where such locking mechanisms hardly resist even moderate pullout forces on the respective terminals. This invention is directed to solving such problems by providing a locking means or system which can withstand relatively high pullout forces on the terminals which are locked within the connector housing.

An object, therefore, of the invention is to provide a new and improved locking system for terminals in an electrical connector.

The electrical connector assembly according to the invention is defined in claim 1. In the exemplary embodiment of the invention, an electrical connector is disclosed to include a dielectric housing having a through passage for receiving a first terminal including a mating section for mating with a second terminal. Generally, locking means are provided on the housing and adapted to engage a locking surface on the first terminal for locking the first terminal in the housing. The locking means is located for engagement by the second terminal upon mating with the first terminal to prevent the locking means from disengagement with the locking surface.

In claims 2 and 3 a female connector of the electrical connector assembly is defined independently.

As disclosed in the preferred embodiment, the locking arm projects through an open mating end of the socket. When the male terminal or pin is inserted into the socket, it engages the locking arm to sandwich the locking arm between the male terminal and

the side wall of the socket, thereby preventing the locking arm from lifting out of the recess.

The objects 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 in combination are believed to be novel are set forth with particularity in the appended claims. The invention, together with its 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:

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

FIGURE 2 is a vertical section taken generally along line 2-2 of Figure 1;

FIGURE 3 is a view similar to that of Figure 2, but with the terminal removed to facilitate an illustration of the details of the housing;

FIGURE 4 is a top plan view of one of the terminals in the electrical connector of Figures 1 and 2;

FIGURE 5 is a side elevational view of the terminal;

FIGURE 6 is an end elevational view of the mating end of the terminal, as looking toward the left-hand end of Figure 5, and showing a male pin inserted into the terminal mating end; and

FIGURE 7 is a view similar to that of Figure 6, but showing the location of the locking arm engaged by the male terminal.

Detailed Description of the Preferred Embodiment

Referring to the drawings in greater detail, and first to Figures 1 and 2, an electrical connector, generally designated 10, is illustrated to include a dielectric housing, generally designated 12, and a pair of female terminals, generally designated 14. Although the illustration shows an electrical connector having a pair of terminals, it should be understood that the invention is applicable for any type of electrical connector of the character described herein regardless of the number of terminals employed by the connector.

Referring to Figure 3 in conjunction with Figures 1 and 2, housing 12 of electrical connector 10 includes a unitary housing 16 molded of dielectric material such as plastic or the like and including a through passage 18 for receiving each terminal 14. Each terminal is inserted into its respective passage in the direction of arrow "A" (Fig. 3). Each passage 18 includes a chamfered open end or mouth 20 at the mating end of housing 16 and through which a male terminal or pin is inserted in the direction of arrow "B"

(Fig. 3) for mating with the respective terminal 14. Lastly, locking means in the form of a resilient locking arm 22 is integrally molded with housing 16 and projects rearwardly into passage 18 from open mouth 20 of the passage.

At this point, it should be noted that a bottom surface 24 of locking arm 22 is spaced above the bottom of passage 18 as can be seen clearly in Figure 3. The locking arm has a hook portion 26 defining a forwardly facing locking shoulder 28. The bottom wall of the housing has an opening 30 to accommodate the projecting hook portion of the locking arm.

Referring to Figures 4 and 5 in conjunction with Figures 1 and 2, each terminal 14 is a female terminal having a rear terminating end 32 and a front mating end 34. The terminal is unitarily formed as by stamping and forming from sheet metal material. The terminal has a pair of insulation displacement sections 36 stamped and formed upwardly out of a bottom wall 38 of the terminal. The insulation displacement sections have notches 40, the edges of the notches being designed to pierce through the insulation of an insulated wire and establish conductivity with the conductor core of the wire. A pair of crimp arms 42 are provided at the rear distal end of the terminal for clamping onto the outside of the insulated wire.

Each terminal 14 is generally U-shaped in cross section, and mating end 34 includes a pair of side walls 44 upstanding from bottom wall 38. The side walls are formed inwardly to define opposing dimples 46 which define a gap, as indicated at 48 in Figure 4, for receiving a male terminal or pin there-between. In essence, bottom wall 38 and side walls 44 define a socket for the terminal, with the socket having an open mating end 50 (Fig. 4) for receiving the male terminal or pin.

Figure 6 shows, somewhat schematically, a male terminal or pin 52 inserted into the socket defined by mating end 34 of the terminal, the male terminal being inserted between side walls 44. Lastly, bottom wall 38 of mating end 34 of the terminal has a rearwardly facing edge 54 which defines a recess or a locking surface for cooperating with hooked latch arm 22 to lock the terminal in its passage 18 of connector housing 16, as described below.

When one of the terminals 14 is inserted into its respective passage 18 in connector housing 16 in the direction of arrow "A" (Fig. 3), the forward edge of bottom wall 38 of mating end 34 of the terminal engages a rearwardly facing chamfered surface 60 (Fig. 3) of hook portion 26 of locking arm 22. Consequently, the locking arm will be biased upwardly in the direction of arrow "C" (Fig. 3), whereupon further insertion of the terminal will cause rear edge or locking surface 54 (Figs. 4 and 5) of the locking surface to move past locking shoulder 28 of the latch arm. The latch arm will snap back downwardly, under its own resiliency, whereupon hook portion 26 will move into the re-

cessed area of the terminal behind locking surface 54 and lock the terminal within the housing by engagement of locking shoulder 28 on the locking arm and locking surface 54 defined by bottom wall 38 of the terminal.

Theoretically, when the terminal is fully inserted into the housing as described immediately above, pulling forces on the terminal, as by pulling on an insulated wire terminated to the terminal in a direction opposite arrow "A" (Fig. 3), will prevent the terminal from being pulled out of locking interengagement of locking shoulder 28 on the locking arm and locking surface 54 on the terminal. However, with the ever-increasing miniaturization of electrical connectors, the locking arm has difficulty resisting such pull-out forces.

The invention solves these problems by the structural combination described above and as explained hereinafter. More particularly, Figure 7 is a view similar to that of Figure 6, except that the location of locking arm 22 is shown within the mating end 34 of terminal 14, and in relation to an inserted or mated male terminal or pin 52. It can be seen that, upon insertion of the male pin into the housing passage and between side walls 44 of the mating end of the terminal, the locking arm is located immediately below the male terminal or pin. Consequently, when any pull out forces on female terminal 14 in a direction opposite arrow "A" (Fig. 3), which would tend to bend locking arm 22 upwardly and release the locking engagement of the arm, the terminal pin provides a supporting backing against the top of the locking arm to prevent or at least resist disengagement of locking shoulder 28 on the locking arm from locking surface 54 on bottom wall 38 of the terminal. Of course, it can be imagined that an extremely large pull out force could cause the terminal to be pulled out of the connector regardless of any provision of any locking means and, in essence, destroy the entire connector. However, under normally expected conditions, the location of the locking arm, so as to be backed-up by the more rigid metal terminal pin, essentially prevents the locking arm from disengagement from the terminal. In essence, the resilient locking arm is sandwiched between the metallic bottom wall 38 of the terminal at the mating end thereof and the metallic male pin.

It will be understood that the invention may be embodied in other specific forms without departing from the definition provided in the claims. 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.

Claims

1. An electrical connector assembly comprised of a

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1. An electrical connector assembly comprised of a



male and of a female connector for coupling respectively a male terminal (52) and a female terminal (14) comprising a dielectric housing (12) having a through passage (18) receiving said female terminal (14), which includes a termination end (32) for engaging a conductor and a mating end (34) for receiving said male terminal (52), a resilient locking arm (22) being provided on the housing (12) within said passage (18) to engage a recess (54) in said female terminal (14) so as to lock same in the passage (18), said dielectric housing (12) and said female terminal (14) forming the female connector (10) to have a space extending along said locking arm (22) and being adapted to be entered by a member of the male connector such as to engage said locking arm (22) and prevent same from disengagement with said recess (54), characterized by said space extending along said locking arm being a gap (48) between side walls (44) of the female terminal (14) and said entering member of the male connector being the male terminal (52) which engages said side walls (44) and is constructed to provide a backing for supporting the locking arm (22).

2. The female connector (10) as set forth in claim 1, wherein the housing (12) is unitarily molded of dielectric material such as plastic, with the locking arm (22) being integral therewith in a cantilevered configuration, the locking arm (22) having a hook portion (26) at a distal end thereof and adapted to be biased into the recess (54) upon pivoting of the locking arm and wherein the recess (54) is located at the mating end (34) of the female terminal (14).
3. The female connector (10) as set forth in claim 1 or 2, wherein the mating end (34) of the female terminal (14) is a socket including said gap (48), said socket having a bottom wall (38) with the recess (54) therein, and said locking arm (22) is located inside the socket, whereby when a male terminal (52) enters the socket and establishes electrical contact with the female terminal (14) it also engages the locking arm (22) to sandwich the locking arm between the male terminal (52) and the bottom wall (38) of the socket.
4. The female connector (10) as set forth in claim 3, wherein the socket of the female terminal (14) defines an open mating end (50) for receiving the male terminal (52), and said locking arm (22) is located on the housing (12) for projecting into the socket through the open mating end (50).
5. The electrical connector assembly as set forth in claim 1, wherein the male terminal (52) has a sin-

gular mating end.

Patentansprüche

1. Elektrische Steckverbinderanordnung aus einem Stecker und einer Steckdose zur jeweiligen Kupplung einer steckerförmigen Klemme (52) und einer dosenförmigen Klemme (14), mit folgenden Merkmalen:
ein dielektrisches Gehäuse (12) mit einem durchgehenden Kanal (18), der die dosenförmige Klemme (14) aufnimmt,
welche ein Abschlußende (32) zur Anlage an einem Leiter und ein Passungsende (34) zur Aufnahme der steckerförmigen Klemme (52) aufweist,
wobei ein nachgiebiger Verriegelungsarm (22) an dem Gehäuse (12) innerhalb des Kanals (18) vorgesehen ist,
um in eine Aussparung (54) in der dosenartigen Klemme (14) einzugreifen, um diese in dem Kanal (18) zu verriegeln,
wobei ferner das dielektrische Gehäuse (12) und die dosenartige Klemme (14), welche die Steckdose (10) bilden, einen entlang des Verriegelungsarms (22) sich erstreckenden Raum aufweisen, der zum Eingriff eines Elements des Steckers ausgebildet ist, um an dem Verriegelungsarm (22) anzulegen und diesen daran zu hindern, von der Aussparung (54) freizukommen, dadurch gekennzeichnet,
daß der sich entlang des Verriegelungsarms erstreckende Raum ein Spalt (48) zwischen den Seitenwandungen (44) der dosenartigen Klemme (14) darstellt und das eindringende Element des Steckers die steckerförmige Klemme (52) ist, die an den Seitenwandungen (44) anliegt und so ausgebildet ist, daß sie ein Widerlager zum Stützen des Verriegelungsarms (22) bildet.
2. Steckdose (10) nach Anspruch 1, dadurch gekennzeichnet,
daß das Gehäuse (12) aus dielektrischem Material, beispielsweise Kunststoff, einstückig gegossen ist,
wobei der Verriegelungsarm (22) integral in vorkragender Weise mit dem Gehäuse ausgebildet ist, der Verriegelungsarm (22) einen Hakenteil (26) am entfernten Ende aufweist und zur Vorspannung in die Aussparung (54) ausgebildet ist, wenn der Verriegelungsarm verschwenkt wird, und
daß die Aussparung (54) an dem Paßende (34) der Steckdose (14) angeordnet ist.
3. Steckdose (10) nach Anspruch 1 oder 2, dadurch gekennzeichnet,



daß das Paßende (34) der dosenförmige Klemme (14) eine Buchse darstellt, welche den Spalt (48) umfaßt,

daß die Buchse eine Bodenwand (38) mit darin angebrachter Aussparung (54) aufweist und daß der Verriegelungsarm (22) innerhalb der Buchse angeordnet ist, wobei, wenn eine steckerförmige Klemme (52) in die Buchse eindringt und einen elektrischen Kontakt mit der dosenförmigen Klemme (14) herstellt, die Klemme auch an dem Verriegelungsarm (22) zur Anlage kommt, um diesen zwischen der steckerförmigen Klemme (52) und der Bodenwandung (38) der Buchse einzuklemmen.

4. Steckdose (10) nach Anspruch 3, dadurch gekennzeichnet, daß die Buchse der dosenförmigen Klemme (14) ein offenes Paßende (50) bestimmt, um die steckerförmige Klemme (52) aufzunehmen, und daß der Verriegelungsarm (22) an dem Gehäuse (12) angeordnet ist, um in die Buchse durch das offene Paßende (15) hineinzuragen.

5. Elektrische Steckverbinderanordnung nach Anspruch 1, dadurch gekennzeichnet, daß die steckerförmige Klemme (52) ein einzelnes Paßende aufweist.

Revendications

1. Ensemble connecteur électrique, composé d'un connecteur mâle et d'un connecteur femelle, pour raccorder, respectivement, une borne mâle (52) et une borne femelle (14), comprenant: un boîtier diélectrique (12) comportant un conduit traversant (18) recevant ladite borne mâle (14), qui comprend une extrémité de terminaison (32) pour liaison avec un conducteur et une extrémité d'accouplement (34) pour recevoir ladite borne mâle (52), un bras de verrouillage élastique (22) étant disposé sur ledit boîtier (12) à l'intérieur dudit conduit (18) pour s'engager dans un évidement (54) de ladite borne femelle (14) de manière à la verrouiller dans le conduit (18), ledit boîtier diélectrique (12) et ladite borne femelle (14) formant le connecteur femelle (10) de façon à laisser un espace s'étendant le long dudit bras de verrouillage (22) et étant conçu pour être pénétré par un élément du connecteur mâle pour bloquer ledit bras de verrouillage (22) et l'empêcher de se dégager dudit évidement (54), caractérisé en ce que ledit espace s'étendant le long dudit bras de verrouillage est un écartement (48) entre des parois latérales (44) de la borne femelle (14), et en ce que ledit élément pénétrant du connecteur

mâle est la borne mâle (52) qui contacte lesdites parois latérales (44) et est structuré pour constituer un renfort pour supporter le bras de verrouillage (22).

2. Connecteur femelle (10) selon la revendication 1, dans lequel le boîtier (12) est moulé d'une seule pièce de matière diélectrique, comme du plastique, le bras de verrouillage (22) étant d'un seul tenant avec lui dans une conformation en porte-à-faux, le bras de verrouillage (22) ayant une partie crochet (26) à son extrémité distale conçue pour être rappelée dans l'évidement (54) lors du pivotement du bras de verrouillage, et dans lequel l'évidement (54) est situé au droit de l'extrémité d'accouplement (34) de la borne femelle (14).
3. Connecteur femelle (10) selon la revendication 1 ou 2, dans lequel l'extrémité d'accouplement (34) de la borne femelle (14) est une douille incluant ledit écartement (48), ladite douille ayant une paroi inférieure (38) dans laquelle se trouve l'évidement (54), et dans lequel ledit bras de verrouillage (22) est situé à l'intérieur de la douille, ce par quoi, lorsqu'une borne mâle (52) pénètre dans la douille et établit un contact électrique avec la borne femelle (14) elle contacte également le bras de verrouillage (22) pour prendre le bras de verrouillage en sandwich entre la borne mâle (52) et la paroi inférieure (38) de la douille.
4. Connecteur femelle (10) selon la revendication 3, dans lequel la douille de la borne femelle (14) définit une extrémité d'accouplement ouverte (50) pour recevoir la borne mâle (52), et dans lequel ledit bras de verrouillage (22) est situé sur le boîtier (12) pour dépasser à l'intérieur de la douille à travers l'extrémité d'accouplement ouverte (50).
5. Ensemble connecteur électrique selon la revendication 1, dans lequel la borne mâle (52) a une extrémité d'accouplement singulière.