

Description

The present invention relates to electrical connectors having a housing for shielding the connections therein in order to prevent the emission of electromagnetic energy.

Although the use of a latching means to connect a first connector to a second connector is known in the art, a shielded connector that provides the option of using latches or not using latches in the same connector, while at the same time maintaining the shield against emissions of electromagnetic energy, is not available.

The unique design of the connector of the present invention provides a shielded connector that may be used with or without latches for binding it to another connector. Significantly, whether or not latches are used, the shield against emissions of electromagnetic energy is maintained. The connector also shields the internal components from ambient electromagnetic radiation.

For a more detailed understanding of the invention and for an illustration of a preferred form thereof, reference is made to the drawing in which:

Figure 1 is an exploded perspective view of a connector of the present invention.

Figure 2 is an end view of two attached connectors of the present invention (attached via an adapter).

Figure 3 is a side view of two attached connectors of the present invention (attached via an adapter).

Figure 4 is a fragmentary cross sectional view taken along the lines 4-4 of Figure 2.

Figure 5 is a fragmentary cross sectional view taken along the lines 5-5 of Figure 3.

Figure 6 is a perspective view of a connector of the present invention attached to a second connector that is, in turn, mounted on a circuit board in a metal housing.

The present invention relates to a shielded connector for electrical circuits comprising a non-conducting housing (preferably made of plastic) containing electrically conductive terminals, said terminals being connectable to electrically conductive cable, and an electrically conductive housing (preferably made of metal or metallized plastic) that shields said nonconducting housing. The terminals may be male (e.g., pins), female (e.g., receptacles), or hermaphroditic. The electrically conductive housing has an aperture for inserting a cable and consists of at least two separable elements and preferably consists of only two elements (not including fastening means, such as screws, for holding the two elements together). Each element is capable of mating with the other element(s) to form the conductive housing. The conductive housing has one or more pockets, preferably two pockets.

Each pocket has an aperture open to the exterior of the conductive housing.

When the elements of the conductive housing are mated, there are no openings in the pocket except for the aperture because the walls of the pocket are otherwise continuous with the exterior walls of the electrically conductive housing. A pocket may be located anywhere on an element of the electrically conductive housing so long as the pocket is open only to the exterior of the electrically conductive housing and it is in contact with the interface where two elements of said housing mate. Thus, part of the pocket can be located in one element and part of the pocket can be located in the second element. It is also possible for the entire pocket, less one wall, to be located in one element and the remaining wall to be supplied by the second element.

There will preferably be one or more apertures in the exterior surface of at least one of the elements extending completely through the element. When the elements are mated, each such aperture should line up with a corresponding second aperture on a mating element. It is not necessary for said second aperture to extend completely through the mating element and, in fact, it is preferable that it not extend completely through. These apertures make it possible to use fastening means, such as screws, to fasten the elements together.

Each element will also preferably have one or more (more preferably two) projections on its surface that is at the interface with another element that are adapted to be inserted into apertures on the mating surface of another element. These projections help to align the elements when they are mated.

Each pocket is shaped so that a projection from a latch will be held securely by the pocket when the two elements of the housing are mated.

Preferably, each pocket is constructed so that it extends in at least two directions away from the aperture within a plane that is parallel to the exterior surface of the element which forms said aperture. It is also preferred that there be two elements and two pockets with approximately half of each pocket being in each element.

The pockets are preferably located so that they are at opposite ends of the conducting housing and as far apart as possible and are adjacent to the distal end of the connector.

Each latch is aligned with the longitudinal axis of the connector. This is the axis along which the connector is inserted into a second connector. As used herein, the distal end of the connector shall mean that end that is closest to said second connector and the proximal end of the connector shall mean that end of the connector that is furthest from the second connector. Similarly, the distal end of a

latch shall be that end disposed in the direction of said second connector, while the proximal end of said latch shall be its opposite end.

The latches should be made of a resilient material. They may be metal or plastic. Each latch will have a projection at right angles to a line extending between its distal and proximal ends. At the point where the projection is attached to the main body of the latch, the projection should be slightly smaller in its cross section than the aperture into which it will be fitted. However, at the point where the projection extends beyond the aperture and into the pocket, the cross section of the latch should be larger and should preferably be only slightly smaller than the pocket. Accordingly, the latch may be inserted into the pocket before the elements of the housing are mated, and once the elements are mated, it should not be possible to remove the latch from the pocket.

The distal end of the latch will preferably have a second projection that is adapted to be inserted into an aperture either on a second connector or on a housing having electrically conductive pins or receptacles that mate with the pins or receptacles of the first housing. The shape of said second projection should be such that it fits snugly within the aperture on the second connector. Preferably, the second projection will be angled slightly toward the distal end of the latch so that when said second projection is inserted into its corresponding aperture it is removable only with some difficulty.

The proximal end of the latch preferably has several projections or ridges that form a gripping surface that may be functionally engaged by human fingers. This aids a person desiring to bend the latch so that said second projection is removed from said second connector and also aids in pulling two connectors apart.

Figure 1 illustrates a preferred embodiment of the present invention. The shielded connector shown in Figure 1 consists of a plastic housing 1 containing electrically conductive receptacles 2. These receptacles are connected to individually insulated wires 3 that merge into an electrically conductive cable 4. Cable 4 fits snugly within a semicircular aperture 5 in a first element 6 of a metal housing. A corresponding semicircular aperture 7 appears in a second element 8 of the metal housing. A U-shaped retaining collar 9 also serves to hold cable 4 snugly. Collar 9 fits into a groove 10 on first element 6 when the elements are mated and the ends of the U extend into the corresponding groove (groove 11) on element 8. Plastic housing 1 also fits snugly in a recess formed by the walls of first element 6. First projections 12 on plastic housing 1 fit into first groove 14 on first element 6 and second projections 13 on plastic housing 1 fit into corresponding second

groove 15 on second element 8. The projections help keep plastic housing 1 firmly in place. Portions of two pockets 16 and 17 are formed within the walls of first element 6 of the metal housing and their corresponding portions 18 and 19 are formed within the walls of second element 8.

When elements 6 and 8 are mated, the pocket portions 16 and 18 combine to form a first pocket and pocket portions 17 and 19 combine to form a second pocket. Also, the semicircular apertures 5 and 7 combine to form a circular aperture that holds cable 4 snugly. Plastic housing 1 is also held securely when elements 6 and 8 are mated. Elements 6 and 8, when mated, are prevented from slipping sideways by projections 20 and 21 on second element 8 that fit into corresponding recesses 22 and 23 on first element 6. Apertures 22 and 23 are holes in the interior wall of element 6 that do not extend through to the outside wall. Screws 24 and 25 are inserted through holes 26 and 27 in second element 8 into threaded apertures 29 and 30 on the interior surface of first element 6 to hold elements 6 and 8 tightly together. Threaded apertures 29 and 30 do not extend completely through to the other side of element 6. It will be seen from the foregoing description that, except for collar 9 in groove 10, and the projections and screws and corresponding apertures that function to hold elements 6 and 8 together, the two elements are substantially identical.

Also shown in Figure 1 are two latches, first latch 31 and second latch 32. Before elements 6 and 8 are mated, a projection 33 on first latch 31 is inserted into pocket portion 16 and a projection 34 on second latch 32 is inserted into pocket portion 17. Also shown, is projection 35 on latch 31 for insertion into a second connector. There is a corresponding projection 36 on latch 32. Each of latches 31 and 32 also has a series of ridges 37 and 38 that provides a surface that may be operatively engaged by a person's finger.

Figures 2-5 present different views illustrating how two connectors of the present invention 40 and 41 may be connected together via an adapter 42.

Figure 6 shows how a connector 43 of the present invention may be connected to a connector 44 which is mounted on a circuit board 45 within a metal housing 46. The two connectors are held together by two latches. One of the latches, latch 47, is shown in the Figure.

Claims

1. A shielded connector for electrical circuits comprising a non-conducting housing (1) containing electrically conductive terminals (2), said terminals being connectable to electrically conductive cables(4), and an electrically con-

latch shall be that end disposed in the direction of said second connector, while the proximal end of said latch shall be its opposite end.

The latches should be made of a resilient material. They may be metal or plastic. Each latch will have a projection at right angles to a line extending between its distal and proximal ends. At the point where the projection is attached to the main body of the latch, the projection should be slightly smaller in its cross section than the aperture into which it will be fitted. However, at the point where the projection extends beyond the aperture and into the pocket, the cross section of the latch should be larger and should preferably be only slightly smaller than the pocket. Accordingly, the latch may be inserted into the pocket before the elements of the housing are mated, and once the elements are mated, it should not be possible to remove the latch from the pocket.

The distal end of the latch will preferably have a second projection that is adapted to be inserted into an aperture either on a second connector or on a housing having electrically conductive pins or receptacles that mate with the pins or receptacles of the first housing. The shape of said second projection should be such that it fits snugly within the aperture on the second connector. Preferably, the second projection will be angled slightly toward the distal end of the latch so that when said second projection is inserted into its corresponding aperture it is removable only with some difficulty.

The proximal end of the latch preferably has several projections or ridges that form a gripping surface that may be functionally engaged by human fingers. This aids a person desiring to bend the latch so that said second projection is removed from said second connector and also aids in pulling two connectors apart.

Figure 1 illustrates a preferred embodiment of the present invention. The shielded connector shown in Figure 1 consists of a plastic housing 1 containing electrically conductive receptacles 2. These receptacles are connected to individually insulated wires 3 that merge into an electrically conductive cable 4. Cable 4 fits snugly within a semicircular aperture 5 in a first element 6 of a metal housing. A corresponding semicircular aperture 7 appears in a second element 8 of the metal housing. A U-shaped retaining collar 9 also serves to hold cable 4 snugly. Collar 9 fits into a groove 10 on first element 6 when the elements are mated and the ends of the U extend into the corresponding groove (groove 11) on element 8. Plastic housing 1 also fits snugly in a recess formed by the walls of first element 6. First projections 12 on plastic housing 1 fit into first groove 14 on first element 6 and second projections 13 on plastic housing 1 fit into corresponding second

groove 15 on second element 8. The projections help keep plastic housing 1 firmly in place. Portions of two pockets 16 and 17 are formed within the walls of first element 6 of the metal housing and their corresponding portions 18 and 19 are formed within the walls of second element 8.

When elements 6 and 8 are mated, the pocket portions 16 and 18 combine to form a first pocket and pocket portions 17 and 19 combine to form a second pocket. Also, the semicircular apertures 5 and 7 combine to form a circular aperture that holds cable 4 snugly. Plastic housing 1 is also held securely when elements 6 and 8 are mated. Elements 6 and 8, when mated, are prevented from slipping sideways by projections 20 and 21 on second element 8 that fit into corresponding recesses 22 and 23 on first element 6. Apertures 22 and 23 are holes in the interior wall of element 6 that do not extend through to the outside wall. Screws 24 and 25 are inserted through holes 26 and 27 in second element 8 into threaded apertures 29 and 30 on the interior surface of first element 6 to hold elements 6 and 8 tightly together. Threaded apertures 29 and 30 do not extend completely through to the other side of element 6. It will be seen from the foregoing description that, except for collar 9 in groove 10, and the projections and screws and corresponding apertures that function to hold elements 6 and 8 together, the two elements are substantially identical.

Also shown in Figure 1 are two latches, first latch 31 and second latch 32. Before elements 6 and 8 are mated, a projection 33 on first latch 31 is inserted into pocket portion 16 and a projection 34 on second latch 32 is inserted into pocket portion 17. Also shown, is projection 35 on latch 31 for insertion into a second connector. There is a corresponding projection 36 on latch 32. Each of latches 31 and 32 also has a series of ridges 37 and 38 that provides a surface that may be operatively engaged by a person's finger.

Figures 2-5 present different views illustrating how two connectors of the present invention 40 and 41 may be connected together via an adapter 42.

Figure 6 shows how a connector 43 of the present invention may be connected to a connector 44 which is mounted on a circuit board 45 within a metal housing 46. The two connectors are held together by two latches. One of the latches, latch 47, is shown in the Figure.

Claims

1. A shielded connector for electrical circuits comprising a non-conducting housing (1) containing electrically conductive terminals (2), said terminals being connectable to electrically conductive cables(4), and an electrically con-





ductive housing, said electrically conductive housing comprising at least two elements (6, 8), each of said elements (6, 8) being capable of mating with the other of said elements to form said electrically conductive housing, at least one of said elements having at least one recessed pocket (16, 17, 18, 19) having an aperture open to the exterior of said element, the or each pocket being adapted to hold a projection (33, 34) on a latch (31, 32) in such a way that said latch cannot be removed from said pocket once said elements of said electrically conductive housing are mated, the interior walls of said pocket being continuous with the exterior walls of said electrically conductive housing and either a portion of said pocket also being located in the second element or at least one wall of said pocket being contributed by a second element, said electrically conductive housing also comprising a cable inlet (5, 7) adapted for insertion of electrically conductive cable.

2. A connector according to Claim 1 wherein said electrically conductive housing is formed by mating two elements (6 and 8), each of said elements (6 and 8) having two partial pockets (16 & 17, 18 & 19), two complete pockets being formed at the interface between the elements when the elements are mated, the two pockets being on a line that falls within the plane formed by the mating surfaces of said elements, said line being perpendicular to the longitudinal axis of said shielded cable connector.
3. A connector according to Claim 1 or 2, wherein the or each pocket extends in at least two directions within a plane parallel to the surface of said element (6 or 8) having said aperture.
4. A connector according to Claim 1, 2 or 3, wherein said electrically conductive housing consists of two elements (6 and 8).
5. A connector according to Claim 4, wherein said elements (6 and 8) are substantially identical.
6. A connector according to Claim 4, wherein each of said elements comprises at least one aperture or portion (16, 18, 17, 19) thereof.
7. A connector according to Claim 1, wherein each element comprises at least one fastening aperture (26, 27, 29, 30) said fastening apertures being adapted to the use of fastening means (24, 25) for fastening the elements (6,8)

together.

8. A connector according to any preceding claim, wherein at least one element (8) has one or more projections (20, 21) on its surface that is at the interface with a second element (6), said projections (20, 21) being adapted to be inserted into corresponding recesses (22, 23) on the mating surface of said second element (6).
9. A connector according to any preceding claim, comprising a latch (31, 32) made of a resilient material inserted into said pocket.
10. A connector according to Claim 9, wherein said latch extends along a line parallel to the longitudinal axis of said shielded connector and a projection (33, 34) from said latch is inserted along a line perpendicular to said axis.
11. A connector according to Claim 10 wherein the proximal end of said latch comprises projections (37, 38) that form a gripping surface that may be functionally engaged by human fingers.
12. A connector according to Claim 10, wherein the distal end of said latch comprises a projection (35, 36) adapted to be inserted into an aperture on a second connector.

Revendications

1. Un connecteur blindé pour circuits électriques, comprenant un boîtier isolant (1), contenant des bornes conductrices de l'électricité (2), lesdites bornes étant raccordables à des câbles conducteurs électriques (4), et un boîtier conducteur de l'électricité, ledit boîtier conducteur de l'électricité comprenant au moins deux éléments (6, 8), chacun desdits éléments (6, 8) étant susceptible de s'accoupler à l'autre, pour former ledit boîtier conducteur de l'électricité, au moins l'un desdits éléments ayant au moins une poche creuse (16, 17, 18, 19) comportant une ouverture, ouverte vers l'extérieur dudit élément, la poche ou chaque poche étant susceptible de maintenir une partie en saillie (33, 34) sur un loquet (31, 32), de façon telle que ledit loquet ne puisse être enlevé de ladite poche une fois que lesdits éléments dudit boîtier conducteur de l'électricité ont été accouplés, les parois intérieures de ladite poche étant en continuité avec les parois extérieures dudit boîtier conducteur de l'électricité et, soit une partie de ladite poche étant également située dans le second élément, soit au moins une paroi de ladite poche étant constituée par

le second élément, ledit boîtier conducteur de l'électricité comprenant également une entrée de câble (5, 7) susceptible de recevoir un câble conducteur de l'électricité.

2. Un connecteur selon la revendication 1, dans lequel ledit boîtier conducteur de l'électricité est formé en accouplant deux éléments (6 et 8), chacun desdits éléments (6 et 8) comportant deux poches partielles (16 et 17, 18 et 19), deux poches complètes étant formées à l'interface entre les éléments, lorsque ces derniers sont accouplés, les deux poches étant situées sur une ligne qui passe dans le plan formé par les surfaces accouplées desdits éléments, ladite ligne étant perpendiculaire à l'axe longitudinal dudit connecteur de câble blindé.
3. Un connecteur selon la revendication 1 ou 2, dans lequel la poche ou chaque poche s'étend dans au moins deux directions dans un plan parallèle à la surface dudit élément (6 ou 8) qui comporte ladite ouverture.
4. Un connecteur selon la revendication 1, 2 ou 3, dans lequel ledit boîtier électriquement conducteur de l'électricité est composé de deux éléments (6 et 8).
5. Un connecteur selon la revendication 4, dans lequel lesdits éléments (6 et 8) sont sensiblement identiques.
6. Un connecteur selon la revendication 4, dans lequel chacun desdits éléments comprend au moins une ouverture ou partie d'ouverture (16, 18, 17, 19).
7. Un connecteur selon la revendication 1, dans lequel chaque élément comprend au moins une ouverture de fixation (26, 27, 29, 30), lesdites ouvertures de fixation étant adaptées à l'utilisation de moyens de fixation (24, 25) pour fixer les éléments (6, 8) ensemble.
8. Un connecteur selon l'une quelconque des revendications précédentes, dans lequel au moins un élément (8) comporte une ou plusieurs parties en saillie (20, 21) sur sa surface qui est située à l'interface d'un second élément (6), lesdites parties en saillie (20, 21) étant susceptibles d'être insérées dans des cavités correspondantes (22, 23) sur la surface d'accouplement dudit second élément (6).
9. Un connecteur selon l'une quelconque des revendications précédentes, comprenant un loquet (31, 32) en un matériau élastique, inséré

dans ladite poche.

10. Un connecteur selon la revendication 9, dans lequel ledit loquet s'étend le long d'une ligne parallèle à l'axe longitudinal dudit connecteur blindé et une partie en saillie (33, 34) partant dudit loquet est insérée le long d'une ligne perpendiculaire audit axe.
11. Un connecteur selon la revendication 10, dans lequel l'extrémité proximale dudit loquet comprend des parties en saillie (37, 38) qui forment une surface de préhension qui peut être saisie fonctionnellement par des doigts humains.
12. Un connecteur selon la revendication 10, dans lequel l'extrémité distale dudit loquet comprend une partie en saillie (35, 36) susceptible d'être insérée dans une ouverture sur un second connecteur.

Patentansprüche

1. Abgeschirmter Verbinder für elektrische Schaltungen, der ein nichtleitendes Gehäuse (1) aufweist, das elektrisch leitende Anschlüsse (2) enthält, wobei die Anschlüsse mit elektrisch leitenden Kabeln (4) verbindbar sind, und der ein elektrisch leitendes Gehäuse aufweist, wobei das elektrisch leitende Gehäuse wenigstens zwei Elemente (6,8) aufweist, wobei jedes der Elemente (6,8) passend zu dem jeweils anderen Element ausgelegt ist, um das elektrisch leitende Gehäuse zu bilden, bei dem wenigstens eines der Elemente wenigstens eine ausgenommene Tasche (16, 17, 18, 19) hat, die eine Öffnung hat, die sich zur Außenseite des Elements öffnet, die oder jede Tasche derart ausgelegt ist, daß sie einen Vorsprung (33, 34) auf einer Klinke (31, 32) derart halten kann, daß die Klinke nicht aus der Tasche genommen werden kann, wenn die Elemente des elektrisch leitenden Gehäuses einmal passend zusammengesetzt sind, die Innenwände der Tasche durchgehend zu den Außenwänden des elektrisch leitenden Gehäuses ausgelegt sind und entweder ein Teil der Tasche ebenfalls in dem zweiten Element liegt oder wenigstens eine Wand der Tasche von einem zweiten Element gebildet wird, und bei dem das elektrisch leitende Gehäuse ebenfalls einen Kabeleinlaß (5,7) aufweist, welcher derart beschaffen und ausgelegt ist, daß das elektrisch leitende Kabel eingeführt werden kann.
2. Verbinder nach Anspruch 1, bei dem das elektrisch leitende Gehäuse von zwei passend aus-



- gelegten Elementen (6 und 8) gebildet wird, jedes Element (6 und 8) zwei Teilaschen (16 und 17, 18 und 19) hat, zwei vollständige Taschen an der Grenzfläche zwischen den Elementen gebildet werden, wenn die Elemente passend zusammengesetzt sind, die beiden Taschen auf einer Linie sind, die in die Ebene fällt, die von den Paßflächen der Elemente gebildet wird, und bei dem die Linie senkrecht zur Längsachse des abgeschirmten Kabelverbinders ist.
3. Verbinder nach Anspruch 1 oder 2, bei dem die oder jede Tasche sich in wenigstens zwei Richtungen in einer Ebene parallel zur Fläche des Elements (6 oder 8) erstreckt, das die Öffnung hat.
4. Verbinder nach Anspruch 1, 2 oder 3, bei dem das elektrisch leitende Gehäuse aus zwei Elementen (6 und 8) besteht.
5. Verbinder nach Anspruch 4, bei dem die Elemente (6 und 8) im wesentlichen übereinstimmend ausgelegt sind.
6. Verbinder nach Anspruch 4, bei dem jedes Element wenigstens eine Öffnung oder einen Teil (16, 18, 17, 19) derselben aufweist.
7. Verbinder nach Anspruch 1, bei dem jedes Element wenigstens eine Befestigungsöffnung (26, 27, 29, 30) aufweist, und diese Befestigungsöffnungen in Verbindung mit Befestigungsmitteln (24, 25) zum Befestigen der Elemente (6, 8) miteinander nutzbar sind.
8. Verbinder nach einem der vorangehenden Ansprüche, bei dem wenigstens ein Element (8) ein oder mehrere Vorsprünge (20, 21) auf jener Fläche hat, die an der Grenzfläche zwischen einem zweiten Element (6) liegt, und die Vorsprünge (20, 21) derart beschaffen und ausgelegt sind, daß sie in zugeordnete Ausnehmungen (22, 23) auf der Paßfläche des zweiten Elements (6) einführbar sind.
9. Verbinder nach einem der vorangehenden Ansprüche, der eine Klinke (31, 32) aus einem federnd nachgiebigen Material aufweist, die in die Tasche einführbar ist.
10. Verbinder nach Anspruch 9, bei dem die Klinke sich längs einer Linie parallel zur Längsachse des abgeschirmten Verbinders erstreckt und ein Vorsprung (33, 34) von der Klinke längs einer Linie senkrecht zur Achse eingeführt wird.

11. Verbinder nach Anspruch 10, bei dem das proximale Ende der Klinke Vorsprünge (37, 38) aufweist, welche eine Greiffläche bilden, die funktionell mit Fingern der menschlichen Hand zusammenarbeiten kann.
12. Verbinder nach Anspruch 10, bei dem das distale Ende der Klinke einen Vorsprung (35, 36) aufweist, welcher derart beschaffen und ausgelegt ist, daß er in eine Öffnung in einem zweiten Verbinder einführbar ist.

