

Description

This invention relates generally to an electrical connector assembly of matched interconnectable electrical components having keying means thereon to permit matching of one electrical component with another.

Often there is need to match pairs of various similarly constructed components together. Examples of such matching pairs can be as simple as those used in childrens' toys or as complex as electronic components. Pairs of components such as these are often characterized as being comprised of a male and a female member. That is, one component of the pair, the male member, is interfittable into the other component of the pair, the female member. As may be appreciated, in more complex elements such as electronic components and more particularly electrical connectors, it is necessary to assure that proper keying of the components of the pair is achieved. The art, especially the electrical connector art, has seen a wide variety of techniques for matching together connectors which are to be mated to one another.

An example of such a technique is known from US-A 3 786 393 which discloses an electrical connector assembly of matched interconnectable electrical components comprising a first electrical component and a second electrical component constructed for interconnection with said first component said first component having first keying means and said second component having second keying means which interfittingly engages said first keying means. These techniques include, for example, interfitting parts such as matching protrusions and recesses, corresponding indicia such as numbering or lettering, and color coding in general where pairs of connectors are uniquely color coded to provide a visual indication of mateability. Each of these keying techniques has various advantages and disadvantages.

In working with sensitive electronic components such as integrated circuits, semiconductor chips and connectors therefor, it is imperative that first, the proper components be matched with one another and second, the matched components be interconnected in the correct position. Further, as electronic assemblies using such electronic components are typically mass produced, assembly speed is essential so as to keep labor and assembly costs to a minimum. Thus any keying technique used would have to be readily identifiable so that components can be quickly matched. One example of such an assembly is where numerous electrical connectors must be matched to mating connectors supported on a printed circuit board. While speed is essential in order to minimize labor costs, there is no margin for error, as an incorrectly mated connector pair could cause significant damage to an electronic apparatus in which the pair is used. While mechanical keying elements, such as

uniquely shaped protrusions and recesses, provide such fool-proof connection, they are not easily visually identifiable thus reducing the speed at which an installer can operate. Color coding on the other hand, increases visual recognition thereby increasing the speed of installation, but color coding alone would not be absolutely fool-proof.

It can be seen that a combination of color coding and mechanical keying elements would provide increased speed and fool-proof mateability. However, if color coding is provided in a secondary manufacturing operation, it would greatly increase the cost of the components. Color coding could be embodied in the component during manufacturing thereof, such as by molding the component from a material of a particular color. However, due to mechanical and electrical constraints dictated by function and design, some electronic components must be formed from materials which cannot be color coded. Thus an installer would have to rely on the mechanical keys designed into the component without having the readily visually recognizable color to distinguish one component from another.

Accordingly, it is desirable to provide an electrical connector assembly of matched interconnectable electrical components with a keying means which is easily visually identifiable to the installer and yet provides for fool-proof interconnectability of electrical components where one or more of the components are not subject to color coding.

It is, therefore, an object of the present invention to provide improved means for keying mating electrical components.

It is a further object of the present invention to provide an electrical connector assembly of matched interconnectable electrical components which include keying members on the electrical components which are easily visually identifiable and provide fool-proof intermateability of the components.

It is a still further object of the present invention to provide an electrical connector assembly of matched interconnectable electrical components having visually identifiable keying elements on the electrical components and which would prevent improper connection of the component pairs.

According to the invention, there is provided an electrical connector assembly of matched interconnectable electrical components comprising a first electrical component and a second electrical component constructed for interconnection with said first component, said first component having first keying means and said second component having second keying means which interfittingly engages said first keying means, said first keying means including a raised pattern of letters, said letters spelling out a particular color, and said second component being color coded so as to correspond to the particular color spelled out by said raised pattern of said first compo-

ment, thereby to provide a visual indication of the matched interconnectability of said first and second components.

By way of example, one embodiment of an electrical connector assembly according to the invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is an exploded sectional showing of an electrical connector assembly employing the keying means of the present invention;

Figure 2 is a bottom perspective showing of a socket connector of the connector assembly shown in Figure 1;

Figure 3 is a top perspective showing of the header connector of the connector assembly of Figure 1;

Figure 4 is a bottom perspective showing of a further embodiment of the socket connector of Figure 2;

Figure 5 is a top perspective showing of a further embodiment of a header connector of Figure 3; and

Figure 6 shows, in perspective, a printed circuit board supporting a plurality of header connectors of Figure 1.

Referring to Figures 1 through 3, an electrical connector assembly 10 of the present invention is shown. The connector assembly 10 is designed to connect an integrated circuit (IC) 12 to a printed circuit board (PCB) 14 shown in Figure 6. Integrated circuit 12 may be any conventional IC, including a semiconductor body 12a and a plurality of depending electrical leads 11. IC 12 is known as a DIP integrated circuit having leads 11 arranged in two longitudinally aligned rows.

The connector assembly 10 includes a connector socket of 16 which accommodates the IC 12 and a connector header 18 which mounts to PCB 14 (Figure 6) and accommodates socket 16 therein. A cover (not shown) may be used to secure IC 12 in socket 16.

Socket 16 is of conventional construction and includes an elongate rectangular body having a substantially open central section 20 and two rows of longitudinally spaced apertures 22 extending between an upper face 24 and a lower face 26. Each aperture 22 accommodates an electrical terminal 28 therein. Electrical terminal 28 includes a lower socket portion 30 and a contact portion 32 which extends into the open section of 20 of socket 16. The integrated circuit 12 may be inserted into the open section 20 of socket 16 so that the leads 11 electrically engage the contact portions 32 of electrical terminal 28.

Header 18 is an elongate member having a rectangular body of mating shape to socket 16. Header 18 is generally an open ended cup-shaped member including a pair of longitudinally aligned, transversely spaced extending rows of contact pins 34. Pins 34 are elongate members which are press-fitted or other-

wise secured in a bottom wall 36 of header 18. Pins 34 are positioned in header 18 such that when socket 16 is inserted therein, the pins 34 will be accommodated in the socket portions 30 of electrical terminals 28. Thus upon insertion of socket 16 into header 18, electrical connection will be established between the header pins 34 and the integrated circuit 12. Socket 16, header 18 and its associated conductive components, terminals 28 and pins 34, are shown only by way of example. Any other type of connector structure could also be used in accordance with the present invention.

As additionally shown in Figure 6, quite often many headers 18 are mounted to a printed circuit board 14. In order to assure that the proper socket 16 is connected to its mating header 18, the present invention provides a color-coded keying means to prevent incorrect matching of sockets to headers. While as above mentioned, simply color coding socket 16 and header 18 would achieve such visual recognition of matched components. In the present invention, color coding the socket 16 to match the header 18 is not possible during manufacture of these electrical components due to the type of material from which each is formed. Header 18 may be formed of any easily color codeable insulative plastic, such as polyester. However, electrical and mechanical design constraints of many applications dictate that socket 16 be formed of a different material, such as polyphenylene sulfide or some other reinforced thermoplastic, which is not susceptible to color coding during manufacture. Thus while each of the headers 18 shown in Figure 6 can be colored a different color, such as red, blue, green, etc., the socket 16 could not be colored so as to correspond to the colors of the headers 18. Accordingly, in these instances, the connector assembly 10 could not avail itself of simple color coding to facilitate matching of one electrical component to another. In the present invention a keying means is provided which is easily visually recognizable and yet can be employed with components which cannot be color coded.

Referring additionally to Figure 2, the undersurface 38 of socket 16 is shown. Extending from undersurface 38, is a pattern of raised alphabetic letters 40 which are formed to spell out a particular primary color. In the instance shown in Figure 2, the pattern of raised letters 40 spell out the word "BLUE". Thus while the socket 16 itself is colored some color other than blue, as is dictated by the material from which the socket is formed, the pattern of raised letters 40 provides an instant visual indication of its associated color, in the present instance blue.

Turning to Figure 3, the lower face 36 of header 18 is shown. Header 18 includes an upwardly extending series of walls 42 which define therebetween a pattern of cavities 44 which closely approximate the general outline of the pattern of letters 40 of socket

16. The pattern formed by cavities 44 are constructed to accommodate in interfitting relationship, the pattern of letters 40 of socket 16. The cavities 44 of header 18 are constructed to be shaped into a general outline of the reverse image of the raised pattern of letters 40 of socket 16. As shown in Figure 3, the cavities 44 need not exactly conform to the reverse image of each letter of the raised pattern of letters 40, as the pattern of cavities 44 need not be readily visually readable, since the header 18 itself may be colored any particular color. In the example shown in Figures 2 and 3, header 18 would be formed of a plastic material which is colored blue. Thus it is readily recognizable that the socket 16 is connectable to the header 18.

In order to further provide visual indication of mateability an additional mating feature, especially helpful for color-blind persons, may also be incorporated into the header design. As shown in Figure 5, header 18a may include reverse image letters 41 molded into the base of cavities 44 which identify the particular color of the header 18a. In the embodiment shown in Figure 5, the letters B-L-A-C-K are formed at the base of the cavities 44. The socket 16a may therefore be matched to header 18a by color or by words.

The particular shape of the letters forming the pattern of letters 40 of socket 16 is uniquely interfitable into the pattern of cavities 44 of header 18 in only one particular orientation. Thus in addition to providing a keying feature which uniquely keys the socket 16 of Figure 2 to the header 18 of Figure 3, the arrangement of letters 40 and cavities 44 also provides a polarization feature which prevents the socket 16 from being inserted into the proper header 18 in an incorrect position. This is required in most electrical connector applications. As shown in Figures 2 and 3, the socket 16 is properly inserted into the header 18 by inverting the socket 16 left to right from its position shown in Figure 2. In such inverted position, socket 16 may be inserted into header 18 as it is shown positioned in Figure 3.

Referring additionally to Figures 4 and 5, one of many alternative keying arrangements is shown. By comparing the socket 16 of Figure 2 with the header 18a of Figure 5, it can be seen that socket 16 could not be connected to header 18a. A similar relationship is shown between the socket 16a of Figure 4 and the header 18 of Figure 3. Other color-coded combinations, such as those suggested in Figure 6, can be readily appreciated.

Referring additionally to Figure 6, a printed circuit board 14 is shown, onto which is mounted four headers 18, 18a, 18b, and 18c of the type described herein. Each of the headers are of identical construction except for the raised walls 42 forming a different pattern of cavities 44 in each. Header 18a would be formed of a plastic material colored black and would accommodate a socket 16a which has a raised pat-

tern of letters 40 spelling out the word "BLACK" (Fig. 4). Similarly, headers 18b and 18c would be formed of plastic material colored grey and white respectively to accommodate sockets 16b and 16c (not shown) with patterns of raised letters spelling out the words "GREY" and "WHITE" respectively. The color code keying feature of the present insertion could not be defeated as the socket 16 having raised letters 40 forming the word "BLUE" (Fig. 2) would not fit into any of headers 18b, 18c, or 18d.

It can be appreciated that an installer working with printed circuit board 14 can easily determine which sockets are insertable into their mating headers. By matching the printed words on each socket 16 with the color of the header 18, an indication of proper mateability is readily provided.

Claims

1. An electrical connector assembly of matched interconnectable electrical components (10) comprising a first electrical component (16) and a second electrical component (18) constructed for interconnection with said first electrical component, said first electrical component having first keying means (40) and said second electrical component having second keying means (44) which interfittingly engages said first keying means (40), said first keying means (40) including a raised pattern of letters (40), said letters spelling out a particular color, and said second electrical component (18) being color coded so as to correspond to the particular color spelled out by said raised pattern (40) of said first component (16), thereby to provide a visual indication of the matched interconnectability of said first and second components.
2. An assembly of Claim 1 wherein said second keying means (44) includes at least one cavity (44) which accommodates said raised pattern of letters (40) of said first keying means.
3. An assembly of Claim 2 wherein said cavity (44) is formed into a pattern complementary to said pattern of letters (40) of said first component (16).
4. An assembly of Claim 2 wherein said second keying means (44) includes a plurality of cavities (44) constructed to be complementary to said raised pattern of letters (40) of said first component (16).
5. An assembly of any one of Claims 1 to 4 wherein said first component (16) is colored a different color from said second component (18).



16. The pattern formed by cavities 44 are constructed to accommodate in interfitting relationship, the pattern of letters 40 of socket 16. The cavities 44 of header 18 are constructed to be shaped into a general outline of the reverse image of the raised pattern of letters 40 of socket 16. As shown in Figure 3, the cavities 44 need not exactly conform to the reverse image of each letter of the raised pattern of letters 40, as the pattern of cavities 44 need not be readily visually readable, since the header 18 itself may be colored any particular color. In the example shown in Figures 2 and 3, header 18 would be formed of a plastic material which is colored blue. Thus it is readily recognizable that the socket 16 is connectable to the header 18.

In order to further provide visual indication of mateability an additional mating feature, especially helpful for color-blind persons, may also be incorporated into the header design. As shown in Figure 5, header 18a may include reverse image letters 41 molded into the base of cavities 44 which identify the particular color of the header 18a. In the embodiment shown in Figure 5, the letters B-L-A-C-K are formed at the base of the cavities 44. The socket 16a may therefore be matched to header 18a by color or by words.

The particular shape of the letters forming the pattern of letters 40 of socket 16 is uniquely interfitable into the pattern of cavities 44 of header 18 in only one particular orientation. Thus in addition to providing a keying feature which uniquely keys the socket 16 of Figure 2 to the header 18 of Figure 3, the arrangement of letters 40 and cavities 44 also provides a polarization feature which prevents the socket 16 from being inserted into the proper header 18 in an incorrect position. This is required in most electrical connector applications. As shown in Figures 2 and 3, the socket 16 is properly inserted into the header 18 by inverting the socket 16 left to right from its position shown in Figure 2. In such inverted position, socket 16 may be inserted into header 18 as it is shown positioned in Figure 3.

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tern of letters 40 spelling out the word "BLACK" (Fig. 4). Similarly, headers 18b and 18c would be formed of plastic material colored grey and white respectively to accommodate sockets 16b and 16c (not shown) with patterns of raised letters spelling out the words "GREY" and "WHITE" respectively. The color code keying feature of the present insertion could not be defeated as the socket 16 having raised letters 40 forming the word "BLUE" (Fig. 2) would not fit into any of headers 18b, 18c, or 18d.

It can be appreciated that an installer working with printed circuit board 14 can easily determine which sockets are insertable into their mating headers. By matching the printed words on each socket 16 with the color of the header 18, an indication of proper mateability is readily provided.

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1. An electrical connector assembly of matched interconnectable electrical components (10) comprising a first electrical component (16) and a second electrical component (18) constructed for interconnection with said first electrical component, said first electrical component having first keying means (40) and said second electrical component having second keying means (44) which interfittingly engages said first keying means (40), said first keying means (40) including a raised pattern of letters (40), said letters spelling out a particular color, and said second electrical component (18) being color coded so as to correspond to the particular color spelled out by said raised pattern (40) of said first component (16), thereby to provide a visual indication of the matched interconnectability of said first and second components.
2. An assembly of Claim 1 wherein said second keying means (44) includes at least one cavity (44) which accommodates said raised pattern of letters (40) of said first keying means.
3. An assembly of Claim 2 wherein said cavity (44) is formed into a pattern complementary to said pattern of letters (40) of said first component (16).
4. An assembly of Claim 2 wherein said second keying means (44) includes a plurality of cavities (44) constructed to be complementary to said raised pattern of letters (40) of said first component (16).
5. An assembly of any one of Claims 1 to 4 wherein said first component (16) is colored a different color from said second component (18).



Patentansprüche

1. Eine elektrische Verbinderanordnung aus aufeinander abgestimmten, zusammenschaltbaren elektrischen Bauteilen (10) mit einem ersten Bauteil (16) und einem zweiten, zum Zusammenschalten mit dem ersten elektrischen Bauteil konstruierten zweiten Bauteil (18), wobei das erste elektrische Bauteil ein erstes Codierungsmittel (40) und das zweite elektrische Bauteil ein zweites Codierungsmittel (44) aufweist, das mit dem ersten Codierungsmittel (40) zusammenpassend in Anlage steht, das erste Codierungsmittel (40) ein eine bestimmte Farbe ausdrückendes Schema aus angehobenen Buchstaben (40) enthält und das zweite elektrische Bauteil (18) so farbcodiert ist, daß es der durch das angehobene Schema (40) des ersten Bauteils (16) ausgedrückten bestimmten Farbe entspricht, um damit eine visuelle Anzeige der aufeinander abgestimmten Zusammenschaltbarkeit des ersten und zweiten Bauteils darzustellen.

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2. Eine Anordnung nach Anspruch 1, wobei das zweite Codierungsmittel (44) mindestens eine Vertiefung (44) aufweist, die das Schema der angehobenen Buchstaben (40) des ersten Codierungsmittels aufnimmt.

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3. Eine Anordnung nach Anspruch 2, wobei die Vertiefung (44) in einem zum Schema der Buchstaben (40) des ersten Bauteils (16) komplementären Schema ausgeformt ist.

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4. Eine Anordnung nach Anspruch 2, wobei das zweite Codierungsmittel (44) eine Vielzahl von Vertiefungen (44) aufweist, die komplementär zu dem Schema der angehobenen Buchstaben (40) des ersten Bauteils (16) konstruiert sind.

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5. Eine Anordnung nach irgendeinem der Ansprüche 1 bis 4, wobei das erste Bauteil (16) in einer vom zweiten Bauteil (18) verschiedenen Farbe eingefärbt ist.

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mier moyen de codage (40), ledit premier moyen de codage (40) comprenant un motif surélevé de lettres (40), lesdites lettres indiquant une couleur particulière, et ledit deuxième composant électrique (18) étant codé par couleur de manière à correspondre à la couleur particulière indiquée par ledit motif surélevé (40) dudit premier composant (16), de manière à fournir par ce moyen une indication visuelle de l'aptitude à l'interconnexion adaptée desdits premier et deuxième composants.

2. Ensemble selon la revendication 1, dans lequel ledit deuxième moyen de codage (44) comprend au moins une cavité (44) logeant ledit motif surélevé de lettres (40) dudit premier moyen de codage.
3. Ensemble selon la revendication 2, dans lequel ladite cavité (44) est réalisée sous la forme d'un motif complémentaire audit motif de lettres (40) dudit premier composant (16).
4. Ensemble selon la revendication 2, dans lequel ledit deuxième moyen de codage (44) comprend une pluralité de cavités (44) ménagées pour être complémentaires audit motif surélevé de lettres (40) dudit premier composant (16).
5. Ensemble selon l'une quelconque des revendications 1 à 4, dans lequel ledit premier composant (16) est coloré d'une couleur différente de celle dudit deuxième composant (18).

Revendications

1. Ensemble connecteur électrique de composants électriques (10) interconnectables adaptés, un premier composant électrique (16) et un deuxième composant électrique (18), agencé pour assurer une interconnexion avec ledit premier composant électrique, ledit premier composant électrique ayant un premier moyen de codage (40) et ledit deuxième composant électrique ayant un deuxième moyen de codage (44) qui s'engage avec ajustement serré contre ledit pre-