ABSTRACT: An electrical connector having adjustable keying and comprising a lockingly engageable plug and receptacle containing respectively mating pins and sockets. The receptacle includes a plurality of circumferentially spaced pluggable keyways which can be selectively plugged by a connector user to provide a keyway for the receptacle at any of a plurality of different possible locations. The plug has a rotatably movable key which a connector user can align with the selected keyway location provided in the receptacle.
ELECTRICAL CONNECTOR HAVING ADJUSTABLE KEYING

The provision of keying between an electrical plug and its receptacle is commonly employed in electrical connectors for a variety of purposes, such as, for example, to ensure proper terminal orientation and/or mating between engaging parts. In certain applications, electrical connectors may be employed which differ only with regard to their keying location. In such cases it has conventionally been necessary to maintain a stock of a plurality of different connectors, one for each different keying location employed.

In accordance with the present invention, an electrical connector is provided having a keying location which is readily adjustable by the user. Thus, where a plurality of connectors are employed which differ only in their keying locations, the connector user does not have to maintain a stock of different connectors, but need only stock a single type of connector for which adjustable keying is provided in accordance with this invention.

The present invention has the further advantage of providing this adjustable keying for a connector in a remarkably simple and inexpensive manner without detracting from connector performance.

The specific nature of the invention as well as other objects, features, advantages and uses thereof will become apparent from the following description of a preferred embodiment of the invention taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of a connector receptacle having the capability of selectively providing or eliminating a keyway at one or more of a plurality of different keyway locations;

FIG. 2 is a fragmentary cross-sectional view taken through a keyway location along the line 2-2 of FIG. 1; and

FIG. 3 is a perspective view of a plug mating with the receptacle illustrated in FIG. 1, the plug having an adjustable key whose location may be selected to correspond to a desired keyway location of the receptacle.

Like numerals designate like elements throughout the figures of the drawings. Also, to facilitate understanding of the embodiment of the invention to be described herein, elements of the connector receptacle illustrated in FIGS. 1 and 2 will be designated by numbers less than 100, while elements of the connector plug illustrated in FIG. 3 will be designated by numbers greater than 100; additionally, cooperating elements on the connector and receptacle will be designated with numerals whose difference is exactly 100.

Reference to FIGS. 1 and 3, an electrical connector is illustrated comprised of a receptacle 10 and a plug 110 constructed and arranged for mating engagement with one another. The receptacle 10 in FIG. 1 includes a tubular shell 12 within which a plurality of electrically insulated pins 14 are suitably provided for engagement with respectively located insulated pin-receiving sockets 114 provided within a tubular shell 112 of the plug 110 in FIG. 3. Where the plug 110 and receptacle 10 are mated. Since the pins 14 and the sockets 114 are conventional and may readily be provided in their respective receptacle 10 and plug 110 along with appropriate means (not shown) to permit electrical connection to associated electrical circuitry, no further description thereof will be given herein.

The tubular shell 12 of the connector receptacle 10 illustrated in FIG. 1 is provided with a mounting flange 16 having mounting holes 18 so as to permit the receptacle to be appropriately mounted on a utilization device, such as an electrical appliance. The inner surface of the shell 12 has a circular groove 20 in which an "O" ring 22 is disposed for cooperation with the forward outer surface of the plug shell 112 so as to provide sealing in a conventional manner. Also, stubs 24 are provided on the forward outer surface of the receptacle shell 12 for cooperation with slots 124 in a bayonet coupling mechanism 126. The plug shell 112 so as to provide conventional bayonet type of locking engagement for the plug 110 and receptacle 10.

The forward inner surface of the receptacle shell 12 in FIG. 1 is provided with four circumferentially spaced fixed keyways 28, each of which receives an aligned pair of respectively located fixed keys 128 provided on the outer surface of the plug shell 112 in FIG. 3 when the plug 110 and receptacle 10 are mated. Slotted spring members 29 are provided in the annular space between each pair of keys 128 of the plug 10 so as to be biased against the inner surface of the receptacle shell 12 when the plug 110 and receptacle 10 are mated, thereby providing electrical shielding and conductivity therebetween.

The description so far has been concerned with the conventional and well-known structural portions of the receptacle 10 and the plug 110 of the connector illustrated in FIG. 1 and FIG. 3.

With this description of conventional structural as background, the novel features of the invention whereby an adjustable keying capability is provided will now be described.

Referring to FIG. 1, it will be seen that the lower halff of the forward inner surface of the receptacle shell 12 is provided with five circumferentially spaced keyways 30 which are in addition to the conventional keyways 28. The number of these keyways 30 which are provided is determined by the number of different keying locations desired, an appropriately located keyway 30 being provided for each desired keying location.

It will be understood from FIG. 1 that a keyway 30 may, in effect, be removed by the insertion of keyway plug 12 therein, and reinstated by removal of the plug 32. Preferably, each plug 32 has the general form of a channel with a downwardly biased spring clip 33 being provided near one end of which, upon insertion of the plug 32, snaps into a retaining groove 34 provided in the receptacle shell 12 near the rear end of the keyways 30, as shown in FIG. 2. Also, each keyway 30 and plug 32 is preferably of dovetail shape to aid in the insertion and retention of the plug 32 in a keyway 30. While any desired combination of plugged and unplugged keyways 30 could be provided, it is preferred that all but a selected one of the keyways 30 be plugged.

To remove a plug 32 from a keyway 30 in FIG. 1, a tool such as a screwdriver is inserted into the channel opening 35 of the plug 32 until the spring clip 33 rises out of the retaining groove 34, thereby releasing the plug 32 so as to permit it to be pulled out of the keyway 30, using an appropriate tool for this purpose.

It will next be described how the connector plug 110 of FIG. 3 is provided with an adjustable key 130 which may be moved to a position corresponding to any selected one of the keyways 30 in FIG. 1. The adjustable key 130 has a generally inverted "U" shape and depends from a band 137 disposed in a groove 138 in the plug shell 112. The band 137 is of appropriate diameter and resiliency so as to normally engage fully the groove 138, while being rotatable with respect to the plug 110 when the adjustable key 130 is raised, such as by inserting a screwdriver into the "U" opening of the key 130.

The band 137 containing the adjustable key 130 also includes a locating lug 139 cooperating with slots 141 provided in the plug shell 112 adjacent the band 137 so as to permit the lug 139 to be positioned in any desired one of the slots 141. It will be understood that the slots 141 are positioned with respect to the fixed and adjustable keys 128 and 130 so that, for each slot position of the lug 139, the adjustable key 130 is aligned with a respective one of the pluggable keyways 30 of the receptacle 10 in FIG. 3. Thus, in the preferred operation of the device mentioned earlier in which a user plugs all but a selected one of the pluggable keyways 30, the user also correspondingly sets the locating lug 139 into the particular slot 141 which will cause the adjustable key 130 in the plug 110 in FIG. 3 to be aligned with the selected unpluggable keyway 30 in FIG. 1 when the two are mated together.

Although the present invention has been described with respect to a particular preferred embodiment thereof, it is to be understood that the invention is subject to a wide variety of modifications and variations in construction, arrangement, operation and/or use without departing from the scope of the invention as defined in the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:
1. An electrical connector having adjustable keying comprising in combination:
a cooperatively engageable plug and receptacle each including a tubular shell and containing pins and sockets which respectively mate when the plug and receptacle are engaged in proper keyed relationship,
said receptacle including a plurality of keyways provided at spaced circumferential locations in the inner surface of the receptacle shell, and
a plurality of keying plugs insertable in at least a predetermined plurality of the keyways provided in said receptacle so as to provide for selective plugging thereof,
said plug including a rotatable band mounted on the outer surface of the plug shell,
said band having a key provided therein so that rotation of said band permits said key to be circumferentially positionable to a location corresponding to that of any desired one of said predetermined plurality of keyways of said receptacle and so as to be able to key therewith when the plug and receptacle are engaged,
said band also including an inwardly biased resilient locating lug provided thereon at a location circumferentially spaced from said key,
said plug also including circumferentially spaced slots formed in the outer surface of the plug shell adjacent said band so as to be cooperatable with said resilient locating lug provided on said band to permit said lug to be insertable in any selected one of said slots in order to lock said rotatable band and thus said key at a circumferential position corresponding to any desired one of said keyways of said receptacle.

2. The invention in accordance with claim 1,
wherein said plug also includes a plurality of fixed keys provided for mating with predetermined ones of said keyways when said plug and receptacle are engaged.

3. The invention in accordance with claim 2,
wherein said plug and said receptacle also include cooperating locking means for providing locking thereof in an engaged position.