May 18, 1965 R. S. ANDERSON 3,184,707

UNIVERSAL RECEPTACLE SHELL CODING DEVICE

Filed Sept. 23, 1963

FIG. 1

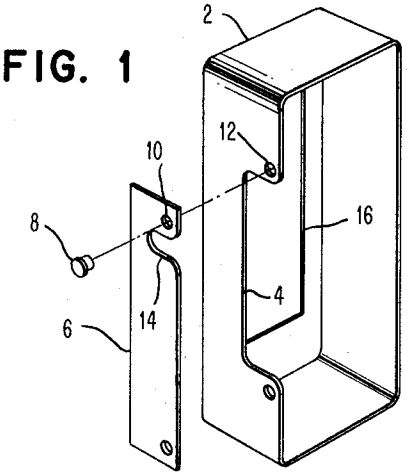


FIG. 2a

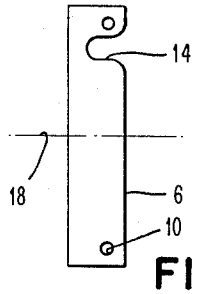


FIG. 2b

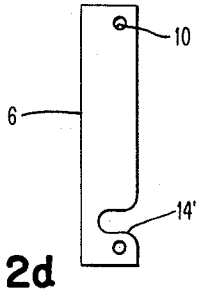


FIG. 2d

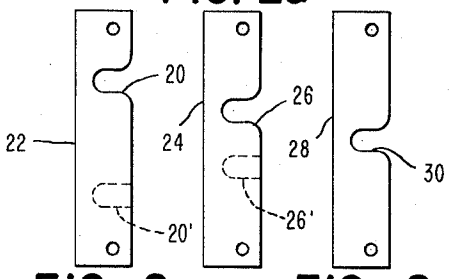


FIG. 2c

FIG. 2e

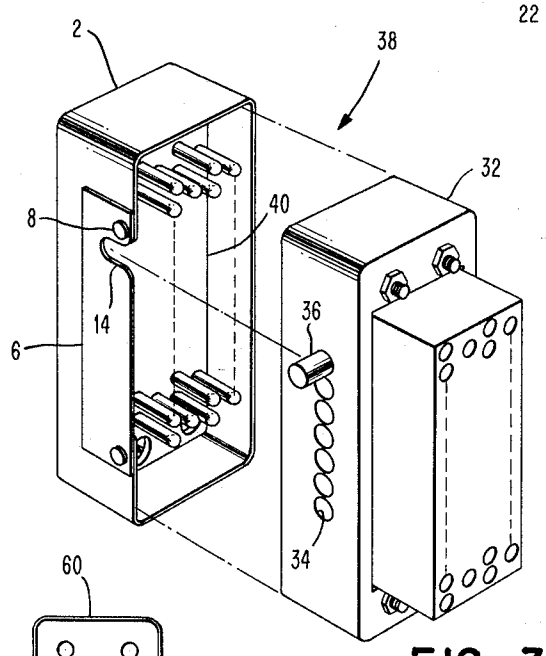
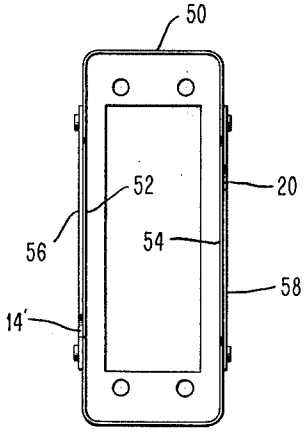


FIG. 3

FIG. 4



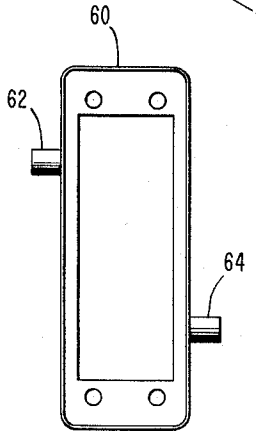


FIG. 5

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UNIVERSAL RECEPTACLE SHELL CODING DEVICE

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This invention relates to a device for coding the receptacle shells of electrical connectors, and, more particularly, provides a universal scheme for the coding of the receptacle shells of electrical connectors to prevent the incorrect mating of the male and female components of such electrical connectors.

In order to connect together the various chassis and cabinets of present day electrical and electronic equipment it is necessary to use a wide variety and large number of electrical connector devices. Due to standardization in the electrical connector industry the connectors of many manufacturers and connectors for various purposes appear similar in shape and design. Such connectors are easily matable or connectable with other connectors, although their intended functions are not the same. The incorrect connection of the various connectors involved in a piece of equipment may result in the application of incorrect operating voltages to various components, as well as the loss of required signal information. Thus, it is essential that in connecting together chassis of components and major components of a system proper coding techniques be employed to insure that only the correct connectors are assembled. Certain external types of marking, such as nameplate or tags are employed; however, these often are separated from the connectors very easily and thus the coding information is quickly lost. A more acceptable system is a permanent coding of the receptacle shells of the electrical connectors which compose the connection. Thus a first coding arrangement is employed on the receptacle shell of the male connector, that is the connector with the pins; and a second coding arrangement, to mate with the first, is employed on the receptacle shell of the female connector, that is the one employing pin-receiving sockets. Such coding arrangements may be assembled at the time of manufacture of the connectors and one has only to be assured that the proper male and female connectors are selected at the time of assembly. However, this produces the difficulty that for every possible coding position the male and female connectors, a supply of such connectors must be carried with the user for his desired applications. Such precoded arrangements would require a large inventory of connectors which may be acceptable at a manufacturing facility or a depot but which would not be acceptable at certain field type uses in military and certain other installations. Certain alternative schemes have been provided whereby the male and female electrical connector shells may be coded just prior to their use. One of such schemes requires the use of a male connector whose shell has a series of knock-out positions which may be removed in accordance with the coding desired. However, special punches are required for moving the knock-outs prior to the time of use. Again this is acceptable in a depot or manufacturing facility; but, it is not acceptable in a field type installation, where such punches are not available.

In the British Patent No. 832,658, issued on April 13, 1960, a further alternative arrangement is disclosed. This arrangement employs a series of external pre-coded plates to be applied to the face of the male connector and the female connector to insure only proper mating of a desired male and female combination. Although this device may easily be installed in the field, a large inventory of parts is required in order to insure that there are adequate supplies of male and female connecting plates for all possible coding positions. Use of the external code plates alleviates the problem of special tools for field type use; however it still necessitates the presence of a large supply of alternate coding plates for all possible combinations that may be required in the field.

The present invention discloses a means by which the shortcomings of the prior devices in the field may be overcome easily and inexpensively. It permits a change of coding or the establishment of particular coding arrangements without the requirement for special tools, and with minimization of the number of spare parts which must be carried with the device. Essentially the device consists of a standard rectagular shell or any other desired shell configuration which has a large-sized aperture placed in one of its side walls. This side wall will be covered with a plate containing a single notched position for coding purposes. The plate is made symmetrical about an axis along its width so that a single notch may be placed in a first position or rotated about its axis to assume a mirror type symmetrical position if the plate is turned 180° about its axis. This permits the use of a single plate for two possible plate code positions. The connector art has standardized the size of its receptacle shells to provide for given numbers of electrical connections by male and female electrical connectors housed by the receptacle shells. The shell sizes are defined in terms of a series number, the larger the series number, the larger the physical size of the shell, and the larger the size of the connectors which can be accommodated. In addition a given area has been assigned for coding to make the shells more easily useable. This area is arranged to provide for up to seven coding notches, regardless of the coding system employed. The area reserved for such coding will vary in size depending upon the series number of the shell. However, the variation in size for a number of consecutive series of shells may be small. Using the principle of the invention, it is thus possible to provide for all seven standard coding positions by means of a maximum of four coding plates which due to their symmetry will provide seven discrete positions. Thus, a single receptaclde shell for a male electrical connector with a choice of four possible coding plates can establish the required seven coding positions. In addition if more coding positions are necessary then an aperture may be placed in an opposite wall of the receptacle shell and a similar plate provided to increase the number of coding positions available.

A female receptacle shell to be used in this system will be provided with a series of apertures in its side walls to match the possible coding positions on the male receptacle shell. In any coding position desired a pin may be semipermanently inserted to match up with the desired coding notch established in the male connector receptacle shell. Thus, a single female receptacle shell with a number of pins and a single male receptacle shell with a set of coding plates provide every possible coding position desired. Additionally, since the coding area established for receptacle shells in different size series in the industry have been standardized to a similar area, the same size coding plate may be employed with receptacle shells of a large number of series. That is, as each series increases in size the same plate may nonetheless be used in that the same area is available for a certain group of such shell series. Beyond a certain point larger shells may require increases in the size of the coding plate. However, there would not be a one-to-one correspondence between coding plate sizes and shell size as indicated by its series. This is not true of prior art devices, particularly the British patent as noted above wherein a single set of coding plates will only adapt to a single series of connectors. It is

therefore an object of this invention to provide a universal coding arrangement for receptable shells of electrical connectors.

It is another object of this invention to provide a universal receptacle shell coding arrangement whereby the particular coding of a receptacle shell maybe readily changed employing simple available hand tools.

It is another object of this invention to provide a universal codable receptacle shell for electrical connectors by means of the employment of symmetrical coding plates, each of which may be used for more than a single coding arrangement.

It is another object of this invention to provide a universal receptacle coding scheme whereby a plurality of coding plates may be employed with a single receptacle shell to achieve a great variety of coding combinations.

It is yet another object of this invention to provide a form of receptacle shell which may easily be coded by the mere insertion of a coding pin into a selected slot.

Yet another object of this invention is to provide a universal coding arrangement for receptacle shells of electrical connectors which is inexpensive, easily interchangeable, and requires a small number of parts.

Further objects and features of the invention will be pointed out in the following description and claims, and illustrated in the accompanying drawings which disclose, by way of example, the principles of the invention and the best modes which have been contemplated for carrying it out.

In the drawings:

FIGURE 1 is an exploded view of the simplest form of the device, constructed in accordance with the concepts of this invention.

FIGURE 2, comprising FIGURES 2*a* through 2*e*, depicts coding plates which may be employed with a device of FIGURE 1.

FIGURE 3 is an exploded view of the assembled male and female connectors with the receptacle shell coding arranged as disclosed herein, and showing the manner in which these connectors may be assembled to form a complete electrical connection.

FIGURE 4 is a front view of the receptacle shell for the male connector only, showing the installation of two coding plates of the type described with reference to FIGURES 1 and 2.

FIGURE 5 is a front view of the receptacle shell for the female connector showing the insertion of matching pins arranged to couple with the coded receptacle shell arrangement as shown in FIGURE 4.

Similar elements will be given similar reference characters in each of the respective figures.

Turning now to FIGURE 1, the device of the invention in its simplest form is illustrated. A standard type rectangular receptacle shell **2** is provided with a side aperture **4**. The aperture **4** is of sufficient size to provide for all the coding positions in the standardized area of the rectangular receptacle shell. A coding plate **6** is arranged to be placed over the aperture **4** and is connected to the shell **2** by means of rivets or other such fastening devices **8**. The rivet **8** is placed through an aperture **10** in the coding plate, and a similar aperture **12** in the shell **2** to assure proper positioning of the coding plate **6** with respect to the shell **2**. Placed within the coding plate **6** is a notch **14**, the position of which may vary in a manner to be described with reference to FIGURE 2. The notch **14** is shown in coding position **1** of the coding plate **6**. The actual electrical connector is installed within the shell **2** (not illustrated) and the back portion of the connector containing the wiring will extend through the aperture **16**.

Turning now to FIGURE 2, various arrangements of the coding plates **6** are shown. As shown in FIGURE 2*a*, the coding plate **6** of FIGURE 1 has been reproduced with a notch **14** as shown. As shown, the coding plate **6** is symmetrical about a central axis **18** through its width so that it may be relocated to provided coding position **1** as shown in FIGURE 2*a*, or rotated to provide coding

position **7** as shown in FIGURE 2*b*. Thus, a single coding plate **6** is employed to provide coding position **1** as shown by notch **14** in FIGURE 2*a* or coding position **7** as shown by the notch in position **14'** in FIGURE 2*b*. FIGURES 2*c*, 2*d* and 2*e* show further coding plates which may be employed to complete the coding of seven possible code combinations. In FIGURE 2*c* a coding notch **20** in coding plate **22** is shown to provide for coding position **2**. By means of the phantom lines at the lower portion of FIGURE 2*c* the coding position **6** shown by the reference character **20'** is also indicated. Thus this coding plate **22** may be employed to provide coding position **2** by means of notch **20** or may be rotated about the central line to provide the coding position **6** when the notch occupies a position indicated by the phantom lines at **20'**. FIGURE 2*d* shows how the coding positions **3** and **5** may be provided for. Coding plate **24** is shown with a notch **26** at code position **3**. By means of the phantom lines the notch **26'** is indicated which shows the coding plate **24** rotated 180° in the plane perpendicular to the paper such that coding position **5** may be provided. FIGURE 2*e* shows a coding plate **28** with a single central notch **30** to provide the single position at the center or coding position **4**.

As has been briefly described above, the shells for various electrical connectors come in a various set of sizes or series. The size of the coding area for such series, may be the same for certain groups of series. Thus only a single group of plates is necessary to cover this entire group of series. As the size of the series increases the coding area becomes larger and a further set of larger plates may be required to accommodate this larger series of connectors. Thus it may be possible to use a single set of coding plates for example four series of connectors and another for another four series, etc.

Referring now to FIGURE 3, there is shown an exploded view of a fully assembled male and female connector with shells coded according to the present invention. The shell **2** has been assembled with a single coding plate **6**, with a notch **14** at its first coding position **1** as described above. A female shell **32** designed to fit within the male shell **2** is provided with a series of apertures **34**. These apertures **34** match up and agree with the possible seven coding positions in the various plates **6**, **22**, **24** and **28**. A pin **36** may be inserted to any one of the seven possible apertures **34** to establish the correct coding relationship between the male and female receptacle shells. Pin **36** may be a knurled ended pin, a rivet or any other suitable fastening means which can be permanently or semi-permanently assembled into the apertures **34**. As is shown in FIGURE 3 a pin **36** has been inserted in the first coding position aperture **34** to mate and agree with the notch **14** appearing in the coding plate **6** of the male receptacle shell **2**. Thus, when assembled, only the receptacle shells of male and female connectors having this coding arrangement could possibly be joined. It would be impossible to force the mating of the pins **36** of the male connector **40** within the shell **2** to mate with the pin-receiving sockets of the female connector (not shown) within the shell **32**, without proper agreement of the notch **14** and the coding pin **36**.

As is obvious from the description of FIGURES 1 and 2, seven coding positions are available with this arrangement. In order to extend the number of coding positions available, plates of the type described with reference to FIGURE 2, may be placed on either side of a shell **50** as shown in FIGURE 4. Thus as shown in FIGURE 4 the shell **50** has apertures **52** and **54** in the side walls thereof. Each of these apertures **52** and **54** is covered by a coding plate **56** and **58**, respectively. These plates may take the form of the plates as shown in FIGURES 2*a* through 2*e* and have apertures in any one of the seven coding positions in each one of the plates. As shown in FIGURE 4, the coding plate **56** has an aperture corresponding to position **14'** of FIGURE 2*b*;

i.e. coding position 7. The coding plate 58 has an aperture corresponding to the position indicated in FIGURE 2c of 20, i.e., coding position 2. To connect with the arrangement as shown in FIGURE 4 the receptacle shell of the female electrical connector is as shown in FIGURE 5. The female receptacle shell 60 has two series of apertures, such as apertures 34 of FIGURE 3, in each side wall. Pin 62 is inserted in the left side wall to match up with a notch 20 of the shell 50 of FIGURE 4. A similar matter, a pin 64 has been inserted in the coding aperture at the right side wall of the shell 60 to match the coding notch 14' of the shell 50. These two shells may then be assembled in a manner shown with reference to FIGURE 3.

Although, in the foregoing description of the concepts of the invention there have been shown seven coding positions for any coding plate, it should be noted that this number is for illustrative purposes only, and does not limit the invention to any number of such coding positions. As many coding positions may be made available as are desired depending upon the size of the notches and the pins required. Further, although the positions of the coding notches for the various coding plates as shown in FIGURES 2a through 2e are shown separate and discrete they may be arranged in such a manner that the relative positions 1 through 7 slightly overlap each other. This will provide no difficulties since no two notches are provided on a single coding plate. The notches shown with respect to the coding plates and the pins may take any desired shape; that is, the notches may be rectangular or square, and the pins similarly shaped.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to the preferred embodiments, it will be understood that various omissions and substitutions changes the form and details of the devices illustrated and its manner of operation may be made by those skilled in the art, without departing from the spirit of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A codable universal receptacle shell assembly comprising a first receptacle shell for housing a first electrical connector: comprising a back plate and a wall forming an integral unit, said wall having a front edge spaced apart from said back plate; said shell having an aperture in said wall, said aperture extending from said front edge of said wall towards said back plate; a coding plate having a leading edge and a trailing edge and proportioned to fit over the aperture in said shell wall, said coding plate having a coding notch therein, said coding notch extending from said leading edge of said coding plate towards said trailing edge; means to connect said coding plate to said shell over said aperture, whereby said leading edge of said coding plate and said front edge of said wall are aligned and said coding notch in said coding plate is positioned over at least a portion of said aperture in said wall; a second receptacle shell for housing a second electrical connector, said second shell being capable of fitting within said first shell to permit mating of said first and second electrical connectors; said second shell comprising a back plate and a wall forming an integral unit, said second shell having a plurality of apertures in its wall for accepting a coding pin; and a coding pin inserted into one of said apertures to match the coding notch of said first shell, to permit mating of only similarly coded first and second receptacle shells.

2. A codable universal receptacle shell assembly comprising a first receptacle shell for housing a first electrical connector: comprising a back wall and two side walls forming an integral unit, each of said two walls having a front edge spaced apart from said back plate; said shell having an aperture in each of said side walls, said apertures each extending within its associated side wall from said front edge of said side wall towards said back plate; a pair of coding plates each having a leading edge and a trailing edge and each proportioned to fit over the apertures in said shell walls, said coding plates each having a coding notch therein, said coding notches each extending within its associated coding plate from said leading edge of said coding plate towards said trailing edge; means to connect said coding plates to said shell over said apertures, whereby the leading edge of each of said coding plates is aligned with the front edge of its associated side wall and said coding notches in said coding plates are position over at least a portion of the apertures in their associated side walls; a second receptacle shell for housing a second electrical connector, said second shell being capable of fitting within said first shell to permit mating of said first and second electrical connectors; said second shell comprising a back plate and two side walls forming an integral unit, said second shell having a plurality of apertures in each of its walls for accepting a coding pin; and a coding pin inserted into one of said apertures in each of said apertures to match the coding notches in said first shell to permit mating of only similarly code first and second receptacle shells.

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