June 11, 1940. W. H. WALLS 2,203,973

ELECTRICAL CONNECTOR

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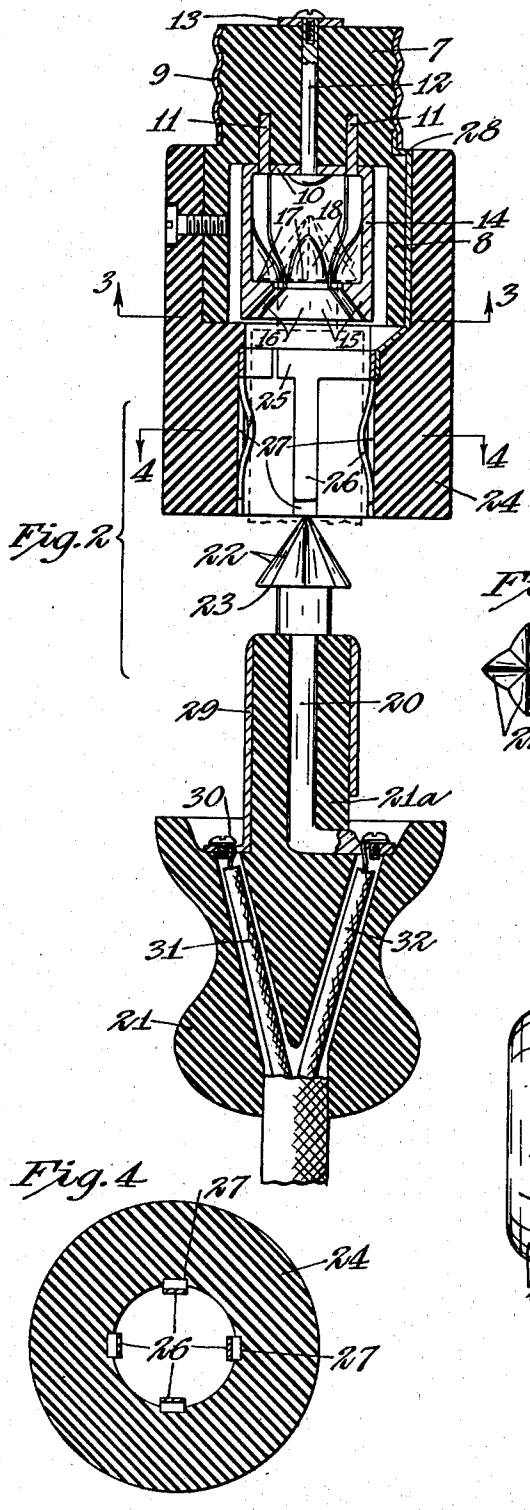


Fig. 2

Fig. 4

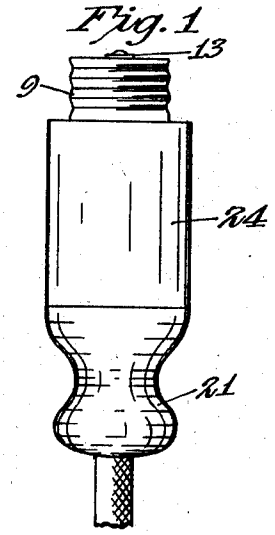


Fig. 1

Fig. 5

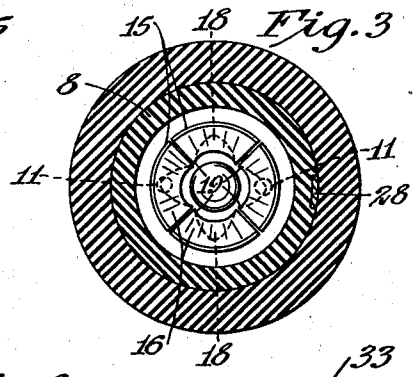


Fig. 3

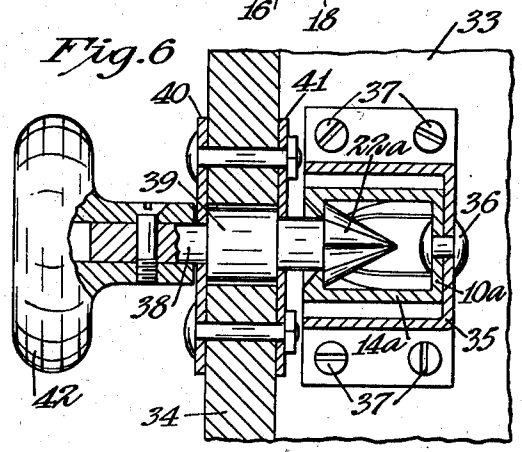


Fig. 6

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ELECTRICAL CONNECTOR

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4 Claims. (Cl. 24—221)

This invention relates to quick detachable connectors such as may be advantageously used in electrical connectors, door knobs and the like.

My invention relates generally to a detachable or separable connector in which cooperating elements may be secured together by the simple act of pressing one into the other and it is so arranged that when the cooperating parts are pressed together they will be firmly interlocked against accidental separation even under a strong pull.

One of the objects of my invention is to provide an easily separable connector wherein the cooperating parts can be pressed one against the other when in axial alignment without requiring any manipulation of either of the parts to bring about a positive interlocking connection.

Another object of the invention is to provide a separable connector wherein the interlocked parts can be easily separated by imparting to one of them a simple twisting action constituting movement in only a small arc of a circle.

Another object of the invention is to provide a separable connector wherein a headed element can be pressed into a pocketed element and wherein means is provided for automatically aligning the head and the pocketed element to positively insure proper entry of the head into the pocketed element and proper seating of the head therein.

These and other objects and advantages of the invention will more fully appear from the following description made in connection with the accompanying drawing, wherein like reference characters refer to the same parts throughout the views, and in which:

Fig. 1 is a side elevation of a separable electric connector;

Fig. 2 is an enlarged sectional view showing the interior construction of the socket and plug with means for completing an electrical connection;

Fig. 3 is a section taken approximately on the line 3—3 of Fig. 2;

Fig. 4 is a section taken approximately on the lines 4—4 of Fig. 2;

Fig. 5 is an end view of the plug; and

Fig. 6 shows the adaptation of my construction to a door knob.

In the structure shown best in Fig. 2 there is illustrated a separable electric connection which includes a block of insulation 7 having a cup-like end 8 which is open as shown, and the opposite end of the block is provided with a threaded sleeve 9 which is of a conducting material. Within the cup 8 is anchored a plug receiving socket which includes a main base plate 10 anchored in the block 7 by means of pins 11 and a bolt 12. The latter has a contact element formed as a washer 13 on the outer end of the bolt. The plate or disc 10 has extending therefrom a plurality of resilient metal prongs 14 which in the illustrated embodiment are four in number. When looking at the ends of the prongs as in Fig. 3, it will be noted that their edges are normally abutting each other. There is a space between the prongs and the inner wall of the cup 8 to permit the prongs to be sprung outwardly. The free ends of the prongs are provided with enlarged portions 15, as best shown in Fig. 2, and these ends have slanting faces 16 and inner shoulders 17, the faces of said shoulders lying in a plane substantially at right-angles to the longitudinal axis of the structure. The shoulder faces 17 define the outer ends of pockets 18 formed in the prongs, these pockets, as best shown in Fig. 3, being substantially concave in cross section. It will be seen that the group of resilient prongs 14 form a substantially circular structure leaving an open central area with the slanting faces 16 on the ends of the prongs directed inwardly toward the center of said open area. Where the edges of the prongs abut each other at their free ends, the inner corners at said edges are shaped in such a manner that adjacent prong corners extend inwardly toward the center of the open central area, these point portions being indicated at 19. When the prongs are in abutment the adjacent inwardly extending portions of the prong corners together form an inward projection and the sides of the composite projection formed slant in a curve away from each other toward their respective and adjacent pockets 18.

The cooperating element or plug element which is adapted to be inserted in the socket formed by the prongs 18 includes a shank 20 which preferably extends partially through a knob 21 of insulating material, and one end of this shank extends outwardly from the knob and is provided with a plurality of cam-like projections 22. As best shown in Fig. 5, these cam elements are four in number corresponding to the number of pockets 18 in the socket prongs, and these cams have cross sectional shape generally the same as that of said pockets. The cam elements have flat faces 23 at their large ends, said faces being substantially at right-angles to the axis of the shank 20, and the cams diminish in size toward their outer ends and converge to a

point, as best shown in Fig. 2. The lateral faces of the cams are slightly convex, as shown in Fig. 5, and the outer edge of each cam at the junction of said faces is formed straight to the above mentioned point. This edge can, however, be made curved if desired.

When the plug assembly is substantially axially aligned with the prong socket assembly and pressed inwardly the ridges of the cam elements will engage the slanting faces 16 at the outer ends of prongs 14 and the plug assembly will be automatically centered. Further pressure of the plug against the prong assembly will cause the latter to be split radially and the plug can be pressed in until the shoulders 17 on the prongs snap into positive interlocking engagement with the faces 23 in back of the large ends of the cams 22, said cams slipping into the pockets 18 formed in the yieldable prongs. With the parts thus interlocked it is impossible to pull the plug from the socket assembly unless, of course, sufficient pull is exerted to break some of the parts. Otherwise a pull will have no effect on the connector.

At times when inserting the plug in the socket prong assembly there is likelihood of the relatively sharp outer edges of the cams 22 engaging said prong assembly at the points where the individual prong elements come together. Under such conditions the cams would merely spread the prongs and they would not drop into the pockets 18. To eliminate such a possibility the small inwardly curved projections 19 are provided to present guiding surfaces which will slightly twist the cams 22 and the remainder of the plug assembly so that the cams will ride into the pockets 18 and not become jammed between adjacent prong elements. While in Fig. 3 it might appear that there is sufficient space between the edges of adjacent prong elements to still admit the relatively sharp edges of the cams 22, this is not possible in actual practice for the reason that the side edges of the prongs abut each other more closely than shown in the drawing, which has been exaggerated to more clearly present the structure involved. This is an important feature of the invention and one which absolutely eliminates any need for turning the plug to any particular position for insertion in order to produce a positive interlocking connection.

In the electrical connector shown there is provided a sleeve 24 having a central aperture therein which acts as a guide for the plug to some extent and which carries a split spring ring 25 having a plurality of spring prongs 26 extending therefrom. The ring 25 is adapted to be seated in a suitable annular groove in the sleeve 24, and the spring prongs 26 are seated in longitudinal grooves 27. The ring 25 is connected by a conducting strip 28 to the threaded sleeve 9 on the end of the block of insulation 7.

The plug 21 has a reduced portion 21*a* which carries a conducting sleeve 29, said sleeve having a binding post 30 to which an electric wire 31 can be connected. A second wire 32 is adapted to be connected to the shank 20. Thus a circuit is established through the shank 20 and cams 22 to the spring prongs 14, the bolt 12 and the contact washer 13. The other side of the circuit through the wire 31 continues through the sleeve 29, the spring contact elements 26 with their ring 25, and thence through the conductor bar 28 to the threaded conducting sleeve 9. The sleeve 9 can be screwed into an ordinary light bulb socket as is well known in the art.

In Fig. 6 the invention is shown applied to a door latch or similar structure. A portion of a door frame or cabinet section is shown at 33 and a fragmentary section of a door is indicated at 34. In this case the spring prongs 14*a* are connected by their base 10*a* to a metallic casing 35 by means of a rivet 36. The casing is secured by screws 37 to the door frame or some corresponding structure. Extending through the door 34 is a shank 38 having an enlarged medial portion 39, and said medial portion is retained in position by face plates 40 and 41. The outer end of the shank 38 is provided with a knob 42 and the inner end of the shank is provided with a plurality of cam elements 22*a* similar to the cams 22 in the first described embodiment. The general connector assembly structure is exactly the same as that shown in Fig. 2, and the device is operated in exactly the same manner.

In the case of either of the above described embodiments of the invention when the shank or plug with its cam elements has been inserted into and interlocked with the spring prong assembly it is positively retained against withdrawal by a pull as has been above described. In order to release the connector or latch, it is necessary only to turn the plug or knob slightly so that the cams acting upon the concave faces of the pockets in the spring prongs will cause radial expansion of the prong assembly and the plug or shank can be easily withdrawn.

From the foregoing description it will be readily seen that I have provided a connector construction wherein a positive interlock is secured, and the structure is such that the plug or shank can be inserted in the prong unit regardless of the rotary position in which said plug or shank may be. Thus it is unnecessary for the user of the connector to turn the shank to any particular position before insertion or to twist the same as it is being inserted. Of course, if the cams should ride against the inwardly pointed portions 19 of the prong assembly the cams and their supporting shank will be given a slight twisting motion due to said projections and not due to any action on the part of the person making the connection. The device is of relatively simple structure, out it is extremely sturdy and impossible to pull apart. At the same time, removal of one part from the other is easily accomplished.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the various parts without departing from the scope of my invention.

What is claimed is:

1. In a connector structure, a plurality of laterally yieldable prongs having their side faces in normally abutting relationship and arranged about an open central area, the inner faces of said prongs defining concave pockets, the outer ends of said prongs providing shoulders at the ends of said pockets, the inner faces of said shoulders lying substantially at right-angles to the longitudinal axis of the prong assembly and the upper faces of said shoulders being inclined downwardly and inwardly toward said axis, a shank insertable in the open central area of said prong assembly and a plurality of cam elements at the end of said shank, said cam elements being substantially triangular in cross section and diminishing in size from their inner ends to their outer ends, said inner cam ends

providing locking faces extending radially of said shank and substantially at right-angles thereto.

2. In a connector structure, a plurality of laterally yieldable prongs having their side faces in normally abutting relationship and arranged about an open central area the inner faces of said prongs defining concave pockets, the outer ends of said prongs providing shoulders at the ends of said pockets, the inner faces of said shoulders lying substantially at right-angles to the longitudinal axis of the prong assembly and the upper faces of said shoulders being inclined downwardly and inwardly toward said axis, said prong assembly being yieldable radially to receive a tapered plug pressed axially thereinto, and said pockets and inner faces of said shoulders being adapted to provide positive interlocking engagement with a plug.

3. A plug adapted to be inserted into and interlocked with a socket composed of a plurality of radially yieldable prongs having pockets on their inner sides and having shoulders whose inner faces lie at right-angles to the axis of the socket, comprising, a group of cam elements substantially triangular in cross section and diminishing in size from their inner ends to their outer ends, two adjacent surfaces of said cams being convex and meeting to provide relatively sharp edges and said inner ends providing faces lying at right-angles to the axis of the group of cams.

4. The structure in claim 2, and the inner corners of the free ends of said prongs at their abutting faces being provided with inwardly extending substantially radial projections having oppositely disposed surfaces curving toward their respective adjacent prong pockets.

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