

[54] CONNECTOR WITH SAFETY CLOSURE

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[58] Field of Search..... 339/36-40,
 339/41, 42, 119, 126, 147 C, 8 P, 5 P;
 292/316, 327

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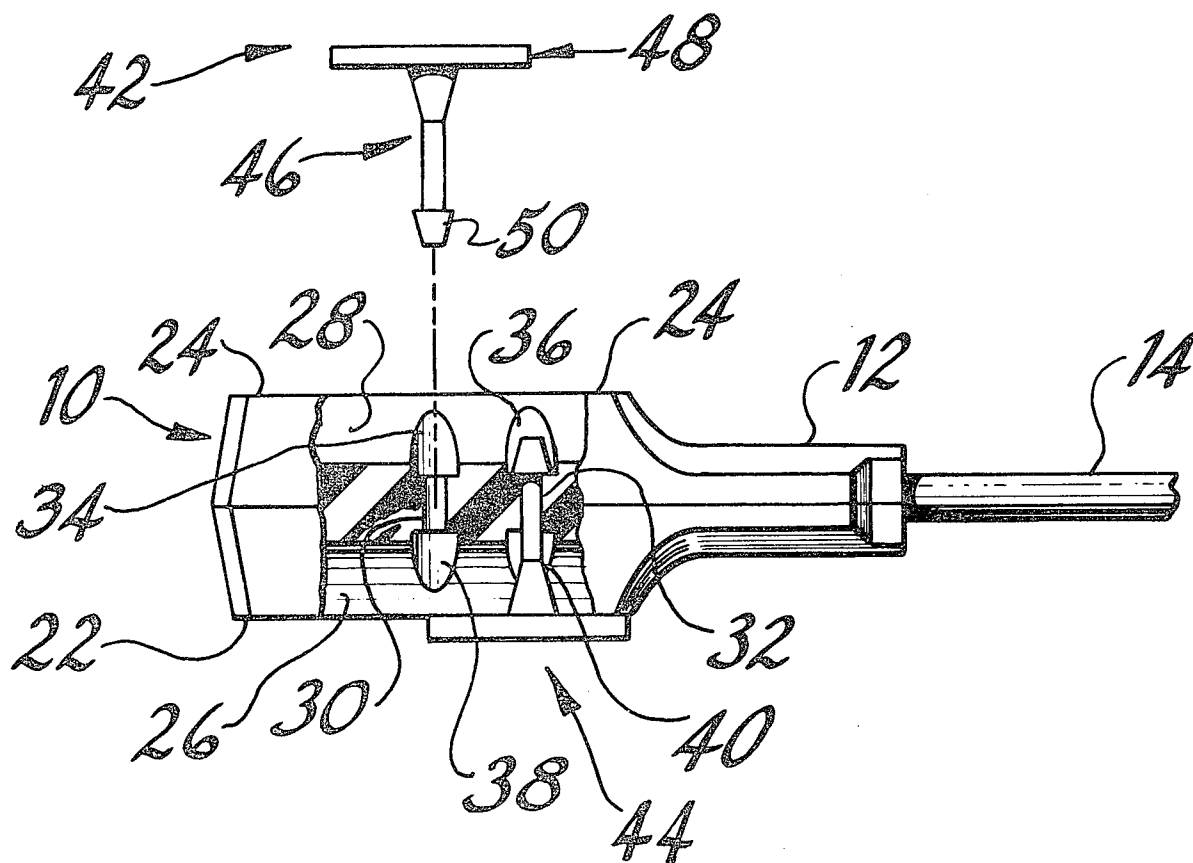
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[57] ABSTRACT

An electrical connector with a rotatable safety closure is provided for reliable closing of the entrance to blade ports in the electrical connector. The closure is afforded by a disc which rotates on a single shank extending from the disc. The shank is rotatably supported in the body of the connector in a conforming hole or well. The disc portion of the closure has blade openings which may be aligned with the blade ports of the connector by rotation of the disc or which may be placed out of alignment by further rotation or by reverse rotation of the disc.

9 Claims, 9 Drawing Figures



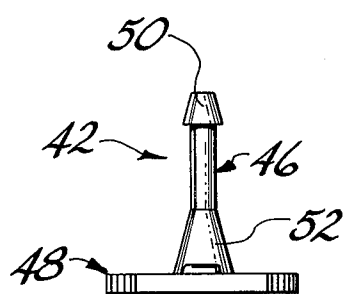
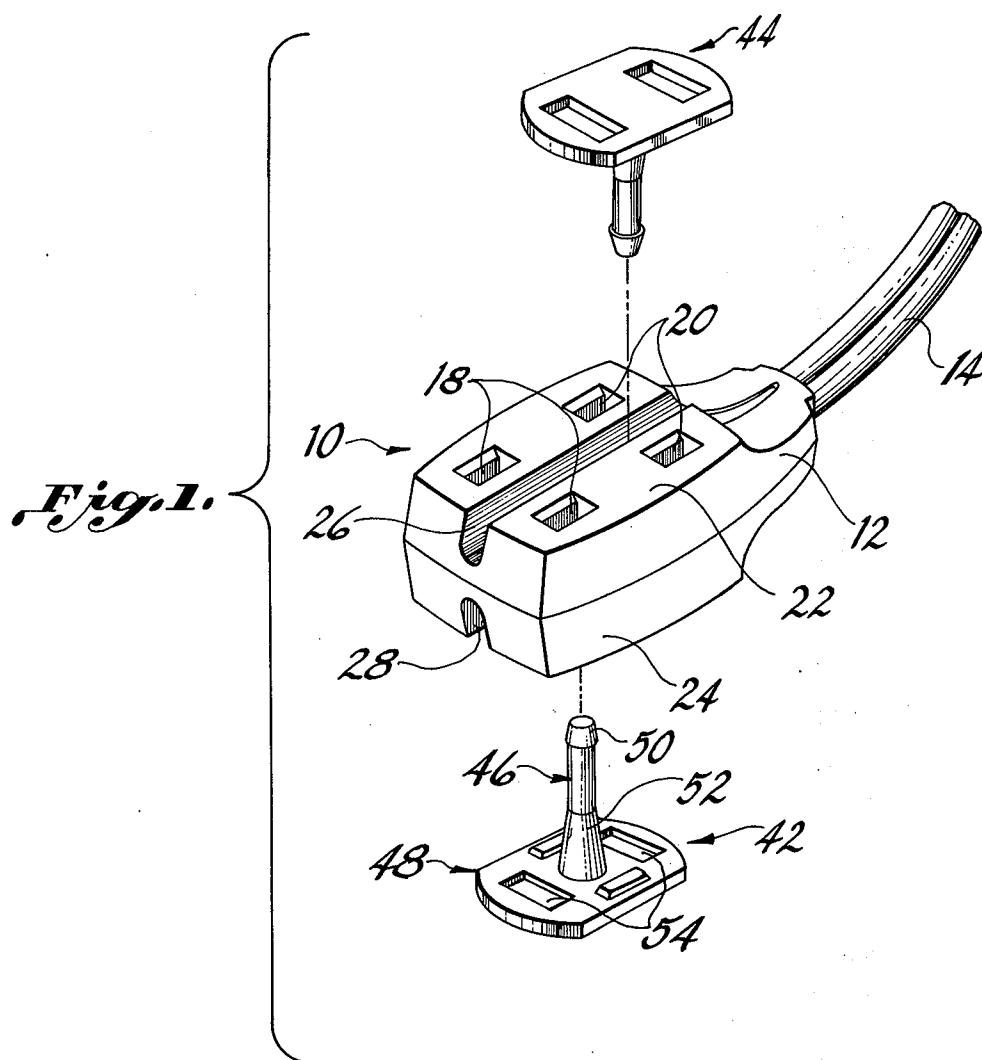


Fig. 2.

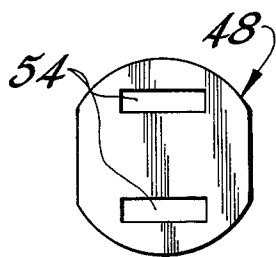


Fig. 3.

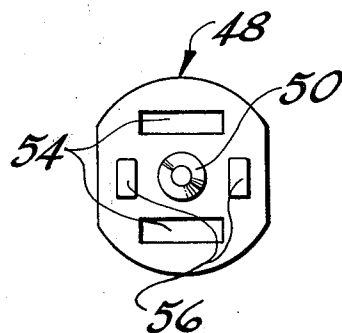
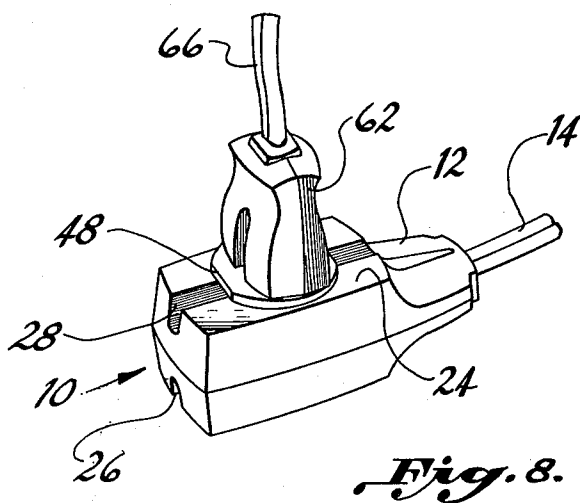
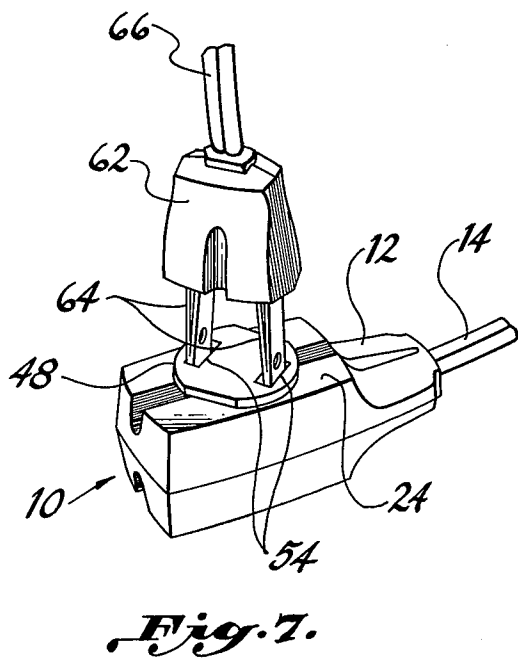
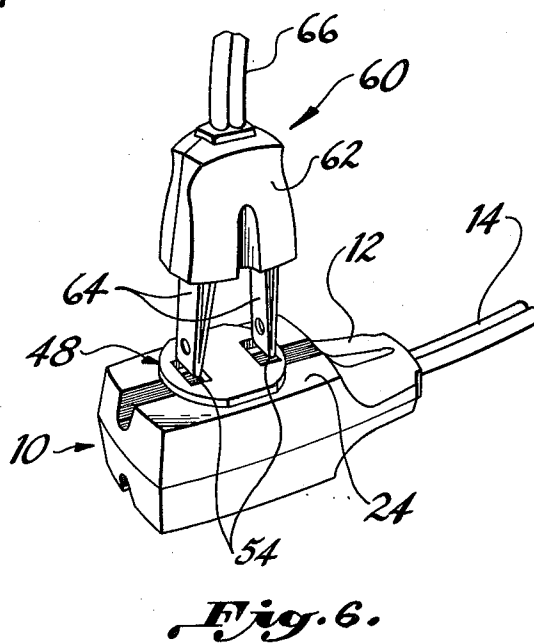
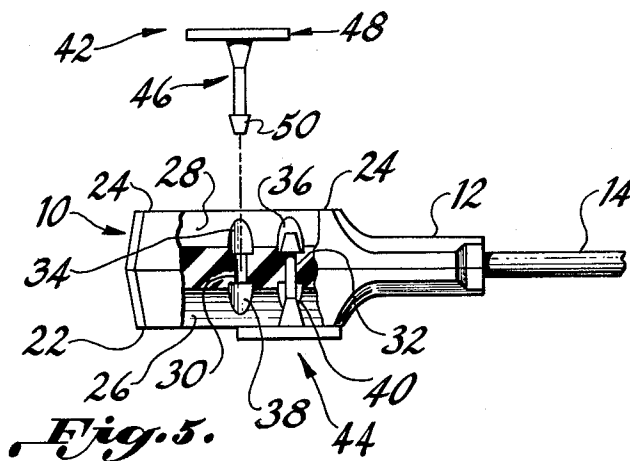


Fig. 4.

SHEET 2 OF 3



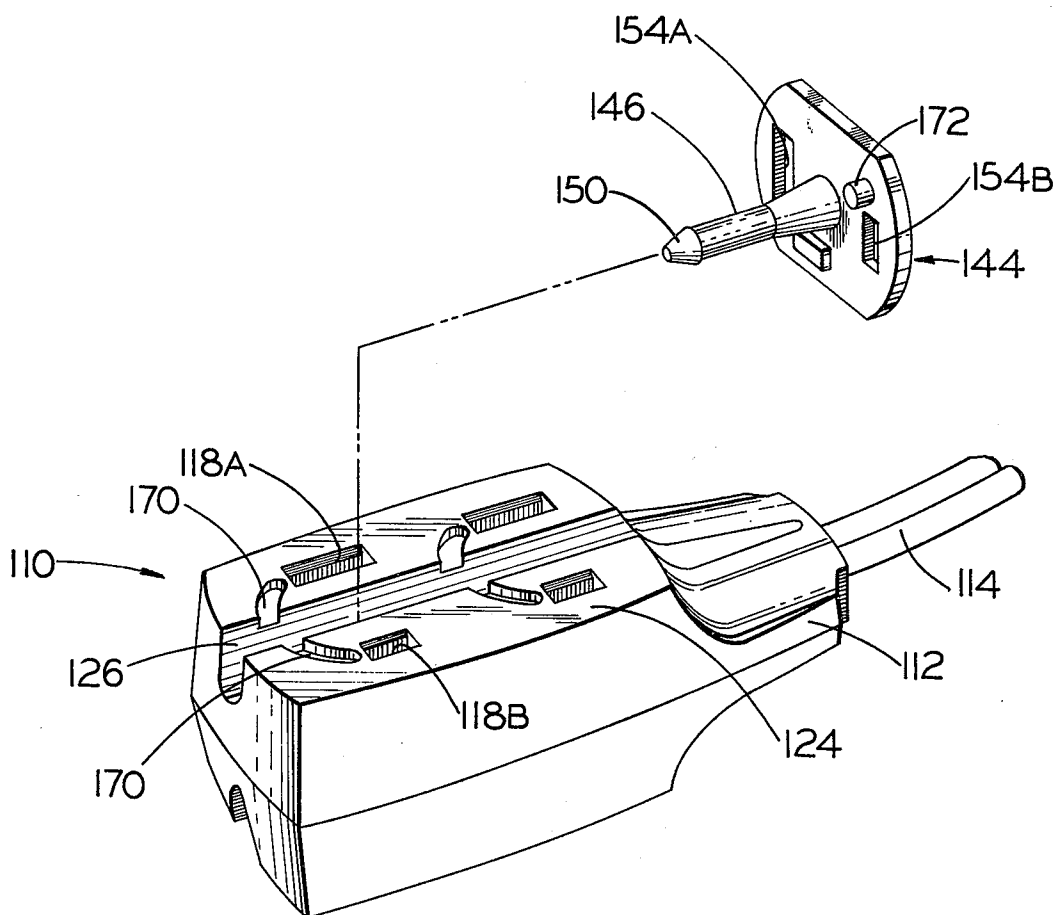


Fig. 9.

CONNECTOR WITH SAFETY CLOSURE

BACKGROUND OF THE INVENTION

For many years portable cordsets, also known as extension cords, have been made and used by the public. Such cordsets include a cap having a single pair of parallel power blades at one end, a connector having multiple power blade receiving ports at the other end, and a pair of flexible insulated conductors extending between the cap and connector.

Recently, the Underwriters' Laboratory has determined that for safety reasons, the number of open blade receiving ports at the connector end of cordsets should be limited to one. For cordsets with multiple pairs of blade openings, means must now be used for closing all but one pair of such connector blade receptacles.

U.S. Pat. No. 3,389,367 teaches one way in which such closure of two of the three disclosed pairs of blade openings of cordset receptacles may be achieved. According to this patent, a removable closure for such blade openings is provided. The closure is mechanically linked about the cord and may be removed entirely from the cordset. Such removal leaves the cordset in the condition of those sets which had no such closure protection. Alternatively, the closure may slide on the cord of the cordset away from the connector and can be retrieved by the user if reuse is desired.

Other patents teach the use of rotatable members in connection with standard electrical wall receptacles or similar devices. Patents such as U.S. Pat. Nos. 2,147,790; 2,507,645; 2,515,870; 2,525,250; 3,113,174 and 3,663,924 are included in this group.

Other closure mechanisms for all but one of the pairs of blade ports of cordset connectors are known and used to comply with the Underwriters' Laboratories requirement set forth above. Essentially, all such cordset connector closure mechanisms are removable to leave all pairs of blade ports of the cordset connector exposed.

OBJECTS OF THE INVENTION

It is one object of the present invention to provide an effective closure for pairs of blade ports of cordset connectors.

Another object is to provide a closure for pairs of blade ports of cordset connectors which can be used individually with each respective pair of ports.

Another object is to provide a closure for pairs of blade ports of cordset connectors which are readily and economically assembled to the connectors.

Another object is to provide a closure of pairs of blade ports for cordset connectors which cannot be readily removed from the connector and which can be readily used in place on the connectors.

Other objects and advantages of the invention will be in part apparent from and in part pointed out in the description which follows.

SUMMARY OF THE INVENTION

The present invention in one embodiment thereof provides an insulating closure for a connector having an insulating resilient body. Within the body are electrically conductive contact strips. The contact strips are spaced from each other and are positioned in the body for contact with power blades. The power blades

enter through blade ports in the body which ports have spacing and dimensions corresponding to those of the power blades. A third port which is located preferably between the blade ports accommodates the shank of a tack-shaped closure element. The closure element is held by its shank in the third opening and is rotatable about the shank.

The head of the closure element is provided with spaced blade openings. Rotation of the closure element about its shank axis brings the blade openings into or out of alignment with a pair of blade ports of the body.

The description is made clearer by reference to the accompanying drawing in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective exploded view of a connector having closure elements posed in a pre-assembled alignment.

FIG. 2 is an elevational view of a closure element.

FIG. 3 is a top plan view of the closure element of FIG. 2.

FIG. 4 is a bottom plan view of the closure element of FIG. 2.

FIG. 5 is a side elevational view in part in section of a connector as shown in FIG. 1 with one closure element in place in the connector and a second closure element poised in pre-assembly alignment.

FIGS. 6, 7 and 8 are perspective views of connectors as shown in FIG. 1 with caps shown in positions of closure element rotation.

FIG. 9 is a perspective view of a connector with a closure element of alternative form aligned with the connector.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, a connector body 10 of resilient insulative material has a generally rectangular shape and has a tapered strain relief end portion 12 where a cord 14 enters the body. The body has an upper surface 22 in which is located two pairs 18 and 20 of power blade ports. A third set of ports not shown in FIG. 1 is located in the opposite or under surface 24 of body 10 as illustrated in FIG. 8. This same connector body is illustrated in its inverted position in FIGS. 5 through 8. The third set of blade ports are about evenly spaced longitudinally between oppositely extending sets 18 and 20. The individual ports of the sets each have dimensions corresponding generally to those of a conventional power blade of a conventional attachment cap or plug. Also the spacing of each port from the opposite member of a pair of blade ports is the conventional spacing for attachment caps.

As seen in FIG. 1, an elongated channel 26 is formed along the mid-line of the upper surface 16 of body 10 and a symmetrical channel 28 is formed in the bottom surface 24. The particular shape of the connector and the channeling of the connector is not important to the present invention and other shapes and arrangements of connector portions may be used in connection with the present invention.

Extending between the channels 26 and 28 are two holes 30 and 32. These holes are best seen in the partial sectional view of FIG. 5 wherein the connector body 10 is shown in an inverted position relative to that of FIG. 1. The holes 30 and 32 have enlarged entrances 34, 36, 38 and 40 countersunk in the channels 26 and 28. The

enlarged entrances have flat bottoms rather than the rounded bottoms such as would conform to the bottoms of channels 26 and 28.

Such holes and enlarged countersunk entrances could, of course, be formed in a connector body even if channels 26 and 28 were entirely absent, and the presence of the channels 26 and 28 are not essential to the invention.

The holes 30 and 32 are formed to receive tack-shaped rotatable closure elements 42 and 44, respectively. Closure elements 42 and 44 are essentially the same in all principal details and a description is given here of details of closure element 42 with the understanding that the description applies as well to closure element 44.

As best seen in FIG. 2, closure element 42 has a shank 46 and a generally disc-shaped head 48. The shank 46 has a generally conically shaped end portion or tip 50.

During assembly shank 46 is inserted into hole 30 until tip 50 passes through hole 30 and enters enlarged entrance 38. The generally conical shape of tip 50, shown actually as a frusto conical shape, permits the shank 46 to be driven through hole 30 with relative ease. A flat underside 51 of tip 50 rests against the flat bottom of enlarged entrance 38. Engagement of the flat underside 51 of conical tip 50 with the flat bottom of enlarged entrance 38 prevents easy withdrawal of the tack-like closure element from body 10. In fact, withdrawal is quite difficult and requires tools as it cannot be done by hand and particularly not by hand actions of small children.

Other alternative means for retaining a rotary closure element, such as 42, within a seat in a connector may be employed without departing from this invention. For example, the tip 50 of such a closure member can be driven into a hole such as 30 without enlarged entrances and can be effectively retained within such a hole by virtue of the undercut conical configuration of tip 50. However, the abutment of the flat underside 51 of tip 50 against a flat surface of connector 10 aids in closure element retention in the connector body.

A conical portion 52 at the attached end of shank 46 provides strain relief to minimize breakage of shank 46 from head 48.

Head 48 has a pair of power blade openings 54, and rotation of the rotary closure element 42 brings this pair of blade openings into or out of alignment with the pair of blade ports in body 10.

The manner in which this rotation may be readily accomplished is illustrated in FIGS. 6, 7 and 8. A conventional cap 60 has an insulating body 62, a pair of electrically conductive power blades 64 and an insulated wire cord 66 to conduct electric power to and from blades 64. Insulating body 62 is conventionally employed as a handle for gripping the cap when inserting blades 64 into or when removing them from an electrical receptacle or connector. In FIG. 6, the cap 60 has its blades 64 positioned over the pair of blade openings 54 in the head of closure element 42.

By inserting the ends of blades 64 into the openings 54 and rotating the cap 60 under hand pressure, the hand held cap 60 and the head 48 of the tack-shaped closure element are brought first into a position as illustrated in FIG. 7. By continuing the rotation of cap 60 by hand pressure, the holes 54 of head 48 are brought into alignment with the blade ports in body 10 and the

blades are insertable into place to bring body 62 into the position shown in FIG. 8.

The rotation of head 48 may be induced by articles other than the cap of a cordset and use of a cap is not essential to the present invention. However, the manipulation of the head is rather difficult when one uses a single implement, as a hair pin or nail, or other item which a small child might use in attempting to insert it into openings in the connector. Because of this difficulty, the presence of the head 48 on the connector of this invention provides a measure of protection to small children against their being injured by inserting small elongated conductive articles into the blade ports of connectors.

Toward this end of making the opening of closed ports difficult for small children, the underside of head 48 of closure 42 is provided with means to restrain rotary motion of the head when the closure element is in place in a connector. When a closure element such as 42 is in place, the underside of its head 48 bears against the surface of the connector. To restrain rotary movement, bosses can be formed on the surface of head 48 which confronts and bears against the connector surface. On head 48 of closure 42, and as seen in FIGS. 1 and 4, two rectangular bosses 56 are formed integrally with head 48.

When the head 48 is in the position of FIG. 6, the bosses 56 extend into the entrances to the pair of blade ports in surface 24. With the bosses in place in such ports, the turning of the head 48 by a small child with a small implement is made more difficult. This adds to the safety of the connector 10.

Also, the presence of the bosses assists in avoiding unwanted or nuisance turning of the head 48. For example, when the head 48 is in the position shown in FIG. 8, the bosses extend into channel 28. Rotation of head 48 to bring the pair of blade openings 54 out of alignment with the corresponding pair of blade ports in surface 24 does not occur unless an extra rotary force is applied sufficient to force the bosses out of channel 28 and up onto surface 24. In other words, once the alignment of blade openings and blade ports has been set, it is maintained under normal circumstances until a definite force is applied to disturb the alignment.

Referring next to FIG. 9, there is shown an alternative form of this invention. The closure element 44 is similar in most essential respects to the element 42 described above with reference to the other figures. The element 144 is inserted into the connector body 110 into a position indicated by the broken line extending from tip 150 of element 144. When in place, the shaft 146 of element 144 extends into the channel 126 and through a hole not shown at the bottom of the channel and between a pair of blade ports 118a and 118b. When so inserted in the connector body 110, the pair of blade openings 154a and 154b are positioned in registry with the blade openings 118a and 118b in the connector body 110.

In the conventional usage of the wiring device industry, the blade openings 154a and 154b, as well as the blade ports 118a and 118b, are said to be oriented. By being oriented it is meant that there is a larger opening, as for example 154a and 118a, as well as a smaller opening 154b and 118b for a single pair of blade openings or blade ports. These differently sized blade ports are distinct from the more usual blade ports found in connector bodies of a resilient material as it is more

usual that such ports are of equal size as are the ports in FIGS. 1 through 4. Where it is desired to have the two such differently sized ports employed, blades selectively reach only the proper electrical contact in the connector. To achieve such selective contact, both of the blade ports must be oriented and also the blades of a cap used in connection with the device must be oriented. An oriented pair of blade openings will receive an oriented pair of blades in only one alignment. This is the purpose of the orientation of the blade openings and of the blade ports of the connector shown in FIG. 9. Such an oriented pair of blade openings 154a and 154b is different from the openings 54 shown in FIGS. 6 and 7, for example, in that the larger of an oriented pair of blades is of sufficient width that it will not fit into any one of the normal size openings 54 no matter which way the blades are turned. This use of orientation of blades and blade ports can provide a measure of safety in supplying power to appliances, hand tools, television sets and the like in ensuring that the power is supplied in a preferred manner.

A conventional unoriented cap such as 60, has blades 54 which will be received in the oriented blade openings of connector 110 and closure element 144 because both of the blades of the conventional cap such as 60 will fit in the smaller of the openings 154b and the smaller of the blade ports 118b. Accordingly, oriented receptacles can be employed in supplying power to lamps and other electrical devices which use caps with unoriented pairs of power blades.

In a connector such as the connector of FIG. 1, prior to the insertion of closure elements 42 and 44, it is sometimes feasible to insert an oriented blade into an unoriented pair of blade openings if the material of the connector itself is sufficiently pliable. In such use the wider blade of the oriented pair may be forced into a smaller blade opening such as 18 or 20 even though it is of a proper size and is not meant to receive the larger blade. By contrast, with a closure element such as 44 in place, the orientated blade cannot be forced through one of the openings of the element because the material of the element is sufficiently rigid and firm to resist such forcing unless exceptional force is employed sufficient to damage the element at its openings.

Similarly, with regard to a closure element such as 144 of FIG. 9, the insertion of the oriented blade into the openings 154a and 154b is done without use of force where the proper orientation of the blades to the openings is employed. Conversely, when the wrong orientation is employed, the rigid material of the closure element will limit the feasibility of introducing the larger blade through the smaller opening 154b.

Because there is a preferred orientation of preferred relation of the openings 154a and 154b of closure element 144 to the blade ports 118a and 118b of connector 110, a provision is made to restrict the rotary movement of the closure element once that element is in place in the connector body 110. When the closure element is in the open position, the blade openings are properly aligned with the blade ports. When it is closed, the openings and ports are not aligned but the element is in a position which permits it to be readily opened into the proper alignment of openings and ports. To accomplish this, an arcuate groove 170 is formed in the upper surface 124 of connector 100 and a cooperating boss 172 is formed on the underside of closure element 144.

Owing to the cooperation of the generally cylindrical boss 172 and due to the relatively short sweep of the arc-shaped channel 170, the closure element can be turned only through an arc of about 90°. When boss 172 is at one end of the channel the blade openings and blade ports are aligned so that the larger opening is over the larger port. Due to the presence of boss 172, the closure element 144 is not free to rotate to a position in which the larger opening is over the smaller port.

The generally rectangular boss 156 assists in keeping the closure element turned to a preset open or closed position in the manner described above with reference to closure element 144.

The connector of FIG. 9 can be equipped with three oriented closure elements to prevent improper insertion of an oriented cap into blade ports which are unprotected by a closure element.

What is claimed and desired to be secured by Letters Patent of the United States is:

1. An electrical connector which comprises:

- a. a resilient insulating body,
- b. a pair of electrical contacts in said insulating body,
- c. said contacts being spaced apart and positioned in said body beneath an exterior surface thereof,
- d. means for conducting electric current to said contacts,
- e. a pair of spaced power blade ports having openings at said exterior surface and communicating with said electrical contacts,
- f. a central port located between said power blade ports,
- g. said central port having an opening at said exterior surface and extending into said body to a predetermined depth,
- h. an insulating closure element having a generally disc-shaped head and an elongated shank depending from the center of said head,
- i. said shank extending into said central port and the underside of said head bearing against said external surface,
- j. a pair of spaced blade openings in said head conforming generally to those in said body,
- k. said closure element being rotatable to bring the pairs of blade openings selectively into alignment or out of alignment.

2. The connector of claim 1, wherein an enlarged portion of the shank is at the unattached end thereof.

3. The connector of claim 2, wherein the enlarged portion of said shank is conically shaped and the wider end of the cone is closer to the head of said closure element and greater in diameter than the adjacent section of the shank.

4. The connector of claim 1, wherein an enlarged portion of said shank is a frustro conical head and is located at the unattached end of said shank with the narrower part of said frustro-cone pointing away from said head.

5. The connector of claim 1, wherein there is formed on the underside of said closure element head and on the confronting external surface of said body surface irregularities which orient said closure element to preferred rotational positions.

6. The connector of claim 5, wherein said irregularities have the form of a trough in said body surface and at least one boss depending from said closure element head.

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7. The connector of claim 1, wherein the blade openings and the blade ports are oriented.

8. The connector of claim 1, wherein an arc-shaped channel is formed in the surface of the connector and a conforming boss depends into said channel from the underside of the closure element. 5

9. A closure element for a connector having a yieldable insulating body and spaced electrical contacts encased in said body which comprises:

- a. a generally disc-shaped head portion, 10
- b. said head portion including a pair of blade open-

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ings to admit power blades to pass through said head portion and into said connector,

c. a shank formed integrally with and extending out from the approximate geometrical center of said head,

d. said shank having a tapered end for ease of insertion into an opening in said connector,

e. and said shank having an oversize portion proximate the unattached end thereof to facilitate rotation of said closure in said connector.

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