Jan. 31, 1961 H. HUBBELL ET AL 2,970,288

TOP WIRED ELECTRICAL CAP AND CONNECTOR

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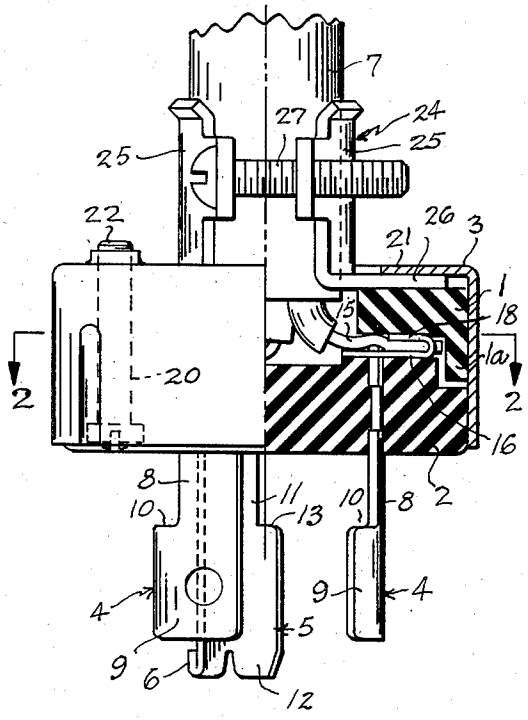


Fig. 1.

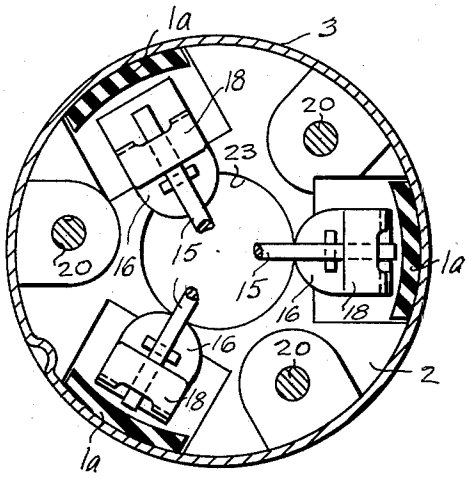


Fig. 2.

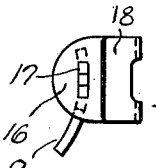


Fig. 7.

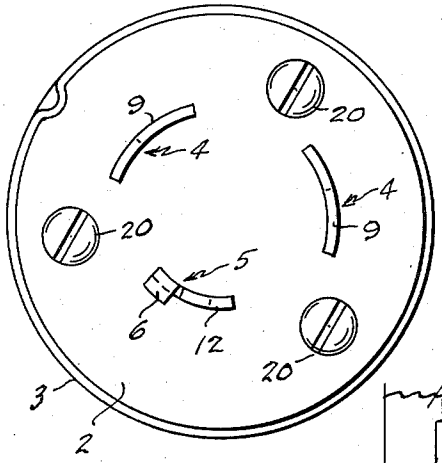


Fig. 3.

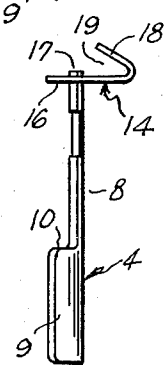


Fig. 5.

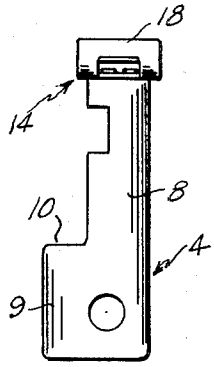


Fig. 6.

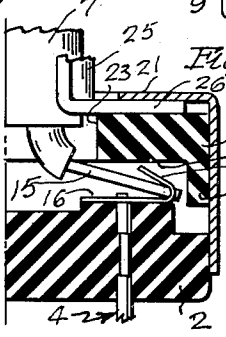


Fig. 4.

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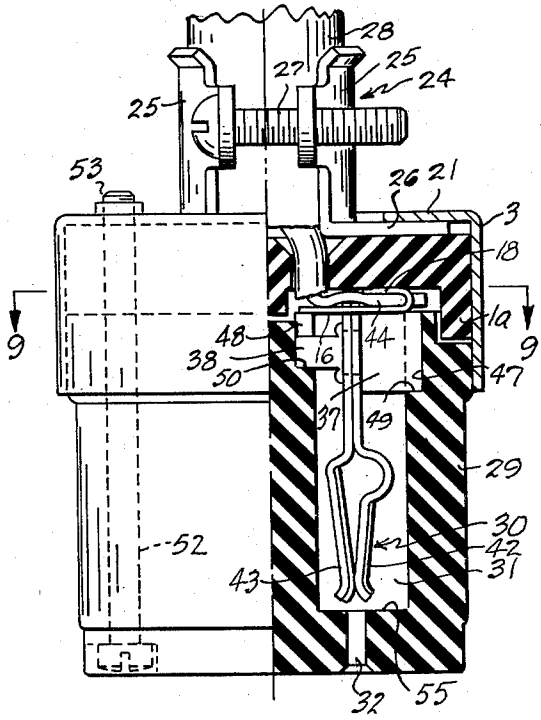


Fig. 8.

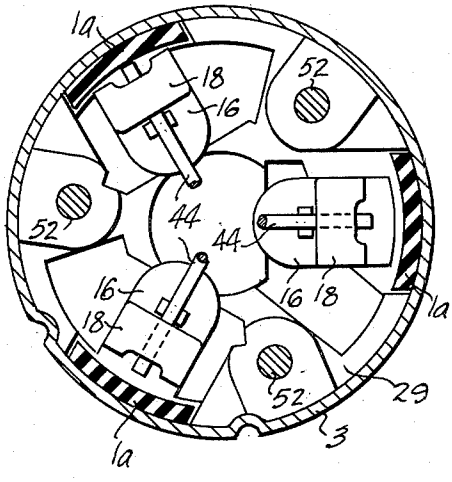


Fig. 9.

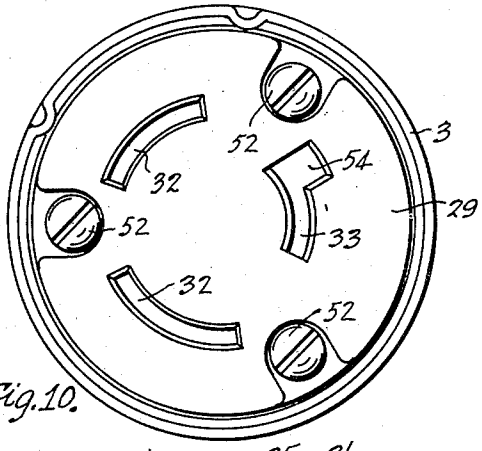


Fig. 10.

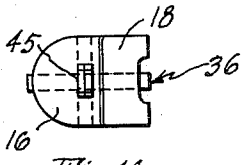


Fig. 14.

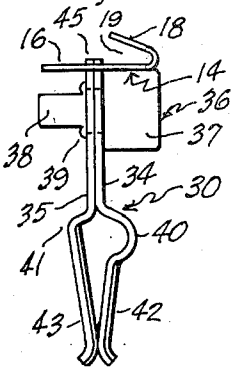


Fig. 12.

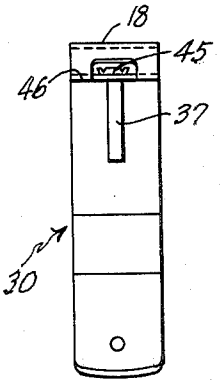


Fig. 13.

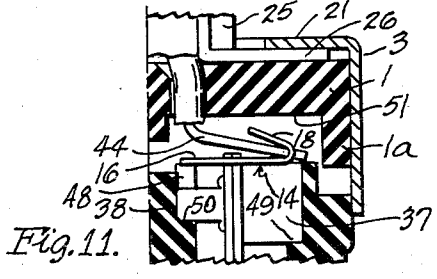


Fig. 11.

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TOP WIRED ELECTRICAL CAP AND CONNECTOR

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Filed June 19, 1956, Ser. No. 592,297

2 Claims. (Cl. 339—174)

This invention relates to electrical wiring devices, particularly to a top wired electrical cap and connector, and has for an object to provide an improved construction for this type of device including improved means for connecting the lead wires to the contacts in the electrical device, either the cap or the connector, which does not require the use of binding screws with their objections of requiring considerable time for making the connection of the conductor wires to the contacts and their liability of loosening up in use, resulting in a loose connection for the wire with consequent loss of proper electrical connection and danger of short circuits.

Another object is to provide a device of this character in which the body portion comprises a pair of body members of insulating material, which are connected together for relative movement by any suitable means such, for example, as screws, and in which by operating these screws to draw the body members together this action will operate the securing means to clamp the bared ends of the conductor wires and provide the electrical connection of these wires to the stationary contacts in the device or some element connected therewith, as well as to secure these wires to the cap or connector contacts.

Another object is to provide a construction in a device of this character involving a plurality of stationary contacts in the device and a plurality of wires leading to these contacts, in which the connection of these wires to the respective contacts may all be effected simultaneously and in one operation.

With the foregoing and other objects in view, we have devised the construction illustrated in the accompanying drawings forming a part of this specification. It is, however, to be understood the invention is not limited to the specific details of construction and arrangement shown, but may embody various changes and modifications within the scope of the invention.

In these drawings:

Fig. 1 is a partial side view and partial section on an enlarged scale of an attachment plug cap comprising this invention;

Fig. 2 is a transverse section thereof substantially on line 2—2 of Fig. 1;

Fig. 3 is a view looking toward the bottom of Fig. 1;

Fig. 4 is a section of a portion of the device illustrating the method of making electrical connection from the lead wires to the stationary contacts;

Fig. 5 is an edge view of one of the contacts;

Fig. 6 is a side view thereof;

Fig. 7 is an end view looking down on the top of Fig. 5;

Fig. 8 is a partial side elevation and partial longitudinal section of a connector comprising the invention, and which may be used with the cap of Figs. 1 to 7;

Fig. 9 is a transverse section substantially on line 9—9 of Fig. 8;

Fig. 10 is a bottom view of this connector;

Fig. 11 is a partial section showing the method of making the electrical connections between the lead wires and the stationary contacts;

Fig. 12 is an edge view of one of the contacts of this connector;

Fig. 13 is a side view thereof looking from the right of Fig. 12; and

Fig. 14 is a top plan view looking down on Fig. 12.

Referring first to the cap form of the device shown in Figs. 1 to 7, it comprises a body portion comprising two body members 1 and 2 of suitable molded insulating material enclosed in a protective metal sheil or casing 3, and to more readily identify these elements the member 1 will be designated the upper member and the member 2 the lower member of the insulated body. The upper member has a tight or force fit in the shell 3 so as to be held permanently in position therein when assembled, while the lower member 2, although closely fitting the shell, is capable of longitudinal sliding movement in the shell so that it may be removed for mounting the stationary contacts of the cap, and also shifted for effecting the connections between the conductor wires and these contacts, as will later be described.

The contacts for this cap may be the standard straight flat contact blades projecting from the lower side of the member 2, but in the form shown they comprise the locking type of blade contacts. In the arrangement shown, three contacts 4 and 5 are arranged equally spaced about the longitudinal axis, the blades 4 being of the same size and shape, while the blade 5, which is usually the grounding blade, is somewhat differently shaped and provided at one side of its free end with a backwardly folded lug 6 forming a thickened portion at one side of this blade. The arrangement comprising the three blade contacts is for connection of these contacts to the conductors of a three-wire insulated cable 7, one of which may be a grounded wire connected to the contact 5, but the device is not limited to any particular number of contacts as the number may be varied as required. The contacts 4 comprise a narrower intermediate portion 8 and a transversely curved wider free end portion 9 providing a locking shoulder 10 facing inwardly, or upwardly as arranged on the drawing, and located between the free end of the blade and the free or lower end of the body member 2, but spaced the proper distance therefrom, these blades being adapted to be inserted in a receptacle or connector, then turned a short distance about the axis of the cap to move the shoulders 10 behind locking shoulders in the connector or receptacle, as will be more fully described in connection with the connector of Figs. 8 to 14. The contact blade 5 is somewhat similarly shaped except that it is somewhat longer than the blades 4, but has a similar narrower intermediate portion 11 and a wider end portion 12 providing an inwardly facing locking shoulder 13 corresponding to the shoulder 10.

Mounted on and permanently connected to the upper or inner ends of the contacts 4 and 5 are securing clips 14 for connecting the bared ends 15 of the lead or conductor wires in the cable to the respective contacts. This comprises a metal plate of substantially uniform width having a flat base portion 16 provided with an elongated opening through which is inserted the reduced end 17 of the contact and which is riveted over to secure this clip to the contact, the narrow portion 17 providing shoulders on which the clip is secured and held by the riveted-over end. The base portion thus extends transversely of the contact blade and at one end, which is the outer end as viewed in Figs. 1 and 2, is folded backwardly and upwardly, as indicated at 18 in Fig. 5. This is the position before being bent downwardly to clamp the end of the conductor wire, as shown in Fig. 1, thus providing a space 19 between the base 16 and the flat lug 18 into which the end of the wire is inserted, as shown

in Fig. 4, and then clamped between opposing planar faces of the flat base **16** and the flat lug **18** by bending this lug **18** down tightly against the lead wire, as shown in Fig. 1. In making this connection the two body members **1** and **2** are connected by any suitable means such, for example, as the screws **20**, passing through these members and threaded into the top wall **21** of the shell casing **3**, as indicated at **22**. The lower member **2** with the contact blades mounted in it with the bases **16** of the clips resting on the top wall of member **2** and the clamping lugs **18** in their upper inclined positions, is inserted in the lower end of the shell or casing **3** and spaced below the member **1**, as shown in Fig. 4. Then the bared ends **15** of the conductor wires in the cable **7** may be inserted through the opening **23** in the upper member **1** and each free bared end inserted in the space **19** between the base **16** and the lug **18** of the respective clips **14**, as shown in Fig. 4. Then by tightening up the screws **20** the member **2** is drawn upwardly against the lower side of the upper member **1**, thus pressing the inclined lugs **18** against the lower side **51** of this member, and as the screws are tightened and the member **2** drawn closely against the member **1**, the lugs **18** are folded or bent downwardly onto the bared ends **15** of the conductor wires, as shown in Fig. 1, securely clamping these ends of the conductors and effecting a strong, tight connection, as well as a good, effective electrical connection between the conductor wires and the contact blades, and this clamping or securing action is secured simultaneously for all of the conductor wires to the respective contacts. The top member **1** is provided with depending walls or lugs **1***a* between the clips **14** and casing **3** to insulate the clips and prevent short circuits.

Strain relief clamps **24** may be provided to reduce strain on the connections between the conductors and the contact blades, a common form comprising a curved body or clamping portion **25** having laterally extending feet **26** extending between the top wall **21** of the shell and the top surface of the member **1** and slidable toward and from the cable **7** to permit the clamping portions **25** to be clamped to the cable by the screws **27**, one on each side of the cable. The bared wires **15** are shown in the drawing as a single solid wire, but the same holding, clamping and electrical effect is secured with multiwire or stranded conductors.

The same construction may be used for connecting the conductor wires from a similar insulated cable **28** to the receptacle or stationary contacts in a receptacle or connector, as shown in Figs. 8 to 14. Certain parts of this connector are the same as those used in the cap of Figs. 1 to 7. Thus the protective metal shell or casing **3** is the same as that used in the cap of Figs. 1 to 7, although the side walls may, if desired, be made longer to more fully enclose the somewhat longer body of the connector. Also the upper body member **1** is the same as that in the cap and is enclosed in the shell **3** in the same way. The lower body member **29**, however, is formed to a shape and size to receive and enclose the stationary or receptacle contacts **30**. This body member **29** is also of molded insulating material and has spaced chambers **31** opening through its top wall to receive the contacts **30**, and in its lower wall are curved elongated slots **32** and **33** to receive the blade contacts **4** and **5** respectively of the cap member for establishing electrical connection from the receptacle contacts to the cap contacts. These contacts **30** comprise two spring plates **34** and **35** placed side by side and secured together at their upper ends by the transverse key **36** comprising an enlarged flat head portion **37** on one side of the blades and a narrower shank **38** passed through elongated openings in the plates **34** and **35** and riveted over at **39** to secure them together. The lower portions of these plates may be offset outwardly, as indicated at **40** and **41**, and the portions below tapered toward each other as indicated at **42** and **43** to provide spring contacts between which the blade contacts of the cap may be inserted to establish the electrical connection between them.

The bared ends **44** of the conductor wires in the cable **28** are connected to these contacts by the same means as employed in the cap of Figs. 1 to 7. Thus it comprises the clip **14** comprising a metal strip having a base **16** secured to the upper ends of the contacts **30** by a reduced end portion **45** passing through an elongated opening in the base portion **16** to secure this clip to the contacts and on the shoulders **46** produced by narrowed portions of the plates. One free end is bent backwardly over the base portion **16**, as shown at **18**, the same as in the cap. These contacts are mounted in the chambers **31** in the body member **29**, as shown in Figs. 8 and 9. That is, the opposite walls of the chambers **31** are provided with downwardly extending channels **47** and **48** extending downwardly from the top wall of the member **29** to receive the head **37** and the shank **38** respectively of the connecting rivet **36**, and these channels provide shoulders **49** and **50** at their lower ends on which these members **37** and **38** respectively rest to position the contacts **30** in the chambers **31** with their lower spring ends in alignment with the slots **32** and **33**, as shown in Fig. 8. This arrangement effectively positions and positively retains the contacts in their proper positions in chambers **31** and also locates the clamping clips **14** at the top of the body members **29** between the top wall of this member and the lower wall or surface **51** of the upper member **1**.

The body members **1** and **29** are connected by screws **52**, the same as in the cap, passing through body members **29** and **1** and threaded at **53** in the top wall of the shell **3**. In making the connection to the conductor wires in the cable **28**, the bared ends **44** are inserted through one or more openings in the top wall of the body member **1**, as shown in Fig. 11, while the lower body member **29** is spaced somewhat below the upper member **1** as shown in this figure. In this position the clamping lug **18** on each contact is in its upper inclined position, permitting the free ends of the conductors **44** to be each inserted into space **19** between this lug **18** and the base **16**, as shown in Fig. 11. Then by setting up the screws **52** the lower body member **29** is drawn upwardly to the position of Fig. 8, pressing the inclined lugs **18** against the lower surface **51** of the upper body member **1** and folding them downwardly and clamping them tightly against the bared ends **44** of the conductor wires, as shown in Fig. 8, providing a tight gripping connection between the contacts and the wires and also securing a very effective electrical connection between them. The cable may be connected to the shell **3** and the insulating body member by the same strain relief device **24** as is used with the cap. Thus the multiple conductor wires are clamped and secured to the receptacle contacts simultaneously by the action of tightening up the screws **52**, the same as in assembling the cap structure of Figs. 1 to 7.

The slot **33** to receive the grounding contact **5** is shaped somewhat differently from curved slots **32** to receive the blade contacts **4** in that it is provided with an offset **54** at one end to receive the thickened lug **6** of the contact **5**, and this insures that the contact blades of the cap can be inserted in the slots of the connector in only one position, and the correct position with the grounding contact **5** insertable only in the slot **33**. These slots are long enough to receive the widened end portions **9** and **12** of the contact blades, and therefore they are longer than the width of the reduced intermediate portions **8** and **11** of the blade contacts. They therefore permit turning of the cap about its longitudinal axis a short distance after the blade contacts are inserted in these slots to carry the locking shoulders **10** and **13** behind the inwardly facing walls **55** in the chambers **31** at the inner ends of these slots to lock the cap against withdrawal from the receptacle or connector when in this position. The widened portions **4** and **5** of the

blades and the receptacle contacts 30 are wide enough so that the blades 4 and 5 are inserted between the spring fingers 42 and 43 as the blades are inserted in the receptacle to effect electrical contact and connection between the blade contacts and the receptacle contacts, and maintain this electrical connection during relative turning movement of the cap and receptacle to the locking position. The cap may be unlocked by merely reversing this turning movement while the blade contacts are in engagement with the receptacle contacts to shift the locking shoulders 10 and 13 from behind the walls 55 to permit withdrawal of the cap from the connector or receptacle.

It will be seen from the above that the means of connecting the conductor wires to either the cap or connector contacts is a very simple one and does not involve the use of binding screws which require considerable time to effect the proper electrical connection, and also are apt to work loose to cause loss of proper electrical connection and possible short circuits; also that all of the conductor wires may be simultaneously connected to their respective contacts both in the cap or in the receptacle or connector by the single operation of setting up the connecting screws connecting the upper and lower body members.

Having thus set forth the nature of our invention, we claim:

1. In an electrical device of the character described, a body of insulating material comprising upper and lower members, said lower member provided with chambers opening at their upper ends through the top of the body member and contact inlet openings leading to their lower ends, opposite side walls of said chambers provided with inwardly facing channels extending downwardly from the upper ends of the chambers, stationary contacts mounted in the chambers in the lower member each with an upper end adjacent the upper side of the lower member, said contacts comprising conductor strips side-by-side provided with elongated aligned openings, a key securing said strips together including a flat shank extending through said aligned openings with a free end projecting from one side of the contact and a wider flat head on the other side, said contacts mounted in the chambers with the free ends of the shanks and the heads of the keys located in said channels to position the contacts in the chambers, means located between said members for securing the bared ends of conductor wires to said contacts each comprising a plate including a body portion provided with an opening, the upper ends of the contacts including reduced portions providing shoulders, said plates being seated on said shoulders with the reduced portions extending through the openings and riveted over to secure the plates to the contacts, said plates substantially U-shaped including free end portions extending backwardly over the body portions forming clamping lugs spaced therefrom for free insertion of the conductor wires between them in a direction longitudinally of the plate from the open side of the U-shape toward the bend, and screws connecting the body members operative to draw them together to compress the lugs between the upper and lower members to bend them downwardly and clamp the conductor wires between the lugs and body portions of the plates.

2. An electrical device comprising: a body of insulating material having upper and lower members; a plurality of spaced stationary metallic electrical contacts mounted in said lower member; each of said contacts having an upper end adjacent the upper side of said lower member; a central opening in and extending longitudinally through said upper member for permitting passage of an end of a multi-wire electrical cable; means for simultaneously securing the bared ends of the individual conductor wires of the cable to said contacts comprising a plurality of substantially U-shaped yieldable metallic members, each being associated respectively with each of said contacts; each of said U-shaped members being in the form of a bent plate of substantially uniform width including a planar body portion which is secured to the upper end of one of said contacts and extends transversely thereof and a free end portion that is bent upwardly and backwardly from said body portion forming a planar clamping lug over said planar body portion and spaced therefrom to permit insertion of a bared conductor wire end between said portions by movement of said bared conductor wire end in a direction longitudinally thereof from the open side of the U-shaped member toward the bent closed side thereof; the open sides of said U-shaped members facing inwardly toward each other and the opening in the upper member; and means for detachably securing said upper and lower members, said last named means being operative to draw said upper and lower members together to press the under side of the upper member against said planar clamping lugs to force and bend them downwardly toward said planar body portions to thereby clamp the bared conductor wire ends that are inserted between said body portions and said clamping lugs, whereby the bared conductor wire ends may be simultaneously clamped by said U-shaped members with planar metallic portions thereof on two opposite sides of each of the bared conductor wire ends.

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