

May 28, 1935.

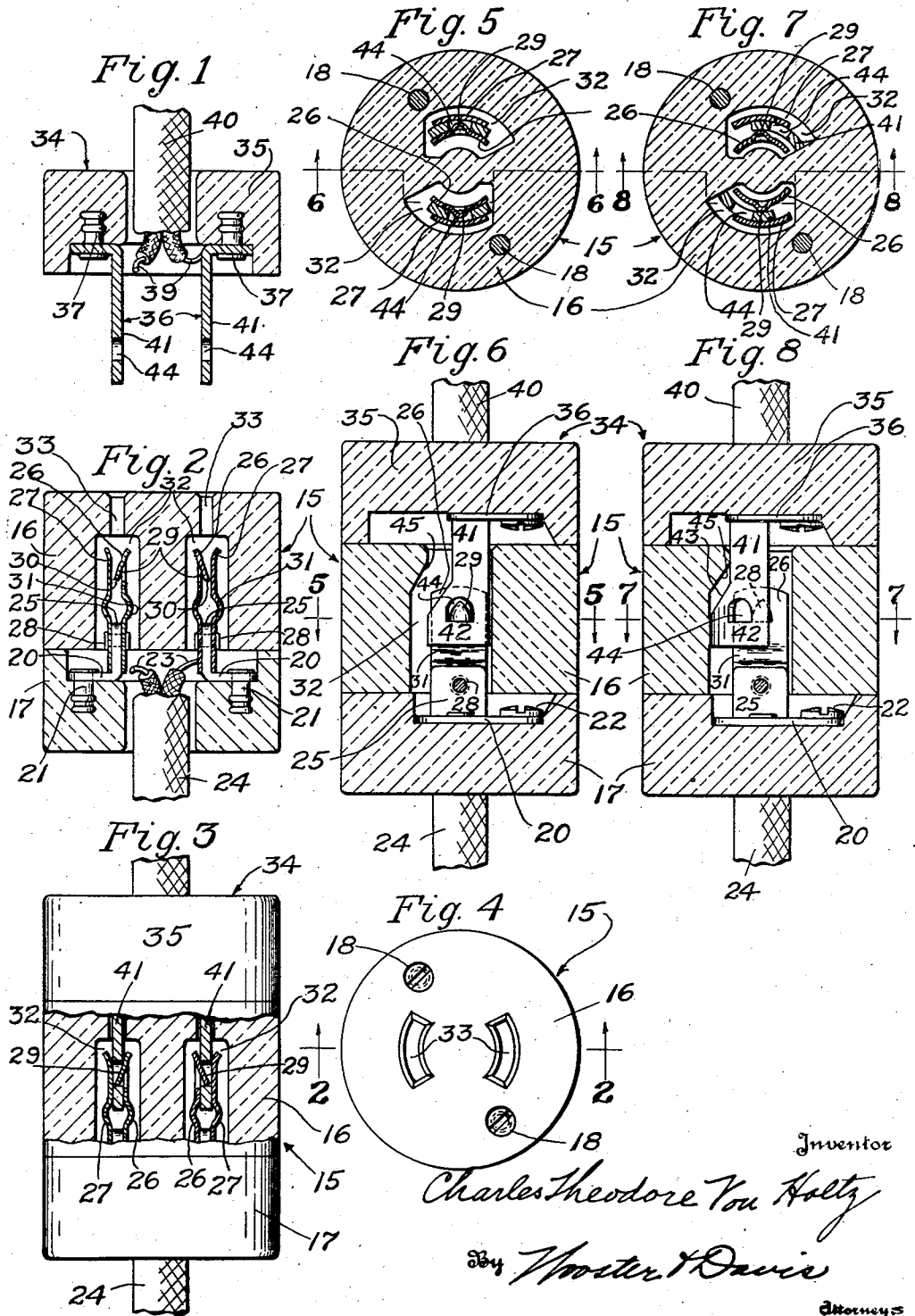
C. T. VON HOLTZ

2,002,558

INTERLOCKING CONNECTION

Filed Dec. 24, 1931

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

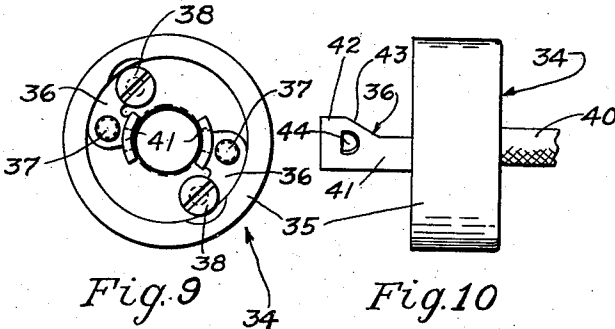


Fig. 9

Fig. 10

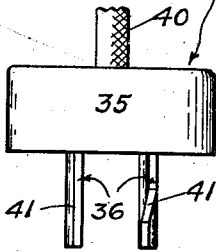


Fig. 11

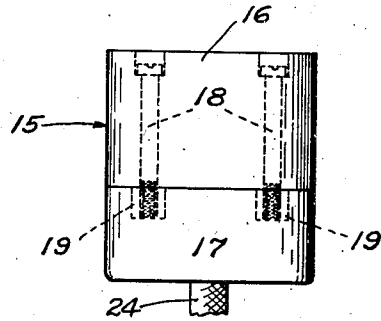


Fig. 14

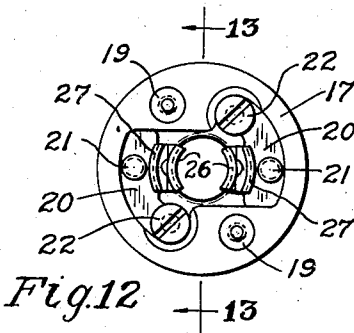


Fig. 12

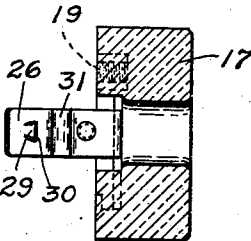


Fig. 13

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# UNITED STATES PATENT OFFICE

2,002,558

## INTERLOCKING CONNECTION

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5 Claims. (Cl. 173—328)

This invention relates to new and useful improvements in electrical connectors, such as are used for connecting the leads of electrical appliances to a source of power.

5 An object of the invention is to provide an improved connector of the kind stated and in which the members may be easily and quickly connected and separated, and which includes interlocking means on the members whereby they may be connected in such a manner as not to be accidentally or casually disconnected as on a strain being placed on the lead wires to an appliance.

10 Another object is to provide a connector as described and wherein the interlocking means is carried by the contacts of the respective members and is mounted to become effective on relative longitudinal movement to connect the members and to become ineffective on a relative turning movement of the members.

15 Other objects and advantages will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawings wherein a satisfactory embodiment of the invention is shown. However, it will be understood that the invention is not limited to the details disclosed but includes all such variations and modifications as fall within the spirit of the invention and the scope of the appended claims to which claims reference is to be had for a definition of the invention.

In the drawings:

Fig. 1 is a vertical central sectional view through the cap of the connector of the present invention;

35 Fig. 2 is a similar view through the plug of the connector, the view being taken substantially along the line 2—2 of Fig. 4;

40 Fig. 3 is an elevational view showing the plug and cap assembled, a portion of the body of the plug being broken away to show the locking engagement between the contacts of the cap and the contacts of the plug;

Fig. 4 is a plan view of the plug of the connector;

45 Fig. 5 is a sectional view as indicated by the line 5—5 in Fig. 6 and showing the contacts interlocked;

Fig. 6 is a longitudinal sectional view as indicated by the line 6—6 of Fig. 5;

50 Fig. 7 is a transverse sectional view as indicated by the line 7—7 in Fig. 8 and showing the contacts in unlocked positions;

Fig. 8 is a longitudinal sectional view as indicated by the line 8—8 of Fig. 7;

55 Fig. 9 is a bottom plan view of the cap alone;

Fig. 10 is a side elevational view thereof;

Fig. 11 is a side elevational view of the cap, the view being taken at right angles to Fig. 10;

Fig. 12 is an end view of the end portion of the plug member showing the mounting of the contacts thereon;

Fig. 13 is a sectional view of the same, the view being taken along the line 13—13 of Fig. 12; and

Fig. 14 is an elevational view of the plug member complete.

10 While in the accompanying drawings the invention is illustrated as applied to a plug and cap for use in flexible connections leading to electrical appliances or portable devices, it will be understood that the plug is used merely for the purpose of illustration, and that the invention is equally adapted for use in stationary receptacles, current taps, and the like.

15 Referring in detail to the accompanying drawings, the plug 10 is shown as comprising an insulating body member made in two sections 16 and 17, the section 16 being substantially cylindrical and the end section 17 being preferably shaped to correspond with the cap which is intended to be used with the plug, whereby to give a neater and more attractive appearance to the assembly. When assembled the body section 16 and the end section 17 are connected together by screws 18 passing through the body section 16 and threaded into inserts 19 molded in the end section 17. Thus when assembled the two sections form a unitary structure and the making of the plug in sections facilitates the manufacture and the assembling and disassembling of the various elements. Also, it allows separation of the sections for connection of the lead wires to the binding posts connected to the contacts carried by the plug.

20 Mounted on the end section 17 of the plug are a pair of spaced contacts 20 secured in place as by the inserts or rivets 21, and each fitted with a binding post or screw 22 for connecting the wires 23 of a cable 24 with the respective contacts. Each of the contacts 20 includes an upstanding portion 25 to the opposite sides of which are applied upstanding spring contact elements 26 and 27 secured to the portions 25 as by rivets 28.

25 The elements 26 on the respective contacts adjacent their outer ends have portions 29 pressed therefrom providing lugs which have abrupt lower edges 30 and which at their sides and top are rounded and merge into the flat surfaces of the adjacent portions of the elements. It will be noted that the lugs 29 are pressed from the elements 26 in a manner to have said lugs directed

toward the elements 27 and arranged in the spaces between the elements 26 and 27. As above suggested the elements 26 and 27 are both preferably of resilient material, and to further add to their resiliency the elements may be bowed just above the upper ends of the portions 25 of the contacts 20, as shown at 31. Elements 26 and 27 are adapted to receive a contact between them and the elements may have their upper free ends turned outwardly or away from one another whereby a contact directed toward the elements will be guided into place between them.

The body 16 of the plug is provided with spaced recesses 32 opening through the lower end thereof and adapted to receive the upstanding portions of the contacts 20 and the elements 26 and 27 of said contacts when the body 16 and end 17 of the plug are assembled. Entrances 33 or slots 33 are provided through the upper wall or end of the body 16 whereby contacts may be passed through the upper or outer end or wall of the body and into engagement with the contacts 20 therein.

A cap 34 adapted to be used in connection with the plug comprises a body of insulating material 35 having contacts 36 secured thereto as by rivets 37. Also, carried by the respective contacts 36 are binding posts 38 to which the wires 39 of the cable 40 may be connected. The contacts 36 each include an outwardly projecting part or arm 41, the outer end portion of which is somewhat laterally enlarged as at 42 and includes an inclined edge portion 43. The contacts in their outer enlarged portion 42 are each provided with an opening or perforation 44, the openings or perforations 44 of the contacts 36 being adapted to co-operate with the lugs 29 on the contacts 20 to positively secure the cap and body against casual separation as will later more fully appear. It is preferred that the enlarged end portions 42 of the blade contacts and also the receptacle contacts 26 and 27 be curved as indicated in Figs. 5 and 6 to facilitate relative turning movements between them.

In the operation of the device, assuming that the cable 24 is connected with a suitable source of current, and that the cable 40 is connected with a portable tool or other appliance which it is desired to energize, the cap 34 may be connected with the plug 15 in a manner to bring the contacts of the cap into engagement with the contacts of the plug whereby the wires of the cable 40 will be energized.

The cap and plug are connected by inserting the blades or outstanding portions 41 of the contacts 36 of the cap through the entrance openings 33 in the outer wall of the body 16 of the plug whereby to have the portions 41 of the contacts 36 enter between the elements 26 and 27 of the contacts 20. Preferably these elements 26 and 27 are so disposed that the space between them is less than the thickness of the contacts 36 whereby the elements 26 and 27 will be pressed or sprung apart and a good electrical connection established.

As the contacts 36 enter between the elements 26 and 27 the lugs 29 on the elements 26 will be engaged and the elements 26 and 27 of each pair of elements will be forced apart. However, as soon as the openings 44 in the contacts 36 come opposite the lugs 29 the elements 26 and 27 will be permitted to move toward one another in a manner to embrace the sides of the contacts 36 since the lugs 29 will immediately

be sprung into the openings 44 and lock the members together.

The contacts are shown in their locked relation in Figs. 3, 5 and 6 and here it will be noted that the sharp or abrupt lower edges 30 of the lugs 29 are disposed over the bottom or lower edges or walls of the openings or perforations 44 in the arms 41 of contacts 36 when the lugs have entered such openings. Therefore, it will be seen that while the contacts of the cap may be brought into engagement with the contacts of the plug by relative longitudinal movement of the parts as by inserting the contacts of the cap through the openings 33 in the body of the plug, the parts may not be moved apart or separated by a simple longitudinal movement. The lugs 29 engaging in the openings 44 will prevent the contacts 36 being pulled out of the plug. The contacts on the receptacle and on the cap are preferably so proportioned and arranged that there is only a relatively small resistance to separation of the cap and receptacle unless the cap blades are fully inserted into the receptacle so that they will be locked. This will tend to insure that the operator will fully insert the cap contacts into the receptacle and into locking position before using the device. It will also be noted that when the cap blades are inserted their ends soon engage the tops of the pressed out portions 29 and they will therefore encounter considerable resistance to further inward movement which temporarily arrests this movement. The operator then unconsciously applies increased pressure to overcome this resistance. When the resistance is overcome the blades complete their inward movement with a sudden positive action which brings them into the final locked or latched position. It will be obvious from this that it will be practically impossible to arrest movement of the blades between the time they first engage the receptacle contacts and the final locked position and that it insures positive electrical contact.

It will be noted particularly in Figs. 5 through 8 that there is considerable space in the recesses 32 laterally of the elements 26 and 27 of the contacts 20. When it is desired to separate the cap from the plug the parts are given a relative turning movement whereby to slide the portions 41 of contacts 36 between the elements 26 and 27 of contacts 20 from the positions shown in Figs. 5 and 6 to the positions shown in Figs. 7 and 8. Since the sides of the lugs 29 are curved or tapered it will be apparent that the forcing of the arms 41 of contacts 20 edgewise or laterally between the elements 26 and 27 will simply result in the said elements being forced slightly apart as shown in Fig. 7. There will be no abrupt surfaces to engage and prevent the relative turning movement and the parts will engage with a cam-like action.

It is preferred that the entrance openings 33 to the body of the plug be maintained as small as practical in order to make reasonably sure that the blades of the caps engage spring contacts in proper latching position. The recesses 32 are therefore considerably greater in cross-sectional area than the entrance openings 33 to the recesses. In order that there will be no difficulty in separating the cap and plug by a longitudinal movement after they have been given a relative turning movement to disposed the contacts as shown in Figs. 7 and 8, one of the side walls in each of the recesses 32 is cut at an incline as at 45 whereby to be engaged by the

inclined edge 43 of the enlarged portion 42 of the contact 36 when separating the plug and cap. Since there will be no abrupt surfaces to engage, it will be apparent that the contacts 36 may easily be withdrawn from the plug by pulling them outwardly after the cap and plug have been turned relatively to dispose their respective contacts in the positions shown in Figs. 7 and 8.

From the foregoing description it will be seen that the present invention provides simple means adapted to interlock when the cap and plug are assembled by relative longitudinal movement of the blade and receptacle contacts as the blade contacts are inserted in the plug or receptacle whereby to prevent casual separation of the cap and plug. It will be noted that the parts interlock as an incident of the movement of the cap and plug toward one another and that no special manipulation is required in order to have the parts interlock. Also, it will be noted that no separate or extra parts are added in order to obtain this locking feature, the construction of the contacts providing for the accomplishment of the desired results.

After a cap has been connected with a plug, unless the parts are equipped with an interlocking feature, it not infrequently happens that the cap and plug are separated as by someone catching their foot on the cable or as by someone attempting to carry the appliance to which the cable is connected beyond the limits permissible by the length of the cable. With the present arrangement the parts are automatically locked together and the contacts of the respective parts are in engagement during the movement which brings about the interlocking of the contacts. Further, during the relative movement of the parts necessary to the unlocking thereof, the contacts remain in engagement and there will be no arcing other than what may occur when the contacts of the cap are being drawn out of the plug.

While the interlocking of the parts to prevent casual separation has been described as taking place during relative longitudinal movement between the members or more specifically between the cap and the plug it will be understood that the members may be locked by a relative turning movement. For example, should the operator turn the members to dispose the contacts as shown in Figs. 7 and 8, he may if he changes his mind regarding the disconnecting or separating of the cap and plug, simply turn the members back into the positions shown in Figs. 5 and 6.

It will now be understood that the cap and plug are locked together against a casual separation by the simple relative longitudinal movement necessary to insert the contacts of the cap into the plug when connecting the cap and plug. Further, it will be apparent that the members must be positively operated as by giving them a different relative movement, namely a relative turning movement before the contacts of the cap may be drawn out of the plug to separate the plug and cap.

As above suggested, the locking or interlocking arrangement is not limited to use in a portable plug as disclosed in the drawing, but is equally applicable to wall receptacle, current taps and the like. It will also appear that the plug may be used with the ordinary standard cap having plain flat contact fingers with no locking action and that a good contact would be made with such fingers since they would be engaged on opposite sides by the spring elements 26 and 27 of the contacts of the plug.

Having thus set forth the nature of my invention, what I claim is:

1. In combination, an insulating body member having recesses therein and entrance openings in one wall leading to said recesses, said recesses including portions laterally of said entrances, contacts in said recesses, a cap carrying contacts to be inserted through said entrance openings to engage the contacts in the recesses on a relative longitudinal movement of the cap and body, lateral extensions on said cap contacts, interlocking means to prevent accidental separation of the cap and body, said interlocking means constructed to become effective on said relative longitudinal movement of the cap and body and ineffective on relative lateral sliding movement of the cap and body contacts on relative rotary movement of the cap and body, said body having inclined surfaces between the lateral portions of the recesses and the entrances, and said cap contacts having inclined surfaces on their lateral extensions to engage the inclined surfaces of the body as the cap contacts are being withdrawn from the recesses to thereby direct the cap contacts toward the entrance openings.

2. In combination, an insulating body having spaced recesses therein and spaced openings forming entrances leading to said recesses, said recesses including portions laterally of said entrances, body contacts in said recesses beneath said entrances, a cap carrying spaced contacts to be inserted through said entrances to engage the body contacts on relative longitudinal movement of the cap and body, said cap and body contacts transversely curved, interlocking means carried by the contacts to prevent accidental separation of the cap and body, said interlocking means constructed to become effective on said longitudinal movement of the cap and body, and said interlocking means constructed to become ineffective on a relative lateral sliding movement of the transversely curved cap and body contacts on the cap and body being rotated relatively about the longitudinal axis of the body.

3. In combination, an insulating body having spaced recesses and spaced openings leading to said recesses, transversely curved contacts in said recesses having laterally extending lugs each providing a shoulder and having inclined side walls, a cap carrying spaced contacts to engage the first contacts by relative longitudinal movement of the cap and body, said recesses and openings being of a size to permit relative lateral sliding movement of the contacts of the cap and body on one another on relative rotary movement between the cap and body, the cap contacts having openings to receive said lugs and cooperate with said shoulder to prevent accidental separation of the cap and body, and the sides of openings being adapted to engage inclined side walls of the lugs by movement of the contacts transversely on one another to remove the lugs from the openings and release the cap on relative rotary movement between the cap and body.

4. In combination, an insulating body having spaced recesses and spaced openings leading to said recesses, contacts in said recesses, a cap carrying spaced contacts to be inserted through said openings to engage the body contacts on relative longitudinal movement of the cap and body, said recesses and openings being of a size to permit relative lateral sliding movement of the contacts of the cap and body on one another on relative rotary movement between the cap and body, said body contacts including spaced spring elements

- adapted to yield laterally to receive and clamp the cap contacts between them, one of said elements having a laterally curved lug projecting therefrom to form a shoulder, the cap contacts each having an opening to receive said lugs when the latter contacts are inserted between said elements by said longitudinal movement and cooperate with said shoulder to lock the cap and body against casual separation, and the sides of said openings engaging the rounded side of the lugs to force them out of the openings on relative lateral sliding movement of the contacts transversely of and on one another on relative rotary movement between the cap and body.
5. In combination, an insulating body having spaced recesses and spaced openings leading to said recesses, contacts in said recesses, a cap carrying spaced contacts to be inserted through said openings to engage the body contacts on relative longitudinal movement of the cap and body, said recesses and openings being of a size to permit relative lateral sliding movement of the contacts of the cap and body on one another on relative rotary movement between the cap and body, said body contacts each including a yieldable member having a laterally curved lug pressed therefrom to form a shoulder, the cap contacts each having an opening to receive said lugs and cooperate with the shoulders to lock the cap and body against casual separation, and sides of the openings engaging the rounded sides of the lugs to force them from the openings on relative lateral sliding movement of the contacts transversely of and on one another on relative rotary movement between the cap and body.

CHARLES THEODORE VON HOLTZ.