Jan. 21, 1941. C. E. GILBERT 2,229,288

ELECTRICAL CONNECTOR

Filed Feb. 16, 1938

Fig. 1.

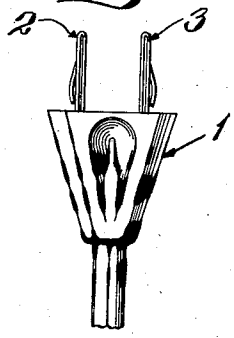


Fig. 2.

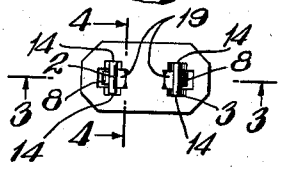


Fig. 3.

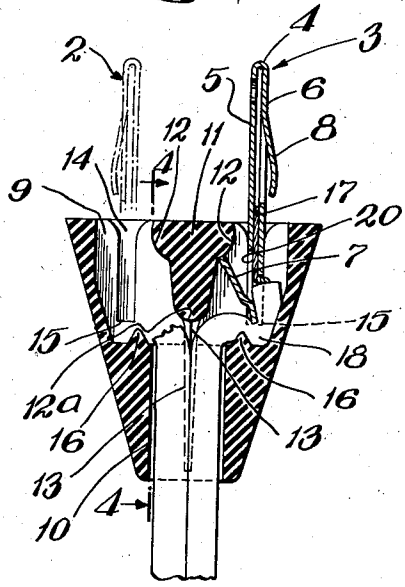


Fig. 4.

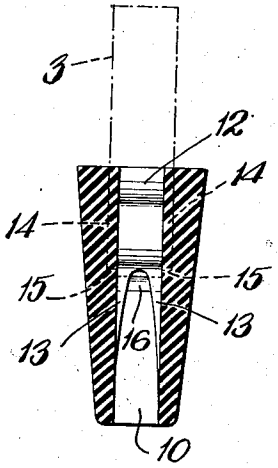


Fig. 5.

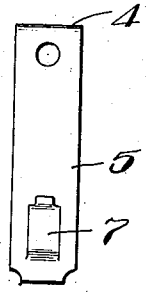


Fig. 6.

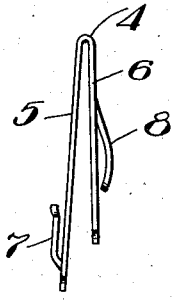
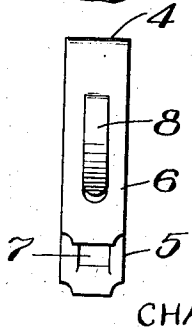


Fig. 7.



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ELECTRICAL CONNECTOR

Charles E. Gilbert, New York, N. Y.

Application February 16, 1938, Serial No. 190,683

3 Claims. (Cl. 173—361)

This invention relates to a new and useful improvement in electrical connectors, such as are used for making electrical connection between an electrical outlet and appliance or between two electric cords, and numerous other uses which will occur to those skilled in the art.

Among the objects of the invention is the provision of a connector having a minimum of parts, which can be produced at a minimum of cost, in which the contact elements are securely retained and held in correct alinement, and also in contact with a conductor without the use of screws, rivets or other attaching devices, in which the connection of the cord to the contact elements is a step in the assembly of the connector itself and in which the possibility of short circuiting is eliminated.

The form of the invention shown in the drawing and described herein is commonly called an electric plug and will be so referred to herein, but it will be understood that the invention is not limited thereto, but is applicable to various other types of connectors.

In the drawing:

Figure 1 is a front elevation of an electric plug embodying the invention assembled and connected to a cord having two conductors;

Figure 2 is a plan view of the plug shown in Fig. 1;

Figure 3 is an enlarged longitudinal section taken as indicated by the lines 3—3 and the corresponding arrows in Fig. 2;

Figure 4 is also an enlarged longitudinal section taken as indicated by the lines 4—4 and the corresponding arrows in Figs. 2 and 4;

Figure 5 is a view of one side of a contact element;

Figure 6 is an edge view of the same contact element; and

Figure 7 is a view of the side of the contact element opposite to that of Figure 5.

As shown in the drawing, the connector consists of but three parts,—the body 1 and two contact elements 2 and 3. The body may be molded in a single piece and by a single operation from Bakelite, or other suitable insulating material. Each contact element may be made by a single stamping operation from a single strip of conducting material bent upon itself as at 4 to form a two-legged prong adapted for insertion into an electrical outlet. One leg 5 of the contact element is somewhat longer than the other leg 6. Adjacent the free end of leg 5 an outwardly and upwardly projecting tongue 7 is provided which may be produced by stamping, so that an aperture in the leg directly behind the tongue is secured. The other leg 6 is preferably provided with an outwardly bowed and downwardly extending tongue 8, also preferably obtained by stamping.

In body 1 there is provided for each contact element a recess 9, the general shape of which is shown in Figures 2 and 3. Also as shown in Figure 3, the body 1 is provided with an opening 10 through which the end of the electric cord can be passed, this opening 10 connecting at its upper end with the lower end of each recess 9. Recesses 9 are separated by the central portion 11 of the plug body 1, which, as shown in Figure 3, tapers gradually from its upper end towards the bottom. Adjacent its upper end central portion 11 curves outwardly to form substantial shoulders 12 projecting into each recess 9. The lower end of portion 11 beginning at point 12a, somewhat above the bottom of recesses 9, consists of an arch-like structure as shown in Figures 3 and 4, forming two sharp ribs, extending downwardly along opposite sides of opening 10 and gradually decreasing in height until they disappear at or slightly above the lower end of opening 10 as best shown in Fig. 3.

Opposed sides of each recess 9 are each provided with a channel 14, the depth of which is such that the over-all width of recess 9, including these channels, is very slightly greater than the width of the contact element, as most clearly shown in Figures 2 and 4. The width of each channel 14 is slightly greater than the thickness of the two legs 5 and 6 of the contact element, as will be seen from Figure 3. Channel 14 extends from the upper end of the body to a point 15 somewhat above the bottom of recess 9. The bottom of recess 9 is provided with an upwardly-extending rib 16 preferably slightly offset inwardly from the bottom of channel 14. The space between the bottom of channel 14 and the top of rib 16 should preferably be somewhat less than the diameter of the electrical conductor including its rubber insulation.

Assembly of the contact elements and the plug body is performed in conjunction with connecting the cord so that a complete assembly of the plug and cord is effected by a single operation, thereby saving labor, time and cost. To perform this assembly the cord is split to separate the two conductors therein, and the insulation removed from the end of the conductors. The cord is then passed upwardly through opening 10. The arch-like structure, with its tapering ribs 13 of gradually increasing height, will cause the

two conductors to separate and to pass one into each recess 9 through which they are guided by body portion 11, until they project therefrom. The bare end 17 of each conductor is then pinched between legs 5 and 6 of the contact element, as shown in Figure 3, and the contact element inserted in its recess. Its edges will be engaged by channels 14 and its legs 5 and 6 will be forced tightly together with the conductor between them, so that good electrical contact is assured.

The contact element is then pushed down into the recess until the edges of its longer leg 5 reach the bottom of channels 14. When the contact has been seated in this way it is held securely in proper alinement by channels 14, the dimensions of which, as already stated, are substantially the same as those of the contact element.

The insulated portion of the conductor immediately adjacent the portion which has been bared will be forced by the lower end of the contact element into the bottom of recess 9, as shown at 18, and will be severely pinched between the lower end of leg 5 of the contact element and rib 16 in the bottom of recess 9. From this point it curves sharply over rib 16 into the upper end of opening 10. Thus a sharp double bend is given to the insulated conductor and it is also strongly gripped as above explained, so that it is impossible to pull the conductor out of the contact element, and the bare end 17 of the conductor is relieved of all strain.

When the contact element is inserted in recess 9 of the body, as described above, tongue 7, which, as will be seen from Figure 3, projects inwardly towards the central portion 11 of the body, will snap under shoulder 12 of central portion 11 and may be forced still more definitely into engagement therewith by means of a suitable tool, through the channel 19, provided for the purpose. In this way the contact element is securely locked within the recess and cannot be unintentionally displaced or removed.

Tongue 7 also serves as a brace for the lower end of leg 5 of the contact element, materially strengthening it, helping to maintain it in correct alinement and assisting it to pinch the conductor between it and rib 16.

Considerable difficulty has been experienced by the short circuiting of the conductors within electric plugs, due to the carelessness of the assembler in stripping the insulation too far back from the ends, so that when they come together at the upper end of the central opening 10 they make contact with each other. In the plug of this invention this cannot occur because the arch-like structure extending substantially throughout the length of opening 10 formed by the two ribs 13, keep the two conductors apart, so that in order to cause a short circuit it will be necessary to strip the ends of both wires for a much greater distance than even the most careless workman would be guilty of. Thus, rib 13 serves two purposes, both of which are exceedingly important. They act as a positive means for guiding the two wires into the respective recess 9, and an equally positive means for keeping the two wires separated for a considerable distance from their ends. Incidentally, ribs 13 also serve as a reinforcement for the thinnest, and, consequently the weakest, sides of the lower end of the plug body.

It will be noted that the recesses 9 and the contact elements and their conductors therein are separated by the solid, integral central portion 11 of the body so that it is absolutely impossible for short circuiting to occur between them, and the body is greatly strengthened through the substitution of this solid, integral part for the usual thin walls which are inevitable when the central opening extends entirely through the body, as has been the common practice.

Tongues 8 on contact elements 5 and 6 may be omitted, but they are advisable. It is a very common experience to find that the blades of the contact elements are very insecurely held by the contacts of the electrical outlet. The spring tension of the contacts of the outlet are supposed to press against the contact blades of the plug with adequate tension, but very frequently they are too weak or have been bent through use, so that they fail to hold the plug securely or to make positive electrical connection. This has resulted not only in much annoyance, but has even caused fires as the result of arcing. Tongues 8 obviate this annoyance and danger; they are positioned in the mid section of each contact element so that they will enter the outlet when the connector is inserted and will either press against the walls of the recesses of the outlet in which the blades are received to hold the plug securely within the outlet irrespective of the pressure between the blades and contacts, or they will engage resiliently with the contacts of the outlet ensuring firm holding and good contact, depending upon how the outlet is constructed.

The aperture 20 formed by the stamping out of tongue 7 in leg 5 may also be found useful in the case of a conductor having unusually heavy insulation, to provide a space into which the end of the insulation can project so that the bend in the bare wire at the lower end of shorter leg 6 will not be so abrupt as to endanger its strength, and so that the pressure upon the lower end of leg 5 will not be so great as to make it difficult to bring the two legs together sufficiently to enable them to enter channels 14.

I claim:

1. An electrical connector consisting of a unitary body of insulating material, a centrally positioned passage extending into said body from one end, a pair of recesses extending into said body from the other end and communicating with said passage, said recesses being symmetrically positioned on either side of the longitudinal axis of said passage and separated by an inwardly-tapering portion of said body whereby the two conductors of an electric cord introduced into the said passage may be caused to separate and to pass one into each recess, the inner end of each recess also being separated from the inner end of said passage by a rib, a contact element for each recess consisting of a strip of conducting material bent upon itself to form a two-legged blade, one end of which is seated in said recess and when so seated is adapted to make contact with an electrical conductor and to force it against the bottom of said recess so that it will be bent sharply around the end of said contact element and bent again in the opposite direction over said rib, said contact element also being provided with an outwardly projecting tongue engaging with said tapered portion of said body to securely lock said contact element in said recess when seated as aforesaid.

2. An electrical connector consisting of a unitary body of insulating material, a centrally positioned passage extending into said body from

one end, a pair of recesses extending into said body from the other end and communicating with said passage, said recesses being symmetrically positioned on either side of the longitudinal axis of said passage and separated by an inwardly-tapering portion of said body whereby the two conductors of an electric cord introduced into the said passage may be caused to separate and to pass one into each recess, the inner end of each recess also being separated from the inner end of said passage by a rib, a contact element for each recess consisting of a strip of conducting material bent upon itself to form a two-legged blade, one end of which is seated in said recess and when so seated is adapted to make contact with an electrical conductor and to force it against the bottom of said recess so that it will be bent sharply around the end of said contact element and bent again in the opposite direction over said rib, and said body having a shoulder constricting each recess adjacent its outer end and said contact element being provided with an offset tongue engaging with said shoulder to securely lock said contact in said recess when seated as aforesaid.

3. An electrical connector which includes a rigid unitary body of insulating material provided with a passage extending inwardly from one end, the opposite sides of said passage being provided with longitudinal ribs of progressively increasing height, a plurality of recesses extending into said body from the other end, the lower ends of which open laterally into the inner end of said passage, said recesses being separated by an inwardly-tapering portion of said body which joins the inner ends of said ribs, said ribs and said tapering portions of said body comprising means whereby the individual conductors of an electrical cord introduced into said passage are caused to separate and to pass into different recesses, a contact element for each recess adapted for connection to one of said conductors and consisting of a strip of conducting material bent upon itself to form a two-legged blade, the free ends of which are seated in the recess so as to pinch and securely hold the bare end of a conductor positioned thereupon, one of said legs being provided with a projecting tongue engaging with said tapered portion of said body to securely lock said contact element in said recess.

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