Oct. 1, 1940. H. CHARMOY 2,216,157

ELECTRICAL PLUG CONNECTOR

Filed Feb. 10, 1938

Fig. 1.

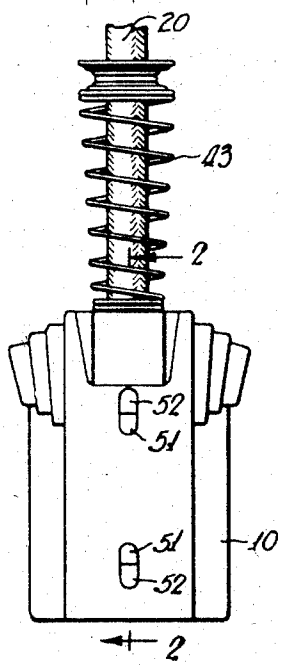



Fig. 2.

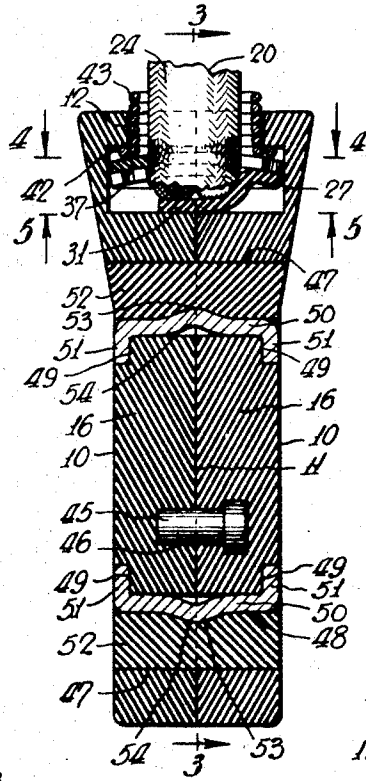



Fig. 4.

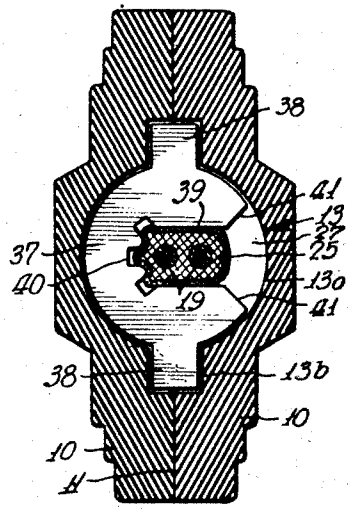



Fig. 3.

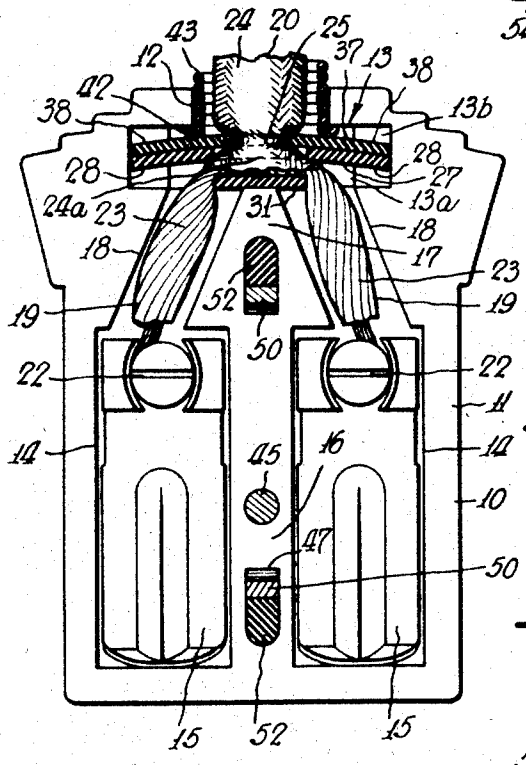



Fig. 5.

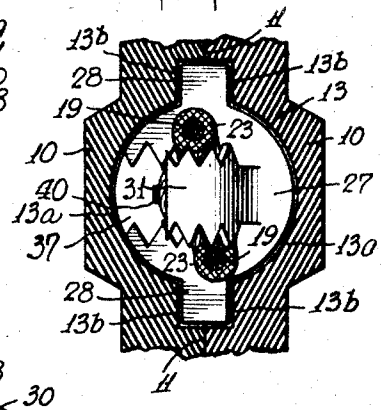



Fig. 6.

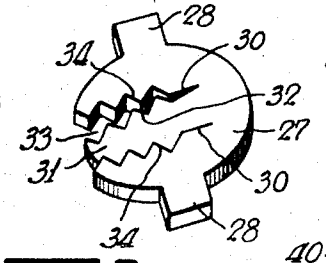



Fig. 7.

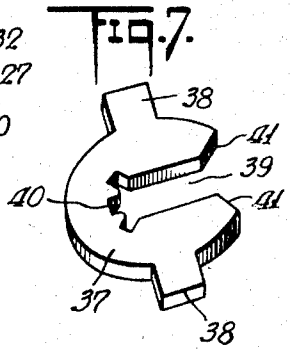



Fig. 9.

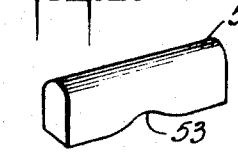
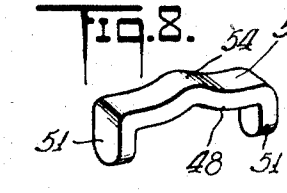



Fig. 8.




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# UNITED STATES PATENT OFFICE

2,216,157

## ELECTRICAL PLUG CONNECTOR

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Application February 10, 1938, Serial No. 189,746

8 Claims. (Cl. 173—322)

The present invention relates to electrical plug connectors, and more particularly to connectors of the detachable type attached to flexible cords.

One object of the invention is to provide an electric plug connector, which is simple, durable, rugged and economical to manufacture, and which will effectively withstand severe service and meet the most rigid requirements of the Board of Underwriters.

A more specific object is to provide a plug connector of the above type, which is capable of withstanding a pulling stress upon the flexible conductor with respect to the connector housing, far greater than is incurred in practice, and without transmission of such stress to the contacts or the mounting means for the latter.

Another specific object is to provide a plug connector of the above type, which is capable of withstanding a twisting stress upon the flexible conductor with respect to the connector housing, far greater than is incurred in practice, and without transmission of such stress to the contacts or the mounting means for the latter.

These objects are carried into effect by providing a washer of comparatively stiff material, grippingly embracing the flexible conductor, and lodged in a cavity in the connector housing, certain portions of said cavity abutting one of the faces of said washer to resist pulling action on said conductor with respect to said housing, and other portions abutting an edge section of said washer to resist the twisting of said conductor with respect to said housing.

Another object is to provide a plug connector, made up of two complementary housing sections, with simple, inexpensive means for securely fastening these sections together, without likelihood of said means coming apart under the most severe conditions of use, and which yet admit of ready diassembly for inspection or repair should occasion arise.

The object last stated is carried into effect generally by use of a metal clamp, extending transversely through registering holes in the two housing sections, and having end lugs straddling the faces of said sections, said clamp being locked in position by a rigid key piece driven into such holes.

In the accompanying drawing in which is shown one of various possible embodiments of the several features of the invention,

Fig. 1 is a front elevation of a plug connector embodying the present invention,

Fig. 2 is a section taken on line 2—2 of Fig. 1 but shown on a somewhat enlarged scale with the cord in tensioned condition,

Figs. 3, 4 and 5 are sections taken on line 3—3, 4—4 and 5—5 respectively of Fig. 2,

Fig. 6 is a perspective view of a washer forming part of the cord anchoring and anti-twisting means,

Fig. 7 is a perspective view of the other washer forming part of the cord anchoring and anti-twisting means,

Fig. 8 is a perspective view of a bar for clamping the plug housing sections together, and

Fig. 9 is a perspective view of a key for locking the clamp of Fig. 8 in position.

Referring now to the drawing, the plug connector comprises a pair of similar mated housing sections 10, desirably made of molded insulating material, and provided with flat inner confronting faces 11. Provided in the inner face of each housing section 10 is a pair of twin channels 14, adapted to receive the usual jack contacts 15, and separated by a central rib 16. The inner end 17 of this rib 16 is of arrowhead shape and separates a pair of branch channels 18, converging from channels 14 and serving to receive the two wires of a flexible conductor cord 20.

The connector end of the flexible cord 20 is split and forked in the usual manner to separate the two individual wires 19, the outer ends of which are bared for connection to terminal screws 22 of jack contacts 15. The asbestos or similar insulating coverings 23, which usually lie between the rubber covered wires 19 and the outer fabric casing 24, are retained on the diverging separated portions of said wires.

Each housing section 10 has a narrow semicircular recess 12 at its rear end and an adjoining trough or recess 13 immediately beyond rib 16, 17 and having a central circular section 13*a* and short lateral extensions 13*b* of width equal to that of said trough section 13*a*. When the mating housing sections are assembled, the registered troughs 13 define a flat cylindrical cavity, and the trough extensions 13*b* define diametrically opposite extensions of said cavity, such cavity with its extensions serving to house the cord anchoring and anti-twisting means now to be described.

The cord anchoring and anti-twisting means is attached near the fork base 25 of the two wires 19 as shown in Fig. 3, and comprises a substantially stiff washer 27, desirably made of fiber insulating composition, and having a circular periphery except for a pair of diametrically opposed radially protruding lugs 28, desirably of rectangular shape. This washer 27 is made with a pair of spaced desirably zig-zagged slits 30, extending to the periphery of said washer, and defining therebetween a tongue 31 with serrated wire gripping edges 32. When attached in cord clamping position this tongue 31 is angularly bent from the plane of the body of the washer to afford a notch 33, bounded by serrated wire gripping sides 34.

The fork base 25 of cord 20 is disposed in the gap between edges 34 left by the downturned tongue 31, and the separated wires 19 straddle said tongue 31, as best shown in Fig. 3, so that the respective wires will be firmly held between the serrated edges 32 of the tongue and the corresponding edges 34 of the washer.

To afford added assurance against the slipping of the wires 19 through the open end of the notch 33 of washer 27, and to provide a reinforcement for said washer, there is advantageously provided a second substantially stiff washer 37, desirably made of the same material as that of washer 27, and having a similar periphery, affording a pair of diametrically opposed radially protruding lugs 38. This washer 37 has a U-shaped notch 39 desirably provided with a flared serrated base 40, and is straddled around the cord 20 at the fork base 25 on the outer side of washer 27, but in reversed angular relationship therewith, so that said cord will be confined between the bases of the two washer notches 33 and 39. To facilitate the entry of this washer 37 in cord straddled position, the outer end 41 of the notch 39 is desirably flared.

The two washers 27 and 37, attached as shown to the cord 20 in overlapping relationship are received in the housing recesses 13, with their corresponding lugs 28 and 38 in overlapping registry extending into the recess extensions 13b. In socket plug application the usual wire cord guard 43 is also retained in the recesses 13 with its enlarged end 42 abutting washer 37.

Washers 27 and 37 are attached to the cord 20 with the outer cut end of the outer cord casing 24 extending below or beyond the bottom face of the body of the washer 27 as shown in Fig. 3 at 24a, so that said casing end will be clamped by said washers against possible fraying.

When the two housing sections 10 are clamped together, the washers 27 and 37 confined in recesses 13 and firmly gripping the coverings 23 of the separated wires 19 will anchor said cord to said housing sections so that any pulling stress on the cord with respect to the plug housing as shown in Fig. 3, will not be transmitted to the terminal connections at the screws 22. The tongue 31 will be pressed towards the plane of the body of the washer 27, and into firm gripping engagement with the wire coverings 23 by the clamping pressure thereagainst of the inner end 17 of the rib 16 as shown in Fig. 3. Since the diverging insulated wires are clamped by washer 27, any pull on cord 20 will urge tongue 31 towards the plane of the body of washer 27, and accordingly the greater the pull, the greater the clamping and gripping action of said washer on the wires 19. The washers 27 and 37 are desirably strong enough to withstand a pulling force of over 50 pounds, far greater than is ever encountered in practice.

With the lugs 28 and 38 of the washers 27 and 37 in the recess extensions 13b, said washers will be held against rotation, and twisting of the cord 20 even though three or more complete turns is possible, without transmission of torsional stress to the terminal connections at the screws 22.

It is seen therefore, that by means of simple, inexpensive, easily attached means, cord 20 will be effectively anchored to the housing to relieve the terminal connections 22 from even severe pulling and twisting stress imparted to the cord. It should be noted that this result is obtained without changing the heretofore conventional type of housing to any great extent.

In order to hold the two housing sections 10 together in registered relationship preliminary to the clamping thereof together, one of said sections is provided with a dowel pin 45, which is affixed to its rib 16, desirably by molding said section around said pin and which extends into a corresponding bore 46 in the rib 16 of the other housing section.

In order to clamp the two housing sections 10 together, these are provided at their rib sections with two sets of registered holes 47, each set receiving a clamp 48 in the form of a metal U-shaped bar, having its intermediate section 50 extending through said holes, and offset end lugs 51 straddling and lodged in corresponding depressions 49 in the faces of housing sections 10 to confine said lugs within the general outer contour of said sections. Each clamp 48 is retained in position by means of a key 52, lodged in the aligned holes 47 and wedged against said clamp. In order to retain the key 52 against endwise movement it is provided with a central depression 53 adapted to engage a central bulge 54 on the clamp 48, formed by arching said clamp, so that the key 52 will be snapped into locked position with respect to said clamp when pressed into the aligned holes 47. In order to impart a limited yield to the key 52 in this snapping action, said key is desirably made of wood.

It is seen that the two housing sections 10 will be effectively clamped together by simple, inexpensive, easily attachable means without likelihood of its loosening or coming apart as in the case of screw or spring means heretofore used, and which yet can be removed to separate the two housing sections for inspection or repair.

Although the invention is shown embodied in a plug connector of the socket type, as far as certain aspects of the invention are concerned it may be embodied in a plug connector of any other type as for instance that adapted for attachment to a wall outlet.

Also as far as certain aspects of the invention are concerned, the peripheries of the washers may be made elliptical or any other form with eccentric peripheral sections and the recess 13 correspondingly shaped to prevent rotation of these washers with respect to the plug housing.

Furthermore as far as certain aspects of the invention are concerned, the edges of the tongue 31 and the edges of the notches 33 and 39 need not be serrated, but may be straight, since such straight edges in certain cases may be sufficient to effectively grip the cord 20.

Also as far as certain aspects of the invention are concerned, the washer 37 may be eliminated, and the washer 27 alone utilized for resisting pulling and twisting stress on the cord 20 with respect to the housing.

Furthermore, it must be understood, that the cord anchoring and anti-twisting features described, may be utilized with any other form of clamping means for the housing sections aside from that described herein.

As many changes could be made in the above construction, and many apparently widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description or shown in the accom-

panying drawing, shall be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An electrical plug connector including a housing, a pair of contact members having terminal posts in said housing, a flexible conductor cord extending into the interior of said housing through one end thereof, and having a pair of forked wires connected respectively to said terminal posts, and a washer embracing the fork base of said forked wires and having a tongue bent out of the plane of the body of said washer and extending between said forked wires the sides of said tongue engaging said wires and clamping the forked wires against those edges of the washer that correspond to said tongue and being lodged in an axial recess of said housing between said terminal posts and said housing end, said recess embracing the rim of said washer.

2. An electrical plug connector including a housing, a pair of contact members having terminal posts in said housing, a flexible conductor cord extending into the interior of said housing through one end thereof and having a pair of forked wires, and a washer of comparatively stiff material lodged in an axial recess of said housing for resisting pulling action on said cord with respect to said housing and having a pair of slits defining a notch and a tongue in said notch, said washer straddling the fork base of said wires and said tongue being bent out of the plane of the body of said washer and extending between the forked wires, whereby said forked wires will be gripped between the sides of said tongue and the sides of said notch.

3. An electrical plug connector including a housing, a pair of contact members having terminal posts in said housing, a flexible conductor cord extending into the interior of said housing through one end thereof and having a pair of forked wires, and a comparatively stiff washer having a pair of spaced zig-zagged slits defining a notch and a tongue therebetween with serrated side edges, said washer being straddled over the fork base of said wires with said tongue bent out of the plane of the body of said washer and extending between the forked wires, whereby said wires will be gripped between the serrated edges of said tongue and said notch respectively, the periphery of said washer being lodged in an axial recess of said housing between said terminal posts and said housing end.

4. An electrical plug connector including a housing, a pair of contact members having terminal posts in said housing, a flexible conductor cord extending into the interior of said housing through one end thereof, and having a pair of forked wires, and a pair of comparatively stiff notched washers straddled around said cord and disposed in substantially overlapping relationship in an axial recess in said housing between said terminal posts and said housing end, one of said washers having a tongue extending between said forked wires to clamp said wires respectively between the edges of said tongue and the sides of the notch of said latter washer.

5. An electrical plug connector including a housing, a pair of contact members having terminal posts in said housing, a flexible conductor cord extending into the interior of said housing through one end thereof and having a pair of forked wires, and a pair of notched comparatively stiff washers made of fiber composition and straddling said cord near the fork base of said wires, said washers being disposed in substantially overlapping relationship in an axial recess in said housing between said terminal posts and said housing end, the washer nearest the outer end of said cord having a tongue cut out from the notched section of said latter washer and extending between said forked wires to clamp said wires respectively between the edges of said tongue and the sides of the notch of said latter washer.

6. An electrical plug connector including a housing, a pair of contact members having terminal posts in said housing, a flexible conductor cord extending into the interior of said housing through one end thereof and having a pair of forked wires connected respectively to said terminal posts, and a pair of washers provided with notches respectively and straddling the fork base of said forked wires in substantially overlapping reversed relationship with each other, whereby said cord will be confined between the bases of said notches, one of said washers having a tongue extending out of the plane thereof and between the forked wires, whereby said wires will be clamped between the opposed edges of said tongue and the sides of the notch of said latter washer respectively, one of said washers having eccentric peripheral sections, said washers being lodged in an axial recess between said terminal posts and said housing end, and at least a portion of said recess having a contour conforming with the periphery of said last mentioned washer to prevent the rotation of said latter washer with respect to the housing.

7. An electrical plug connector including a housing, a pair of contact members having terminal posts in said housing, a flexible conductor cord extending into the interior of said housing through one end thereof and having a pair of forked wires connected respectively to said terminal posts, and a washer grippingly embracing the fork base of said cord between said posts and said terminal end and confined in a recess in said housing end, said washer having a tongue angularly bent out of the plane of the body of said washer and extending between the forked wires to clamp said wires between said tongue and the sides of the washer opening through which said cord extends, said housing affording a stop member for limiting the angular position of said tongue with respect to said washer.

8. An electrical plug connector including a pair of substantially similar housing sections clamped together, each of said sections being provided with a pair of twin channels separated by a rib, a pair of contact jacks in said channels and having terminal posts in said housing, a flexible conductor cord extending into the interior of said housing through an axial opening therein and having a pair of forked wires connected respectively to said terminal posts, and a washer embracing the fork base of said wires, and having a tongue angularly bent out of the plane of the body of said washer and extending between the forked wires to clamp said wires between said tongue and the sides of the washer opening through which said cord extends, said washer being lodged in an axial recess of said housing between said posts and said housing opening and having said tongue closely adjacent to the inner ends of said ribs, whereby the angular position of said tongue with respect to the body of the washer is limited by said rib ends.

HARRY CHARMOY.