ELECTRICAL SOCKET CONNECTOR WITH SUPPORTING CLIP

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ELECTRICAL SOCKET CONNECTOR WITH SUPPORTING CLIP

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This invention relates to an electrical fixture for making connection with a dual conductor electric cord to energize either an individual lamp socket in the fixture or a branch conductor cord for a string of lamp sockets or the like, the present application being a division of my pending application, Serial No. 24,941, filed May 4, 1948 for Electrical Connector Fixture, which has matured into Patent No. 2,491,463, issued December 13, 1949.

The invention relates to improvements in the type of connector fixture as claimed in my copending application Serial No. 761,061, filed July 15, 1947, for Decorative Lighting Fixture, now Patent No. 2,559,706, issued July 10, 1951, wherein electrical connection is made with a dual conductor cord by forcing a pair of metal prongs or pins through the insulation of the cord and into contact with the electrical conductors therewithin. The advantages of this type of connector fixture are that it enables light sockets to be mounted at any point along a conventional dual conductor electrical cord without scraping the insulation from the wires and making a permanent type of connection requiring the use of tools or solder. Such a fixture is of particular advantage in mounting decorative lights on a conductor cord for lighting a Christmas tree or the like where the lights may have to be placed at irregular intervals on the cord to obtain the desired lighting effect, and wherein it may be desirable to shift the lights to different positions on the cord from time to time, so as where the same string of lights is used year after year on different Christmas trees. This type of fixture permits the lights to be moved from one position to another along the cord without leaving parts of the bare conductor wires exposed which would have to be taped, making the cord unsightly and a possible fire and shock hazard if the tape should come off, and of course involving the work of applying the tape.

In a similar manner, this type of fixture may also be used to energize branch conductor cords from a main cord to add additional strings of lights wherever they may be needed. The lamp sockets on the branch cords may also preferably be of the pin connector type so that they may be spaced at random to give the desired lighting effect. In addition to the mentioned uses for decorative lighting purposes, this type of fixture may further be used for making temporary or permanent connection with a twin conductor cord for any other purpose whatsoever.

The general object of the present invention is to provide improved forms of construction for an electrical connector fixture of the type described to make the fixture more durable and of greater utility and to reduce the cost of manufacture. Particular objects are to provide a type of construction having parts which may be easily molded of readily available plastic materials, to provide a design for the individual plastic parts which requires less complicated dies for the molding thereof, and to provide an improved form of construction and design of parts to reduce the cost of assembly. Another object is to provide a form of construction for the principal molded parts which will permit the use of the same molding dies to make parts for both a lamp socket type of fixture and extension cord connector type of fixture. Additional and more specific objects of the invention are to provide improved forms of ram or piston cord connector for forcing the wires onto the prongs or pins of the fixture, to provide an improved form of cap member including such piston element, and to provide improved means for securing a spring mounting clip to the fixture.

In the present forms of construction, the principal part of body member may be provided with a screw threaded metallic shell to form a lamp socket or it may constitute a connector fixture for a dual conductor branch or extension cord. The body member has a segmental end portion defining a recess having a transverse channel for the conductor cord with which the fixture is to be connected, and in the bottom of the conductor cord channel are mounted a pair of metallic pins having a length just sufficient to pierce through the insulation and into the stranded electrical conductors of a conventional rubber or plastic covered twin conductor cord without piercing through the insulation on the opposite side of the cord. The conductor cord is forced onto the metallic pins by a ram or piston element which is projected into the said recess. The piston element is carried by a cap member which fits over the segmental end portion of the body member to force the piston toward the pins in
the bottom of the channel so that electrical connection will be made with the two conductors of
the cord in the channel when the cap is secured to the body member. When the body member
constitutes a light socket, the cap is provided with a spring clip for mounting the light on a
Christmas tree branch or support. The cap may be attached to the body member by a screw thread-
ed connection, or by the use of cooperating pro-
jections and recesses adapted resilient snap en-
gagement.

Other objects and advantages of the invention
will become apparent to persons skilled in the
art as the description proceeds in connection
with the accompanying drawing illustrating pre-
ferred embodiments of the invention. It is to
be understood, however, that the purpose of the
drawing is to illustrate the principles of the in-
vention and not to limit the invention, as various
other changes in the form of construction and
arrangement of parts will occur to persons skilled
in the art, and all such modifications within
the scope of the appended claims are included
in the invention.

In the drawings:
Figure 1 is a longitudinal sectional view show-
ing one form of the invention embodied in an ex-
tension cord connector type of fixture;
Figure 2 is a longitudinal sectional view show-
ing a similar form of the invention embodied in
a lamp socket type of fixture;
Figure 3 is a perspective view of the device
shown in Figure 2, with the cap removed;
Figure 4 is a perspective view of the piston ele-
ment for the cap;
Figure 5 is a sectional view illustrating the
manner of inserting the piston element in the
cap;
Figure 6 is a general view illustrating the use
of both types of fixtures shown in Figures 1 and 2;
Figure 7 is a sectional view of another modific-
ation;
Figure 8 is a perspective view of the device
shown in Figure 7 with the cap removed from
the body; and
Figure 9 is a sectional view showing a different
manner of securing the mounting clip to the cap
case of the device.

Figure 1 illustrates the construction of the
branch or extension cord connector fixture shown in Figure 6, the purpose of this fixture
being to connect the twin conductor branch cord
11 to the main twin conductor cord 12. The
assembled parts of the fixture 10 comprise a body portion 15, a cap 16, a washer 17 and ram or
piston 20.

The body 15 has a segmentally externally
threaded end portion 21 with threads 22 for secur-
ing the cap 16. The two segments of the end
portion 21 define a recess comprising a trans-
verse conductor channel 23 having a bottom wall
24. At spaced points on the wall 24, as shown in Figure 3, are mounted sharp metallic pins
25 and 26 spaced to pierce through the insula-
tion and into the stranded conductors of a con-
ventional size rubber or plastic covered twin con-
ductor cord. Each pin has a flange 27 partially
sunk in a shallow recess in the wall 24, which
flange serves to position the pin so that the pin
will not be long enough to pierce entirely through the insulation on both sides of the cord so that it
might possibly push a conductor strand out
through the insulation where it would be in an
exposed position after the fixture is removed.
It is found that the pins may easily be made to
the proper length for the purpose, since most
common conductor cords are of fairly uniform
size and cannot be appreciably flattened in the
bottom of the channel by the piston 20. The
inner or riveted end of each pin is mechanically
and electrically connected with a small plate or
tab 28 which is soldered to one of the conductors
of the cord 11. An upsetting partition 29 is
formed integral with the wall 24 to separate the
soldered connections and uninsulated conductor
ends to prevent short circuit, it being understood
that the whole body 15 is molded of a suitable
electrically insulating material.

The conductor cords 11 and 12 may each com-
prise separate insulated stranded conductors
adapted to be laid side by side in the bottom of
the channel 23, or they may comprise the more
recent type of rubber or plastic covered twin con-
ductor cords where the insulation on the two
conductors is united on adjacent sides to make
a single flat conductor cord. In either event, if
the individual stranded conductors are laid flat
and side by side in the bottom of the channel 23,
they will thereafter be held firmly in that
position by the piston 20. The end of the plug
20 is preferably provided with parallel grooves
30 to fit the conductor cord. The parts are pro-
portioned so that when the cap 16 is screwed down
against the shoulder 31 on the body, the grooved
surfaces in the end of the piston 20 are brought
close to the ends of the prongs but without touch-
ing the prongs so that the insulation on the pis-
ton side will not be pierced.

The soldered connections on the end of the
cord 11 are enclosed by a cover member 32 which
is mounted on the body member by means of a
flanged friction joint 36. In assembly, this joint
is preferably permanently bonded by applying a
plastic solvent such as acetone, or by using any
suitable adhesive material.

The washer 17 forms a bearing for the non-
rotating piston 20 as the cap 16 is screwed on
the body 15. In mounting the fixture on a con-
ductor cord, the cord is laid in the channel 23
across the points of the pins 25 and 26 and the
cap is engaged with the starting threads on the
segmental end portion of the body member.
Then, as the cap is turned down, the piston forces
the conductor cord toward the bottom of the
channel, causing the pins to pierce the stranded
conductors and make electrical connection ther-
ewith.

In the socket fixture shown in Figure 2, simi-
lar parts are identified by the same reference
numerals. The body 35, cap 36 and washer 37 are
different in some respects from the corresponding
elements of Figure 1, in order to adapt them to
the light socket, but each of these parts possesses
the same cooperating elements to cause a conduc-
tor cord in the channel 23 to be engaged by the
metallic pins 25 and 26 when the piston 20 is
forced into the recessed channel by screwing the
cap on the body member. The body 35 is made
in one piece and is provided with a screw thread-
ed metallic shell 33 forming a socket for the lamp
40. The shell 33 has a shoulder 41 mechanically
electrically connected with the riveted end
of pin 25. A resilient center contact 42 for the
The socket fixture of Figure 2 embodies a novel form of spring mounting clip which may be more easily assembled than types of clips hitherto used. The present mounting clip comprises two identical spring members 43 and 44 having angular end portions 45 which may be inserted one at a time through a narrow slit 46 in the end of the cap. With this form of clip the individual members 42 and 45 may be inserted through the slit 46 from the bottom side thereof without deforming the spring members. After the plug 20 is inserted in the cap on top of the washer 37, the angular end portions 45 are held flat against the end of the cap to hold the outer ends of the spring members resiliently in mutual engagement as shown. The combined thickness of washer 37 and end portions 45 is preferably the same as the thickness of washer 17 in Figure 1 to permit use of the same dies for molding certain of the parts in the two types of fixtures.

Referring now to Figures 4 and 5, the ram or piston 20 will be observed to have an upstanding portion 59 of rectangular cross section to fit and slide in the transverse channel 23 between the two segments of the end portion 24 of the body. The portion 58 is divided throughout a considerable portion of its height by a flange 54, having its greatest width at the lower end of the piston element. On opposite sides of the slot 51 at the lower end of the piston are generally semi-circular flange elements 52 having truncated end portions 53 to reduce the width of the flange in the direction of the slot to a dimension less than the internal diameter of the threaded portion of the cap. Portions of these flange elements extend outwardly to a diameter greater than the threaded part of the cap. By pinching the piston 20 with a pair of pliers 55 having inwardly directed nose ends 56 to grip the body portion 24 adjacent the flanges 52, as shown in Figure 5, the tapered slot 51 may be squeezed together to contract the flanges 52 sufficiently to pass the threaded opening 57 in the cap. When the piston 20 is inserted into the bottom of the cap, the flanges 52 are allowed to expand into an undercut groove 58 to retain the plug in the cap. This form of construction eliminates the necessity for threading flanges 52, and at the same time makes the piston 20 readily removable if its removal should ever be necessary. Since the physical dimensions of the piston 20 are quite small in practice, the plastic material of which it is molded provides ample resilience for this method of assembly without damaging the piston, and after the tool 55 is removed the flanges 52 immediately spring out into the undercut groove 58 to hold the parts permanently assembled. It is, of course, understood that the piston 20 has a loose fit in the cap 16 for free relative rotation when the cap is screwed on its body member. Except for the slot 46, the cap in Figure 2 may be made identical with the cap 16 in Figure 1, and in any event, it is to be understood that the piston and cap fit together and are assembled in the same way in both types of fixture.

Figures 7 to 9 illustrate two modifications in which the ram or piston element is made integral with the cap member. In these embodiments the number of parts is reduced and the assembly operation of inserting the piston element in the cap is eliminated. In the embodiment shown in Figures 7 and 8, there is illustrated a body member 16 receiving a cap member 18 in a snap fit instead of threaded engagement. On opposite sides of the conductor cord recess or channel 17, the body 15 has a pair of segmental end portions 78 to receive and secure the cap 18. Provend 79 are formed on the outer cylindrical surface of the segmental portions 78 to snap into grooves or recesses 90 in the cap for securing the parts together. The cap contains an integral ram or piston element to project into the recess between the segmental portions 78 and force a cord down into the conductor channel 17 to become pierced and electrically connected with the pins 25 and 26. The opposite sides of the piston element 81 join with the rim of the cap to provide continuous bearing surface against the conductor cord throughout the length of the channel 77. The pins 25 and 26 may thereby be disposed with equal advantage at any points in the bottom of the channel 17, if being preferred to have sufficient distance between these two pins to minimize the weakening of the conductor cord from the piercing of the insulation. As a practical matter, they do not appreciably weaken a conventional rubber or plastic covered conductor cord because they may be made quite slender and the insulating covering on the cord immediately expands into the punctures as soon as the pins are removed. A slot or recess 91 is formed in the end of the cap member to secure a mounting clip. In the present embodiment the mounting clip comprises a pair of identical metallic spring members 71 having projections or bars 72 raised thereon, as shown, to be snapped into opposite indentations 73 in the walls of the slot or recess 91. The recess 70 preferably extends up into the piston element to contain enough of the length of the clip members 71 to provide a firm anchor thereof. The sides of the recess are cut back at 74 to accommodate the spring action of the clip members whereby they may be spread apart to grip a branch or other support close to the fixture. Additional means may be employed to anchor the clip members, if desired, but it is preferred to make the recess 70 of dimensions to frictionally engage the clip members, the plastic material of which the cap is molded being sufficiently resilient in a small cap to retain the projections 72 in the indentations 73 by a snap fit as in a snap fastener.

Still other forms of integral piston elements and other connecting means for securing the cap to the body member utilizing the principles of the present invention will occur to persons skilled in the art.

Figure 9 illustrates another manner of securing a mounting clip in a recess or slot in the cap member. The cap 85 is similar to the cap 76 in Figure 8 in that it has a groove or recess 80 in its rim for snapping over a locking projection on the body member, and in that it has an integral piston element 81 to press the conductor cord onto the contact pins when the cap is placed on the body. The cap 85, however, is provided with an external recess 87 which may extend some distance up into the piston element 81. The mounting clip comprises a pair of identical metallic spring members 88 having end portions 89 bent out at right angles, as shown. The end portions 90 of the two clip members are inserted through the central hole of a plastic washer 86, and the clip assembly thus formed is inserted in the recess 81 in the cap, where it may be permanently secured by applying a drop of acetone, or the like,
to bond the washer to the cap member. Still other means may be devised by persons skilled in the art for securing a spring clip in a slot or recess in the cap member extending toward or into the central piston element.

By mounting the spring clip well within the piston element of the cap member, particularly as shown in Figure 7, the clip members may have sufficient length to provide the desired spring action without causing the fixture to stand high above the branch or other support on which it is mounted. It is desirable to have the fixture mounted as close to its support as possible.

It is to be understood, of course, in Figure 7 that the spring clip may be omitted and an extension cord connected directly with the pins 25 and 26 in lieu of the lamp socket 32 to provide an extension cord connector fitting to serve the purpose of the fixture 10 shown in Figures 1 and 6. The various features of novelty in the body and cap members have the same advantage and utility with an extension cord connector fitting as a lamp socket type of fitting 34. In the various embodiments shown, the invention provides a two piece fixture by which additional lamps or extension cords may be connected with a main cord without requiring any tools or the usual skill necessary to make electrical connections. All the elements necessary for making the connection are self-contained in the body member and cap without the use of any screws or nuts which are easily lost and may result in a faulty connection if improperly applied. The threads on the threaded parts are relatively large and easy to engage, and in all embodiments the parts fit in such a manner as to make it self-evident to an unskilled person when they are put together in the proper manner. The pointed pins and electrical connections associated therewith are permanently mounted in an inaccessible position so that a person connecting or disconnecting wires from the fixture cannot possibly come in contact with any energized metallic parts, or with the sharp points. The energized parts are also inaccessible to tin foil and other metallic ornaments used on Christmas trees and the like.

The fixtures may be moved about on the cord as desired from time to time without materially shortening the life of the conductor cord, or all the fixtures may be removed from the cord to make it available for some other use. The single undivided cord channel in each embodiment allows the use of two conductor cords without splitting the cord around a central bolt as has heretofore generally been necessary in such fixtures.

Having now described my invention and in what manner the same may be used, I claim as new and desire to protect by Letters Patent is:

1. In an electric light socket fixture having a body member with a light bulb socket in one end of the body and a conductor cord channel in the other end of the body equipped with piercing contact pins to energize said socket, a cap for said channeled end of the body member, a rotatable piston element in said cap to enter said channel and press a conductor cord in the channel against said contact pins, a contractible flanged base on said piston element to prevent the piston and the body member, a central opening in the end of the cap, and a pair of opposed spring clip members having inner end portions insertable into said opening from the outside of the cap and clamped in the cap by said piston element to impart spring action to said outer ends of the clip members to grip a support.

2. In an electric light socket fixture having a body member with a light bulb socket in one end of the body and a conductor cord channel in the other end of the body equipped with piercing contact pins to energize said socket, a cap for said channeled end of the body member, a longitudinally slotted piston element in said cap projecting into said channel to press a conductor cord in the channel against said contact pins, a flanged base on said piston element rotatably seated in said cap, and an annular abutment in said cap over-hanging said flanged base to retain the piston element in the cap when the cap is removed from the body member, said flanged base being contractible for assembly of the piston element in the cap by pinching together the slotted portion of the piston element.

3. In a miniature light socket fixture having a body member with a light bulb socket in one end of the body and a conductor cord channel in the other end of the body equipped with piercing contact pins to energize said socket, a cap for said channeled end of the body member to press a conductor cord in said channel against said contact pins, a central opening in the end of said cap, and a pair of separate, opposed spring clip members having inner end portions clamped together in said cap opening to impart spring gripping action to the outer ends of said clip members for holding the fixture in upstanding position on a support, the clamping action thus exerted on said inner end portions of said clip members constituting the sole retention for said clip members in the cap.

4. In an electric light socket fixture having a body member with a light bulb socket in one end of the body and a conductor cord channel in the other end of the body equipped with piercing contact pins to energize said socket, a cap for said channeled end of the body member to press a conductor cord in said channel against said contact pins, a central opening in the end of said cap, a pair of separate, opposed spring clip members having inner ends insertable into said opening from the exterior side of the cap, and opposed wall surfaces in the cap rigidly clamping portions of said inner ends together in the cap to impart spring gripping action to the outer ends of said members for holding the fixture in upstanding position on a support, said wall surfaces constituting the sole retention means engaging said clip members to hold the clip members in the cap.

5. In an electric light socket fixture having a body member with a light bulb socket in one end of the body and a conductor cord channel in the other end of the body equipped with piercing contact pins to energize said socket, a cap for said channeled end of the body member to press a conductor cord in said channel against said contact pins, a central opening in the end of said cap having two confronting spaced walls, opposed indentations in said walls, a pair of separate spring clip members having inner end portions clamped together between said walls to impart spring gripping action to the outer ends of the clip members, and projections on said inner end portions engaging said indentations with a snap fit, said con-
fronting spaced walls constituting the sole retention for said clip members in said cap.

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