United States Patent

Paulfus

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[54] ONE-PIECE SOCKET FOR DECORATIVE LIGHT

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[73] Assignee: **Noma-World Wide Inc.**, Chicago, Ill.

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[52] **U.S. Cl.**.....**339/97 L**, 339/157 C, 339/199 R

[51] **Int. Cl.**.....**H01r 11/20**

[58] **Field of Search**.....339/97, 99, 157, 199

[56] **References Cited**

UNITED STATES PATENTS

2,506,620	5/1950	Sundt	339/99 L
2,692,374	10/1954	Carson	339/99 L

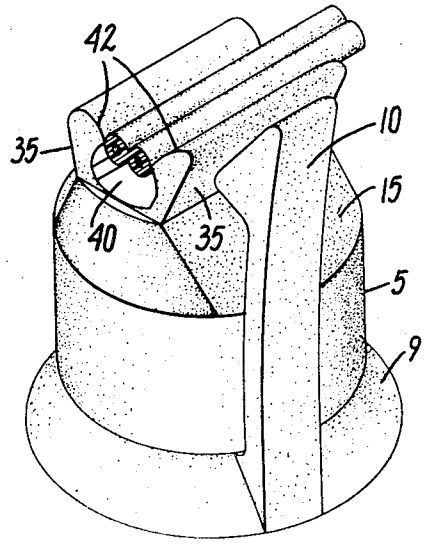
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[57] **ABSTRACT**

A one-piece socket for a decorative light, such as a Christmas tree light, is provided. The socket is of the pin-tap terminal type and employs a pair of resilient gripper arms at the base of the socket which are adapted to flex apart to accommodate an electrical wire and to retain the wire in firm connection with the pin-tap terminals when the wire is positioned in a wire receiving channel defined by the arms. The arms are formed with guide surfaces which direct the wire into the channel and which also aid in spreading the arms apart when the wire is forced thereagainst so as to facilitate the positioning of the wire in the channel.

10 Claims, 4 Drawing Figures



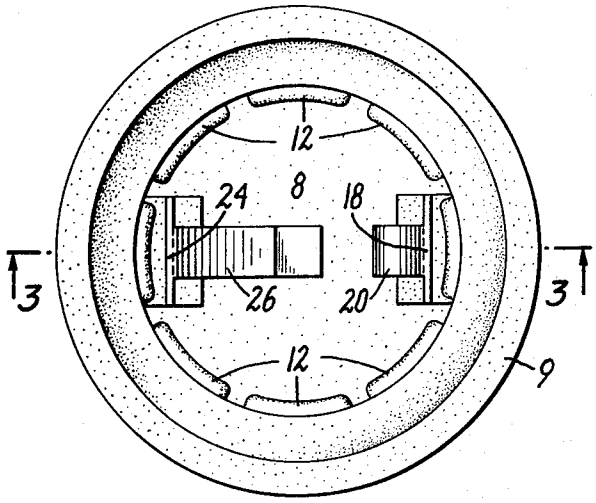


FIG. 2

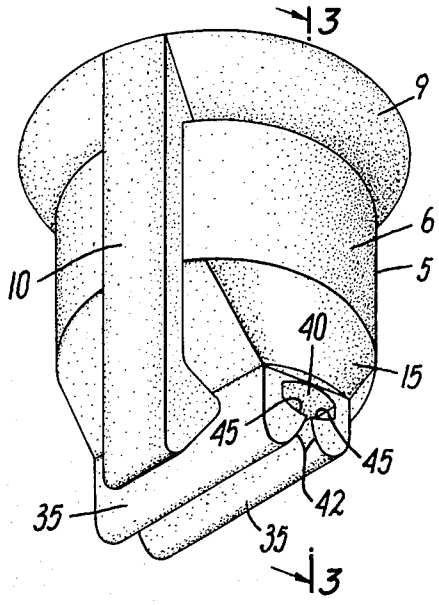


FIG. 1

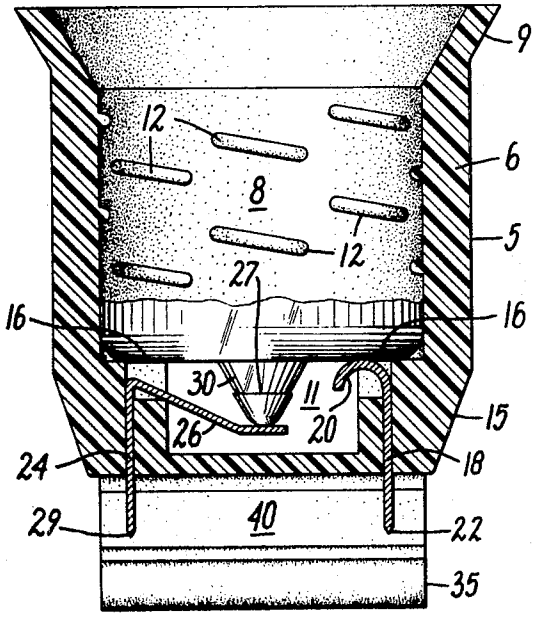


FIG. 3

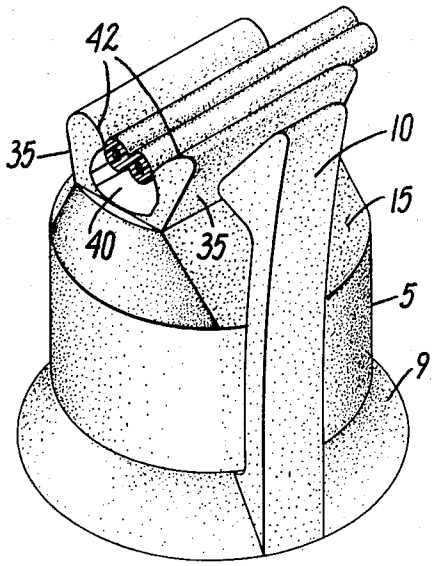


FIG. 4

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ONE-PIECE SOCKET FOR DECORATIVE LIGHT

BACKGROUND OF THE INVENTION

Christmas tree lights have often been provided with sockets of the pin-tap terminal type. Such sockets have a pair of electrical connectors which are mounted in the socket so as to engage the Christmas tree light bulb. These connectors have pointed terminal ends which are positioned at the base of the socket. These pointed ends are positioned so as to pierce the insulation of an electrical wire which is threaded through the socket and make contact with the metal core of the wire and to thereby connect the bulb into the circuit. Such pin-tap terminals are desirable since they can be rapidly attached to the electric wire and eliminate the need for stripping of the wire to expose the metallic wire core, thereby making it quite easy to attach the wire to the socket.

Typical sockets of this type are shown in the U.S. Pat. Nos. 2,647,246 to Gilbert, 3,251,023 to Schick and 3,372,362 to Schick. The sockets shown in these patents all employ pin-tap terminals which connect the electrical wire threaded through the socket to the light bulb. All of the sockets shown also employ a separate cap, cover, or base member which is fitted into or otherwise engages the socket body to capture and hold the wire in position against the pin-tap connectors. Although such caps, covers, or base members can hold the wire quite securely in position, the expense incurred in forming a separate member and in assembling it onto the socket body is relatively high. Moreover, the fit between the socket body and the cap, cover, or base member must be quite tight, thereby requiring that both the socket and mating cap members be formed to relatively close tolerances, thus increasing the cost of the assembly.

It is desirable to eliminate the need for a cap, cover, or base member for the socket assembly since this eliminates the expense of forming and assembling a separate cap, cover, or base member for the assembly. U.S. Pat. No. 2,692,324 to Carson shows an electric lamp having a base employing pin terminals and a pair of resilient arms formed integrally with the base and adapted to hold an electrical wire in position when connected to the pin terminals. Carson does not show a socket of the type contemplated in the patents referred to above since the bulb is not a replaceable component in Carson's electric lamp. Additionally, Carson's assembly requires that the arms be pried and held apart while the wire is inserted into position. With such a construction it is somewhat more difficult to connect the wire to the assembly than with many pin-tap connector sockets in which the connection can be formed as the wire is moved into position by, or with, cap or cover. In Carson's lamp this cannot be done since the arms of the lamp must be spread apart before the wire is moved into position and connected to the pin-tap terminals.

STATEMENT OF THE INVENTION

This invention provides a socket for a decorative light such as a Christmas tree light which has the advantage that the wire can be connected to the pin-tap terminals in a single connecting motion and has the further advantage that the socket is formed all in one piece without the necessity for a cap, a cover, or a base to hold the wire in position. The construction of the socket of the invention is simple and relatively inexpensive.

The socket of the invention comprises a unitary socket body having a central cavity therein adapted to receive and retain an electric light bulb; the socket body also has a channel formed in the base thereof for receiving a wire; a pair of connectors are positioned in the socket with respect to the central cavity so as to engage the bulb in electrical connection therewith, each of said connectors having a pin-terminal and projecting into the channel; a pair of resilient arms are formed integrally with the socket body and define at least a portion of said channel, said arms being adapted to flex apart so as to permit a wire to be moved into the channel and into connection with the pin terminals, and being further adapted to return to a normal position and to thereby capture the wire firmly in position; the arms are formed with guide surfaces at the base end thereof for receiving the wire prior to its entry into the channel such that upon application of a force against the surfaces via the wire the arms flex apart permitting the wire to enter the channel.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in perspective of the socket of the invention.

FIG. 2 is a top view of the socket.

FIG. 3 is a view in cross-section taken along the line 3—3 of FIG. 1.

FIG. 4 is a schematic view showing the wire being forced against the guide surfaces and into the channel of the socket body.

GENERAL DESCRIPTION OF THE INVENTION AND SPECIFICATION

As noted above, the socket of the invention is formed with a pair of resilient arms formed integrally therewith at the base of the socket body. These arms define a space or channel in the socket body through which the wire is threaded. The arms also capture and hold the wire firmly in position and in electrical contact with the pin terminals. The arms can be generally C-shaped or L-shaped in cross-section, with the wire receiving channel defined by the central area of the "C" or "L." The arms, as well as the socket body, preferably are made from a plastic material which not only is flexible, but also acts as an insulator for the bulb and the wire. Typically suitable plastic materials are polypropylene, polyethylene, polyvinylchloride and synthetic rubbers. It is also possible to make the socket of a conducting material such as a metal if desired, provided however, the metal is coated or otherwise insulated.

Materials other than those mentioned above can be used for the socket, but whatever material is used, it must be sufficiently resilient to permit the arms to flex apart and together, but at the same time be strong enough to firmly hold the wire in position against the pin terminals. The gripper arms should be made thin enough to readily flex apart, but thick enough to firmly hold the wire in position. The resilient arms can extend completely across the width of the socket body or can comprise only a small portion of the socket body width. However, the arms are always integrally formed with the socket body so that the socket assembly is all one piece.

The arms are formed with guide surfaces against which the electrical wire is forced to move it into the channel. In response to force applied to the guide surfaces, the arms flex apart to accommodate the wire in the channel. These surfaces, when together, generally define a "V," or notch-shaped, or through-like central region at the base of the socket which extends axially in the same direction as the wire and as the channel. The guide surfaces can be flat or curved but preferably are convexly curved, since this the convex shape aids in the spreading of the arms apart when the wire is forced against them. The guide surfaces can be formed to an angle such that the apex of the notch or V-shaped region defines an angle of as small as 15°. Larger angles are preferred but the angle should not however exceed 165° since for angles greater than 165° the guide surfaces will provide little assistance in spreading the arms apart. Angles within the range of about 30° to 60° are preferred.

As noted above the arms define a central channel in which the wire is received and retained. The arms, interiorly of the guide surfaces are recessed so as to define a ledge which acts as a stop for the wire when in position to prevent it from being displaced from its position in contact with the pin-tap terminals.

The socket shown in FIG. 1 has a plastic body 5 formed of polypropylene. The body has a central cylindrical region 6 formed with a central cavity 8 for receiving a light bulb. The upper portion of the socket body 5 has an annular flared skirt 9 and is formed with an arm 10 extending downwardly

therefrom. The arm **10** serves as a clip for holding the socket on the limb of a Christmas tree. The central cavity **8** of the socket is formed with a series of protrusions **12** which engage the threads of a light bulb **30** so as to retain the bulb in position. These protrusions **5** are formed to a pitch corresponding to that of the threads of the bulb. Beneath the cylindrical portion **6** of the body a tapered base portion **15** is formed. This tapered base portion **15** defines a narrowed central passage **11** extending downwardly from the central cavity **8**. The bottom of the central cavity **8** has a ledge **16** against which the bulb, when in position as shown in FIG. **3**, rests.

A pair of pin tap connectors **18** and **24** are embeded in the plastic material of the tapered region **15** of the socket body. One of the pair of pin-tap connectors **18** has a hook-shaped upper end **20** which protrudes onto the ledge **16** so as to contact the base of the bulb. The other end of the pin-tap connector **18** is pointed and extends into a channel **40** formed in the socket body as will be described more particularly hereinafter. The pointed end is adapted to pierce the insulation of a wire in the channel and make an electrical connection with the metal core of the wire. The other of the pin-tap connectors **24** is generally V-shaped as an arm **26** which projects centrally into the passage **11** into a central position at which it engages the tip **27** of the bulb **30** as shown in FIG. **3**. The other end **29** of the pin-tap connector **24** is also formed with a point as to engage and pierce the insulation of an electrical wire in the channel and make an electrical connection with the metal wire core. The pointed ends **22** and **29** are off-set from each other such that each point engages a different metallic wire core of the pair of cores of the electrical wire.

The tapered base **15** of the socket body terminates at a pair of resilient arms **35** formed integrally with the socket body. These arms are generally hook-like in cross-section and extend across a major portion of the width of the socket body. The hook-like portions of the arms **35** face each other so as to define together the central channel **40** through which the wire can be threaded. The ends **22** and **29** of the pin-tap connectors project into this channel into a position so as to engage and pierce the insulation of the electrical wire (not shown). The exterior sides of these arms **35** are generally flat. However, the arms are formed at the bottom thereof with guide surfaces **42** which are slightly convexly curved. The guide surfaces together define a V-shaped notch or trough which extends axially in the same direction as the wire. The apex angle of this notch **15** is approximately 45° . The guide surfaces assist in forcing apart the arms which are flexible and thus, permit the electrical wire to be pushed past the edge **45** defining the end of the guide surface **42** and into the channel **40** and thereby into connection with the terminal ends **22, 29** of the pin-tap connectors. The guide surface **42** serves as bearing surfaces against which the wire is forced. When the wire is forced toward the channel **40**, due to the notch or V-shaped configuration of the guide surfaces, the arms are forced apart as shown in FIG. **4** until the wire passes beyond the ledge **45** into the channel **40**. Once in the channel **40**, the wire is held in place and in connection with the terminals by the ledge **45**.

In operation, in order to connect an electrical wire to the socket **5**, it is hereby necessary to place a wire along the notch-shaped region defined by the guide surface **42** with one core wire of the pair of core wires on each guide surface. When a force is applied to the wire toward the channel **40**, the guide surfaces **42** urge the arms **35** apart permitting the wire to enter the channel **40**. The wire becomes pierced and connected to the terminals **22, 29** of the pin-tap connectors **18, 24** and are retained in position by the ledge **45** on each arm.

Thus, it can be appreciated from the above that the socket of the invention provides a one-piece socket construction in which no cap or cover is required since the arms **35** enclose the wire and retain it in position in the channel **40**. Moreover, the wire can be moved into connected position in one simple motion. Thus, assembly of the socket is a simple and expeditious matter.

Having regard to the foregoing disclosure, the following is claimed as the inventive and patentable embodiment thereof:

1. A one-piece socket particularly suited for use in a Christmas tree light assembly comprising, a socket body having a central cavity therein adapted to receive and retain an electric light bulb, said socket body having a channel formed in proximity to the base thereof for receiving a wire; a pair of connectors positioned in the socket body with respect to the central cavity so as to engage the bulb in electrical connection therewith, each of said connectors having a pin-tap terminal end projecting into the channel; a pair of resilient gripper arms formed integrally with the socket body and defining at least a portion of said channel, said arms being adapted to flex apart so as to permit a wire to be moved into the channel and into connection with the pin-tap terminals, and being further adapted to return to a normal position and to thereby capture and hold the wire firmly in position in connection with the terminals, said arms being formed with guide surfaces at the base end thereof for receiving the wire prior to its entry into the channel and for guiding the wire into the channel such that upon application of a force against the surfaces via the wire, the arms flex apart and permit the wire to enter the channel and contact the pin-tap terminals.

2. A one-piece socket in accordance with claim **1**, in which the guide surfaces face each other to define a trough-like region at the base of the socket.

3. A one-piece socket in accordance with claim **2** in which the trough-like region extends axially in the same direction as the channel.

4. A one-piece socket in accordance with claim **1** in which the guide surfaces are convexly curved.

5. A one-piece socket in accordance with claim **1** in which the guide surfaces face each other and converge at an apex angle within the range of from about 15° to about 165°.

6. A one-piece socket in accordance with claim **1** in which the guide surfaces of the gripper arms terminate at a ledge which defines one boundary of the channel.

7. A one-piece socket in accordance with claim **1** made of a plastic material.

8. A one-piece socket particularly suited for use in a Christmas tree light assembly, comprising a one-piece plastic body having a central cylindrical cavity therein adapted to receive an electric light bulb; means in the cavity for retaining the light bulb in position therein; a pair of resilient gripper arms formed integrally with the socket body and extending therefrom said gripper arms defining, at least in part, a channel in the socket body through which an electric wire can be threaded, said arms each having a re-entrant facing portion, each forming closely spaced ledge portions defining a wall of the channel; each of said gripper arms also having an outwardly facing convexly curved guide surface, which surfaces together define a notch-like trough axially aligned with the channel, said surfaces being adapted to receive and guide a wire into position in the channel upon application of a force via the wire toward the channel such that the arms flex outwardly away from each other to permit the wire to pass between and past the ledge portions, the gripper arms thereupon returning to their normal position and said ledge portions thereupon capturing the wire in the channel; a pair of pin-tap connectors embedded in the socket body and having pointed terminal ends projecting into the channel in off-set positions so as to engage both metal cores of the wire, one of said pin-tap connectors extending into a central region in the socket body so as to contact the bottom tip of a bulb and the other of the connectors engaging another portion of the bulb.

9. A one-piece socket in accordance with claim **8** in which the socket body has a passage connecting the central cavity and the channel, and in which the connector which engages the bulb tip extends into this passage.

10. A one-piece socket in accordance with claim **8** including a retainer member formed on the socket body for engaging a support such as a branch of a Christmas tree to hold the socket in position.

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