Oct. 15, 1968 R. L. MARTIN 3,406,374

CORD CONNECTING PLUG

Filed Nov. 26, 1965

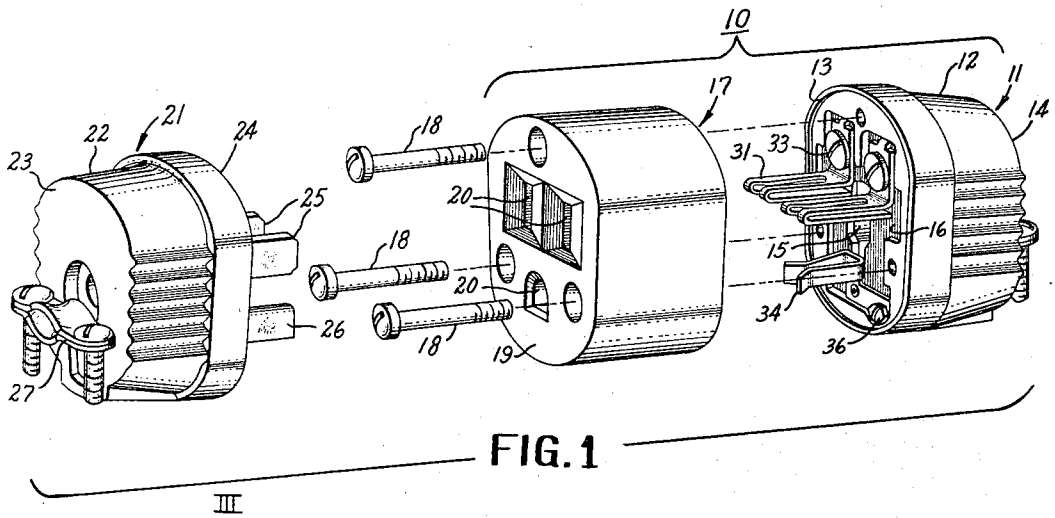


FIG. 1

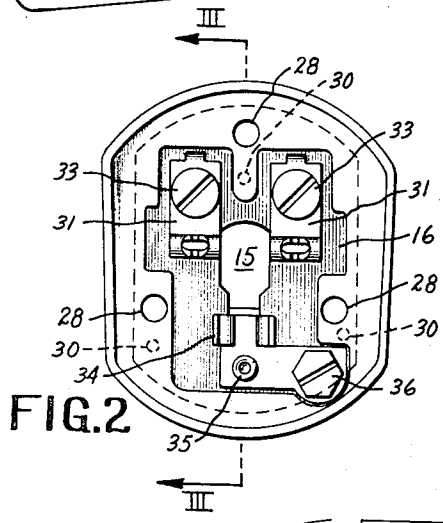


FIG. 2

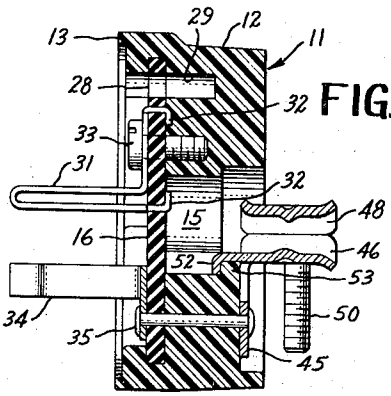


FIG. 3

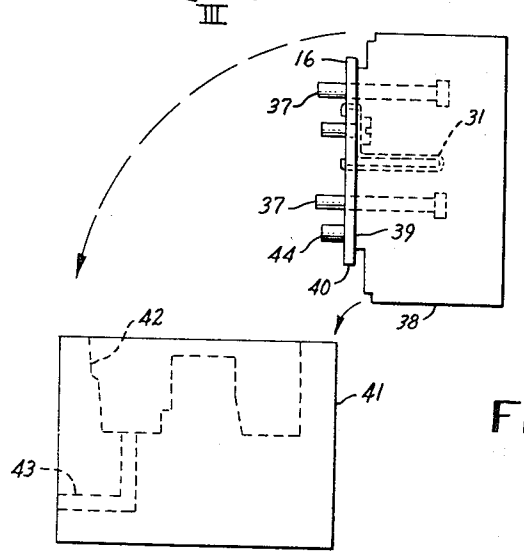


FIG. 5

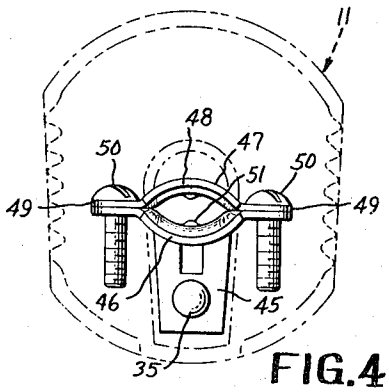


FIG. 4

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CORD CONNECTING PLUG

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ABSTRACT OF THE DISCLOSURE

A cord connecting plug and a method of forming is taught which emphasizes enclosing the portion of an insulated support of electrical contact elements with casing material. An integral fastener is formed at preforated edge portions by flow of casing resin through the perforation to link the casing and an overlaying rim of plastic.

The present invention relates to cord connecting plugs for use with electrical extension cords and to a method of making such plugs.

In the manufacture of cord connecting plugs, electric contacts have been secured to molded insulated casings in various ways. In one type of plug, a base portion of each contact is molded directly into the casing material when the casing itself is formed. In a second type of plug, holes are formed in the casing during the molding process. Contacts then are secured to the casing by means of threaded fasteners which are received in these holes. In a third type of plug, the contacts are first attached to a separate insulating board. The board is either fitted into an annular groove in the previously molded casing or attached to the casing by means of threaded fasteners which extend through the board into the casing material.

These types of plugs all have certain disadvantages. If the contacts are molded directly into the insulating casing, it is difficult to keep the contact surfaces free of "flash" or excess casing material due to material leakage during the molding process. If the contacts are molded into the casing or attached directly to the casing material by means of threaded fasteners, it is difficut to properly position them. This improper positioning becomes extremely critical when the plug is used in cold environments since the normally resilient material in the insulating casing becomes rigid under such conditions, thus preventing "give" which would compensate for the incorrect contact positioning. If the contacts are first attached to a separate insulating board and the board-contact assembly snapped into a preformed annular groove in the casing or attached to the casing by means of threaded fasteners, the material and assembly costs for the plug are greatly increased. Additionally, in all three types of plugs, the coupling between the contacts and the casing may prove to be relatively weak.

It is an object of the present invention to provide an electrical cord connecting plug manufactured by a method which eliminates the problem of contacts being covered by "flash" or excess casing material.

It is also an object of the present invention to provide a cord connector in which proper contact pressures will be maintained regardless of the resiliency of the insulating casing and in which the contacts will be properly positioned at all times.

It is a further object of the present invention to provide a cord connector in which a contact-carrying insulating disc will be firmly locked within an insulating casing without the use of preformed annular grooves or threaded fasteners.

Cord clamps are often used with all three types of plugs. Such clamps usually consist of relatively movable wire-gripping yokes attached at a single point to the plug casing. A ground contact in the plug is usually connected to the

clamp through an interposed wire or bar. Clamps so fastened may prove unsatisfactory at times in that the single point of attachment may not withstand stresses placed on the cord. Also, if the interposed wire or bar breaks loose within the casing, repairs to the plug are difficult and expensive.

It is still a further object of the present invention to provide a cord clamp which is secured to the casing at more than one point and which needs no separate, interposed wire between a ground contact and the cord clamp.

To fulfill these objects, a cord connector is provided which includes a casing having front and rear faces connected by an aperture into which a shoulder on the casing projects adjacent the rear face. An insulating disc with contacts secured thereto is positioned adjacent the front face where it is retained by casing material which overlies the peripheral portions of the disc. A cord strain relieving means, positioned adjacent the rear face of the casing, is attached to the casing at one point by means of a fastener which extends through the casing to the front face where it secures one of the contacts. The cord strain relieving means also includes a hooked portion which fits over the projecting shoulder in the aperture to help secure the strain relieving means to the casing at a second point.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which constitutes the present invention, the invention may best be understood by reference to the following description when taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a perspective view of complementary electrical connectors in which the present invention is utilized;

FIGURE 2 is a front view of the contact-carrying insulating disc showing the manner in which the peripheral portions of the disc are overlain by the casing material;

FIGURE 3 is a sectional view taken generally along lines III—III of FIGURE 2;

FIGURE 4 is an elevational view of the cord lamp which constitutes one aspect of the present invention;

FIGURE 5 is a simplified side view of apparatus in which steps in the manufacture of the present invention may be carried out.

Referring now to the drawings, FIGURE 1 illustrates complementary connecting plugs which incorporate the present invention. A female connecting plug **10** includes a base portion **11** and cover portion **17**. The base portion **11** consists of a cylindrical insulating casing **12** having a front face **13** at one end of the cylinder and a rear face **14** at the opposite end of the cylinder. These two faces are connected by a central aperture **15** which extends axially through the casing. A contact-carrying insulating disc **16** is secured adjacent the face **13** of the casing in a manner more fully described below. The cup-shaped cover portion **17** is secured to the casing **12** by bolts **18** which extend through the cover and are threaded into corresponding holes in the insulating disc **16** and sockets in the casing **12**. The cover portion **17** includes an end wall **19** having several openings **20** therein which are aligned with the contacts carried on the insulating disc **16**. A male connecting plug **21** includes an insulating casing **22** with faces **23** and **24**. A pair of contact prongs **25** and a ground contact prong **26** project outwardly from the face **24**. A cord strain relieving means or cord clamp **27** is secured to the face **23**. The construction of this cord clamp and the manner in which it is secured will be described in greater detail below.

Referring now to FIGURES 2 and 3, it will be seen that the insulating disc **16**, which is made of fiberboard or other suitable insulating material, includes a central aperture in alignment with the aperture **15**, tap drill size holes **28** through which bolts **18** are threaded and inserted into sockets **29** in the casing, and several small holes **30**, the

purpose of which is explained below. Each of a pair of contacts **31** is staked to the disc **16** by tabs **32** which are extended through openings in the disc **16** and are bent toward one another along the opposite side of the disc. The contacts **31** include wire-clamping screws **33** which pass through apertures in the disc **16** into the material of casing **12**. An electrical cord (not shown) of the type having a pair of insulated, current-carrying wires and an insulated ground wire, all of which are encased within a common outer sheath, may be electrically connected to the contacts by wrapping the bare ends of the current-carrying wires beneath the heads of the screws **33** before the screws are tightened. Once the screws are tightened, the bare ends of the wires are held securely against the contacts. The ground contact prong **34** is secured to the disc **16** by a single headed rivet **35** which extends completely through the casing **12**. A second head is formed at the other end of the rivet at assembly. The bare end of the ground wire is secured beneath the head of a clamping screw **36** in the same way the bare ends of the current-carrying wires are secured beneath the heads of screws **33**.

As will also be seen in FIGURES 2 and 3, the disc **16** is secured adjacent the front face **13** by partially embedding it within the material of casing **12**. Only the peripheral portions of the disc **16** are overlain by the rim of casing material so that the contact-carrying central area is free of any "flash" or excess material. The strength of the connection between the disc and the casing material is improved due to the presence of the holes **30** in the disc **16**. These apertures are filled with casing material joining the rim material to the underlying material so that the disc and casing are effectively interlocked without the use of separate fasteners.

A preferred method of creating this molded, interlocking connection involves the use of molding apparatus of the type shown in simplified fashion in FIGURE 5. In making the cord connecting plug, a blank fiberboard disc is punched to form the apertured disc **16**. Current-carrying contacts **31** are then staked to this disc in the manner described above. The disc-contact assembly is located on pins **37** in an upper half or cope **38** of the molding apparatus and is forced against a face **39** of the cope so that the contact-carrying central area of the disc is sealed off. The size and shape of the face **39** are such that the peripheral portions **40** of the disc remain unsealed. It should be noted that the face **39** has a protuberance **44** projecting therefrom through an aligned aperture in the disc **16**. The purpose of this protuberance is made clear below.

After the contact-disc assembly is in place, the cope is seated upon a lower half or drag **41** of the molding apparatus. This drag includes a cavity **42**, the contours which define the surfaces of a casing. Moldable material is injected through an inlet passageway **43** into the closed chamber formed by the juxtaposed cope and drag. As the closed chamber becomes filled, the moldable material surrounds the peripheral portions of disc **16** and fills the holes **30** to effectively lock the disc to the casing without the use of threaded fasteners or other mechanical holding means. Naturally, as the moldable material solidifies around pins **37** and protuberance **44**, holes will be formed in the casing. The holes formed due to the presence of pins **37** are those already referred to as sockets **29** into which the cover-retaining bolts **18** are threaded. The hole left due to the presence of projection **44** receives the clamping screw **36** of the ground contact prong **34**.

Once the casing material is solidified, the casing is removed from the mold by any suitable means; e.g., knockout plungers. While the preferred type of casing material is one which remains resilient after solidification, it will be seen that moldable non-resilient casing materials may also be used in practicing the present invention.

As was mentioned above, the double headed rivet **35**, one end of which has been formed in place following assembly, extends entirely through the casing **12**. At one end, a head on the rivet serves to hold the ground contact prong **34** to the disc **16**. At the other end, a head on the rivet secures a plate **45** to the rear face **14** of the casing **12**. The plate **45** is an integral part of the bottom yoke **46** of a cord clamp. The bottom yoke **46** and a mirror-image upper yoke **47** include a concave segment **48** flanked by apertured flanges **49** through which adjusting screws **50** pass. These screws are preferably threaded in the same direction to facilitate manufacturing and usage of the clamp. Each of the concave segments of the yokes include a protuberance **51** which grip the outer sheath of an electrical cord more firmly than a smooth-surfaced concave segment would. It should be noted that rivet **35** provides not only a mechanical connection for the ground contact and the cord clamp, but also may be used to provide an electrical connection between the two parts if the cord clamp is to be grounded, as it usually is.

As may be best seen in FIGURE 3, the lower yoke **46** is secured to the casing **12** at one point by a head on rivet **35**. The lower yoke is also secured at a second point by a hooked portion **52** which is interlocked with a shoulder **53** projecting into the aperture **15** near the rear face of the casing. The interlocking hooked portion and shoulder insure that the double-headed rivet need not absorb all strains placed upon the cord clamp. For instance, if a user attempts to disconnect the cord connecting plugs by pulling on the wire rather than on the plug casing, the strain exerted on the cord clamp will be distributed between the interlocking hooked portion and shoulder and the head of the rivet. Therefore, the rivet is less likely to fail from metal fatigue than it might be if all strains were to be absorbed by it.

From the aforegoing description, it is apparent that the present invention provides an improved method of making a cord connecting plug by which a contact-carrying insulating disc is secured to an insulating casing without the use of a preformed annular groove or additional mechanical fasteners. It should also be apparent that the present invention teaches an improved cord clamp which is firmly secured to an insulating casing at more than one point, but with a minimum of hardware.

Although it has been described what is at present considered to be the preferred embodiment of the invention, it should be understood that various modifications may be made therein. It is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is new and desired to be secured by Letters Patent of the United States is:

1. A cord connecting plug including:

(a) a casing having front and rear faces connected by an aperture extending through said casing;

(b) an insulating disc adjacent said front face and having a plurality of contact means secured thereto;

(c) said casing including an integral, inwardly-extending rim of casing material at said front face;

(d) said rim overlying the peripheral portions of said disc, thereby retaining said disc adjacent said front face;

(e) said casing also including a shoulder projecting into the aperture adjacent said rear face;

(f) a cord strain relieving means adjacent said rear face and having a hooked portion interlocked with said shoulder; and

(g) a fastener securing at least one of said contact means to said disc and extending through said casing and further securing said strain relieving means to said rear face.

2. A cord connecting plug as recited in claim **1** wherein said disc includes at least one hole filled with casing material joining the rim material to the casing material underlying said disc, whereby said disc and said casing are effectively interlocked.

3. A cord connecting plug as recited in claim **1** wherein said casing is made of a non-resilient material.

4. A cord connecting plug as recited in claim **1** wherein said cord strain relieving means comprises a fixed yoke

secured to said casing and a movable yoke, said yokes being joined to one another by spaced threaded members.

5. A cord connecting plug including:

(a) a casing having front and rear faces connected by an aperture extending through said casing;

(b) an insulating disc adjacent said front face and having a plurality of contact means secured thereto, said disc further including at least one hole therethrough; and

(c) a rim of inwardly-extending casing material at said front face, said rim overlying peripheral portions of said disc and being integrally connected to casing material underlying said disc by casing material within the hole.

6. A cord connector as recited in claim 5 wherein said casing material is non-resilient.

7. A cord connector including:

(a) a casing having first and second faces connected by an aperture extending through said casing;

(b) a shoulder on said casing projecting into the aperture adjacent said second face;

(c) a cord strain relieving means adjacent said second face and having a hooked portion interlocked with said shoulder; and

(d) a fastener extending through said casing and further securing said cord strain relieving means to said second face.

8. A cord connector as recited in claim 7 wherein the cord strain relieving means comprises a fixed yoke secured to the casing and a movable yoke, said yokes being joined to one another by spaced threaded members and being adapted to hold a cord in a fixed position relative to the casing.

9. The method of making a cord connector including the steps of:

(a) positioning an insulating disc having a contact-carrying central area within a mold cavity to present contacts on a single side of said disc;

(b) sealing off the central area of the disc;

(c) filling the cavity with a moldable insulating material so that both faces of the disc at the periphery thereof becomes imbedded in the material; and

(d) removing the molded article from the mold cavity.

10. The method of making a cord connector including the steps of:

(a) positioning an insulating disc having contacts protruding from a central portion of an upper surface thereof within a cavity;

(b) sealing said central portion so that the lower surface of the disc and the periphery of the upper surface are exposed to the cavity;

(c) filling the cavity with an insulating moldable material so that said lower surface and said periphery of the upper surface become embedded within the material;

(d) curing the material until it solidifies; and

(e) removing the molded assembly from the cavity.

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