United States Patent [19]

Wilson

[11] **3,883,804**

[45] **May 13, 1975**

[54] **ELECTRICAL FENCE-TESTER HAVING A PLURALITY OF CONNECTORS FOR CONNECTING THE TESTER COMPONENTS**

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[73] Assignee: **Dare Products, Incorporated,** Battle Creek, Mich.

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[52] **U.S. Cl.**..... **324/122;** 174/59; 174/88 R; 324/72.5; 324/133; 339/98; 339/244 R

[51] **Int. Cl.**..... **G01r 19/16;** H01r 9/00; H01r 13/46

[58] **Field of Search**..... 324/72.5, 122, 133; 339/98, 99, 210, 247, 244 R, 244 B; 174/59, 88; 340/254

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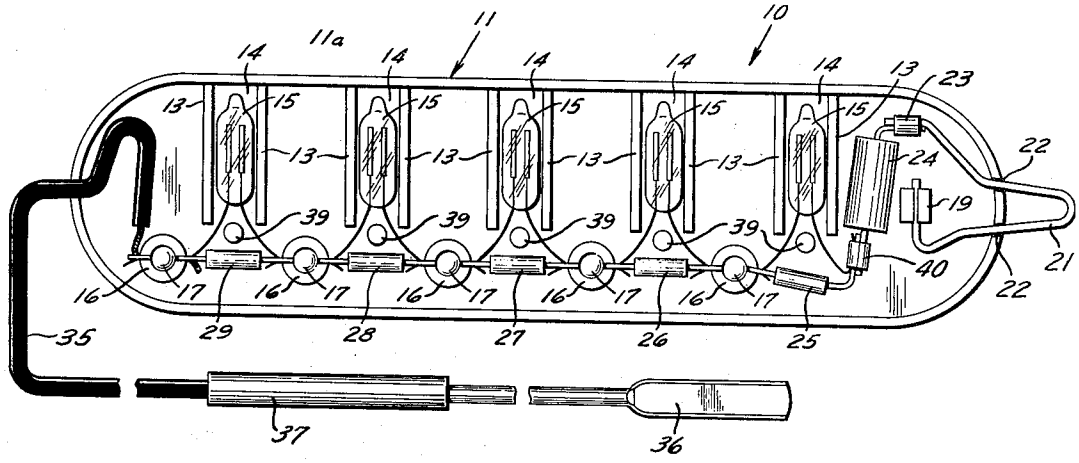
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Attorney, Agent, or Firm—Samuel Kurlandsky

[57] **ABSTRACT**

An electrical fence tester is provided having novel electrical connectors for electrically connecting the various electrical components thereof, each electrical connector comprising a pillar integrally molded into the case of the tester, an axial channel provided in the pillar, a transverse slot provided at the end of the pillar for inserting wires of the components to be connected, and a rod-form clamping member adapted to be inserted into the axial channel of the pillar and retained therein and to maintain the wires in electrical contact with each other. In one embodiment the rod-form clamping member comprises a metal rivet having a split shank, the wires to be connected being retained within the slot of the split shank, the rivet being affixed in place by melting the lip of the pillar over the rivet head, either with a soldering iron or by sonic welding. In another embodiment, the clamping members are in the form of plastic rods integrally molded on the inner surface of the cover for the tester case, the rods being inserted in the axial channels of the pillars over the wires to be connected, the cover then being sealed in place with an adhesive or by means such as sonic welding.

5 Claims, 10 Drawing Figures



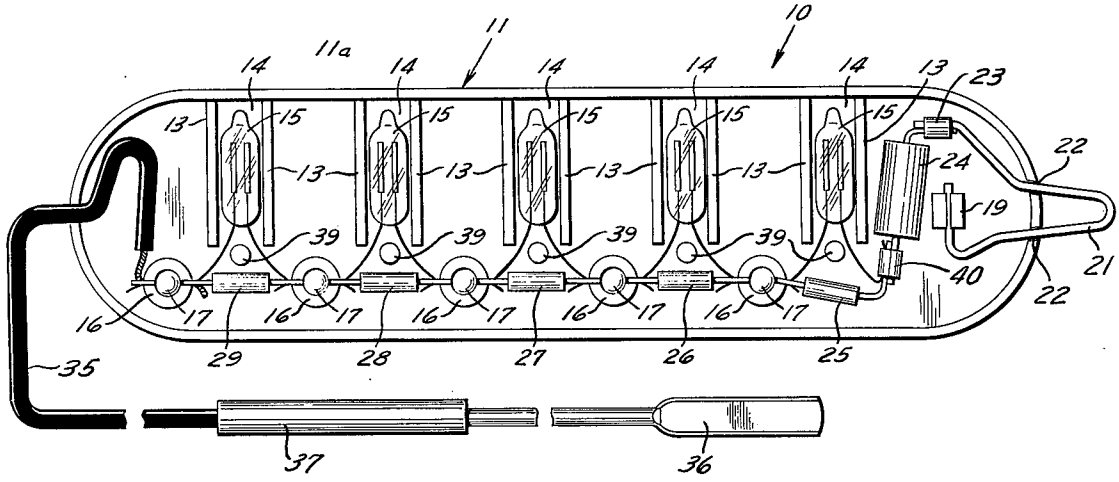


figure 1

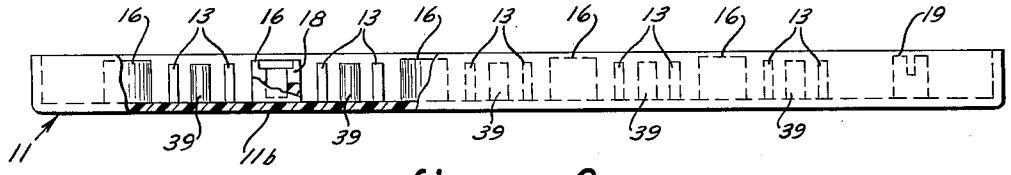


figure 2



figure 3

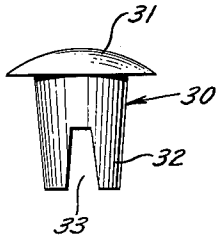


figure 5

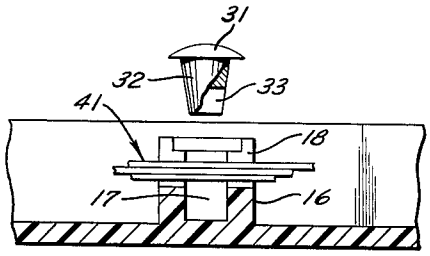


figure 4

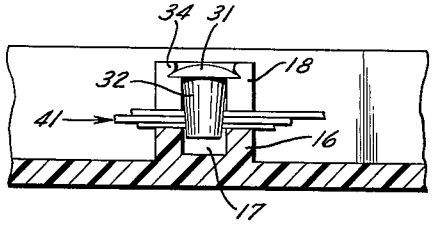


figure 6

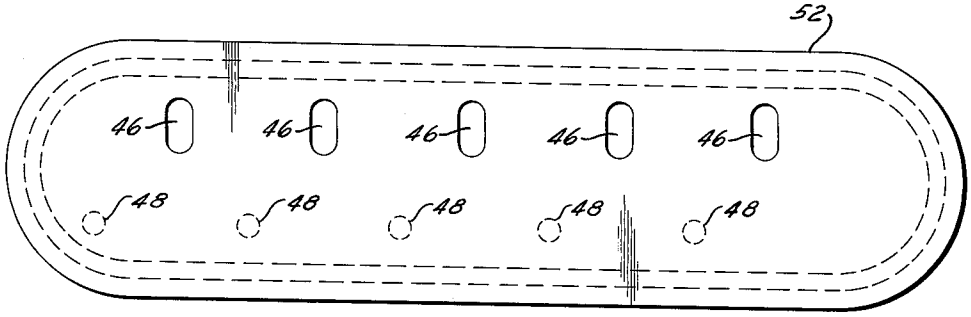


figure 7

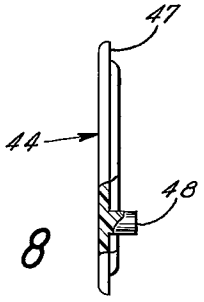


figure 8

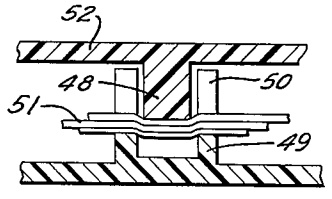


figure 10

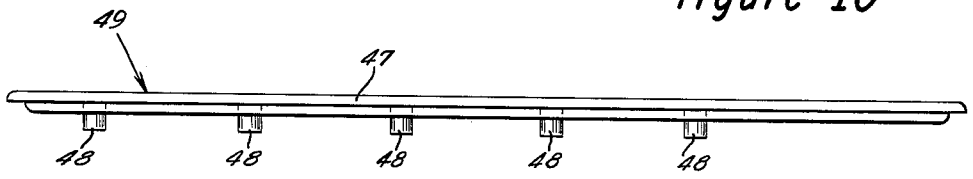


figure 9

ELECTRICAL FENCE-TESTER HAVING A PLURALITY OF CONNECTORS FOR CONNECTING THE TESTER COMPONENTS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to electrical connectors, and more particularly refers to electrical connectors which are inexpensive to form and apply, and which may be utilized in the construction of inexpensive electrical equipment, and further refers to an electrical fence tester having its components connected by the electrical connections of the invention.

2. Prior Art.

Electrical components have been traditionally connected into an electrical circuit by soldering their lead wires with those of the other components. Such a process is reliable and entirely suitable for use in high precision equipment which may be sold at a high price. However, hand soldering itself is too expensive to use for connection of the components of inexpensive electrical equipment. Various forms of connectors such as tubular connectors applied by crimping have been utilized. However, such connectors have been either too expensive or in many cases have not provided reliable electrical connections which remain operative over extended periods of use.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an electrical connector for connecting a plurality of wires, which connector may be molded into a container for the circuit.

It is a further object to provide an electrical connector, the major portion of which can be integrally molded while the container is being molded.

It is an additional object to provide an electrical conductor wherein electrical connection may be rapidly made, and when made provides excellent electrical connection over extended periods of use.

It is still further an object to provide an electrical fence tester utilizing electrical connectors according to the invention.

Still other objects will readily present themselves to one skilled in the art upon reference to the ensuing specification, the drawings, and the claims.

According to the invention, an electrical connector is provided by integrally molding into the container for the circuit one or more receptacles having an axial channel and a transverse slot adapted to receive a plurality of wires to be connected. In one form of the invention, a split metal rivet is inserted into the axial channel, straddling and engaging and pressing against the wires, and the lip of the receptacle heated and deformed over the rivet to hold it in place. In another embodiment, one or more rods are integrally molded with the plastic cover of the device and so arranged that when the cover is inserted in place, the rods enter the axial channels and maintain the wires in place in electrical contact with each other.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a top view of a container, receptacle or case for an electrical fence tester with the cover removed, showing the various components connected together by electrical connectors according to the invention.

FIG. 2 is a side elevational view partly in cross-section of the container with the components removed.

FIG. 3 is a side elevational view of the cover for the receptacle.

FIG. 4 is an enlarged fragmentary sectional view of a portion of the container showing a pillar with wires to be connected in place.

FIG. 5 is a side elevational view of a split rivet for use with the pillar.

FIG. 6 is an enlarged fragmentary sectional view showing the rivet applied in place in the axial channel of the pillar holding the wires together, and showing the lip of the pillar molded over the head of the rivet.

FIG. 7 is a top view of a cover and container for an electric fence tester utilizing another embodiment of the invention.

FIG. 8 is an end view of the cover, and

FIG. 9 is a side elevational view of the cover shown in FIGS. 7 and 8.

FIG. 10 is an enlarged fragmentary sectional view of a portion of the FIG. 7 container showing a pillar with wires to be connected in place.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1–3, an electrical fence testing apparatus **10** is shown embodying electrical connectors according to the invention. The apparatus comprises a container or case **11** and a cover **12.** The cover has a peripheral flange **12***a* for engaging the peripheral side wall **11***a* of the container **11.** The container also has a bottom **11**b integrally molded (FIG. **2**). Partitions **13** are provided to form chambers **14** for housing neon or other glow lamps **15** and maintained in place by retaining pins **39.** Electrical connectors according to the invention comprise a plurality of electrical connector pillars **16** which are integrally molded into the bottom **11**b of the container and are provided with axial channels **17** and transverse slots **18,** shown in greater detail in FIGS. **4** and **6.** A terminal retainer **19** (FIGS. **1** and **2**) engages one end of a terminal **21,** the external portion of which extends through slots **22** provided in the rim of the case **11.** The other end of the terminal **21** is connected by a clip **23** to a line resistor **24** which is in turn connected by a clip **40** to one of a series of resistors **25,** 26, 27, 28, and **29** connected in electrical series. The apparatus also includes a test lead **35** and a prod **36** having an insulating tube grip **37.** The various components of the apparatus are connected together by placing the leads from the lamps **15** in the transverse slots **18** of the proper connector pillars **16.** Split rivets **30,** such as shown in FIG. **5,** having a head **31,** a shank **32,** and a slot **33** provided in the shank are placed in the axial channels **17** of each pillar **16.** The rivet is pressed down with the wires to be connected engaged in the slots **33** of the rivets (FIG. **4**) until engagement is made with the leads **41,** and pressed downward further on the leads with sufficient force to maintain them in contact with the rivet. The lip **34** of each pillar is then heated as with a soldering iron or sonic welding or any other method, until the lip is bent over the head of the rivet to maintain it permanently in place, as shown in FIG. **6.** This results in a permanently operable electrical connection. The remaining connections are made in similar manner.

FIGS. **7, 8, 9,** and **10** illustrate another embodiment of the invention. This embodiment utilizes the same

container or case **44** and circuit shown in FIGS. **1** and **2.** The cover **45** similarly is provided with lamp openings **46** and a flange **47.** Pillars **49** having an axial channel **50** are integrally molded in the bottom of the container or case **44,** and a transverse slot **50** provided at the end of each pillar **49** (FIG. **10**), as in the previous embodiment described. However, this embodiment differs in that the cover **49** is provided with a plurality of protuberances **48** designed to cooperate with the axial channels **50** of the pillars **49.**

In assembling the apparatus, the leads **51** are placed in the transverse slot **50,** as shown in FIG. **10.** The cover is then applied in place over the container. As the cover is moved close to the container, the protuberances **48** engage and enter the axial channels **50.** As the cover **52** reaches its final position in engagement with the container **44,** the protuberances engage and squeeze together the leads positioned in the transverse slots **50,** thereby providing good electrical contact which is maintained over extended periods. The cover is affixed in place on the rim of the container by an adhesive, by heating as with a soldering iron, or by sonic welding.

As shown in the drawings and described, the container, cover, and connector pillars are integrally molded from a plastic material. Suitable materials are polystyrene, polyethylene, polypropylene, polyvinyl chloride, polyurethane, phenylformaldehyde, and many other molding materials commonly used. However, if desired, other non-conducting materials may be utilized such as formica, fiberglas impregnated with resin, pressed board, and similar molded materials.

The circuit shown in the drawings is a conventional voltmeter-type circuit. The electrical current tested is applied to the series resistors **25, 26, 27, 28** and **29** which form a voltage divider. Since the current flowing through all the resistors is the same, the potential differences across the resistors are proportional to their individual resistances. The neon bulbs **15** light only when a threshold voltage is exceeded. Consequently, by properly choosing the resistances so that they decrease in ohmic value from left to right, an arrangement may be obtained wherein a small test voltage lights only one bulb, a larger one two bulbs, and so on from left to right, until a maximum voltage lights all the bulbs. Direct voltage calibration may also be obtained by proper resistance selection, as is well known in the art.

The electrical connectors of the invention have several advantages over prior art connecting means. First, they provide a very inexpensive method of forming good electrical connections in an electrical apparatus. Second, the connection may be very rapidly formed and is well suited for use in automatic circuit fabricating apparatus. The connections thus formed have been found to provide excellent electrical connection of the entire plurality of wire leads joined thereby. The embodiment utilizing protuberances formed on the cover of the apparatus container is especially rapid in use as the single step of applying and affixing the cover simultaneously establishes a plurality of electrical connections for the entire apparatus circuit contained in the container.

While but several forms of the invention have been shown and described, other forms within the spirit and scope of the invention will now be apparent to those skilled in the art. Therefore, the embodiments shown in the drawings are to be considered are merely setting forth the invention for illustrative purposes and are not intended to limit the scope of the invention herein described and shown.

I claim:

1. An electrical fence tester comprising:

A. a container,

B. a cover adapted to be mounted on said container and to be affixed thereto,

C. an electrical circuit comprising:

1. a plurality of resistors connected in series, the values of said resistors decreasing from one end to the other,

2. a plurality of glow lamps one connected across each of said resistors,

3. a plurality of electrical connectors connecting the respective leads of said glow lamps and said resistors to each other, each connector comprising:

a. a pillar integrally molded to said container having non-threaded axial channel and having an open transverse slot provided at the end of said pillar and communicating with said axial channel, and

b. a protuberance axially slidably disposed in said axial channel in contact engagement with the walls of said axial channel engaging and maintaining the electrical leads from said glow lamps and said resistors in electrical contact,

4. external terminals connected to said circuit.

2. An electrical fence tester according to claim **1,** wherein each of said protuberances is a split metal rivet having a slot at the end thereof and having said electrical leads disposed within said slot.

3. An electrical fence tester according to claim **2,** wherein the lip of each of said pillars is deformed over the heads of said rivets to retain said rivets in place.

4. An electrical fence tester according to claim **1,** wherein each of said protuberances is integrally molded into the surface of said cover and so disposed as to enter the axial channel of a pillar when said cover is mounted in place.

5. An electrical fence tester according to claim **4,** wherein said container, said cover, said pillar, and said protuberance are molded from a plastic material.

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