

Feb. 28, 1967

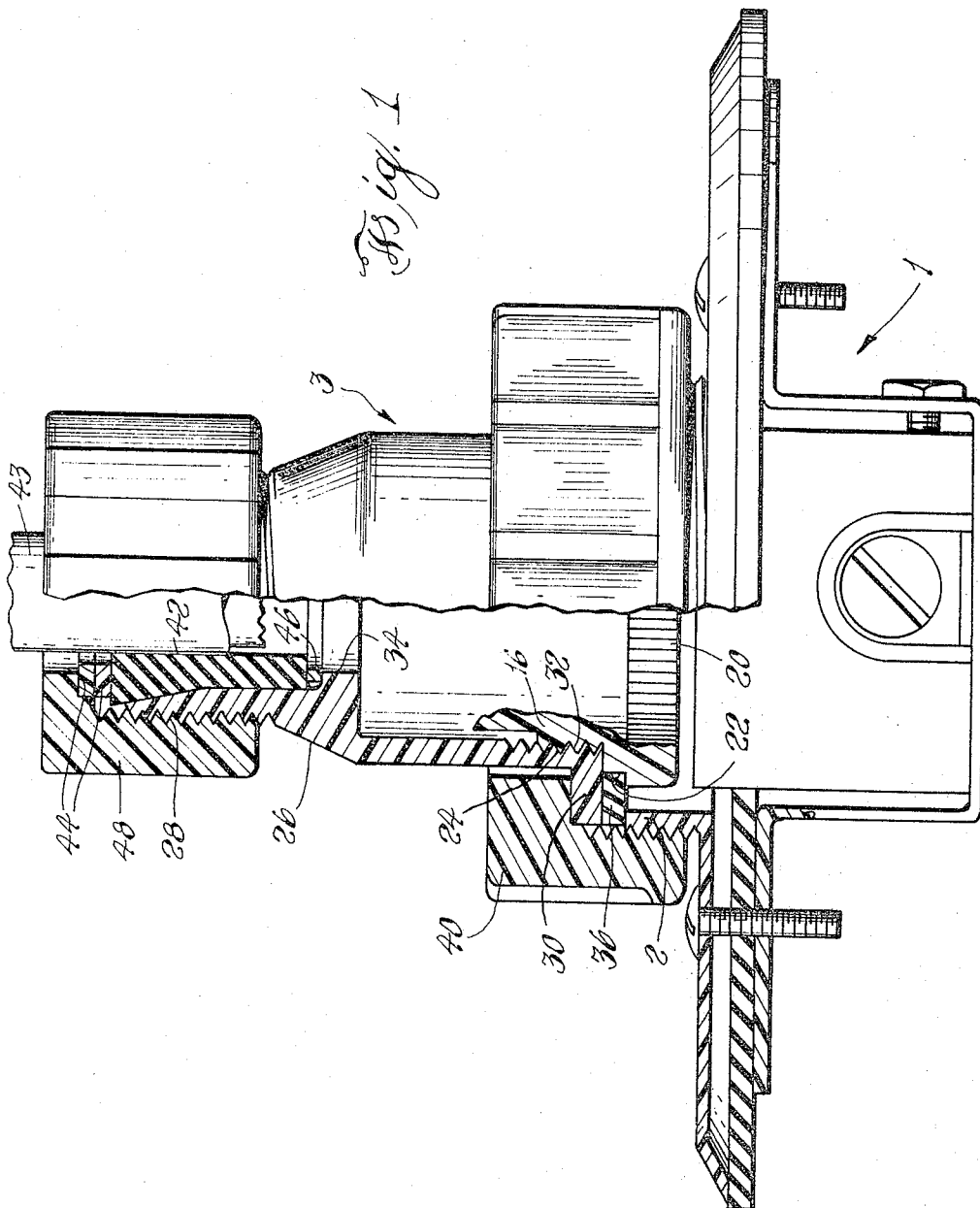
E. SWARTZ

3,307,138

WATERTIGHT REPAIRABLE ELECTRIC PLUG

Filed March 19, 1965

3 Sheets-Sheet 1



INVENTOR.
EDWARD SWARTZ

BY *William J. Bowers*
AGENT
John M. Pearson
ATTORNEY.

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E. SWARTZ

3,307,138

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3 Sheets-Sheet 2

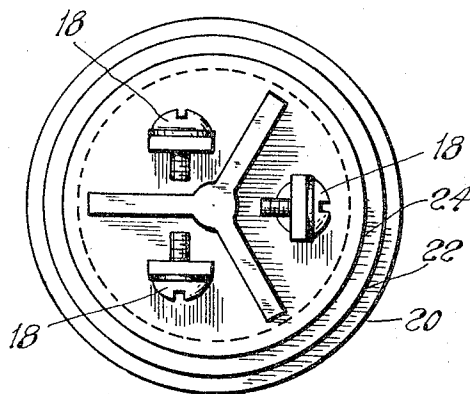


Fig. 3

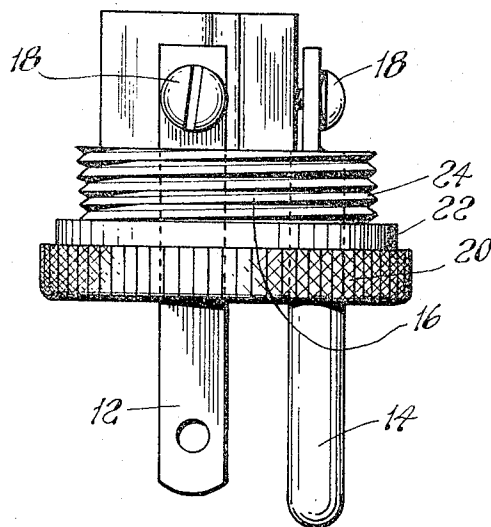


Fig. 2

INVENTOR.
EDWARD SWARTZ
BY *Arthur J. Howes*
AGENT
John W. Pease
ATTORNEY

Feb. 28, 1967

E. SWARTZ

3,307,138

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3 Sheets-Sheet 3

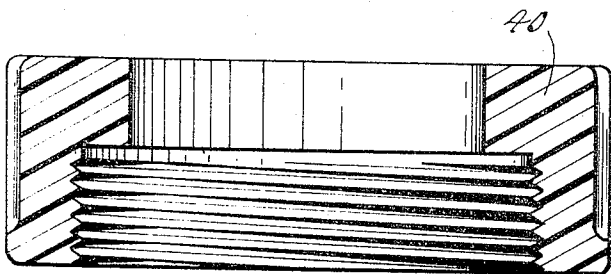


Fig. 5

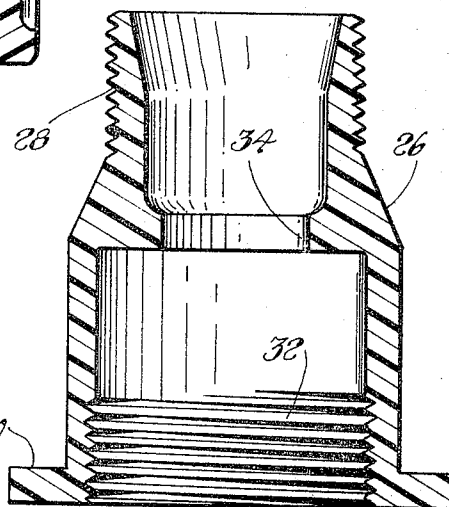


Fig. 4

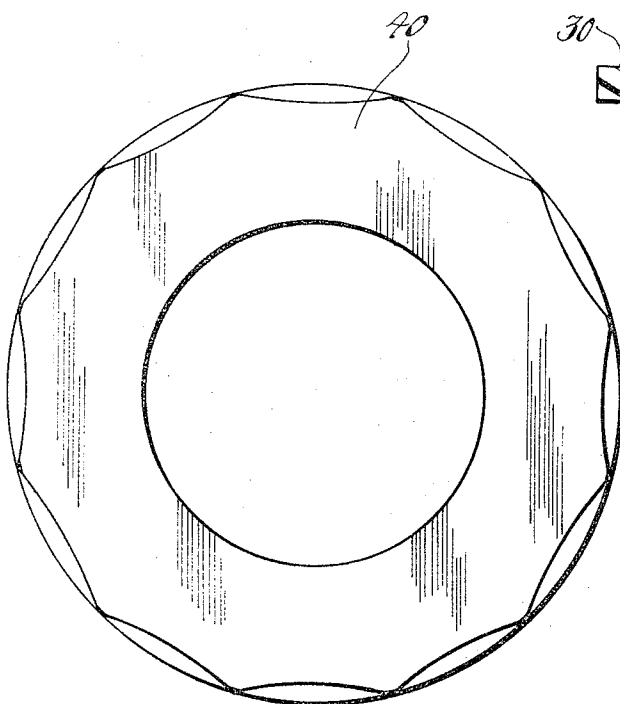


Fig. 6

INVENTOR
EDWARD SWARTZ
BY *Richard L. Bowers*
AGENT
John W. Pears
ATTORNEY

1

3,307,138

WATERTIGHT REPAIRABLE ELECTRIC PLUG

Edward Swartz, 120 Fountain St.,

Haverhill, Mass. 01108

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2 Claims. (Cl. 339-89)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to an electric plug for maintaining a watertight connection when inserted into receptacle connection box and which can be taken apart, repaired or replaced on a cable by inexperienced personnel using only a screwdriver.

Bladed type plugs and receptacles for the plugs are commonplace devices for connecting an electric power consuming device and a power source. Many power supply receptacles are mounted outdoors where they are exposed to rain. Such receptacles are also located in exterior locations aboard ship and in shore installations exposed to saltwater spray and dousing as well as rain. Generally these receptacles have a cylindrical shield that is externally threaded and a threaded cap attached to the receptacle by a short length of chain for enclosing the terminals when the receptacle is not in use. All commercial plugs now used on portable tools, instruments, extension cords, etc., are not watertight while inserted into a mating receptacle though the receptacle has a cap to keep it watertight when the plug is not used. It is essential to moisture seal the plug-receptacle connection to prevent short circuit or shock hazard. No satisfactory connection devices have been available for these more demanding conditions. Existing molded rubber plugs, molded integral with the cable, do not solve these problems and have the additional disadvantage of not being repairable.

An object of this invention is to provide an improved blade type electric plug for use with a shielded type of receptacle that will maintain a positive watertight condition of the electrical contacts. A further object is to provide a plug for use on weatherdecks of ships or shore installations.

A further object is to provide a blade type plug for use in environments where airborne saltwater spray and saltwater dousing is likely.

A further object is to provide a simple, easily repairable, comparatively low cost plug capable of forming a sealed electrical connection with a receptacle in environments where shorting by conductive liquid may occur.

Other objects and advantages will appear from the following description of an example of the invention, and the novel features will be particularly pointed out in the appended claims.

FIG. 1 shows an assembled embodiment of this invention in a shielded type receptacle partly in side elevation and partly in longitudinal section.

FIGS. 2 and 3 are side elevation and end views respectively of the contact terminal subassembly of the plug shown in FIG. 1.

FIG. 4 is a longitudinal section of the plug body of the embodiment shown in FIG. 1, and

FIGS. 5 and 6 are elevation and longitudinal section views of a cap of the plug shown in FIG. 1.

In FIG. 1 there is shown a conventional shield type receptacle 1, marketed commercially, e.g. industry 7792 receptacle for a bladed plug and including an externally threaded cylindrical shield 2. When the socket is not in use it is sealed by a screw cap, not shown. A plug 3 in accordance with this invention is shown in place in the shielded receptacle. This invention is intended for use

2

with any of the various commercially marketed shielded receptacles of the type shown.

The contact terminal subassembly shown in FIGS. 2 and 3, of the plug 3, includes two identical blade type contact terminals 12 and a third blade type contact terminal 14 of somewhat different geometry from the other two terminals generally serving as a ground terminal and as plug polarizing means. The three terminals are not symmetrically distributed about the axis of the plug tip. The design and spacings of the terminals are chosen to conform with the design of the receptacle for which the plug is intended. The terminals are molded in place and sealed by the dielectric body 16 which may be any of various moldable synthetic plastic materials e.g. nylon that have good dielectric properties. The three terminals extend through the plastic body and a screw 18 is threaded into the inner end of each of the terminals for securing conductor ends, not shown, to the terminals.

The dielectric contact supporting body comprises in longitudinal succession a knurled finger grip section 20, a squared edge circular step 22 of less diameter than section 20, an externally threaded section 24 of lesser diameter than circular step 22, and a dielectric barrier molded in place and having three radial walls for electrically isolating the screw bearing ends of the terminals.

A hollow plug body 26 having a cylindrical exterior terminating at one end in a threaded section 28 and terminating at the other end in a flange 30 and an interiorly threaded section 32 adjacent the flanged end is designed for assembly with the threaded portion 24 of the contact terminal subassembly as shown in FIG. 1.

The plug body is formed with an interior circular lip 34 intermediate its ends. The mouth of the plug body at the end opposite the flanged end, is flared.

An elastomeric annulus or gasket ring 36 having an outside diameter substantially the same as the outside diameter of the flange and an inside diameter substantially the same as the diameter of the step 22 and a thickness somewhat less than the height of step 22 is seated around step 22 whereby the gasket ring is retained between the flange 30 of the plug body and the knurled finger grip section 16 of the contact terminal subassembly.

A screw cap 40, shown in FIGS. 5 and 6, fitted loosely on the exterior cylindrical surface 26 of the plug body and for engaging the flange 30 and the threaded exterior shield 2 of an outdoor receptacle 1. An annular elastomeric waterproofing packing 42 flared near one end is disposed in the flared end of the plug body to surround a cable 43 connected to the plug body. Washers 44 and 46 abut the ends of packing 42. A screw cap 48 on the threaded end of the plug body is provided to force inwardly and compress the flared packing 42 to insure a watertight seal between the plug cable 43 to which it is connected.

At assembly the cap 48 and washers 44 are threaded on the cable 43, the packing 42 is urged along the cable, and the washer 48, screw cap 40, plug body 26 and gasket ring 36, are threaded on the cable 43. The cable end is prepared and the bared ends of the wires of the cable are secured by the screws 18 to the terminals. Then the gasket ring 36 is seated on the contact terminal support around the circular step 22 and the plug body is threaded onto the contact terminal support until snug to confine the gasket ring between the flange of the plug body and the finger grip section of the plug tip. The washer 46 is seated against the lip 34 and the packing 42 and the washers 44 are urged to the plug body and then forced by the cap 48 into the plug body.

When the plug described is plugged into a receptacle 1 that is provided with an exterior threaded shield 2, the screw cap 40 is threaded on the receptacle shield until tight to clamp the periphery of the gasket ring 36 be-

3

tween the flange and the end of the receptacle shield to seal the plug receptacle connection against moisture.

The plug can be readily disassembled from the cable and repaired if one or more of the connections in the plug fail. Alternatively the cable may be cut adjacent the plug; then the cap 48 is unscrewed from the plug body, and the plug body and contact terminal subassembly are separated. The wire remnants are cleaned out. The cable end is prepared and the plug is reassembled as described above. Substantial savings are obtained because this watertight plug is repairable.

It will be understood that various changes in the details, materials and arrangements of parts (and steps), which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

I claim:

1. A plural blade type plug for a receptacle of the type having a threaded cylindrical shield and adapted to be sealed with a moisture sealing cap when the receptacle is not in use, said plug comprising:

- (a) a molded plug blade support of dielectric material,
- (b) a plurality of plug blades for engaging the receptacle terminals molded into said plug blade support and each extending through the plug blade support and formed for connection to respective conductors,
- (c) said plug blade support including in longitudinal succession a finger gripping section beyond which extend the plug blades, a recessed circular step, and a threaded portion of lesser diameter than the circular step,
- (d) a hollow cylindrical plug body terminating in a flange at one end and interiorly threaded at that end

4

for assembly with the threaded portion of said blade support for shielding the blade to conductor connections,

- (e) an elastomeric annulus surrounding the circular step of said blade support and confined between the flange of the plug body and the finger gripping section of the support,
- (f) a screw cap slidable along the exterior of said plug body for abutting the flange and for threaded engagement with the exterior of the receptacle shield for compressing the elastomeric annulus between the flange and the open end of the shield after the plug is in the receptacle.

2. A plural blade type plug as defined in claim 1 further comprising:

- (g) elastomeric packing in the end of said plug body opposite the flanged end,
- (h) the exterior of the end of said plug body opposite the flanged end being threaded, and
- (i) a threaded cap on the threaded end of the plug body having a cable opening therethrough for compressing the packing to form a moisture seal between the plug body and a cable that extends into the plug body.

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EDWARD C. ALLEN, *Primary Examiner.*

W. DONALD MILLER, *Examiner.*