

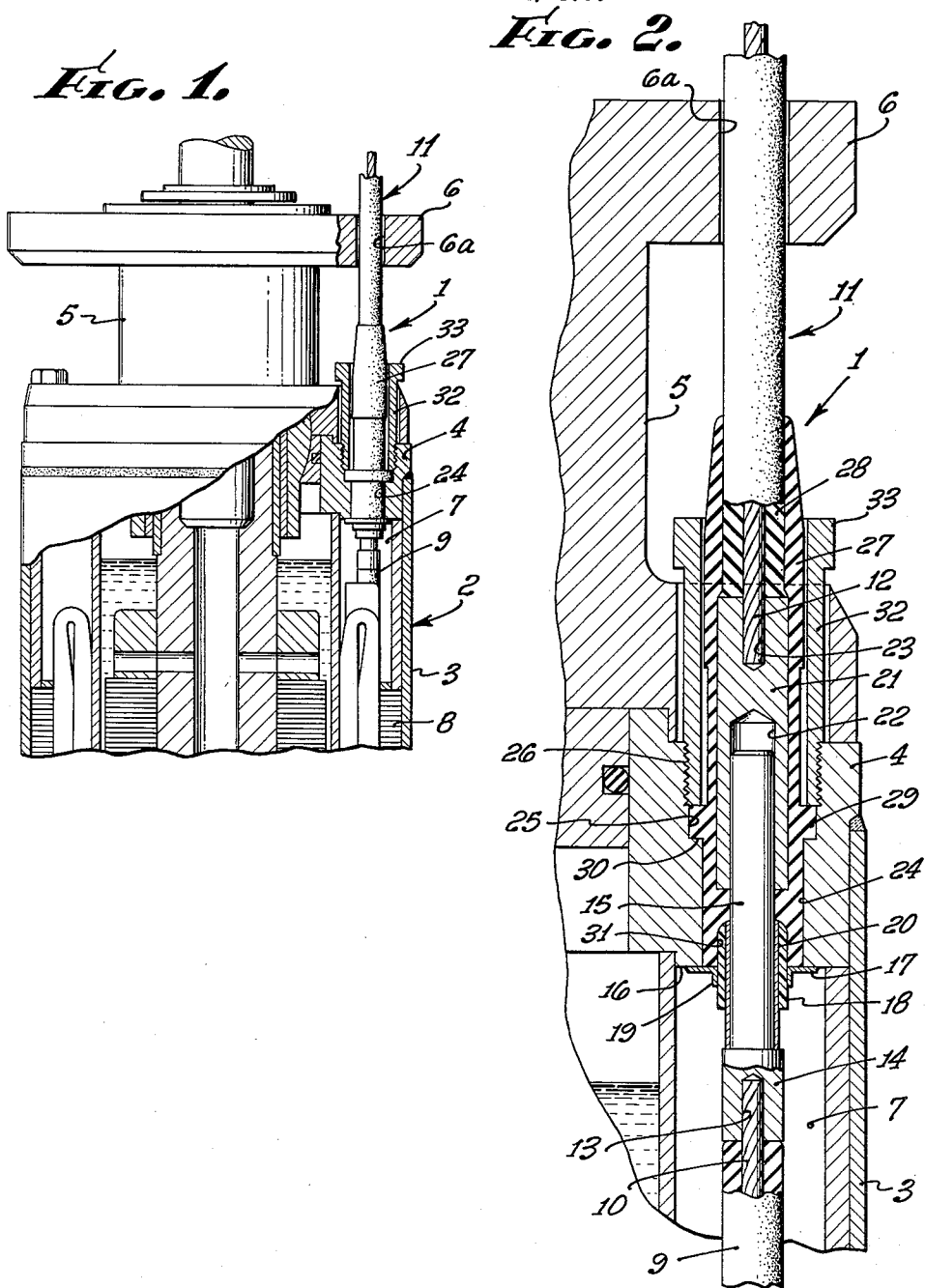
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DETACHABLE PLUG CONNECTOR FOR SUBMERSIBLE APPARATUS

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DETACHABLE PLUG CONNECTOR FOR SUBMERSIBLE APPARATUS

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1 Claim. (Cl. 339-94)

This invention relates to detachable plug connectors adapted for use with submersible apparatus, such as submersible electric motors.

Such connectors serve to convey electrical energy from the top of the well to the stator windings of the motor. The motor usually has a casing which serves, with other elements of the structure, to enclose the stator windings in a sealed chamber. In this way, access of well liquid to the windings is prevented, thereby forestalling damage to the windings.

External connections to the windings must be effected in such manner as to maintain the sealing of the chamber in which the windings are located.

It is one of the objects of this invention to provide a detachable connector structure for such winding that ensures against the entry of liquid to the winding past the connector.

It is another object of this invention to make it possible in a simple manner, hermetically to seal the chamber and to maintain the seal whether the plug connector is in conductive position or not.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of one embodiment of the invention. For this purpose, there is shown a form in the drawings accompanying and forming part of the present specification. This form will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawings:

FIGURE 1 is a fragmentary view, partly in longitudinal section, of a submersible motor incorporating the invention; and

FIG. 2 is a greatly enlarged fragmentary sectional view of the plug connector as installed in a submersible motor.

In the present instance, a plug connector 1 is shown as installed in connection with a submersible motor 2. This submersible motor 2 has an outer shell or casing 3 carrying a collar 4. It also has an extension 5 having an upper flange 6. Aperture 6a in the flange permits the passage of an insulated conductor 11.

The collar 4 forms a part of the motor housing, and serves to define a closed chamber 7 in which is located a stator winding 8.

Since this manner of forming a sealed space for the stator winding 8 is now well-known, further description thereof is unnecessary.

An insulated conductor 10 leads from a terminal of the stator winding 8, and is provided with a bared end portion, illustrated in this instance as made of stranded wire. The insulation layer 9 is preferably made of rubber.

The insulated conductor 11 is adapted to extend to the top of the well. As illustrated most clearly in FIG. 2, the lower end 12 of the conductor is bared, and is shown as of stranded form. A rubber or other insulation layer 28 covers the conductor 11, except for the bared end 12.

The coupler illustrated herein is intended detachably to provide a connection between the conductor 10 and the opposed end 12 of conductor 11 without destroying the seal of the chamber 7.

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The conductor 10 is soldered or otherwise permanently attached within an opening or aperture 13 formed in the lower enlarged end 14 of a conducting pin 15. This conducting pin 15 is permanently supported by the aid of the lower surface 16 of the collar structure 4, which may be made of metal or other suitable material. For this purpose, there is provided a metal flanged ring or collar 17 which is welded or otherwise sealingly affixed to the surface 16. Extending through this ring 17 is a ceramic insulating sleeve 18 firmly joined to the flange 19 of the ring 17. Disposed between the sleeve 18 and the pin 15 is a thin metal sleeve 20. This metal sleeve 20 has a clearance with respect to pin 15, and is attached thereto, as by soldering, to the shoulder formed by the enlarged end 14 of the pin 15. The ceramic sleeve 18 is properly bonded both to the sleeve 20 and to the flange 19 of ring 17.

The pin 15 forms one of a pair of detachable coupling members. It is preferably made of oxygen-free, high-conductivity copper, and is silver-plated in order to improve conductivity.

The other element of the detachable connection is formed by a rod-like conducting member 21 which has an aperture 22. Into this aperture the pin 15 is adapted to slide.

The upper end of the conducting member 21 is provided with an aperture 23 into which the lower bared end 12 of conductor 11 is firmly attached, as by soldering.

The collar 4 is appropriately formed with a relatively large diameter aperture 24 into which the pin 15 and member 21 extend. This aperture is provided with an enlarged portion 25, the upper end 26 of which is threaded.

In order to insulate the detachable elements 15 and 21 from the casing elements of the motor 2, an insulating member 27 is provided. This insulating member is preferably made of resilient elastomer, and is firmly attached to the insulation layer 28, as well as to the exterior surface of the connector member 21. This insulating member 27 rests on the ring 17 at its lower end. It is provided with a flange 29 resting upon the shoulder 30 formed by the enlarged aperture 25. The lower end of the member 27 is provided with a recess 31 appropriately to accommodate the upper portion of the ceramic sleeve 18.

In order firmly to attach the insulation 27 to the collar 4, use is made of a hollow screw 32 which passes with clearance over the insulation member 27. Its lower end is threaded into the threads 26; it engages the flange 29 to compress it against shoulder 30. An enlarged head 33 is provided for appropriate manual manipulation for engaging and disengaging the lower threaded end with the threads 26.

When it is desired to uncouple the conducting members 15 and 21, the hollow screw 32 is rotated to disengage it from the threads 26. Then the conducting member 21, with its associated rubber layer 27, may be pulled upwardly to disconnect the member 21 from the pin 15.

When disconnected, the welded ring 17 prevents ingress of any well liquid into the chamber 7. This ring forms a permanent hermetic seal for the chamber 7.

The inventor claims:

In a connector structure adapted to conduct electrical energy past a wall such as the wall of a submersible motor: said wall having a through aperture, an upper enlarged part of said aperture having a threaded portion, and said aperture having a shoulder between the enlarged threaded portion and the remainder thereof; a support member sealingly attached to one surface of the wall and underlying the portion of the aperture which is unthreaded; said member having an aperture registering with the wall aperture; an electrical conducting pin extending through said registering aperture and extending above and

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below said registering aperture; said pin having an enlarged shoulder located below said registering aperture; a sleeve of insulation material interposed between the pin and the wall of said registering aperture and having a portion extending above said registering aperture and being sealed to said wall of said registering aperture; a metallic sleeve interposed between said insulation sleeve and said pin and sealed to said insulation sleeve and having a portion extending below said registering aperture engaging and sealingly soldered to said shoulder; a conductor member having an opening into which the portion of the pin extending above said registering aperture slides; the pin having a part of said portion that is not received in the opening; a tubular layer of resilient insulation material surrounding and contacting said part of said portion

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of the pin, said conductor member, and said portion of said insulating sleeve, and abutting said support member; said layer having a flange resting on said shoulder of the wall aperture; and a hollow member disposed over the layer and having a threaded section engaging the threads in the wall aperture, and a portion abutting the flange urging the flange against the shoulder.

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