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⑤④ **Electric coupler.**

⑤⑦ An electric coupler (1) is mounted on an end of an armoured electric cable (6) having a plurality of individually screened conductors (5). The coupler comprises a metal head (2) which forms the front face of the coupler; at least two tubes (3) of electrically insulating material secured in the head; an electrical contact (4) positioned within each tube and electrically connected to a respective conductor of the cable from an end part of which the screen (14) has been cut back, clamping means (10) electrically and mechanically connected to the head, clamping the wire armouring (9) of the cable; a foramenous metallic earth screen (16) surrounding the tubes and the said end part of each conductor; and a hard resinous insulating compound (19) which fills the voids within the screen, embeds the screen and forms the outer circumferential surface of the coupler.

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ELECTRIC COUPLER

This invention relates to an electric coupler, especially, though not exclusively, an electric coupler for use in mines and quarries.

In a known arrangement, an electric coupler comprises a metal housing; a plastics head at one end of the housing within which electric contacts are secured; an opening at the other end of the housing through which the insulated conductors of an electric cable pass, the conductors being attached to the contacts; and a gland for clamping the wire armouring of the cable to the outer surface of the housing; the voids within the coupler being filled with a resin or compound passed through an aperture in the housing after the coupler has been assembled, and which hardens to form a weather-proof coupler.

This known arrangement has the disadvantages that the metal housing makes the coupler heavy and expensive to produce; no screening is normally provided between the contacts; and that a different size of gland has to be used for each size of cable.

It is the object of this invention to overcome these disadvantages.

According to the present invention an electric coupler is mounted on an end of an armoured electric cable having a plurality of individually screened conductors, and comprises a metal head which forms the front face of the coupler; at least two tubes of electrically insulating material secured in the head; an electric contact positioned within each tube and electrically connected to a respective conductor of the cable from an end part of which the screen has been cut back; clamping means electrically and mechanically connected to the head, clamping the wire armouring of the cable; a foramenous metallic earth screen surrounding the tubes and the said end part of each conductor; and hard resinous insulating compound which fills the voids within the screen, embeds the screen and forms the outer circumferential surface of the coupler.

The insulating compound is preferably based on an epoxy resin, a polyurethane or an acrylic casting resin.

Preferably the conductors are crimped to the contacts. An insulating sleeve preferably surrounds each crimped joint. Preferably the sleeve is of heat shrinkable plastics. Alternatively the sleeve may be formed from a wound tape of insulating material.

By using a metal head, portions of the head can be designed to extend between the contacts, thereby screening the contacts from one another. The metal head is preferably in one piece. Alternatively the head may be in two parts, a front part forming a face for the coupler, and a rear part forming screening fins between the contacts.

Preferably the wire armour clamping means is mounted on to at least one metal support pillar attached to the metal head. Preferably the clamping means has a fastening screw or screws by which each conductor screen can be mechanically and electrically connected to the clamping means.

Preferably there are three support pillars attached to the metal head. Preferably the support pillars are screw threaded to the head. Where the head is in two parts, preferably a threaded portion of at least one support pillar extends through an aperture in the rear part and is screw threaded to the front part thereby securing the parts together.

Alternatively the wire armour clamping means may be mounted on metallic screening fins which extend from the metal head to form interphase barriers both between the contacts and between the conductors. In this case wire armour clamping means may comprise at least two metal rings through the centres of which the conductors pass and which are drawn together to grip the wires. For example, two separate metal rings may be secured by nuts which are screwed onto threaded spigots or studs which extend from the screening fins, or one ring may be formed integrally with the screening fins and at least one separate ring fastened to it by screws.

The contact insulating tubes are preferably bonded to the metal head by a suitable adhesive. Alternatively, where the head is in two parts, the tubes may be held in position by clamping a portion of each tube between the two parts of the head. The tubes are preferably of a thermoset polyester dough moulded material.

Preferably the foramenous metallic earth screen is connected by clamping rings to the head and the wire armouring clamping means. The screen may be a preformed metal (e.g. brass) mesh or (provided provision is made for filling with resin) a thin metal (e.g. copper) sheet.

Any suitable type of mould may be employed in the manufacture of the invention. Preferably, the mould is in two-parts and formed from cast iron, tool steel, stainless steel or aluminium alloy - (depending on the expected usage and storage conditions available). To prevent adhesion between the mould and the insulating compound, the inter-

nal surfaces of the mould are treated with a permanent release coating (e.g. of PTFE) but, as an alternative, it is possible to coat the internal surfaces of the mould with any suitable greasy compound which is not miscible with the liquid resin, e.g. silicone grease, each time the mould is used. Another possibility is to use a mould made wholly from a strong, heat-resisting plastics material, e.g. PTFE.

This invention has the advantage that it is much lighter than conventional couplers, and less expensive to produce. The wire armouring clamping means can be used for cables having any diameter within a predetermined relatively wide range.

The invention is further described, by way of example, with reference to the accompanying drawing which is a longitudinal cross-section showing an electric coupler in accordance with the invention in course of manufacture;

The drawing shows a single-part metal head (2) for the coupler having three tubes (3) secured within it. The tubes (3) are of a thermoset dough-moulded polyester insulating material and are secured in the head by an epoxy adhesive.

Each tube (3) forms an insulator for a contact (4) on the end of a respective screened conductor (5) of a three core wire armoured cable (6). The contact (4) is made of copper and is crimped on to its exposed conductor (5) and held within the corresponding tube (3) by a brass contact securing ring (7) screwed on to the contact. An insulating sleeve (8), formed from a heat shrinkable plastics material, surrounds each crimped joint to keep the interstices of the stranded conductor free from the insulating compound in which the metal parts will in due course be embedded.

The cable armouring (9) is connected to a clamp (10) which is mounted on metal support pillars (11) which are screwed into and extend from the metal head (2). The clamp (10) comprises three metal rings (12) through which the cable conductors pass, the rings being fastened together by nuts (13) which are screwed on to the support pillars (11), with the armouring clamped between the rings.

In this particular example, the cable (6) comprises three screened conductors (5). The conductor screenes (14) are mechanically and electrically connected to the clamp (10) by a fastening screw (15).

A brass screening mesh (16) is positioned around the contacts and conductors to form an outer screen, the mesh being mechanically and electrically connected by clamping rings (17, 18) to the head (2) and the clamp (10).

A two-part mould (19) formed from cast iron and having a coating of PTFE on its internal surfaces, is then clamped around the head (2) and cable (6) and a polyurethane casting resin poured into the mould until all the voids (20) within the screen are filled and the screen is embedded within the resin. When the resin has hardened, the clamps and mould are removed to leave the finished coupler.

Claims

1. An electric coupler, mounted on an end of an armoured electric cable having a plurality of individually screened conductors, comprising a metal head which forms the front face of the coupler; at least two tubes of electrically insulating material secured in the head; an electric contact positioned within each tube and electrically connected to a respective conductor of the cable from an end part of which the screen has been cut back; clamping means electrically and mechanically connected to the head, clamping the wire armouring of the cable; a foramenous metallic earth screen surrounding the tubes and the said end part of each conductor; and a hard resinous insulating compound which fills the voids within the screen, embeds the screen and forms the outer circumferential surface of the coupler.

2. An electric coupler as claimed in Claim 1, wherein the metal head is in one piece.

3. An electric coupler as claimed in Claim 2, wherein at least one support pillar is screwed into the metal head.

4. An electric coupler as claimed in Claim 1, wherein the metal head is in two parts, a front part forming a face for the coupler, and a rear part forming screening fins between the contacts.

5. An electric coupler as claimed in Claim 4, wherein a threaded portion of at least one support pillar extends through an aperture in the rear part and is screw threaded to the front part thereby securing the parts together.

6. An electric coupler as claimed in Claim 3 or Claim 5, wherein the wire armour clamping means is mounted on to at least one metal support pillar attached to the metal head.

7. An electric coupler as claimed in Claim 6, wherein the clamping means comprises at least

two metal rings through which the cable conductors pass, the rings being fastened together by nuts which are screwed on to threaded portions on the support pillars, with the wire armouring clamped between the rings.

8. An electric coupler as claimed in Claim 2 or Claim 4, wherein the wire armour clamping means is mounted on metallic screening fins which extend from the metal head to form interphase barriers both between the contacts and between the conductors.

9. An electric coupler as claimed in Claim 8 wherein the wire armour clamping means com-

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prises at least two rings through which the cable conductors pass, the rings being fastened together by nuts which are screwed on to threaded spigots or studs which extend from the screening fins.

10. An electric coupler as claimed in Claim 8 wherein the wire armour clamping means comprises at least two rings through which the cable conductors pass, one ring being formed integrally with the screening fins and at least one separate ring being fastened to it by screws.

11. An electric coupler as claimed in any one of the preceding claims, wherein the screen is a preformed metal mesh.

