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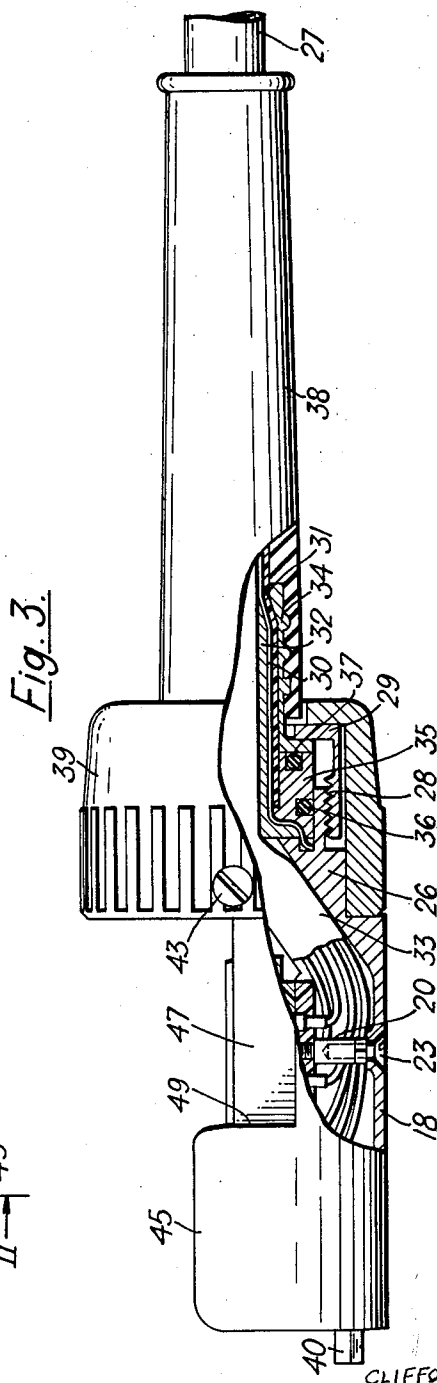
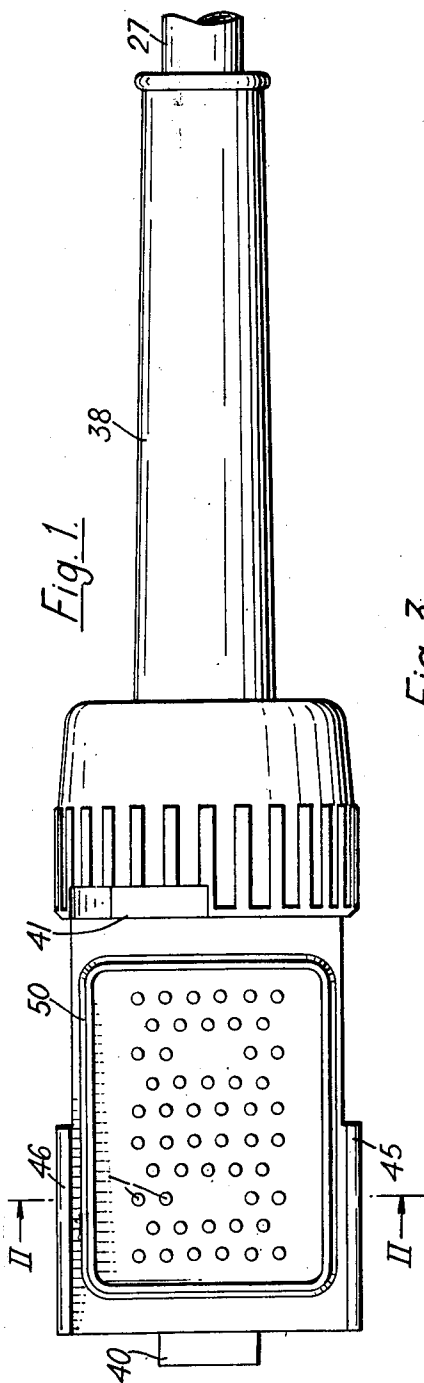
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TWO-PART COUPLINGS FOR MULTIPLE CONDUCTOR CABLES

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2 Sheets-Sheet 1



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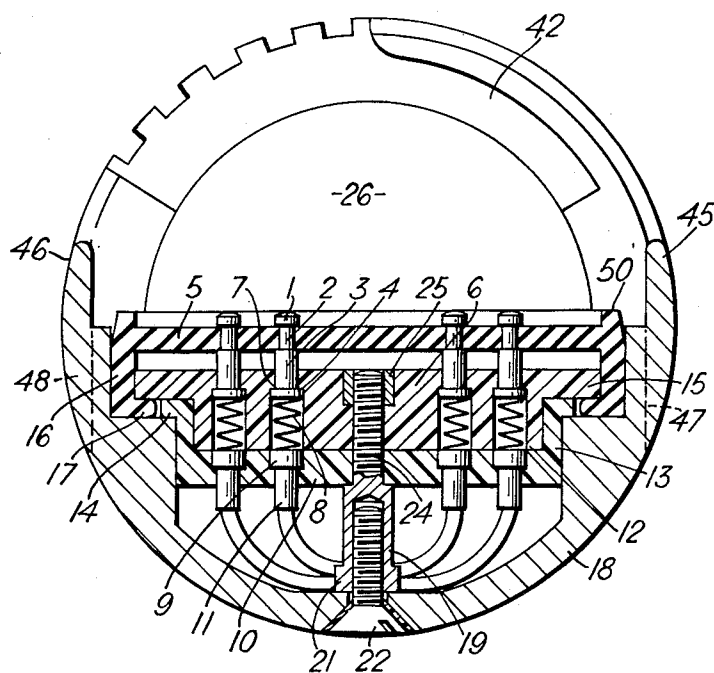
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Fig. 2.



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TWO-PART COUPLINGS FOR MULTIPLE
CONDUCTOR CABLES

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12 Claims. (Cl. 339—48)

This invention relates to two-part couplings for detachably connecting together two lengths of multiple conductor cable. More particularly it is concerned with couplings of the kind in which the exposed end faces of the electric contacts of the one coupling part (to which contacts the neighbouring ends of the conductors of one cable are respectively connected) are adapted to make contact with the exposed end faces of the respective contacts of the other coupling part (to which contacts the neighbouring ends of the conductors of the other cable are respectively connected) when the two parts of the coupling are brought into full engagement, the one with the other.

Such couplings have the advantage over the more common pin and socket contact couplings in that the two parts of the coupling can be identical—a great convenience when it is required to pay out and couple together a number of cable lengths. They present difficulties, however, as regards their manufacture owing to the need to mount the contacts in a resilient manner and at the same time prevent entry of moisture into the cable by way of its ends. By the present invention we provide an improved form of cable coupling which satisfies all reasonable requirements as regards resiliency of contacts and also ensures an effective sealing of the cable.

The specification of application Serial No. 70,205 filed on the same day as this application describes and claims a coupling part, the contacts of which are housed each in a separate tunnel in an insulating mounting block and are urged axially in a direction to project beyond the face of the mounting block, each by a compression spring disposed between the contact and an abutment fitting into the tunnel, the projecting end of each contact passing through and making a waterproof joint with a flexible insulating diaphragm which, at its periphery, makes a watertight joint with the insulating block.

In accordance with the present invention the contacts of a coupling part are housed each in a separate tunnel in one part of a two-part insulating block and are urged axially in a direction to project beyond the front face of that part each by a compression spring disposed between the contact and an abutment housed in the other part of the two-part block. The projecting end of each contact passes through and in doing so makes a watertight joint with a flexible insulating diaphragm which at its periphery or perimeter makes a water-tight joint with the adjoining part of the mounting block. The rear end of the abutment is adapted to receive or have connected to it, directly or indirectly, one of the conductors of the cable.

The rear ends of the abutments and the conductors attached to them may, in the finished coupling part, be embedded in a mass of insulation serving to seal them against moisture and to seal the rear part of the mounting block to the end of the cable but we prefer to house the two-part block and the insulating diaphragm in a water-tight protective casing, adapted to form a mechanical attachment with the casing of a similar coupling part to hold the respective contacts of both parts in contact with one another, in such a way that the insulating

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diaphragm serves to seal the two-part mounting block to the casing.

The form of the housing and the disposition of the two-part block may be such that the front face of the block from which the contacts project is normal to the axis of the cable entry as in the example described with reference to and shown in the drawings of our aforesaid co-pending application, or it may be such that the front face of the block lies obliquely to that axis or in a plane, or planes, parallel to a plane containing that axis as shown in the drawings which will hereinafter be referred to.

The cable may be sealed at its point of entry into the casing in any suitable conventional manner. A seal between our improved coupling part and an identical part may be effected by providing an upstanding rib around the periphery of the front face of the flexible insulating diaphragm. For holding two coupling parts in operative relationship any suitable means may be employed.

It will be understood that although the front face of the mounting block will usually be of circular shape in the case where it lies normal to the axis of cable entry, it may be of other shapes. In the case of a coupling part in which the front face of the mounting block lies in a plane or planes parallel to a plane containing the axis of the cable entry, the front face of the block will often be of square or rectangular shape.

The invention will be further illustrated by a description of one embodiment with reference to the accompanying drawings in which

FIGURE 1 is a plan of the coupling part,

FIGURE 2 is a simplified sectional elevation, taken on line II—II in FIGURE 1, and

FIGURE 3 is a side elevation, partly sectioned in a vertical plane through the axis of the coupling part.

(FIGURE 2 is on a larger scale than FIGURES 1 and 3.)

Referring to the drawings, the coupling part is provided with 52 contacts, only four of which are shown in FIGURE 2. Each contact is formed with a head 1 mounted on the end of neck 2 which is itself an extension of a body 3 terminating at its lower end in an enlarged part 4. The neck part 2, which in effect is the base of a circumferential groove in the contact body, is cylindrical and of a diameter slightly greater than one of a number of holes in a flexible diaphragm 5 through which the contact passes. As a result, when the contact is snapped into position in the diaphragm, the diaphragm presses firmly against the base of the circumferential groove (that is around the neck 2), whereby a good seal is made between each contact and the diaphragm. The width of the circumferential groove forming the neck 2 may be slightly less than the wall thickness of the diaphragm 5, whereby the diaphragm also presses against the boundaries of the circumferential groove.

The head 1 of each contact which projects beyond the outer face of the diaphragm 5 is appropriately rounded or chamfered around its peripheral edge to form a butt contact for engaging a corresponding contact in a complementary coupling part.

Each of the contacts 1 is housed in a separate tunnel in one part 6 of a two-part insulating block, hereinafter referred to as the outer part of the block. The bore of each tunnel is stepped, the end nearer the front face of the block being of smaller diameter, so as to form a shoulder 7 against which the enlarged part 4 of the contact 1 bears. The body 3 of the contact is a sliding fit in the part of the tunnel of smaller bore and the enlarged part 4 of the contact is a sliding fit in the part of the tunnel of larger bore.

The contact is urged axially to project beyond the front face of the two-part block by a compression spring 8 dis-

posed between the enlarged part 4 of the contact and an abutment 9 mounted in the inner part 10 of the insulating block. The abutment 9 is in the form of a metal disc housed in a recess in that face of the inner part 10 of the two-part block that abuts against the rear face of the outer part 6 of the block. The disc 9 is formed integrally with a rearwardly extending hollow stem 11, which passes through the wall of the inner part of block to project beyond the rear face of the two-part block. The abutments 9 may be secured by casting or moulding the inner part 10 of the mounting block around the positioned members, or alternatively the stems 11 of the abutments may be a press fit in suitable holes formed in the block 10. A further possibility is to provide the stems 11 with screw threads which mate with corresponding threads in holes in the inner part 10 of the block.

The two parts 6 and 10 of the mounting block make a spigot and socket joint one with other to assist registration, the part 6 being formed with a spigot 12 and the part 10 being formed with an upwardly extending rim 13 which forms a socket for the spigot 12. At the upper end of the rim 13 is an outwardly extending flange 14, the upper face of which bears against a flange 15 on the upper part 6 of the block. The diaphragm 5 is formed with a downward extending rim 16 which fits closely around the flange 15 of the upper part 6 of the block, and at the lower edge of the rim 16 there is an inwardly extending flange 17 of a thickness a little greater than the thickness of the flange 14 of the lower part of the block, against which it abuts.

The two part block is mounted in a semi-cylindrical casing 18 for the coupling part. The width of the part of the casing with which the rim 16 on the diaphragm makes contact is such that the rim 16 is a sliding fit in the casing. The block is secured in the casing by two pillars 19 and 20, one of which (19) can be seen in FIGURE 2 and the other (20) in FIGURE 3. Referring to FIGURE 2, each pillar is formed at its lower end with a hexagonal head 21, which rests on a flat surface formed in the bottom of the casing 18 and is secured thereto by a screw 22 (23), and at its upper end with a smaller diameter threaded part 24, which passes through an aperture in the two-part block. The shoulder formed at the junction of the parts 24 with the body of the pillar bears against the lower surface of the inner part 10 of the two-part block. At the upper end of the aperture through which the threaded part 24 of the pillar passes is an internally threaded insert 25, moulded into the part 6 of the block whereby by rotating the hexagon 21 (and the corresponding hexagon on the pillar 20) the two parts 6 and 10 of the two-part insulating block are drawn together and held in contact. The length of the pillars is such that when the screws 22 and 23 are tightened, the flange 17 of the diaphragm 5 is compressed between the flange 15 of the outer part 6 of the block and the casing 18. The amount by which the flange 17 is compressed is limited by the flange 14. Nylon washers inserted under the heads of the screws 22 and 23 seal the lower part of the casing against moisture.

The semi-cylindrical casing 18 is formed with an integral cylindrical extension 24 which carries sealing gland for a multi-conductor cable 27 (FIGURES 1 and 3). The extension 26 is provided with an axially extending cylindrical sleeve 28 having an external thread carrying an internally threaded clamping ring 29 by means of which the gland is secured to the casing 18.

The gland for the cable comprises a three part tubular clamp for the end of the steel wire braid armouring 30 and the end of the outer sheath 31 of the cable 27. This clamp consists of a single inner sleeve 32 fitting over the core 33 of the cable 27 (comprising 52 insulated conductors) and two outer sleeves 34 and 35 which together clamp the armouring and the cable sheath against the outer surface of the sleeve 32. One outer sleeve (35) of the clamp is grooved to receive two flexible O-rings 36

and 37 by which this part is sealed to the sleeve 28 and to the other outer sleeve 34 of the clamp. The outer sealing of the cable end is completed by a rubber sleeve 38 which is moulded in situ over the end of the cable 27 and the sleeve 34.

The coupling part can be secured to a similar coupling part by means of a hollow cup shaped clamping member 39 which is free to rotate to a limited extent, e.g. through about 60° around the cylindrical extension 26 of the casing 18 and the nut 29. A projection 40 on the outer end of the casing 18 passes through a notch 41 in the rim of the clamping member 39 of a similar coupling part as the two coupling parts are brought together, in a direction perpendicular to the face of the diaphragm 5. The coupling part 39 is then rotated to cause the extension 40 of the other coupling part to slide into a recess 42 in the rim of the clamping member 39 (see FIGURE 2). The member 39 may be locked in the clamping position by means of a pair of screws 43 (FIGURE 3) which pass through the clamping member 39 into recesses in the extension 26.

The insulated conductors 44 of the cable 27 pass into the semi-cylindrical casing 18, between the casing and the lower part of the two-part insulating block, and each conductor of the cable is connected as by soldering to one of the abutments 9, the conductors passing into hollow downwardly projecting sleeves (11) of the abutments as shown in FIGURES 2 and 3. After all of the electrical connections between the abutments 9 and the conductors of the cable have been made, and the two-part block secured in the casing 18, the residual space in the casing may if desired be filled with a setting insulating material. Such filling should, however, not be necessary since the diaphragm effectively seals the two-part block in the casing.

Over half its length, the semi-cylindrical casing 18 is formed with upwardly projecting tongues 45 and 46 which, in conjunction with similar tongues of the other coupling, guide the two parts into the correct relative positions with respect to each other, such that the 52 contacts on one part made with the 52 contacts on the other part. The tongues (45, 46) on one part of the coupling mate with recesses 47, 48 in the other part of the coupling. The two parts of the coupling are locked together by tightening the screws 43 on each coupling part. Engagement between the edges 49 (FIGURE 3) of the tongues 45, 46 in the two coupling parts prevents axial withdrawal, one from the other.

The diaphragm 5 is formed with an integral upstanding rib 50 around the periphery of its front face and when the coupling parts are brought together these ribs are pressed against each other and form a seal around the mating contacts.

What we claim is:

1. For a two-part coupling for detachably connecting together two lengths of multiple conductor cable, a coupling part comprising a two-part insulating block, a plurality of contacts housed each in a separate tunnel in one part of the block, abutments adapted for connection to the cable conductors housed in the second part of the block, compression springs disposed between the contacts and the abutments to urge the contacts axially in a direction to project beyond the front face of the two-part insulating block, a flexible insulating diaphragm which covers the front face of the block and has at its periphery an integral intumed flange adapted to embrace and make a watertight joint with the block, the projecting end of each contact passing through and making a waterproof joint with said diaphragm, a protective casing housing the two part block and adapted to form a mechanical attachment with the casing of a similar coupling part to hold the respective contacts of both parts in contact with one another, means for drawing the two-part block into the casing to grip the flange on the diaphragm and seal the periphery of the two-part block to the cas-

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ing, and means for sealing a cable length associated with the coupling part to the casing where it enters the casing.

2. A coupling part as claimed in claim 1 associated with a length of multiple conductor cable, the conductors of which are electrically connected to said abutments, in which the stripped back end of the cable located within the casing is embedded in a cast body of synthetic resin which adheres to the second part of the block.

3. A coupling part as claimed in claim 1 associated with a length of multiple conductor cable, the conductors of which are electrically connected to said abutments, in which the insulating block is of synthetic resin and the stripped back end of the cable located within the casing is embedded in a cast body of the same synthetic resin which adheres to the second part of the block and forms a substantially homogeneous body therewith.

4. A coupling part as claimed in claim 1 in which the ends of the tunnels from which the contacts project are reduced in bore to form shoulders and the parts of the contact lying within the bore are enlarged to form shoulders which abut against the shoulders in the tunnels.

5. A coupling part as claimed in claim 1 in which the part of each contact passing through the diaphragm is circumferentially grooved, the diameter of the base of the groove being so related to the diameter of the hole in the diaphragm through which the contact passes that the contact is gripped in a watertight manner by the diaphragm.

6. For a two-part coupling for detachably connecting together two lengths of multiple conductor cable, a coupling part comprising a two-part insulating block, a plurality of contacts housed each in a separate tunnel in a first part of the block, abutments in the form of metal members housed in recesses in the face of the second part of the block that abuts against the rear face of the first part of the block, compression springs disposed between the contacts and the abutments to urge the contacts axially in a direction to project beyond the front face of the two-part insulating block, a flexible insulating diaphragm which covers the front face of the block and has at its periphery an integral intumed flange adapted to make a watertight joint with the block, the projecting end of each contact passing through and making a water-

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proof joint with said diaphragm, integral with said abutment stems which pass through the second part of the block to project from its rear face, the projecting ends of the stems being adapted for connection to the cable conductors, a protective casing housing the two-part block and adapted to form a mechanical attachment with the casing of a similar coupling part to hold the respective contacts of both parts in contact with one another, means for drawing the two-part block into the casing to grip the flange on the diaphragm and seal the periphery of the two-part block to the casing, and means for sealing a cable length associated with the coupling part to the casing where it enters the casing.

7. A coupling part as claimed in claim 6, in which the abutments and their stems are a press fit in suitable holes in the second part of the insulating block.

8. A coupling part as claimed in claim 6, in which the surfaces of the abutments are flush with the front face of the second part of the block.

9. A coupling part as claimed in claim 1 in which the two parts of the block made a spigot and socket joint one with the other.

10. A coupling part as claimed in claim 6 in which the two parts of the block make a spigot and socket joint, one with the other.

11. A coupling part as claimed in claim 1 in which the diaphragm is provided with an integral upstanding rib around the periphery of the front face thereof, that is, the face from which the ends of the contacts project.

12. A coupling part as claimed in claim 6 in which the diaphragm is provided with an integral upstanding rib around the periphery of the front face thereof, that is, the face from which the ends of the contacts project.

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