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(54) **Cables**

(57) The surface of one or more individual wires or fibres 1 in an electric and/or optical fibre cable, or the surface of one or more bundles of such elements stranded together, is provided with a coating 3 of powder having water blocking properties. Examples of such powders are sodium carboxymethyl cellulose and cross-linked acrylamide polymer. In an embodiment the stranded wires 1 are impregnated 2 with petroleum jelly or silicone resin and the surface dusted 3 with a blocking agent. Plastics sheaths 4, 6 and a metallic barrier strip 5 are provided. The metallic strip 5 may be coated on one or both sides with blocking agent. Additionally or alternatively individual elements may be coated with blocking agent.

Fig.1.

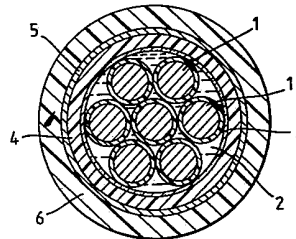


Fig. 1.

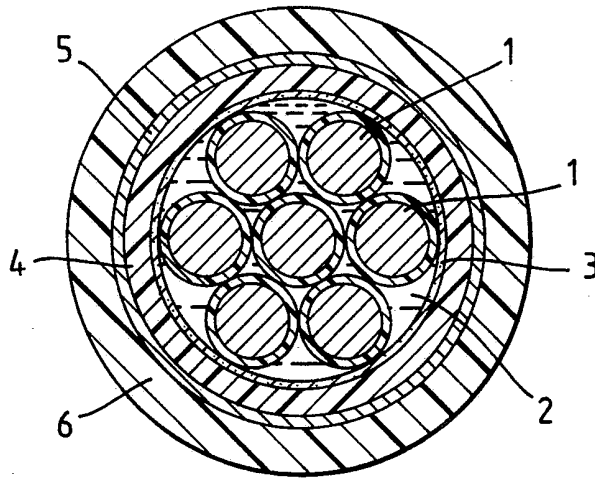
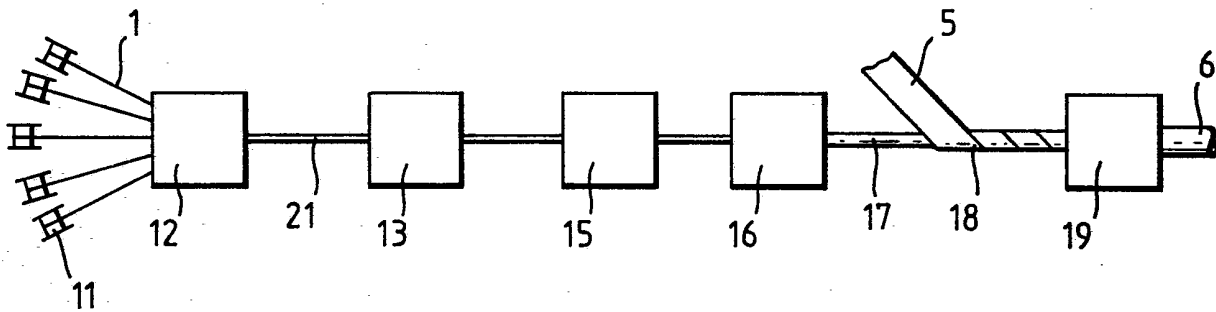


Fig. 2.



SPECIFICATION

Cables

5 This invention relates to electrical or optical fibre cables, that is to say cables incorporating one or more
 10 filamentary elements of an electrically conducting or light conducting nature, or a combination of such elements, within a channel in a protective cover, and
 10 relates also to the manufacture of such cables.

In accordance with one aspect of the invention at least one surface within said channel has a coating of powder having water blocking properties.

By "water blocking properties" is meant a powder
 15 that swells in contact with water or one which dissolves in water to cause an increase in viscosity and eventual water blockage. Examples of such powders are sodium carboxymethyl cellulose and cross-linked acrylamide polymer.

20 The water blocking powder may be provided on a surface of at least one of said electrically- or light-conducting elements, or on the surface of one or more bundles of elements which have been stranded together.

25 The elements may be in the form of a plurality of metal wires, either uninsulated or carrying an insulating coating, or a plurality of optical fibres preferably with a protective resin coating depending upon the nature of the cables.

30 The powder is conveniently applied to the surface of the element or bundle of elements by drawing the individual element or bundle through a bath containing the powder before the application of the protective cover.

35 Where the elements are in the form of a stranded together bundle having the interstices between the elements impregnated with a liquid or semi-liquid filling medium, such as petroleum jelly or other petroleum, polymer or silicone based compound, for
 40 the purpose of blocking water paths along the interior of the cable, the powder will, in general, adhere satisfactorily to the surface of the bundle due to the presence of the filling medium absorbed into the outer layer of the bundle. However, in some cases a layer of
 45 a liquid or semi-liquid material such as the filling medium, silicone, or one or other suitable substance may be applied to the surface of the bundle prior to the powder application to facilitate the adherence of the powder thereto. Similarly in the case of a single
 50 element, for example a wire or optical fibre, the surface of the element may be coated with a liquid or semi-liquid material for this purpose.

Where individual elements comprise a wire or optical fibre with an insulating and/or protective cover
 55 or coating, the wires or fibres may themselves be coated with water blocking powder prior to the application of the cover or coating.

Similarly where a plurality of elements are formed into a bundle the individual elements may be coated
 60 with said powder prior to being stranded together.

Where the cable incorporates a bonded or non-bonded metallic or non-metallic screen or barrier

around the filamentary elements a surface of the screen or barrier may be coated with said powder.

65 The powder may be applied to the screen or barrier as previously described above for coating the elements or by means of an electrostatic deposition technique.

Water blocking powder may in some cases be
 70 applied to carrier tape or string helically applied to one of more bundles of elements before the application of the protective cover.

An electric cable in accordance with the invention and a method of forming the cable will now be
 75 described by way of example with reference to Figure 1 and 2 of the accompanying schematic drawing, in which

Figure 1 illustrates a cross-section through the cable, and

80 Figure 2 illustrates in diagrammatic form a process for the manufacture of the cable.

Referring first to Figure 1, the cable comprises a plurality of insulated wires 1 stranded together, and impregnated with a water-repellent medium 2 such as
 85 petroleum jelly or silicone oil, and having on its surface a dusting of a water blocking powder 3, such as sodium carboxymethyl cellulose. Although only six wires are shown, in practice there may be many more. The thickness of the powder coating 3 has been
 90 exaggerated for clarity. The coated wire bundle 1 is surrounded in turn by an inner protective sheath 4 of plastics material extruded over the bundle, a metallic barrier strip 5, either folded longitudinally or wound helically around the inner sheath, and an outer
 95 plastics sheath 6 extruded around the barrier strip 5. The barrier strip is also conveniently coated with a layer (not shown) of water blocking powder on one or both surfaces.

In the manufacture of the cable, the insulated wires
 100 1 are fed from spools 11 and are stranded together using any suitable known stranding technique at 12, the stranded together wire bundle 21 being passed through a bath 13 of a liquid filling compound which is caused to penetrate the interstices of the wires. The
 105 filled wire bundle is then passed through a bath 15 of sodium carboxymethyl cellulose in powdered form, having a powder size of between $<10 \mu$ and 600μ , a layer of powder being retained on the surface of the impregnated bundle by adhesion to the filling com-
 110 pound absorbed into the outer layer.

The coated wire bundle is then passed through an extruder 16 where an inner plastics cover 17 is applied to it, a metal strip 5 being around the cover at 18, and an outer plastics sheath 6 extruded around the strips
 115 on passage through a further extruder 19.

The water blocking powder may expand on contact with water and/or dissolve into the water causing increase in viscosity and these effects either singly or in unison have the effect of blocking the further
 120 passage of water between the wire bundle and the inner cover 17.

Although the stranded wires of the cable described are coated with water blocking powder it will be appreciated that individual elements may additionally

or alternatively be coated. Moreover other suitable surfaces may be so coated to reduce or eliminate water penetration along the cable.

CLAIMS

- 5 1. An electrical or optical fibre cable wherein at least one surface within said channel has a coating of powder having water blocking properties.
2. A cable according to Claim 1 wherein the water blocking powder fills less than 5% of the available interstitial space or spaces within said channel.
- 10 3. A cable according to Claim 1 or 2 wherein the water blocking powder consists of carboxymethyl cellulose or a cross-linked acrylamide polymer.
4. A cable according to Claim 1, 2 or 3 wherein said
- 15 water blocking powder is provided on a surface of at least one of said electrically- or light-conducting elements, or on the surface of one or more bundles of elements which have been stranded together.
5. A cable according to Claim 4 incorporating a
- 20 plurality of electrically-conducting elements in the form of metal wires.
6. A cable according to Claim 4 incorporating a plurality of light-conducting elements in the form of optical fibres coated with a protective resin.
- 25 7. A cable according to Claim 1, 2 or 3 wherein a surface within the channel, other than the said electrically- or light-conducting element or elements, is coated with said water blocking powder.
8. A cable according to Claim 7 wherein the water
- 30 blocking powder is coated on a filament or tape within said channel.
9. A cable according to Claim 7 wherein the cable incorporates a bonded or non-bonded metallic or non-metallic screen or barrier around the filamentary
- 35 elements, wherein a surface of the screen or barrier is coated with said water blocking powder.
10. A cable according to Claim 1, 2 or 3 incorporating a plurality of optical fibres loosely accommodated in one or more channels in the protective cover.
- 40 11. The manufacture of a cable according to Claim 5 or 6 wherein the individual elements are coated with said water blocking powder before being stranded together.
12. The manufacture of a cable according to Claim
- 45 5 or 6 wherein the powder is applied to the surface of the stranded together elements.
13. The manufacture according to Claim 11 or 12 wherein the individual elements or the stranded together elements, as the case may be, are drawn
- 50 through a bath containing the powder before the application of the protective cover.
14. The manufacture according to Claim 12 wherein the stranded together elements are impregnated with a liquid or semi-liquid filling medium prior to the
- 55 application of the water blocking powder thereto.
15. The manufacture according to Claim 12 wherein a layer of liquid or semi-liquid material is applied to the surface of the stranded together elements prior to the application of the water blocking powder thereto.
- 60 16. The manufacture of a cable according to Claim 11 wherein a layer of liquid or semi-liquid material is applied to the surface of the individual elements prior to the application of the water blocking powder thereto.
- 65 17. The manufacture of a cable according to Claim

9 wherein the powder is applied to the screen or barrier by an electrostatic deposition technique.

18. An electrical or optical cable substantially as shown in and as hereinbefore described with reference to Figure 1 of the accompanying drawing.

19. The manufacture of an electrical or optical cable carried out substantially as shown in and as hereinbefore described with reference to Figure 2 of the accompanying drawing.

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