(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: 0 059 005 A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 82200120.2

(22) Date of filing: 01.02.82

(51) Int. Cl.³: H 01 B 11/10, H 01 B 11/00

(30) Priority: 20.02.81 NL 8100842

(43) Date of publication of application: 01.09.82 Bulletin 82/35

(84) Designated Contracting States: AT BE DE FR GB IT NL SE

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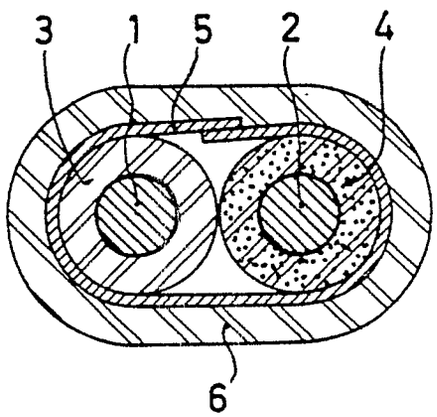
(54) Electric cable for signal transmission.

(57) A cable for signal transmission having one or more insulated signal conductors, one or more screening wires having a screening sheath manufactured from a conductive synthetic resin, a conductive foil around signal conductors and screening wires with screening sheaths which makes electrical contact with the screening sheaths as well as a synthetic resin outer sheath.



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"Electric cable for signal transmission"

The invention relates to an electric cable for signal transmission. Such cables must be thoroughly screened against interferences from and to the ambience and notably must provide both a good electrostatic and a good electromagnetic screening. A known type of electric cable for signal transmission is the so-called coaxial cable or coax cable for short. A coax cable is built up from a central conductor, a dielectric layer of, for example, solid synthetic resin or foamed resin, an outer conductor formed, for example, of a braid of copper wires, possibly combined with a metal foil and an outer sheath of synthetic resin. In practice it has been found that the working and processing of the outer conductor of a coax cable, for example when connecting the cable to a plug, is clumsy and time-consuming.

Applicants have demonstrated by means of experiments that, when the outer conductor as mentioned above is replaced by a layer of an electrically conductive synthetic resin, for example, polyvinylchloride or polythene which comprises a considerable quantity of conductive soot, for example, 10-25% of soot, in which layer an electric conductor, for example, a solid copper wire or a stranded copper wire is incorporated in order to increase the screening function, a signal transmission cable is obtained which has a reasonable electrostatic screening but a slightly lesser electromagnetic screening. In such a signal transmission cable, the electric conductor meant for screening (screening conductor) may be constructed as a separate conductor, which lies outside the conductive resin layer, surrounding the central (signal) conductor. Then the screening conductor is

surrounded by a separate cylindrical sheath of conductive synthetic resin which, via a bridge of conductive synthetic resin, is connected to the likewise cylindrical sheath of conductive synthetic resin provided around the insulated central conductor (signal conductor) extending parallel to the screening conductor. The insulated signal conductor is an electric conductor, for example, a solid copper wire or stranded copper wire surrounded by an insulating sheath of synthetic resin.

The object of the present invention is to provide an electric cable for signal transmission which is simple to manufacture and can easily be processed and has both a good electrostatic and an electromagnetic screening.

According to the invention this object is achieved with an electric cable for signal transmission which comprises one or more insulated signal conductors, one or more electrically conductive screening wires, in which each screening wire has a screening sheath of conductive synthetic resin, an electrically conductive foil around the insulated signal conductors and the screening wires provided with screening sheaths, the foil being in electric contact with the screening sheaths as well as an outer sheath of synthetic resin provided around the foil.

The cable according to the invention is suitable notably for use as a screened connection wire in electrical apparatus, especially audio and video apparatus, for example TV sets. It is to be preferred to use a signal conductor and screening wire which are fully, or at least partly, manufactured from copper. Herewith an optimum signal transmission and screening effect are obtained. An excellent signal conductor or screening wire consists of copper, tin-plated copper, iron core with copper sheath, or a copper alloy, for example, copper with zinc (bronze) or copper with cad-

mium. It is recommendable to manufacture signal conductor and screening wire from the same material. The cross-section of the signal conductor and screening wire is preferably circular with a maximum size of 1.0 mm^2. The signal conductor and screening wire may be constructed as a solid wire or as a bundle of twisted single wires (litze).

In a simple but efficacious embodiment the cable comprises one insulated signal conductor and one parallel extending screening wire with screening sheath which are collectively surrounded by first the conductive foil and then by the outer sheath.

In this good embodiment the cable according to the invention comprises, for example, two insulated signal conductors combined with 1 or 2 screening wires having screening sheaths or, for example, four insulated signal conductors combined with 1 - 4 screening wires. The insulated conductor and sheathed screening wires may extend parallel in a flat plane with which a ribbon cable or flat cable is obtained, or be twisted to form a circular cable. The signal conductor is electrically insulated by a layer of synthetic resin, such as polyvinyl chloride (PVC) or polythene. The conductive synthetic resin of the screening sheath is commercially available, for example under the tradename Abbey 100 or Sumikon VM-1003. Both commercial products are based on the synthetic resin polyvinyl chloride in which 10-25% of electrically conductive soot is dispersed. The metal foil used preferably is an aluminium foil which is helically wound with overlap around the insulated signal conductor and screening wire provided with screening sheath. The synthetic resin outer sheath is manufactured, for example, from PVC or polythene.

The cable according to the invention can be manufactured in a simple manner by providing the signal conductor and the screening wire with an extruded sheath of synthetic resin and conductive synthetic resin,

respectively then winding the metal foil around the signal conductor and screening wire with overlap, and finally extruding a synthetic resin outer sheath over the metal foil.

The cable according to the invention can be processed in a simple manner and in particular be provided with, for example, a plug or a contact socket in a mechanized manner and while using the apparatus existing for this purpose. The outer sheath with foil can easily be removed from a cable end after cutting and stripping. Simultaneously, the synthetic resin sheath and screening sheath can be removed mechanically from respectively the signal conductor and screening wire - due to the fact that the insulated conductor and the screening wire provided with screening sheath are not connected together and can hence fan out - and the conductor and wire may then be connected electrically to the connection contacts of electrical components.

One of the most interesting aspects of the present invention is that the cable is fully suitable for electrical connection to the desired components according to the known insulation penetrating method, also known as piercing or insulation displacement contact (IDC) process. In a piercing process, connection combs are used which are provided with contact points as well as with tapering grooves which comprise knife edges on their insides. The cable according to the invention is contacted according to the piercing process by first removing the outer sheath and foil and then forcing the insulated conductor and screening wire provided with screening sheath each in a groove of the connection comb. The knife edges cut through the insulation and make electric contact with the conductor. The connection comb thus connected to the cable can be contacted by means of the contact points to the desired electrical apparatus.

In a favourable embodiment of the cable in

accordance with the invention the insulated signal conductors and screening wires extend parallel to each other in a flat plane. Such a flat cable or ribbon cable gives optimum possibilities of a fully automatic further-processing particularly in connecting the cable to the desired electrical equipment by piercing.

In another favourable embodiment the diameter of the insulated signal conductor corresponds to that of the screening wire with screening sheath. As a result of this the above-mentioned piercing process is further simplified because the usual piercing combs which have grooves of the same diameter can be used.

In a further favourable embodiment the foil is provided, on the side of the outer sheath, with a layer of synthetic resin, for example PVC, polythene or polyester which connects the foil to the outer sheath. Upon extrusion of the outer sheath, such a softening of the synthetic resin provided on the foil takes place that the said synthetic resin adheres to the resin of the outer sheath. In this embodiment of the cable in accordance with the invention, the outer sheath with the foil can be removed simultaneously when the cable is connected, for example, to a plug.

The invention will be described in greater detail with reference to the drawing, the Figure of which is a cross-sectional view of a cable according to the invention.

Reference numeral 1 in the Figure denotes a copper signal conductor and 2 denotes a copper screening wire. Signal conductor 1 has a PVC sheath 3. Screening wire 2 is surrounded by a sheath 4 of conductive synthetic resin, in this case PVC with 10-25% of conductive soot. The diameter of conductor 1 with sheath 3 corresponds to that of wire 2 with sheath 4. An Al-foil 5 is wound transversely with overlap around the sheaths 3 and 4. On the outer surface remote from the sheaths 3 and 4, the foil 5 comprises a layer of PVC (not shown) which is connected to the PVC outer sheath 6.

1. An electric cable for signal transmission which comprises one or more insulated signal conductors, one or more electrically conductive screening wires, each screening wire having a screening sheath of conductive synthetic resin, and an electrically conductive foil around the insulated signal conductors and the screening wires provided with screening sheaths, the foil being in electric contact with the screening sheaths as well as an outer sheath of synthetic r[illegible]ovided around the foil.

2. An electric cable as claimed in Claim 1, in which the insulated signal conductors and screening wires extend parallel to each other in a flat plane.

3. An electric cable as claimed in Claim 1 or 2, in which the diameter of the insulated signal conductor corresponds to that of the screening wire with screening sheath.

4. An electric cable as claimed in any of the preceding Claims, characterized in that, on the side of the outer sheath, the foil comprises a layer of synthetic resin which connects the foil to the outer sheath.

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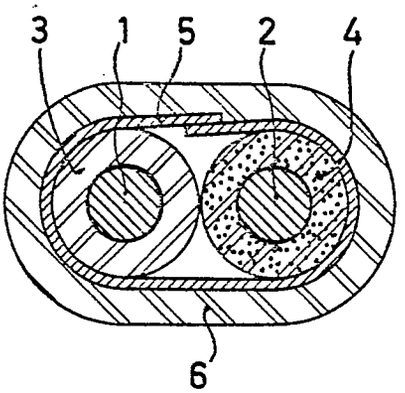

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EUROPEAN SEARCH REPORT

Application number: 0059005

EP 82 20 0120

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
Y	FR - A - 2 108 141 (TREFIMETAUX) * page 2, line 1 - page 4, line 6; figures *	1
Y	US - A - 4 041 237 (S. MOORE) * column 2, line 39 - column 3, line 24; figures 1,2 *	1,4
A	US - A - 2 415 652 (R.B. NORTON) * column 2, line 37 - column 3, line 15; figure 2 *	1
A	DE - A - 2 523 653 (LICENTIA) * page 3, last paragraph - page 4, paragraph 1; figures 1-3 *	1

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

H 01 B 11/10
11/00

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

H 01 B 11/00
9/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same category
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	01-06-1982	DEMOLDER

EPO Form 1503.1 06.78