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Campbell

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[54] CABLE CONSTRUCTION

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[58] **Field of Search**.....174/105, 34, 36, 33, 27, 107, 174/113, 115, 116

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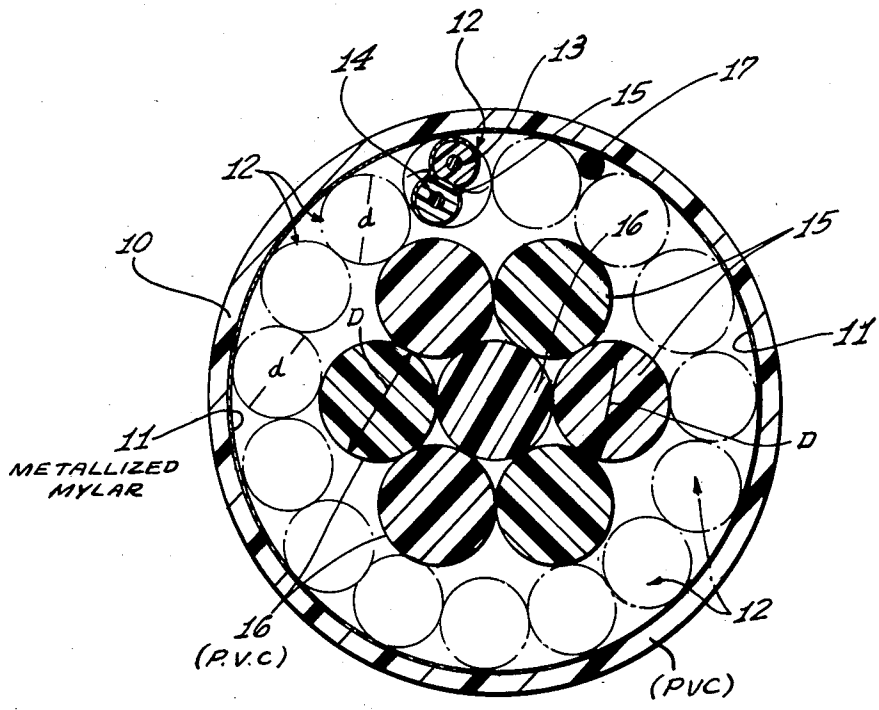
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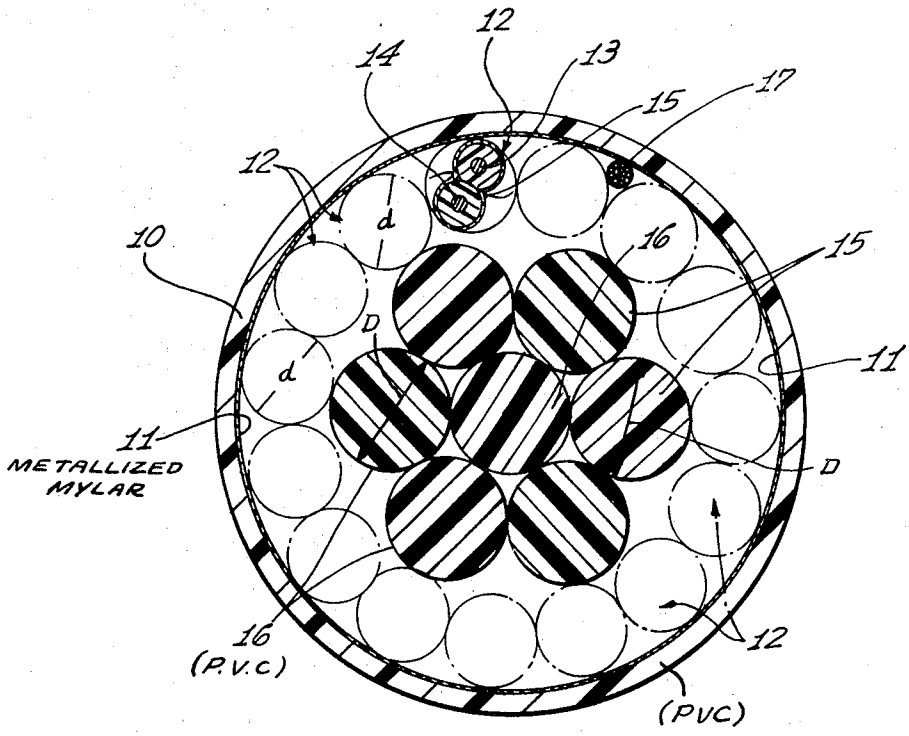
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[57] **ABSTRACT**

A cable construction is disclosed comprising a flexible shield, conductor pairs arranged along the inner surface of the shield and filler strings in the interior thereof resiliently urging the conductor pairs into engagement with the shield.

3 Claims, 1 Drawing Figure





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CABLE CONSTRUCTION

The present invention relates to a construction for a cable, particularly for a cable designed for the transmission of digital data.

Modern digital data processing and computing systems are characterized by three important aspects. First the hardware, particularly as far as the electronic data processing equipment and components is concerned, is subject to ever increasing miniaturization so that the size of the components involved is reduced drastically particularly when compared with standards prevalent only a dozen years ago. On the other hand, data processing systems as a whole have become quite extensive, particularly for multiprogramming and time sharing operations. Such systems are particularly characterized by an abundance of peripheral equipment. The peripheral equipment is connected to a processing station or unit, or several thereof, through signal transmission cable. The third important aspect is that there is a drastic increase in operating speed, so that signals to be transmitted have a considerable content in high frequency components. As a consequence signals that are being processed anywhere in such a system are developed in sources which are quite differently spaced from the designation. Thus, such signals are characterized unfortunately in many instances by a lack of uniformity in shape due to large difference in impedance in the respective signals travel paths.

It is, therefore, a specific object of the present invention to provide a cable construction particularly for a cable destined to transmit digital signals whereby the cable is characterized by offering similar and constant impedance to signals propagating through different wires or conductors included in the cable. The transmitted signals may be quite unrelated and asynchronous to each other; nevertheless, if such a cable is used, for example, to connect a particular peripheral device to a processing device systems organization and operation will be greatly facilitated as a whole if it can be established that the several signals establishing communication between these two devices and propagating through that cable are, in effect, similarly affected by that transmission. Moreover, if different peripheral equipment devices are connected to a processing unit, impedance matching, signal recognition and signal assembly is greatly facilitated if the various cables offer accurately predictable impedance per unit cable length to any signal passing through. In other words, a cable constructed in accordance with the invention offers uniform attenuation and similar impedance to all signals providing, for example, communication between a peripheral equipment device and the processing unit, and all cables in the system provide comparable attenuation on a unit length basis.

In accordance with the present invention, it is suggested to employ a flexible sleeve serving as an electrically conductive shield. The shield may be made of metallized tape, preferably with an insulating cover. Individual pairs of twisted but insulated wires or conductors, preferably with an overall insulating wrapping for each pair, are placed in that sleeve in abutment with the inner surface thereof. The central region of the sleeve is filled with a flexible insulating material, such as a plurality of resilient strings. This filler urges the individual conductor pairs against the inner surface of the shield to form a layer therealong. As a consequence, the conductors of a pair have uniform distance from the two pairs of conductors on either side as well as from the shield. Thus, the capacitance of each of these pairs or wires relative to the grounded sheet is uniform and this in turn insures constant impedance for all transmission paths in the cable and as individually established by such a pair of conductors.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, it is believed that the invention, the objects and features of the invention and further objects, features and advantages thereof will be better understood from the following description taken in connection with the accompanying drawings in which:

The FIGURE illustrates a cross section through a cable in accordance with the preferred embodiment of the present invention.

Reference numeral **10** refers to an outer sheath serving as cover and protection. This cover **10** is flexible and provides electric insulation. For example, sheath **10** is made of black polyvinyl chloride. Sheath **10** covers in particular a metallized tape such as an aluminum Mylar tape **11** serving as the electrically conductive and grounded shield for the cable proper. Elements **10** and **11** can be considered a tubular sleeve which is flexible and electrically conductive to the extent that sufficient shielding is provided for the signal conductors included in the cable.

The sleeve contains a plurality of pairs **12** of conductors such as wires. The FIGURE illustrates altogether fifteen pairs of twisted conductors, one pair being shown in detail to include wires **13** and **14**. Conductors **13** and **14** may be made of aluminum, copper or the like. A conductor may be a single-strand wire, but preferably it is a multistrand copper wire covered with an insulating layer such as **14**. The conductors of a pair are twisted and each such twisted pair is provided, in addition, with an overall Mylar wrap **15**, having primary function to prevent each pair of conductors from untwisting. In frontal cross section each pair of conductors appears to have approximately circular profile which is instrumental in obtaining overall and uniform average spacing of each conductor from shield **10**.

A drain wire **17**, such as a multistrand wire is disposed in the space between two neighboring ones of the conductor pairs to engage the shield sleeve **11** for making contact therewith and extending over the entire length of the cable. This way, ground potential is uniformly applied to all portions of the shield over the entire length thereof.

The interior of the fully expanded sleeve **10–11** is considerably larger than the space required for receiving all (15) of these pairs **12** of wires, because the pairs are disposed as a single layer along the inner periphery of sleeve **11**. The interior or core portion of this construction is filled with plastic fillers, such as polyvinyl chloride strings or strands **16**. The filler strings react resiliently with the conductor pairs to cause the sleeve **10–11** to expand fully, and to urge each one of these individual pairs **12** of twisted wires against the inner wall of sleeve **11**, and particularly against the shield layer **11**. As can readily be seen, the conductors of a pair as twisted have a particular resultant diameter *d*; that diameter is smaller than the diameter D of the filler strings. As a consequence, each of the individual wires does not only have, on the average, uniform distance from the shield but this spacing is maintained even if the cable is reeled, flexed, etc. Therefore, each conductor has predictable constant capacitance to ground as well as to its neighboring conductors and signal transmission through such a cable is, therefore, very uniform because of uniform attenuation.

The size of the cable is controllable and determined essentially by the number of conductor pairs to be included. The conductor pairs **12** shall be positioned as a type of layer extending along the interior wall of sleeve **11** and preferably without a gap. Therefore, the filler strands or strings **16** have to be selected to offer such a core which permits assembly thereon of the desired number of conductor pairs to form a gapless cover or "layer" thereon. That arrangement is then placed into the approximately dimensional sleeve arrangement **10–11**.

The invention is not limited to the embodiments described above but all changes and modifications thereof not constituting departures from the spirit and scope of the invention are intended to be included.

I claim:

1. A cable construction particularly for the transmission of digital signals comprising:

a flexible tubular, electrically conductive shield;

signal conductors in the shield, consisting of a plurality of individually insulated, twisted pairs of conductors ar-

ranged as a single layer along the interior of the tubular shield in abutment therewith, the conductor of each and all pairs having essentially similar distance, on the average, from the closest respective inner surface portion of the shield the conductors of a pair as twisted having a resultant diameter, and

insulating material including at least one resilient string of diameter larger than the resultant diameter of the conductors of any of the pairs, provided as filler in the interior of the tubular shield constituting a flexible and resilient core and urging individual pairs of conductors against the inner wall of the shield so that pairs of conductors are disposed and maintained in single-layer configuration along the shields, there being no conductor pairs disposed in the interior of the shield other than as part of the said layer.

2. A cable as in claim 1, the conductors of each of said pairs provided with a common wrapping of insulation layer to inhibit untwisting, the filler urging the conductors of a wrapped pair in unison against the flexible shield.

3. A cable as in claim 1, the insulating material forming the flexible core comprising a plurality of resilient cylindrical strings made of insulating material, each having diameter larger than the resultant diameter.

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