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[54] **WIRE TWISTING DEVICE**

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[58] **Field of Search** 140/149; 242/147, 242/156.1; 57/16, 17, 18, 59, 62, 63, 64

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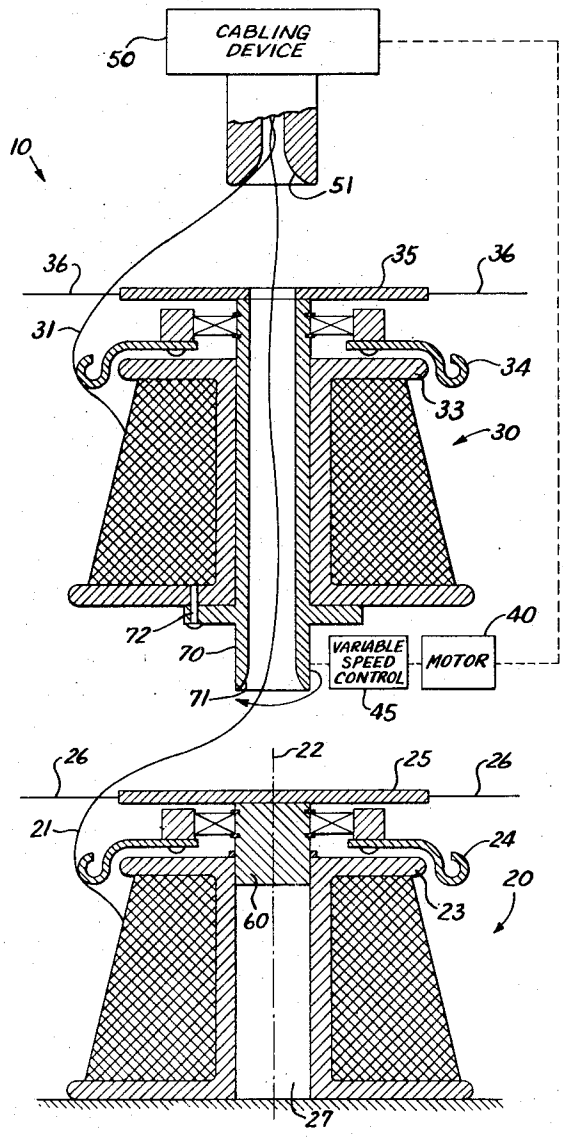
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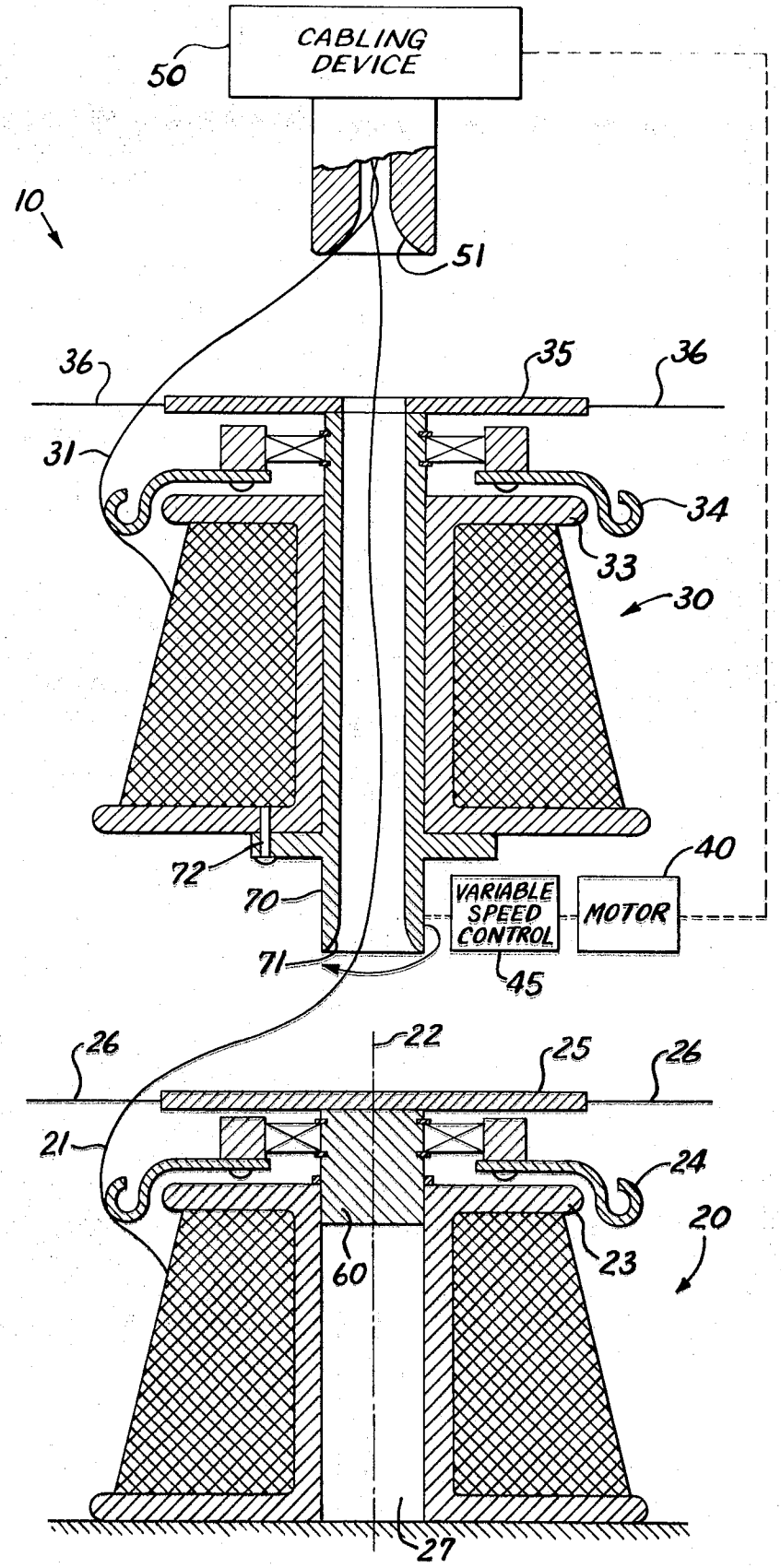
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[57] **ABSTRACT**

A device for forming a twisted pair of wires comprises a rotatable supply spool mounted above a stationary supply spool with the rotatable spool having an axial opening for permitting the passage therethrough of the wire from the stationary spool to a take-up reel or cabling device. The rotatable supply spool is driven at a predetermined angular velocity relative to the rate of the take-up device to provide the desired degree of twist. Coaxially mounted above the upper flange of each spool is a round disk which is slightly larger than the flange and is rotatable to provide unwinding of the wire from the spool and around the flange in a substantially constant-tension manner. Each spool is also provided with a hub coaxially mounted above the disk and having resilient spokes extending radially therefrom to provide a substantially uniform tension.

2 Claims, 1 Drawing Figure




CABLING DEVICE
50
10
51
36
35
36
31
34
33
30
40
72
70
VARIABLE SPEED CONTROL
MOTOR
71
45
26
22
25
26
21
24
20
60
23
27

WIRE TWISTING DEVICE

The present invention relates to wire-twisting apparatus and particularly to such apparatus for forming a uniformly twisted pair of wires as part of a cabling operation.

One particular problem in making twisted wire, either in a single operation or when combined with a cabling operation, is that of maintaining a substantially uniform tension on the supply wires so that the twist obtained is relatively uniform. The twisting is often desirable for insulated wires in the manufacture of telephone communication wires (often referred to as "twisted pairs") or cables. Twisting the wires tends to improve the strength, attractiveness, and ease of handling of the end product; thus, a uniform twist is generally desired to optimize these characteristics. Moreover, for telephone communication lines or the like, twisting the wires also tends to balance the electromagnetic effects of the current passing therethrough to thus minimize crosstalk and other such phenomena.

Wire-twisting devices are generally classed into two basic types: (1) those in which one or more of the supply spools are rotated to provide the desired twist, (2) those in which the take-up means is rotated to provide the desired twist. It is often easier to obtain the desired twist by rotating one of the supply spools rather than the take-up means because the latter tends to be heavier and more cumbersome. In general, in a cabling operation wherein a relatively large cable is made from a plurality of twisted pairs, it is not practical to use existing equipment to perform the wire-twisting and cabling operations in one continuous process because of the relatively excessive floor space and expense required thereby.

It is therefore an object of the invention to provide an improved wire-twisting device which is economical to manufacture.

It is another object of the invention to provide such an improved device which provides a uniform twist and occupies a minimum amount of floor space.

Other objects and advantages of the invention are more particularly set forth in the following detailed description, and in the accompanying drawings, the single FIGURE of which is a front elevational view of a wire-twisting device constructed in accordance with the invention.

With reference to the FIGURE, there is shown a device **10** constructed in accordance with the invention for forming a uniformly twisted pair of wires as part of a continuous operation for fabricating a cable comprising a plurality of twisted pairs. In general, device **10** comprises a stationary supply spool **20** for carrying one of the wires **21** to be twisted. Spool **20** has a central axis **22** oriented in a substantially vertical position and an upper wire-confining flange **23** of a given diameter. A round ring or disk **24** having a diameter greater than that of flange **23** is rotatably mounted coaxially with spool **20** above flange **23** for guiding wire **21** past flange **23** in a substantially constant-tension manner as described below in greater detail. A hub **25** having a plurality of resilient spokes **26** extending radially therefrom (the hub/spoke combination sometimes referred to as a "whisker disk") is mounted coaxially with spool **20** near disk **24** for adding a relatively uniform amount of tension to wire **21** as also described in greater detail below. A rotatable supply spool **30** is provided for carrying the second wire **31** and is coaxially mounted above stationary spool **20.** Similar to stationary spool **20,** rotatable spool **30** has an upper wire-confining flange **33** of a given diameter, a round disk **34** having a diameter greater than that of flange **33** and rotatably mounted coaxially with spool **30** above flange **33,** and a hub **35** having a plurality of resilient spokes **36** extending radially therefrom and mounted coaxially with spool **30** near disk **34.** Unlike stationary supply spool **20,** however, rotatable supply spool **30** is adapted to be driven at a predetermined angular velocity relative to the take-up rate of a take-up means **50** by a driving device such as a motor **40** which may be coupled to both spool **30** and take-up means **50** by a shaft **70**; variable speed control **45,** and a suitable pulley system, gear train, etc. The particular construction of take-up means **50** forms no part of the invention and therefore is not discussed in great detail. Generally, greater advantage of the invention may be taken when take-up means **50** is a cabling device, although if desired the cabling device may be replaced by a simple take-up reel. In addition, spool **30** (shaft **70**), disk **34,** and hub **35,** each have an axial opening therethrough to provide a passageway for wire **21** from stationary supply spool **20.** Thus, as cabling means **50** unwinds the wire from supply spools **20** and **30,** the rotation of spool **30** causes wire **31** to twist around wire **21** to thus form a twisted pair at the eyelet **51** of cabling device **50.**

Referring to the FIGURE more particularly, wire **21** is unwound from stationary spool **20** over the curved outer edge of disk **24** through the spokes **26** of hub **25** and up through the axial openings of rotatable spool **30** (shaft **70**), disk **34,** and hub **35** to eyelet **51** of take-up means **50.** As wire **21** unwinds from spool **20,** the tension thereof ordinarily fluctuates due primarily to the angle at which wire **21** meets the curved edge of disk **24,** the angle being more acute (thereby increasing wire tension) when wire **21** is unwinding from the top of spool **20** than that when it is unwinding from the bottom. Sometimes the tension varies due to various other factors such as the friction coefficient of the wire or any insulation thereon, the manner in which the wire was wound upon the spool, ambient temperature and humidity, etc. To substantially eliminate the non-uniformities in the twist of the wire often caused by non-uniform wire tension, the device of the invention provides rotatable disk **24** to guide wire **21** past upper flange **23.** When the tension in wire **21** is relatively small, it slides around the curved portion of disk **24.** When the tension increases to a predetermined level, however, the friction between wire **21** and disk **24** increases to cause disk **24** to rotate, thereby decreasing the wire tension to a level below the aforementioned predetermined level. This action is repeated as often as necessary to thus maintain the tension in wire **21** within a tolerance range such that, for practical purposes, the tension is substantially constant. The predetermined tension level is determined according to the amount of friction between rotatable disk **24** and its bearing surface, illustrated here as a bearing shaft **60** placed in the central axial opening **27** of spool **20,** which opening is commonly found in conventional spools of wire. The amount of friction is controlled by the particular lubricant employed and/or the machine tolerances of the parts. It is understood that the particular manner in which disk **24** is rotatably mounted relative to spool **20** forms no part of the invention and may therefore be im-

plemented in any suitable manner. Hub **25** is fixedly mounted to spool **20** in a manner such that resilient spokes **26** present a predetermined amount of friction to wire **21** in order to add a relatively uniform amount of wire tension. Spokes **26** are made from a resilient material such as nylon and bend as wire **21** unwinds to permit the wire to pay-off spool **20** but with a predetermined amount of friction to add a uniform amount of tension to wire **21.** For a range of wire sizes there is a specified number of resilient spokes **26** of a given diameter required for obtaining the proper tension. Generally for the heavy size wires where more tension is required there will be more spokes of a larger diameter and for finer size wires where less tension is required there will be less spokes of a smaller diameter.

The operation of rotatable supply spool **30** is similar to that of stationary supply spool **20** except for the fact that spool **30** is rotated at a predetermined angular velocity by motor **40.** By controlling the angular velocity of rotatable supply spool **30** relative to the take-up rate of cabling device **50** (as, for example, by using motor **40** to drive both the spool, through variable speed control **45,** and cabling device **50**), wire **31** is twisted around wire **21** at a rate that provides the desired twist or "lay." Disk **34** and hub **35** with resilient spokes **36** operate in a manner similar to disk **24** and hub **25** with resilient spokes **26** of spool **20** to provide a relatively constant tension in wire **31.** As illustrated, spool **30** is mounted on hollow shaft **70,** and anchored thereto by a pin **72,** which is driven by motor **40.** Disk **34** is rotatably attached to shaft **70** with suitable friction therebetween similar to disk **24** of spool **20.** Hub **35** with resilient spokes **36** is fixedly mounted on the top of shaft **70** to add a relatively uniform amount of wire tension similar to the hub/spoke structure of spool **20.** Again, as with spool **20,** the mounting of spool **30,** disk **34,** and hub **35** may be implemented in any suitable manner. It should be noted that tension differences between wires **21** and **31** and may be further reduced by mounting spools **20** and **30** symmetrically relative to eyelets **71** and **51,** respectively. Furthermore, eyelets **71** and **51** may preferably be made bell-shaped as shown to minimize friction.

Thus, there has been shown and described an improved wire-twisting device which provides a uniform twist and occupies a minimum amount of floor space. The device is relatively simple to construct and therefore economical to manufacture. Moreover, practically any desired number of devices constructed in accordance with the invention may be used to make twisted pairs for a multi-line cable in a single continuous operation that tends to reduce the cost of manufacturing the cable. Additional space saving in a vertical direction is afforded by the invention in that the eyelets may be mounted much closer (e.g., a spacing of one foot instead of three to four feet) to their respective spools because the relatively sharp angle created thereby no longer is a source of additional, tension-increasing friction.

It will, of course, be understood that modifications of the present invention, in its various aspects, will be apparent to those skilled in the art, some being apparent only after study, and others being merely matters of routine design. As such, the scope of the invention should not be limited by the particular embodiment and specific construction herein described, but should be defined only by the appended claims, and equivalents thereof.

Various features of the invention are set forth in the following claims.

What is claimed is:

1. A device for forming a uniformly twisted pair of wires, comprising:

a stationary supply spool for carrying a first one of said wires and having its central axis orientated in a substantially vertical position and also having a first upper wire-confining flange of a given diameter;

a first round disc having a diameter greater than that of said first flange and rotatably mounted coaxially with said spool above said first flange, said first disc being engageable with said first wire to provide sole guidance there for to maintain said first wire in substantially constant tension as said first wire is drawn off of said stationary spool;

a rotatable supply spool for carrying the second one of said wires and coaxially mounted above said stationary spool and having a second upper wire-confining flange of a given diameter, said rotatable spool further having an axial opening therethrough;

a second round disc having an axial opening therethrough and being rotatably mounted coaxially with said rotatable spool above said second flange, said second disc having a diameter greater than that of said second flange and being engageable with said second wire to provide the sole guidance therefor to maintain said second wire in substantially constant tension as said second wire is drawn off of said rotatable supply spool;

take-up means for receiving both said first wire from said stationary spool through said axial openings and said second wire from said rotatable spool at a predetermined rate;

and means for driving said rotatable supply spool at a predetermined angular velocity relative to the rate of said take-up means to obtain a desired wire twist.

2. A device according to claim **1,** which further comprises a first hub having at least one resilient spoke extending radially therefrom and fixedly mounted coaxially with said stationary spool near said first round disk for adding a relatively uniform amount of tension to said first wire; and a second hub having an axial opening therethrough and at least one resilient spoke extending radially therefrom, said second hub fixedly mounted coaxially with said rotatable spool near said second disk for adding a relatively uniform amount of tension to said second wire.

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