Sept. 11, 1962 G. DEMMEL 3,053,039

METHOD AND APPARATUS FOR PRODUCING STRANDED-CABLE COMPONENTS

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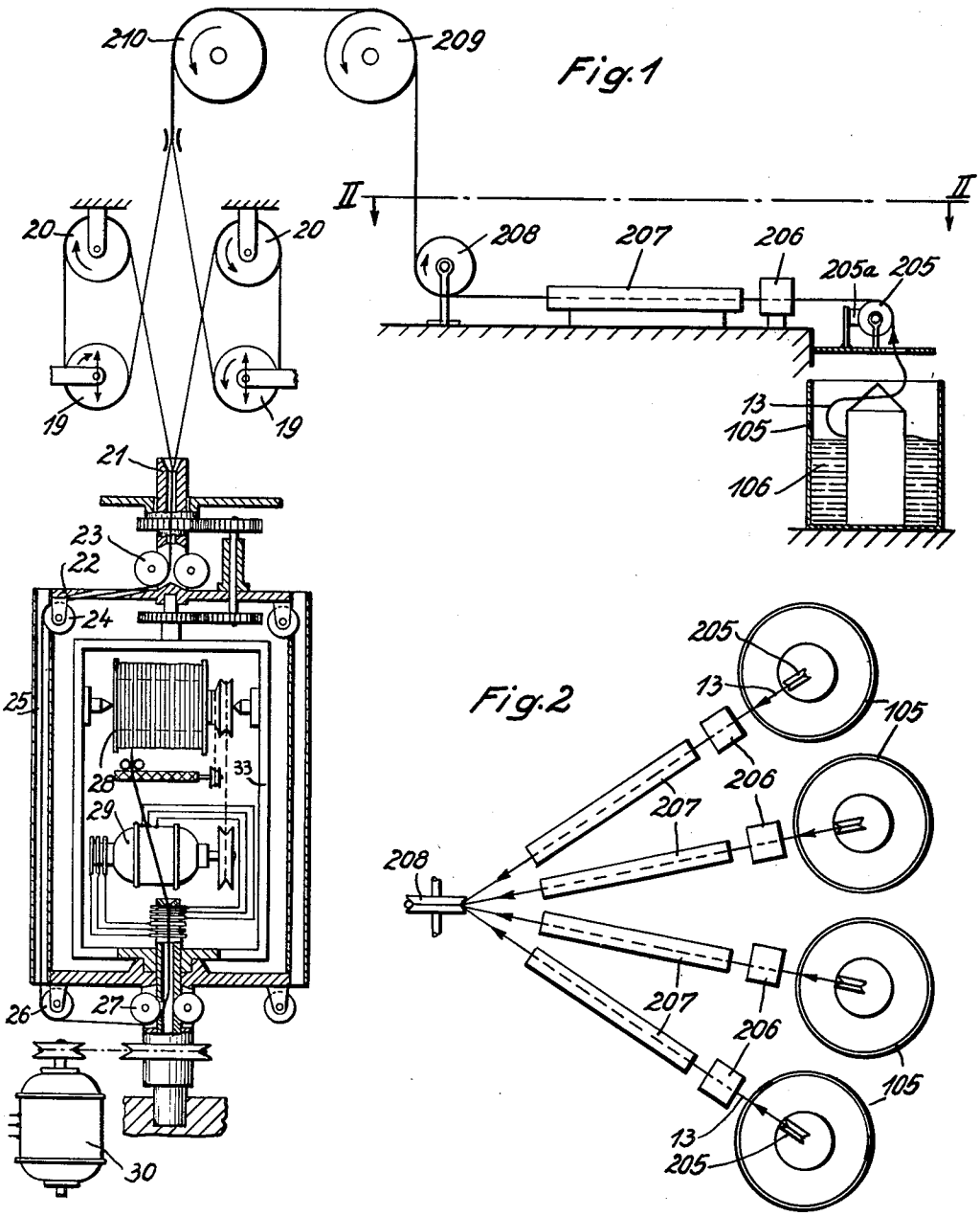

Fig. 1

Fig. 2

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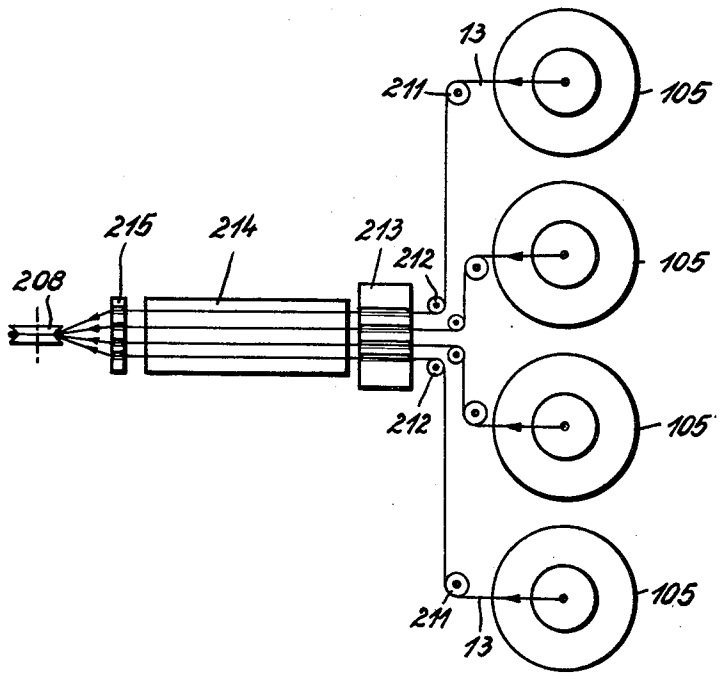
Fig. 3



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METHOD AND APPARATUS FOR PRODUCING STRANDED-CABLE COMPONENTS

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7 Claims. (Cl. 57—35)

My invention relates to methods and apparatus for manufacturing stranded cables and stranded-cable components, such as star-quads and other twisted groups of cable conductors, preferably for communication lines.

According to the known manufacture of stranded-cable components, the individual wires or wire groups that constitute the elements to be twisted together on the cabling machine, pass individually over capstan pulleys through a symmetrizing device and thence to the twisting mechanism of the cabling machine where the wires, wire groups or other elements, hereinafter collectively called "strands," are formed into the desired cable component, whereafter the stranded cable component is wound onto a take-up drum. In the conventional cabling plants, the strands are pulled off supply drums located inside of the machine assembly, and the twisted quad or other cable component is wound up on a drum mounted outside of the machine assembly for rotation about a stationary axis. However, there are also cabling methods which operate in the reverse manner with respect to the travel of the elements to be twisted. That is, according to the reverse method, the strands are pulled from a supply at a stationary location outside of the cabling machine proper, and the twisted cable component is ultimately wound upon a take-up drum located inside the machine. Cabling machine assemblies of the latter type are disclosed, for example, in U.S. Patent 2,956,391, issued October 18, 1960 and in the copending application of H. Menke et al., Serial No. 11,366, filed February 26, 1960, now Patent 2,985,994. My invention particularly relates to cabling machines of the upright type operating in accordance with the reverse method last mentioned.

Regardless of the particular method and equipment being employed, it is necessary, as a rule, to identify the insulated individual wires or wire groups in the cable. Such identification is usually applied when the individual wires are provided with an electric insulation of synthetic material consisting of a full-bodied synthetic substance or a synthetic foam material. The identification is applied while the individual wire emerges from an extrusion press in which it is jacketed with the synthetic insulation. In most cases, an identifying color is applied to the surface of the insulation. This method, however, has the disadvantage that, for example when producing star-quads, four differently colored or differently identified individual conductors must be produced and must be kept available for the cabling of a quad.

It is an object of my invention to simplify the application of an identifying marking to the individual strands or other cable elements, particularly when using individual wires or wire groups insulated by synthetic material.

According to my invention, I take advantage of certain operating features of the above-mentioned cabling equipment operating in accordance with the reverse method. That is, my invention requires the provision of a cabling plant in which a twisting machine of the upright type receives each of the individual strands from a supply located outside of the cabling machine proper at a spacially fixed location, whereas the twisted cable component produced from the strands is wound upon a take-up drum located centrally within the cabling machine. Operating with such a machine, and according to my invention, the

individual wires or strands, as they are being pulled off the supply, are drawn through a stationarily mounted coloring or identifying device and thereafter through a stationary drying device before entering into the twisting mechanism of the cabling machine proper. This has the advantage that when the individual strands are being insulated with synthetic plastic by passing them through an extrusion press, all strands may be given a uniformly colored or colorless appearance, the identifying markings being automatically applied only when the strands pass into the cabling machinery.

The method according to the invention can be performed by pulling the individual strands through separate marking devices and separate drying devices. However, according to another feature of my invention, all strands to be twisted together in the cabling machine can be passed through a common identifying and a common drying device. It is preferable to arrange all strand-supply drums for the respective components of a quad on one and the same side of the cabling machine proper.

The invention will be further explained below with reference to the embodiment of the invention illustrated by way of example on the accompanying drawings in which:

FIG. 1 is a schematic side view of a cabling machine assembly.

FIG. 2 is a schematic top view onto the plane denoted by II—II in FIG. 1; and

FIG. 3 is a top view of a modified arrangement.

The machinery illustrated in FIGS. 1 and 2 serves for the production of star-quads and is of a type in which the individual strands are pulled through separate identifying and drying devices prior to entering the twisting mechanism proper. The four strands 13, each consisting either of a single insulated wire or an insulated group of wires, are pulled out of stationarily mounted supply containers 105. All four strands are provided with an insulation of synthetic plastic, for example foam insulation, having all the same color or being left colorless, i.e. in the state of the natural appearance of the extruded insulation. That is, each individual strand, as it comes from the extrusion press where the insulation is placed upon the conductor, is simply wound into one of the containers 105 in form of a coil or loop 106. All storage containers 105 are located on one and the same side of the cabling machine.

The individual strands pass over a guide roller 205, which is preferably provided with a controllable brake 205a, and which changes the direction of the strand by 90°. Thence each strand travels through a marking device 206 in which a coloring dye or impression is applied to the insulation, whereafter the strand passes through a drying device 207. After the markings are dry, the strands pass over a common guide roller 208 and another guide roller 209 over a common pulling capstan roller 210 whence they pass into the symmetrizing device of the cabling machine. The symmetrizing device comprises for each strand a vertically displaceable dancer roller 19 and a stationarily journalled roller 20. If desired, an additional pre-twisting and a re-twisting device may be located ahead of the symmetrizing device.

From rollers 20 the strands pass through a twisting nipple 21 of a rotating cabling basket 22 and thence over guide rollers 23 and 24, a guide pipe 25, and two further guide rollers 26, 27 to the take-up drum 28. The cabling basket is driven from motor 30. The take-up drum is journalled in a frame structure 33 coaxially journalled about the vertical axis of the cabling basket and so geared thereto as to remain stationary while the basket 22 is rotating. The drum 28 is driven from a motor 29 mounted on the stationary frame structure 33.

As is apparent, the guide rollers 205 and 208 located on both sides respectively of the identifying and drying

devices make it possible to have the strands travel horizontally through horizontally extending, identifying and drying means.

According to FIG. 2 the strand-supply containers **105** are located on part of a circle about the center point of the guide roller **208**. Such a unilateral arrangement of the strand-supply means with respect to the cabling machine proper is particularly advantageous in permitting a space-saving grouping of the identifying and drying equipment.

In the modified embodiment according to FIG. 3, the strands **13** coming from the supply containers **105** pass over guide rollers **211** and **212** through a common marking device **213** and thence through a common drying device **214** whereafter the strands pass through a perforated disc **215** to the common guide roller **208** from which they enter into the symmetrizing device in the same manner as in the machine assembly according to FIG. 1.

The individual strands coming from the respective supply containers or drums may also be passed through separate marking devices as exemplified by FIG. 2 but may thereafter pass through a single drying device like the one shown at **214** in FIG. 3. In this case suitable guide rollers or other guide means are preferably provided between the individual marking devices and the common drying device. The strands passing through separate marking and drying devices according to FIGS. 1 and 2, may also be pulled into the cabling machine proper by means of separate capstan rollers in lieu of the common capstan roller **210** mentioned above. The common guide roller **208** illustrated in FIGS. 1, 2 and 3 may be provided with separate guiding grooves for the respective strands, or separate guide rollers may be substituted for the common guide roller **208**. The identifying markings may consist in a complete coloring of the entire strand surfaces obtained by passing them through a dye bath, or the markings may be imprinted upon the insulation in the conventional manner, for example in form of color rings which are produced by passing the insulated strand between rotating inking rollers and which recur repetitively along the strand at a given distance from each other.

I claim:

1. In the manufacture of communication cable components by twisting individual insulated cable elements on a cabling machine having an interiorly located take-up drum for receiving the twisted product, the method of facilitating identification of the cable elements in the product which comprises pulling the individual insulated elements from respective stationary supply locations along respective fixed paths into the cabling machine while the elements are in unmarked condition, applying to the insulated elements a coloring marking along said path, and thereafter subjecting the marked elements to drying along said paths.

2. Apparatus for producing communication cables and cable components from individual insulated conductors, conductor groups and the like strands, comprising a plurality of stationarily located strand supply means each containing, when in operation, an insulated strand not previously marked for identification, a cabling mechanism for twisting said strands together, a take-up drum rotatably mounted inside of said mechanism for receiving the twisted cable product, guide means defining for each strand a predetermined and stationarily located continuous path extending from a respective one of said supply means to said cabling mechanism, marking means mounted along at least one of said paths for applying a coloring agent to a corresponding respective strand as it travels along said path from said supply means to said cabling mechanism, and a drying device mounted between said marking means and said cabling mechanism for drying the coloring agent.

3. In cable producing apparatus according to claim 2, said guide means including a guide pulley common to all said paths and located between said cabling mechanism and all of said supply means, said marking means comprising a plurality of separate marking devices each located between said guide pulley and a respective supply means for applying a coloring agent to respective strands, and said drying device comprising a plurality of separate dryers each mounted between said guide pulley and a respective marking means for drying the applied coloring agent.

4. In cable producing apparatus according to claim 2, said guide means including a guide pulley common to all said paths and located between said cabling mechanism and all of said supply means, said marking means comprising a single marking device common to all of said strands and located between said guide pulley and said supply means, and said drying device comprising a single dryer also common to all of said strands and located between said guide pulley and said marking device for drying the applied coloring agent.

5. In a cabling apparatus according to claim 2, said supply means being all located on one and the same side of said cabling mechanism, said guide means comprising two guide rollers located respectively ahead of said marking means and behind said drying means relative to the strand path and defining a horizontal portion of said path, and said marking and drying means having respective vessels extending horizontally along and about said path portion.

6. A method of producing a twisted multi-conductor cable having a plurality of insulated conductor strands identifiably distinguishable from each other in the completed cable, comprising the steps of supplying a plurality of individual unmarked conductor strands from respective supply locations each fixed in space, pulling said conductor strands along respective predetermined and stationary continuous paths extending from said respective fixed supply locations to a twisting location common to all said strands, and applying an identifying marking to at least some of said strands at locations along said paths between a respective supply location and said twisting location.

7. A method of producing a twisted multi-conductor cable having a plurality of conductor strands identifiably distinguishable from each other in the completed cable, comprising the steps of supplying a plurality of insulation-covered individual unmarked conductor strands from respective supply locations each fixed in space, pulling said conductor strands along respective separate predetermined, stationary and continuous paths extending from said respective fixed supply locations to a location common to all said strands, applying an identifying coloring agent to at least some of said strands at a location along the respective paths of said strands at locations along said paths between a respective supply location and said location common to all strands, and drying the applied coloring agent along said paths immediately prior to said common location.

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