Sept. 16, 1952 H. D. ISENBERG 2,610,607

DEVICE FOR COLOR CODING INSULATED CONDUCTORS

Filed July 26, 1949 2 SHEETS—SHEET 1

Fig. 2

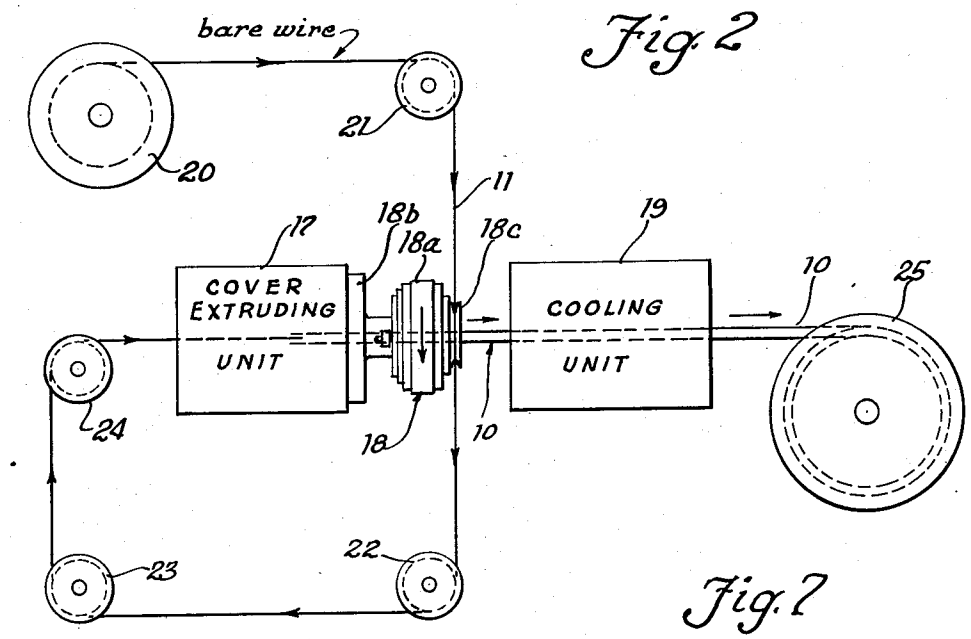


Fig. 7

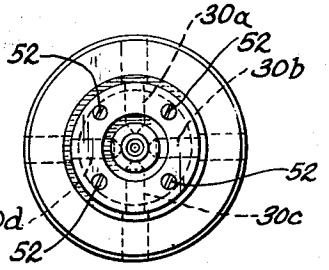


Fig. 4

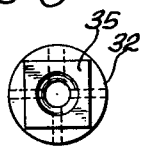


Fig. 5

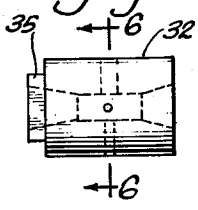


Fig. 6

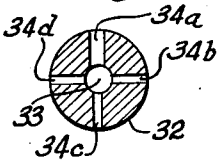
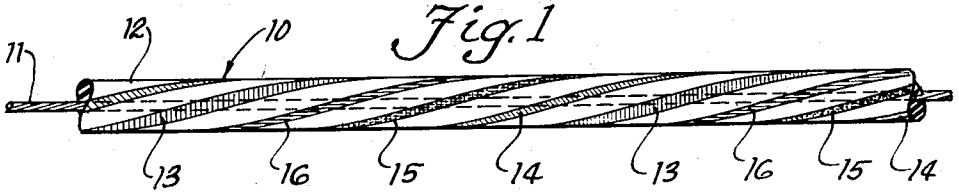


Fig. 1



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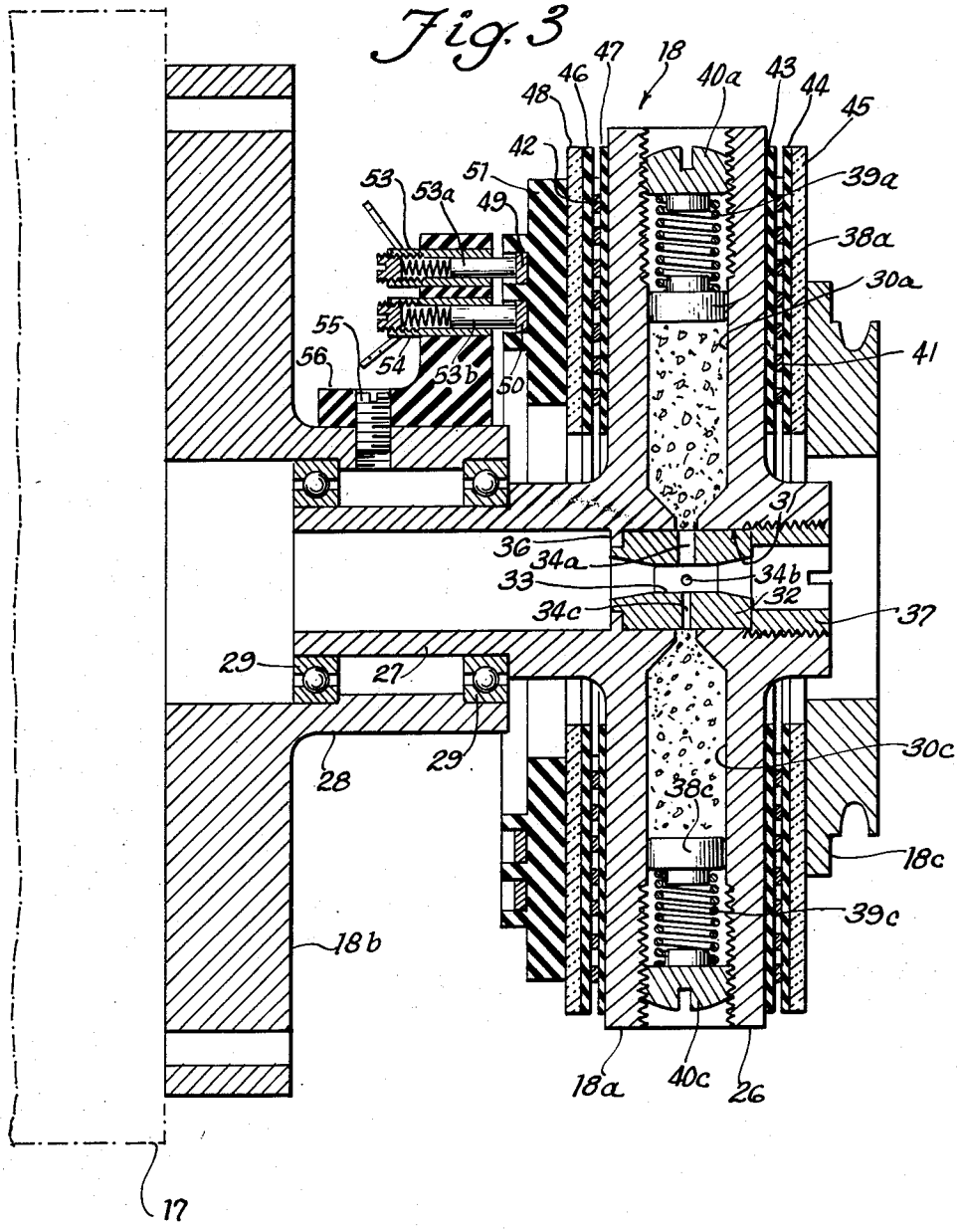
DEVICE FOR COLOR CODING INSULATED CONDUCTORS

Filed July 26, 1949 2 SHEETS—SHEET 2

Fig. 3



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DEVICE FOR COLOR CODING INSULATED CONDUCTORS

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Application July 26, 1949, Serial No. 106,825

19 Claims. (Cl. 118—412)

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The present invention relates to apparatus for making insulated conductors and more particularly to an improved device for forming coded stripes on an insulated conductor.

Color coding of insulated conductors to facilitate circuit wiring operations is well known. One of the most common methods of color coding insulated conductors is that of using differently colored material, such, for example, as varnished cambrics or cotton braids of different colors, as the outer insulating coverings for the conductors. However, when certain types of insulating materials, such, for example, as thermoplastic materials, are used to form the outer insulating coverings for the conductor, this method of color coding is not economically feasible. Moreover, the wiring procedures employed in certain industries require more elaborate color coding than is provided merely by solid color identification of conductors having given electrical characteristics.

Accordingly, it is an object of the present invention to provide an improved device for color coding insulated conductors.

It is another object of the invention to provide an improved device for producing one or more continuous color coding stripes on an insulated conductor.

It is a further object of the invention to provide an improved device of the character described which operates continuously to produce the desired coded color stripes on an insulated conductor as the conductor is passed through the device.

According to still another and more specific object of the invention, an improved color coding device is provided which functions continuously to produce a plurality of displaced spiral stripes of different colors on the outer surface of a continuously moving insulated conductor, and which is readily adjustable to form different colored stripe combinations and is readily adaptable for use in color coding insulated conductors having different outside diameters.

It is a still further object of the invention to provide a device of the character described which also assists in forming thermoplastic insulating material into conductor coverings of uniform diameter and wall thickness incident to formation of color codes on the surfaces of the conductor coverings.

It is still another object of the invention to provide a device of the character described which is simple in construction and arrangement and fully automatic in operation.

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The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawings, in which:

Fig. 1 illustrates a segment of an insulated conductor having spirally arranged stripes of different colors incorporated in the insulating material thereof through use of the present improved color coding device;

Fig. 2 diagrammatically illustrates apparatus, including the present improved color coding device, for forming the insulated cable shown in Fig. 1;

Fig. 3 is a sectional view of the present improved device for forming the coding stripes of different colors on the insulation of the insulated conductor shown in Fig. 1;

Fig. 4 is an end view of a bushing forming one of the components of the device shown in Fig. 3;

Fig. 5 is a side view of the bushing shown in Fig. 4;

Fig. 6 is a sectional view taken along the lines 6—6 in Fig. 5; and

Fig. 7 is an end view of the rotatable head embodied in the color coding device shown in Fig. 3.

Referring now to the drawings and more particularly to Fig. 1 thereof, the insulated conductor 10 there illustrated is formed by the apparatus shown in Fig. 2 and color coded by the device embodied in the apparatus of Fig. 2 and shown more particularly in Figs. 3 to 7, inclusive. This insulated conductor comprises a central stranded conductor 11 having extruded thereon an insulating covering consisting of a thermoplastic insulating material, such, for example, as polyethylene, nylon or one of the polyvinyl chloride plastic materials. For identification purposes, the insulated conductor 10 has four colored spiral stripes 13, 14, 15 and 16 of different colors impregnated in the insulating cover 12 thereof. One of these stripes, i. e., the stripe 13, has a width substantially greater than the width of each of the other three stripes. This stripe is known as the master stripe, whereas the three narrower stripes 14, 15 and 16 of uniform width are known as the ancillary stripes. For insulated conductors adapted for different uses or having different electrical characteristics, the wide or master stripe 13 may have different colors, with corresponding changes in the colors of the ancillary stripes 14, 15 and 16.

Referring now more particularly to Fig. 2 of the

drawings, the apparatus there illustrated for forming the insulated cable 10 comprises a cover extruding unit 17, the present improved color coding device 18 and a cooling unit 19 arranged to operate in tandem in the order named. In the illustrated arrangement of the apparatus, the color coding device 18 is provided with a rotatable head 18a which is rotated about the cable 10 and with a mounting pedestal 18b which is employed to mount the device on the conductor exit end of the cover extruding unit 17. The cover extruding unit may be of any desired commercial type capable of extruding a uniform layer of thermoplastic insulating material upon a solid conductor or a stranded conductor in a semiplastic state and forming the insulating material into a cover of the desired thickness and diameter. A bare conductor 11 in the form of single strand wire or multi-strand cable is fed to the cover extruding unit 17 from a supply spool 20 over idler pulleys 21, 22, 23 and 24 which are utilized to change the direction of movement of the conductor. For the purpose of rotating the rotatable head 18a of the color coding device 18 about the insulated conductor 10 as it exits from the extruding unit 17, this head is provided with a drive pulley 18c around which the conductor 11 is wrapped as it travels between the two idler pulleys 21 and 22. Upon exiting from the cooling unit 19, the insulated cable 10 is spooled on a take-up spool 25.

In considering the operation of the above-described apparatus to form the insulated conductor 10, it will be understood that the take-up spool 25 is driven from suitable drive means, not shown, through a slip clutch, and that the supply spool 20 is frictionally braked to impede its rotation so that the conductor 11 is maintained under tension between the supply and take-up spools continuously during its travel through the apparatus between these two spools. As the bare conductor passes through the extruding unit 17, the thermoplastic cover forming material is extruded onto this conductor and formed to produce an insulating wall of the desired thickness on the conductor. As the insulated cable 10 thus formed exits from the cover extruding unit 17 the insulating material extruded thereon remains in a semiplastic state. Upon exiting from the cover extruding unit 17, the insulated conductor passes through the color coding device 18. In this device, the head 18a is rotated about the cable 10 through the driving action supplied by movement of the bare conductor 11 around the driving pulley 18c. Thus the head 18a is rotated to produce the differently colored spiral stripes 14, 15 and 16 in the surface layer of the insulating covering 12 in the manner more fully explained below. After exiting from the color coding device 18 the finished cable is run through the cooling unit 19 to complete the thermoplastic setting operation, following which it is spooled for shipment on the take-up spool 25.

Referring now more particularly to Figs. 3 to 7, inclusive, of the drawings, the present improved color coding device 18 is there illustrated as comprising the supporting pedestal 18b, the rotatable head 18a and the driving pulley 18c, all referred to in the preceding paragraph. In the arrangement illustrated, the pedestal 18b is used to mount the device upon the exit end of the cover extruding unit 17. It will be understood, however, that this device may be separately supported independently of the cover extruding unit so as to be physically divorced from the other components of the cable forming apparatus. As best shown in Fig. 3, the rotatable head 18a comprises a central body member 26 having a hollow shaft portion 27 extending outwardly from the center thereof which is journaled for rotation upon a bearing extension 28 of the pedestal 18b by means of ball bearings 29.

In order to provide angularly spaced reservoirs within the central body member 26 for receiving the colored plastic materials used in forming the spiral stripes 13 to 16, inclusive, on the cable 10, this member is bored radially inward from the peripheral edge thereof to the center thereof at four equally spaced points around its periphery in the manner illustrated in Figs. 3 and 7 of the drawings. Four plastic material receiving reservoirs 30a, 30b, 30c and 30d for respectively receiving and holding differently colored plastic materials are thus formed in the part 26. It will be understood that as many such reservoirs may be provided as are required for the formation of a particular number of coding stripes on the cable 10. The inner ends of the reservoirs 30a, 30b, 30c and 30d each communicate with an axially centered opening 31 through the member 36 within which a bushing 32 is detachably mounted.

The bushing 32 has a central opening 33 extending axially thereof through which the cable 10 passes in traversing the device 18 and is also provided with four circumferentially spaced ports or channels 34a, 34b, 34c and 34d through the wall thereof which communicate with the inner ends of the reservoirs 30a, 30b, 30c and 30d to transmit the colored plastic materials from these reservoirs to the surface of the insulating covering 12 as the cable 10 passes through the central opening 33. As best shown in Figs. 3 and 6, the ports 34b, 34c and 34d, are utilized in forming the ancillary stripes 14, 15 and 16. For the purpose of detachably mounting the bushing 32 in the member 26 with the master stripe forming port 34a in registry with the opening into a desired one of the four reservoirs 30a, 30b, 30c and 30d and with the three other ports 34b, 34c and 34d respectively in registry with the openings into the other three reservoirs, the bushing 32 is provided with a squared end portion 35 which seats within a squared opening formed in an internal flange 36 in the member 26. It will be understood that the squared end portion 35 of the bushing 32 is adapted to enter the squared opening in the flange 36 in any one of four right angularly displaced settings of the bushing 32 relative to the member 26. A cap 37 threaded into the right end of the head part 26 is utilized to maintain the bushing 32 assembled with the member 26.

For the purpose of holding the colored plastic materials deposited in the four reservoirs 30a, 30b, 30c and 30d under pressure and of forcing the materials through the ports 34a, 34b, 34c, 34d onto the surface of the insulated conductor 10, each reservoir is closed at the outer end by a spring pressed piston which may be removable therefrom to permit refilling of the reservoir as required. Thus the outer end of the reservoir 30a is closed by a piston 38a which is spring loaded by means of a spiral spring 39a interposed between the piston and a closure cap 40a threaded into the outer end of the reservoir barrel. Corresponding components 38c, 39c and 40c are utilized to close the reservoir 30c and to maintain the plastic material deposited in this reservoir under pressure.

In order to heat the plastic material within the four reservoirs 30*a*, 30*b*, 30*c* and 30*d* to a plastic state, electric heating elements 41 and 42 in the form of spirally wound pancake resistors are provided on either side of the rotatable head member 26. The resistor 41 is clamped between two annular insulating discs 43 and 44 by means of an annular clamping plate 45. Similarly, the second heating element 42 is clamped between two annular insulating discs 46 and 47 by means of an annular clamping plate 48. Preferably, the insulating discs 43, 44, 46 and 47 are formed of mica or another suitable electrical insulating material. Electrically, the two heating elements 41 and 42 are connected in series between a pair of conductive slip rings 49 and 50 which are supported within annular recesses provided in an annular insulating member 51 formed of Bakelite or the like. Suitable assembly screws or bolts indicated at 52 in Fig. 7 of the drawings and extending through registering openings in the parts 26, 18*c*, 43, 44, 45, 46, 47, 48 and 51 at points located between the four angularly displaced reservoirs, may be employed to clamp the identified components of the rotatable head 18*a* in assembled relationship.

Heating current is supplied to the two series connected heating elements 41 and 42 through a pair of terminal assemblies 53 and 54 which respectively include carbon brushes 53*a* and 53*b* spring biased to engage the slip rings 49 and 50. These terminal assemblies are fixedly mounted between a supporting pedestal or bracket 56 formed of Bakelite or another suitable insulating material, which in turn is mounted upon the bearing extension 28 of the pedestal 18*b* by means of one or more assembly screws 55.

From the above explanation it will be understood that in utilizing the color coding unit 18 to produce the described spiral stripes 13, 14, 15 and 16 on the outer surface of the insulated cable 10, the reservoirs 30*a*, 30*b*, 30*c* and 30*d* are each filled with a thermoplastic material, preferably in granular form, intermixed with the desired coloring pigments, and that pigments for producing different colors are used in the mixtures deposited in the different reservoirs. By way of example, it may be assumed that the reservoir 30*a* is filled with a granulated mixture of thermoplastic material and color pigment while the head 18*a* stands in a position wherein this reservoir is vertically upright. After the reservoir 30*a* is thus filled, the piston 38*a* is inserted in the mouth of the reservoir, the spring 39*a* placed on top of the piston and the closure cap 40*a* threaded into the open end of the reservoir to compress the spring 39*a* and thus produce pressure engagement between the piston 38*a* and the granulated mixture of thermoplastic material and pigment. The other three reservoirs may similarly be filled one at a time with granulated mixtures of thermoplastic material and color pigments of the desired colors. Current may now be supplied to the heating elements 41 and 42 for the purpose of heating the mixtures within the four reservoirs to a fluid or plastic state. The unit is now ready for operation.

In operation, the spring loaded pistons 38*a*, 38*b*, etc., within the reservoirs 30*a*, 30*b*, 30*c* and 30*d* force the fluid thermoplastic materials from these reservoirs directly onto the surface of the insulating material 12 as the cable 10 passes through the central opening 33 in the bushing 32. In this regard it will be recalled that the insulating covering 12 of the cable 10 is in a semiplastic state

at the time that the cable passes through the central opening 33 in the bushing 32. Thus, the walls of the opening 33 serve to form the plastic covering 12 of the cable to the exact desired diameter and thickness as the cable passes through the bushing 32. Also, since the insulating material 12 is still in a plastic or semiplastic state, the colored plastic materials contained within the reservoirs 30*a*, 30*b*, 30*c* and 30*d* are extruded into and intermixed with the surface layer of the material 12 to form an integral part of the insulating covering of the cable. Moreover, since the head 18*a* is being rotated about the cable 10 under the influence of the conductor 11 as it is drawn about the pulley 18*c*, the stripes are spirally formed around the cable 10. In this regard, it will be understood that since the head 18*a* is driven directly by the conductor 11, the angular speed thereof is directly related or proportional to the linear speed of the cable 10 through the central bushing 32, such that the pitch of the spiral stripes 13, 14, 15 and 16 remains the same regardless of variations in the linear speed of the cable 10 through the three tandem related units 17, 18 and 19. If a change in the pitch of the spiral stripes is desired, it may be obtained by utilizing pulleys 18*c* of different outside diameters, thereby to change the relationship between the linear speed of the cable 10 through the bushing 32 and the rotational speed of the head 18*a*.

From the preceding explanation it will be understood that the present improved color coding device is entirely simple in arrangement and that it operates in a fully automatic manner to produce permanent coded color stripes on an insulated conductor having a thermoplastic insulating material as the outer insulating covering thereof. Further, the coding of the spiral stripes formed on the outer insulating wall of the insulated conductor may be changed as desired by shifting the position of the bushing 32 to bring the large port 34*a* thereof into communication with different ones of the four reservoirs 30*a*, 30*b*, 30*c* and 30*d*. If a code is to be used which requires less than four stripes along the insulated conductor, a central bushing 32 may be employed having one or more of the four ports 34*a*, 34*b*, 34*c* and 34*d* omitted therefrom. Further, the color coding unit may easily be adapted to the production of insulated conductors having different outside diameters by substituting bushings 32 having different sized central openings 33 therethrough.

While one embodiment of the invention has been described, it will be understood that various modifications may be made therein which are within the true spirit and scope of the invention as defined in the appended claims.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. In apparatus for color coding an insulated conductor which comprises means for moving the conductor longitudinally, a device for forming a coding stripe on the moving conductor, comprising, in combination, means defining a reservoir for the coding material, a bushing having a central opening of fixed size adapted to encircle said insulated conductor as said insulated conductor is moved through said opening, said bushing having a stripe forming port through the wall thereof for transmitting the coding material from said reservoir to the surface of said insulated conductor, and means for rotating said bushing about said insulated conductor with said port in communication with said reservoir.

2. Apparatus for forming a coding stripe on an insulated conductor, comprising means defining a reservoir for the coding material, a bushing having a central opening of fixed size adapted to be traversed by said insulated conductor, said bushing having a stripe forming port through the wall thereof for transmitting the coding material from said reservoir to the surface of said insulated conductor, means for moving said insulating conductor through said opening, and means for rotating said reservoir and said bushing about said insulated conductor as said insulated conductor traverses said central opening, thereby to form a spiral stripe along the surface of said conductor.

3. Apparatus for forming a coding stripe on an insulated conductor, comprising means defining a reservoir for the coding material, a bushing having a central opening of fixed size adapted to be traversed by said insulated conductor, said bushing having a stripe forming port through the wall thereof for transmitting the coding material from said reservoir to the surface of said insulated conductor, means for pulling said insulated conductor through the central opening of said bushing, and means for rotating said reservoir and bushing about said insulated conductor at an angular speed which is directly related to the linear speed of said insulated conductor through said bushing, thereby to form a spiral stripe on the surface of said insulated conductor.

4. Apparatus for forming a coding stripe on an insulated conductor, comprising means defining a reservoir for the coding material, a bushing having a central opening of fixed size adapted to be traversed by said insulated conductor, said bushing having a stripe forming port through the wall thereof for transmitting the coding material from said reservoir to the surface of said insulated conductor, means for pulling said insulated conductor through the central opening of said bushing, and means actuated by linear movement of said conductor for rotating said reservoir and bushing about said insulated conductor at an angular speed which is directly related to the linear speed of said insulated conductor through said bushing, thereby to form a spiral stripe on the surface of said insulated conductor.

5. A device for forming differently colored coding stripes on an insulated conductor, comprising a striping head provided with a plurality of angularly displaced reservoirs for coding materials of different colors, and a bushing carried by said head and provided with a central opening of fixed size adapted to be traversed by said insulated conductor, said bushing having angularly displaced stripe forming ports through the wall thereof each communicating with a different one of said reservoirs for transmitting the coding materials from said reservoirs to the surface of said insulated conductor.

6. A device for forming differently colored coding stripes on an insulated conductor, comprising a rotatable striping head provided with a plurality of angularly displaced reservoirs for coding materials of different colors, a bushing carried by said head and provided with a central opening of fixed size adapted to be traversed by said insulated conductor, said bushing having angularly displaced stripe forming ports through the wall thereof each communicating with a different one of said reservoirs for transmitting the coding materials from said reservoirs to the surface of said insulated conductor, and means for rotating said head about said insulated conductor.

7. A device for forming differently colored coding stripes on an insulated conductor, comprising a rotatable striping head provided with a plurality of angularly displaced reservoirs for coding materials of different colors, a bushing carried by said head and provided with a central opening of fixed size adapted to be traversed by said insulated conductor, said bushing having angularly displaced stripe forming ports through the wall thereof each communicating with a different one of said reservoirs for transmitting the coding materials from said reservoirs to the surface of said insulated conductor, and means actuated by movement of said conductor for rotating said head about said insulated conductor at an angular speed directly related to the linear speed of said conductor through the central opening of said bushing, thereby to form differently colored spiral stripes on the surface of said insulated conductor.

8. A device for forming differently colored coding stripes on an insulated conductor, comprising a striping head provided with a plurality of angularly displaced reservoirs for coding materials of different colors, a bushing provided with a central opening of fixed size adapted to be traversed by said insulated conductor and having angularly displaced stripe forming ports through the wall thereof and respectively communicating with said reservoirs for transmitting the coding materials from said reservoirs to the surface of said insulated conductor, and means for detachably mounting said bushing on said head with said ports communicating with said reservoirs.

9. A device for forming differently colored coding stripes on an insulated conductor, comprising a rotatable striping head provided with a plurality of angularly displaced reservoirs for coding materials of different colors, a bushing provided with a central opening of fixed size adapted to be traversed by said insulated conductor and having angularly displaced stripe forming ports through the wall thereof and respectively communicating with said reservoirs for transmitting the coding materials from said reservoirs to the surface of said insulated conductor, means for detachably mounting said bushing on said head with said ports communicating with said reservoirs, and means for rotating said head about said insulated conductor, thereby to form differently colored spiral stripes on the surace of said insulated conductor.

10. A device for forming differently colored coding stripes on an insulated conductor, comprising a rotatable striping head provided with a plurality of angularly displaced reservoirs for coding materials of different colors, a bushing provided with a central opening of fixed size adapted to be traversed by said insulated conductor and having angularly displaced stripe forming ports through the wall thereof each communicating with a different one of said reservoirs for transmitting the coding materials from said reservoirs to the surface of said insulated conductor, means for detachably mounting said bushing on said head with said ports communicating with said reservoirs, and means actuated by movement of said conductor for rotating said head about said insulated conductors at an angular speed directly related to the linear speed of said conductor through the central opening of said bushing, thereby to form differently

colored spiral stripes on the surface of said insulated conductor.

11. A device for forming differently colored coding stripes on an insulated conductor, comprising a striping head provided with a plurality of angularly displaced reservoirs for coding materials of different colors, a bushing provided with a central opening adapted to be traversed by said insulated conductor and having angularly displaced stripe forming ports through the wall thereof for transmitting the coding materials from said reservoirs to the surface of said insulated conductor, at least one of said ports having a stripe forming dimension different from the stripe forming dimensions of the other ports, and means for fixedly mounting said bushing on said head in any one of a plurality of predetermined different positions wherein said one port communicates with a selected one of said reservoirs and the other ports respectively communicate with the other reservoirs.

12. A device for forming differently colored coding stripes on an insulated conductor, comprising a rotatable striping head provided with a plurality of angularly displaced reservoirs for coding materials of different colors, a bushing provided with a central opening adapted to be traversed by said insulated conductor and having angularly displaced stripe forming ports through the wall thereof for transmitting the coding materials from said reservoirs to the surface of said insulated conductor, at least one of said ports having a stripe forming dimension different from the strip forming dimensions of the other ports, means for fixedly mounting said bushing on said head in any one of a plurality of predetermined different positions wherein said one port communicates with a selected one of said reservoirs and the other ports respectively communicate with the other reservoirs, and means for rotating said head about said insulated conductor, thereby to form differently colored stripes on the surface of said insulated conductor.

13. A device for forming differently colored coding stripes on an insulated conductor, comprising a rotatable striping head provided with a plurality of angularly displaced reservoirs for coding materials of different colors, a bushing provided with a central opening adapted to be traversed by said insulated conductor and having angularly displaced stripe forming ports through the wall thereof for transmitting the coding materials from said reservoirs to the surface of said insulated conductor, at least one of said ports having a stripe forming dimension different from the stripe forming dimensions of the other ports, means for fixedly mounting said bushing on said head in any one of a plurality of predetermined different positions wherein said one port communicates with a selected one of said reservoirs and the other ports respectively communicate with the other reservoirs, and means actuated by movement of said conductor for rotating said head about said insulated conductor at an angular speed directly related to the linear speed of said conductor through the central opening of said bushing, thereby to form differently colored spiral stripes on the surface of said insulated conductor.

14. A device for forming differently colored coding stripes on an insulated conductor, comprising a striping head provided with a plurality of angularly displaced reservoirs for thermoplastic coding materials of different colors, heating means forming a part of said head and operative to heat said thermoplastic coding materials to a plastic state, closure means for said reservoirs including spring loaded pistons for maintaining the plastic coding materials under pressure, a bushing provided with a central opening adapted to be traversed by said insulated conductor and having angularly displaced stripe forming ports through the wall thereof for extruding the coding materials from said reservoirs onto the surface of said insulated conductor as said conductor traverses the central opening through said bushing, and means for detachably mounting said bushing on said head with said ports communicating with said reservoirs.

15. A device for forming differently colored coding stripes on an insulated conductor, comprising a striping head provided with a plurality of angularly displaced reservoirs for thermoplastic coding materials of different colors, electric heating elements disposed on either side of said head thereof for heating said thermoplastic coding materials to a plastic state, closure means for said reservoirs including spring loaded pistons for maintaining the plastic coding materials under pressure, a bushing provided with a central opening adapted to be traversed by insulated conductor and having angularly displaced stripe forming ports through the wall thereof for extruding the plastic coding materials from said reservoirs onto the surface of said insulated conductor as said conductor traverses the central opening through said bushing, and means for detachably mounting said bushing on said head with said ports communicating with said reservoirs.

16. A device for forming differently colored coding stripes on an insulated conductor, comprising a striping head provided with a plurality of angularly displaced reservoirs for thermoplastic coding materials of different colors, electric heating elements disposed on either side of said head for heating said thermoplastic coding materials to a plastic state, closure means for said reservoirs including spring loaded pistons for maintaining the plastic coding materials under pressure, a bushing provided with a central opening adapted to be traversed by said insulated conductor and having angularly displaced stripe forming ports through the wall thereof for extruding the plastic materials from said reservoirs onto the surface of said insulated conductor, at least one of said ports having a stripe forming dimension different from the stripe forming dimensions of the other ports, and means for fixedly mounting said bushing on said head in any one of a plurality of predetermined different positions wherein said one port communicates with a selected one of said reservoirs and the other ports respectively communicate with the other reservoirs.

17. A device for forming differently colored coding stripes on an insulated conductor, comprising a striping head provided with a plurality of angularly displaced reservoirs for thermoplastic coding materials of different colors, electric heating elements disposed on either side of said head for heating said thermoplastic coding materials to a plastic state, closure means for said reservoirs including spring loaded pistons for maintaining the plastic coding materials under pressure, a bushing provided with a central opening adapted to be traversed by said insulated conductor and having angularly displaced stripe forming ports through the wall thereof for ex-

truding the plastic materials from said reservoirs onto the surface of said insulated conductor, at least one of said ports having a stripe forming dimension different from the stripe forming dimensions of the other ports, means for fixedly mounting said bushing on said head in any one of a plurality of predetermined different positions wherein said one port communicates with a selected one of said reservoirs and the other ports respectively communicate with the other reservoirs, and means actuated by movement of said conductor for rotating said head about said insulated conductor at an angular speed directly related to the linear speed of said conductor through the central opening of said bushing, thereby to form differently colored spiral stripes on the surface of said insulated conductor.

18. Apparatus for forming a color coded insulating covering on an electrical conductor which conductor has a covering of thermoplastic insulating material extruded thereon, a bushing having a central opening adapted to be traversed by said covered conductor while the material is in a plastic state and provided with central opening walls which assist in forming the thermoplastic insulating material into a covering before the material sets, said bushing having a stripe forming port through the wall thereof for transmitting colored coding material to the surface of said covering, and means for extruding color coding material onto the surface of said covering through said port while said thermoplastic insulating material is in said bushing and before said thermoplastic material has set.

19. Apparatus for forming a color coded insulating covering on an electrical conductor,

which conductor has a covering of thermoplastic insulating material extruded thereon, a bushing having a central opening adapted to be traversed by said covered conductor while said material is in a plastic state and provided with central opening walls which assist in forming the thermoplastic insulating material into a covering before the material sets, said bushing having a stripe forming port through the wall thereof for transmitting colored coding material to the surface of said covering, means for extruding color coding material onto the surface of said covering through said port while said thermoplastic insulating material is within said bushing and before said thermoplastic insulating material has set, and means for rotating said bushing about said conductor, whereby said port traces a helical path around said conductor as said conductor traverses the central opening of said bushing.

HANS D. ISENBERG.

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