

July 4, 1950

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2,513,802

APPARATUS FOR COVERING CORES

Filed Sept. 18, 1946

2 Sheets-Sheet 1

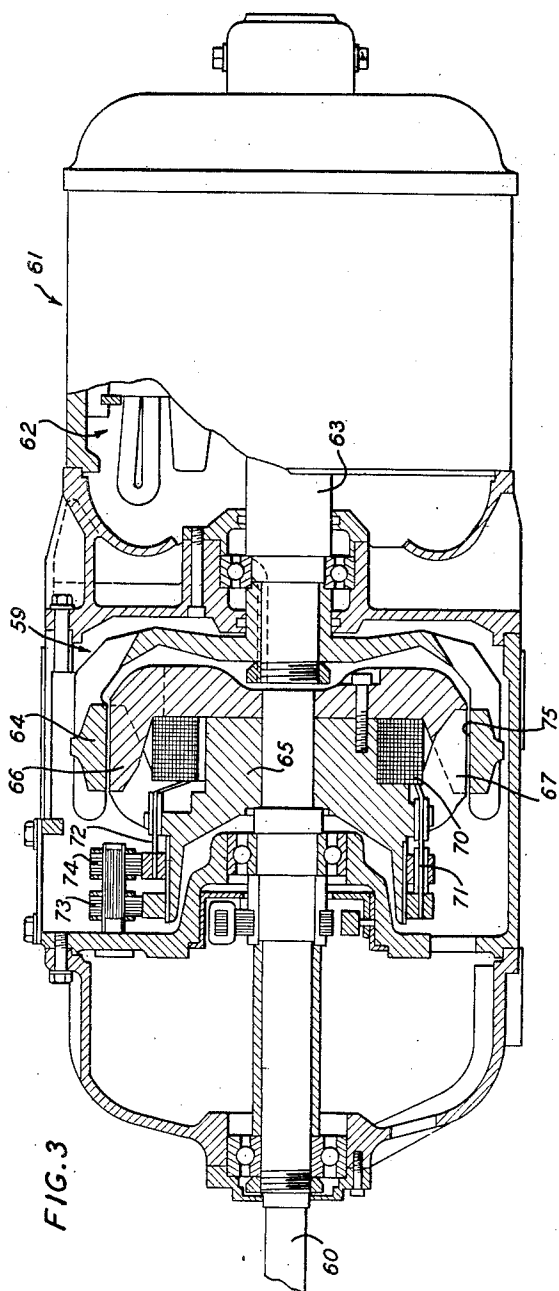
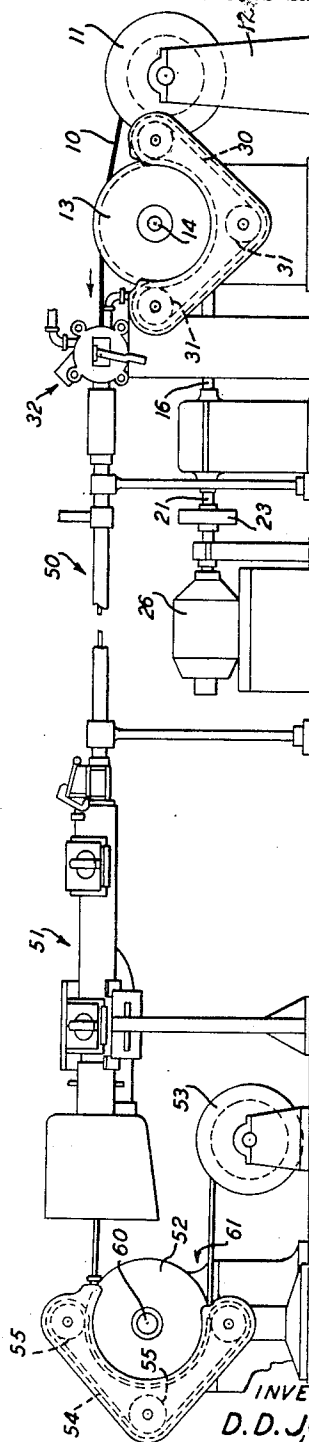


FIG. 1

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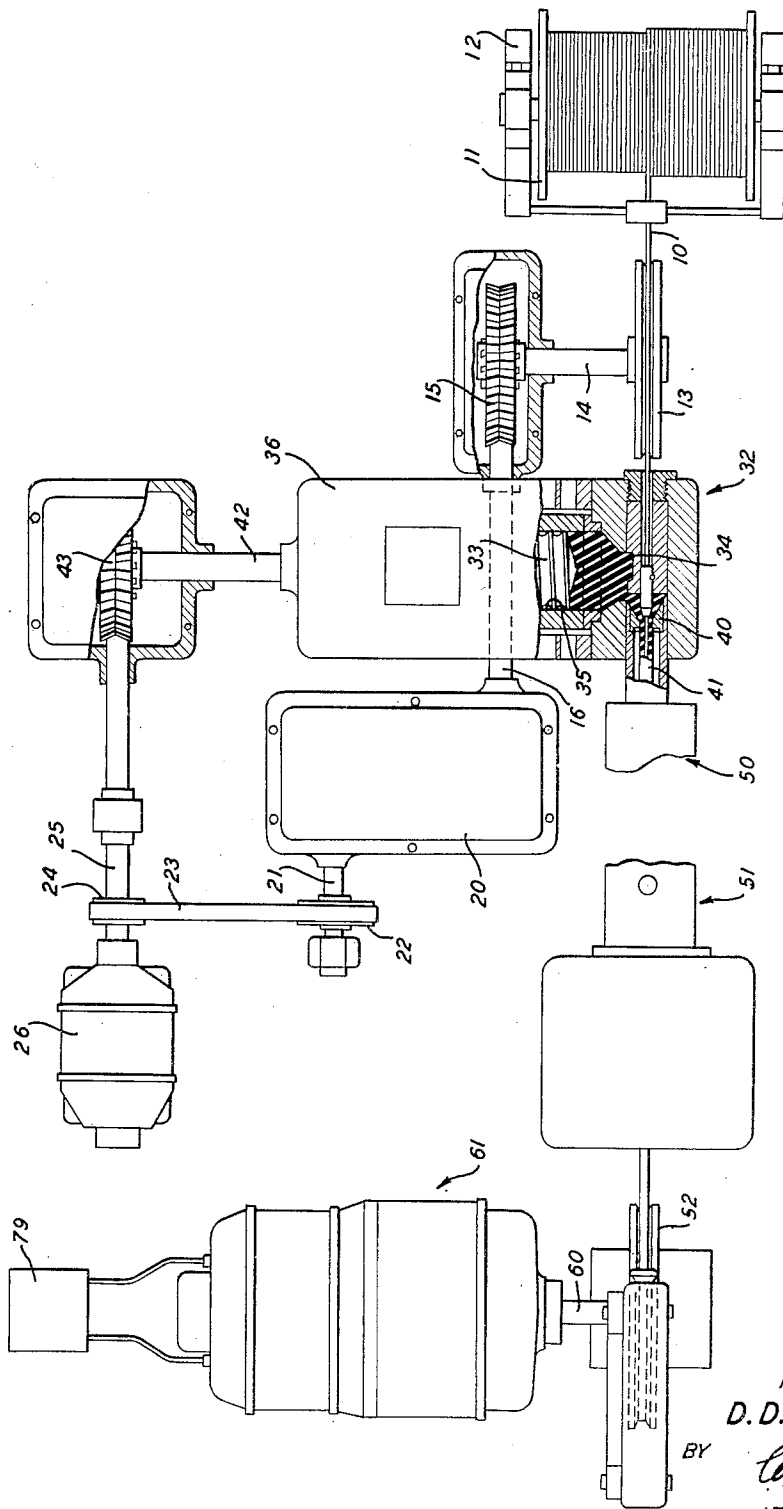
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APPARATUS FOR COVERING CORES

Filed Sept. 18, 1946

2 Sheets-Sheet 2



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2,513,802

APPARATUS FOR COVERING CORES

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Application September 18, 1946, Serial No. 697,809

7 Claims. (Cl. 18—13)

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This application relates to apparatus for covering cores, and more particularly to apparatus designed to continuously apply coverings of insulating or jacketing materials over cores, such as filamentary conductors and the like.

In the manufacture of insulated conductors, either bare or covered filamentary conductors are sometimes advanced continuously from supply reels through extruders and elongated continuous vulcanizing tubes by takeup capstans positioned at the ends of the vulcanizing tubes. The extruders continuously extrude coverings of vulcanizable materials over the conductors as they are advanced from the supply reels therethrough. Since the vulcanizing tubes are relatively long, the portions of the conductors between the extruder and the takeup capstan sag considerably. If the supply reels from which the conductors are drawn are not balanced, or if the conductors are unevenly distributed on the supply reels, the conductors are advanced through the extruders with nonuniform tensions on different portions thereof passing through the extruders. Since the extruders feed material at a substantially constant rate of speed, variations in the tension of the conductors cause variations in the thickness of the coverings formed by the extruders. Placing freely rotatable sheaves between the supply spools and the extruders tends to smooth out the rate of feed from unbalanced supply reels but acts only as a dampener on the variations in tensions on the conductors. In the past, there have been no satisfactory means for feeding conductors through the extruders under uniform tensions.

An object of the invention is to provide new and improved apparatus for covering cores.

A further object of the invention is to provide new and improved machines for forming uniform coverings of insulating or jacketing materials on cores, such as filamentary conductors and the like.

An apparatus illustrative of the invention includes, in the order named, a supply reel, a positively driven supply capstan, a continuous extruder, an elongated vulcanizing tube, a takeup capstan, and a slipping drive for rotating the takeup capstan and a takeup reel. The supply capstan and a stock screw of the extruder are positively driven through a common drive, and hence, have constant relative speeds. A conductor withdrawn from the supply reel is wrapped around the supply capstan, which rotates to positively advance the conductor from the supply reel at the rate of peripheral speed of the capstan. The takeup capstan is driven by the slipping

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drive, which maintains a constant torque on the takeup capstan, so that the portion of the conductor between the takeup capstan and the supply capstan is maintained under a uniform tension as the takeup capstan advances the conductor through the extruder and the vulcanizing tube. Since the supply capstan advances the conductor from the takeup reel positively and the takeup capstan maintains a constant tension on the conductor, any nonuniformity in tension on the conductor that might result from uneven distribution of the conductor on the supply reel or from unbalance in the supply reel is eliminated.

15 A complete understanding of the invention may be obtained from the following detailed description of an insulating machine forming a specific embodiment thereof, when read in conjunction with the appended drawings, in which:

20 Fig. 1 is a fragmentary, front elevation of an insulating machine forming one embodiment of the invention;

25 Fig. 2 is an enlarged, fragmentary, top plan view of the machine with a portion thereof shown in section, and

Fig. 3 is an enlarged, fragmentary, partially sectional view of a portion of the machine.

Referring now in detail to the drawings, a conductor 10 (Fig. 1), which may be bare or covered, is advanced from a supply reel 11 mounted rotatably on a supply stand 12 by a supply capstan 13. The supply capstan 13 is driven through a shaft 14, worm gearing 15, a shaft 16, a variable gear box 20, a shaft 21, a pulley 22, a belt 23, a pulley 24 and a shaft 25 driven by an electric motor 26. The conductor 10 is wrapped at least once completely around the capstan 13, and a presser belt 30 mounted on freely rotatable pulleys 31—31 presses the conductor 10 tightly against the capstan 13 so that slippage between the conductor 10 and the capstan 13 is prevented. Hence, the conductor 10 is advanced by the supply capstan 13 from the supply reel 11 at a constant speed regardless of unbalance of the supply reel 11 or uneven distribution of the conductor 10 on the supply reel 11, if either or both of these conditions are present.

The conductor 10 is pulled through an extruder 32 having a stock screw 33, which forces a vulcanizable insulating or jacketing material 34 through a passage 35 in a cylinder 36 of the extruder 32 at a constant rate of flow for a given rate of rotation of the stock screw 33. A forming die 40 of a predetermined size serves to form the vulcanizable material 34 into a covering 41

around the conductor 10. The stock screw 33 is driven by a shaft 42 driven by the shaft 25 through worm gearing 43. Since the rate of rotation of the stock screw is constant with respect to the rate of rotation of the supply capstan 13, the rate of speed at which the conductor 10 is advanced by the supply capstan is constant with respect to the rate of delivery of vulcanizable material by the stock screw 33 for any particular setting of the variable gear box 20.

The covered conductor 10 is advanced from the extruder 32 into and through an elongated vulcanizing tube 50 positioned in tandem with the extruder. A vulcanizing medium, such as steam, or the like, is introduced under pressure into the vulcanizing tube 50 to vulcanize the covering 41. The covered conductor passes into a suitable water seal 51, and then is passed around a takeup capstan 52 and is wound upon a takeup reel 53. A presser belt 54 mounted on freely rotatable pulleys 55—55 presses the conductor tightly against the takeup capstan 52 so that there is no slippage between the conductor and the takeup capstan.

The takeup capstan 52 is mounted on a shaft 60 of a magnetic clutch motor drive 61 of a well-known type. The motor drive 61 includes an induction motor 62 having a shaft 63, which is rotated by the motor 62, and a magnetic clutch 59. A drum 64 composed of magnetic material is fastened rigidly to the shaft 63 and is rotated therewith. A spider 65 having poles 66 and 67 is fastened rigidly to the shaft 60. An annular coil 70 fastened rigidly to the spider 65 is connected electrically by the conductors 71 and 72 to slip rings 73 and 74, respectively, to which slip rings electric current is supplied, whereby the electric current flows through the annular coil 70 to cause magnetization of the poles 66 and 67, which are spaced from the drum 64 by a slight air gap 75. The magnetization of the poles 66 and 67 magnetizes the portion of the drum 64 adjacent thereto, and, as the drum 64 is rotated by the motor 62, the drum 64 draws the spider 65 therewith with some slipping therebetween, whereby the shaft 60 is rotated. The motor 62 will exert a constant predetermined torque upon the shaft 63, which torque is transmitted by the shaft 60 to the takeup capstan 52, but permits slipping between the drum 64 and the spider 65. The takeup capstan 52 exerts a constant predetermined pull upon the covered conductor, which pull is sufficient to pull the conductor 10 from the supply capstan 13 at the same rate of speed at which the capstan 13 advances the conductor. Hence, the capstans 52 and 13 advance the conductor 10 at a constant, predetermined rate of speed and maintain the conductor 10 under a constant, predetermined tension so that the vulcanizable material 34 is formed uniformly around the conductor. An electronic control 79 of a well-known type may be adjusted to vary the torque applied by the drive 61 to the takeup capstan 52. Thus, the tension imparted by the takeup capstan 52 may be varied for covered conductors having different weights per unit of length than that of the covered conductor 10.

In the operation of the apparatus described hereinabove, the conductor 10 is passed around and advanced by the supply capstan 13 at a constant rate of speed for any particular settings of the motor 26 and the variable gear box 20 so that the supply capstan 13 acts as a measuring capstan. The takeup capstan 52 is rotated by the drive 61 and transmits a predetermined

torque to the takeup capstan 52. The torque applied tends to rotate the takeup capstan 52 at a higher rate of peripheral speed than that of the supply capstan 13 but this is prevented by the action of the covered conductor 10, which is pressed against the takeup capstan. Hence, the takeup capstan 52 applies a constant tension to the portion of the conductor between the takeup capstan and the supply capstan 13, and advances the conductor through the extruder 32, the vulcanizing tube 50 and the seal 51 as fast as the supply capstan 13 will permit the conductor 10 to be advanced, which will be at a constant rate of speed regardless of any unbalance of the reel 11 or nonuniformity in distribution of the conductor 10 thereon.

The stock screw 33 is driven in synchronization with the supply capstan 13, which regulates the rate of speed in which the conductor 10 may be drawn through the extruder 32 by the takeup capstan 52 so that the vulcanizable material 34 is extruded by the extruder 32 at a rate of speed, which is constant relative to the rate of speed of the conductor. Since the rate of flow of the vulcanizable material from the extruder 32 and the rate of speed of the conductor 10 and the tension thereof are constant, the covering 41 formed around the conductor 10 is uniform and is not affected by irregularities in the feed of the portion of the conductor 10 between the supply reel 11 and the supply capstan 13.

The extruder 32 is suitable for extruding many types of plastic materials over conductors. For example, it may be used to extrude thermoplastic compounds as well as vulcanizable compounds. If the extruder is used to extrude thermoplastic materials, water rather than a vulcanizing medium may be inserted into the vulcanizing tube 50. Or, an elongated cooling trough (not shown) filled with water may be substituted for the vulcanizing tube when thermoplastic material is extruded by the extruder.

Other types of slipping drives than the drive 61 may be used to drive the takeup capstan 52. For example, either a slipping mechanical clutch or a torque motor might be used in place of the drive 61.

What is claimed is:

1. Apparatus for covering cores, which comprises means for supporting a continuous core, an extruder for continuously forming plastic material around such a core, means positioned between the core-supporting means and the continuous extruder for positively advancing the continuous core from the core-supporting means at a constant rate of speed, a second core-advancing means for advancing the core through the extruder from the first-mentioned core-advancing means, and a slipping drive for driving the second core-advancing means.

2. Apparatus for covering cores, which comprises means for supporting a continuous core, an extruder for continuously forming plastic material around such a core, means positioned between the core-supporting means and the continuous extruder for positively advancing the continuous core from the core supporting means at a constant rate of speed, a second core-advancing means for advancing the core through the extruder from the first-mentioned core-advancing means, and means including a magnetic clutch for driving the second core-advancing means.

3. Apparatus for covering cores, which comprises a supply reel, means for mounting the supply reel rotatably so that a filament wound on the

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supply reel may be advanced therefrom, a supply capstan for advancing the filament from the supply reel at a constant rate of speed, a takeup reel, a takeup capstan positioned between the takeup reel and the supply capstan, means including a slipping drive for applying a constant torque to the takeup capstan to place a constant tension on the portion of the filament between the supply capstan and the takeup capstan and to advance that portion of the filament at said constant rate of speed, and an extruder positioned between the supply capstan and the takeup capstan for extruding plastic material over the filament at a constant rate.

4. Apparatus for covering cores, which comprises a supply reel, means for mounting the supply reel rotatably so that a filament wound on the supply reel may be withdrawn therefrom, a supply capstan for withdrawing the filament from the supply reel at a constant rate of speed, a takeup reel, a takeup capstan positioned between the takeup reel and the supply capstan, adjustable means including a slipping drive for applying a predetermined torque to the takeup capstan to place a constant tension on the portion of the filament between the supply capstan and the takeup capstan and to advance that portion of the filament at said constant rate of speed, means for adjusting said torque-applying means to vary said predetermined torque, and an extruder positioned between the supply capstan and the takeup capstan for extruding plastic material over the filament at a constant rate.

5. Apparatus for covering cores, which comprises a supply reel, means for rotatably supporting the supply reel to permit a core wound on the supply reel to be unwound therefrom, an extruder for continuously forming a covering over the core, means including a slipping drive for applying a predetermined pull to the covered core to advance the core through the extruder, and means positioned between the supply reel and the extruder for limiting the rate of speed at which the pull-applying means may pull the core through the extruder.

6. Apparatus for covering cores, which comprises a supply reel, means for rotatably support-

ing the supply reel to permit a conductor wound on the supply reel to be unwound therefrom, an extruder including a stock screw for continuously forming a covering over the conductor, means for rotating the stock screw at a predetermined rate of speed, means for applying a predetermined pull to the covered conductor to advance the conductor through the extruder, conductor-advancing means positioned between the supply reel and the extruder for positively advancing the conductor, and positive drive means for driving the conductor-advancing means in synchronization with the screw-rotating means.

7. Apparatus for covering cores, which comprises a supply reel, means for mounting the supply reel rotatably so that a conductor wound on the supply reel may be advanced therefrom, a supply capstan for advancing the conductor from the supply reel, means for pressing the conductor against the supply capstan to prevent slipping therebetween, means for positively driving the supply capstan at a predetermined peripheral rate of speed, a takeup reel, a takeup capstan positioned between the takeup reel and the supply capstan, means including a magnetic clutch for applying a constant torque to the takeup capstan to place a constant tension on the portion of the conductor between the supply capstan and the takeup capstan and to advance that portion of the conductor at the same rate of speed as that at which the supply capstan advances the conductor, a continuous extruder positioned between the supply capstan and the takeup capstan, said extruder including a stock screw for forcing plastic material over the conductor, and means for driving the stock screw in synchronization with the supply capstan-driving means.

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