

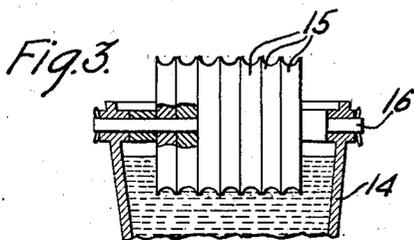
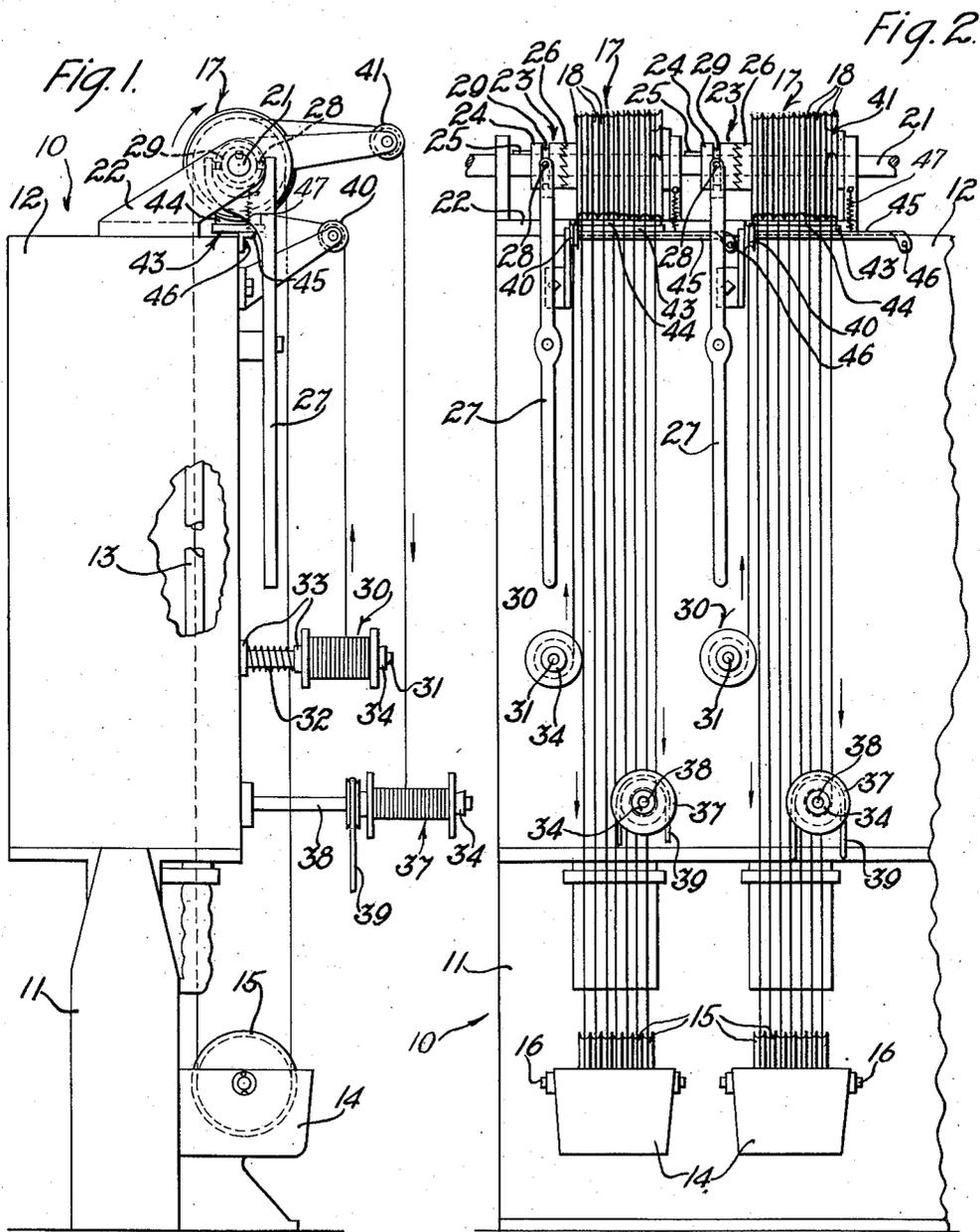
Nov. 25, 1930.

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1,782,425

APPARATUS FOR COATING STRANDS

Filed April 24, 1926



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UNITED STATES PATENT OFFICE

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APPARATUS FOR COATING STRANDS

Application filed April 24, 1926. Serial No. 104,360.

This invention relates to an apparatus for coating strands, and more particularly to an apparatus for applying an insulating enamel coating to an electrical conductor in wire form.

In applying insulating material to wire it is frequently the practice to take the wire from a supply spool, with a friction device incorporated in it or adjacent to it for imparting tension to the wire, pass the wire through a receptacle containing enameling material a plurality of times and through a relatively long vertically disposed baking oven a corresponding number of times to harden the enameling coatings, after which the insulated wire passes around a capstan which draws it at the desired speed through the apparatus and from which it passes to a take-up spool. In order to produce a uniform coating it is necessary that the wire pass through the coating material at a constant and uniform speed, and that the relatively long lengths of wire be maintained independent of each other and of the walls of the oven during the hardening of the coatings. Uneven tension may be introduced in the wire at the supply spool and capstan, and in order to control this tension so that the wire moves smoothly and with a minimum of vibration at all times careful and constant supervision of the operation of the apparatus is required.

The objects of this invention are to provide an improved apparatus for uniformly coating a strand rapidly, efficiently and with a minimum of supervision.

In accordance with one embodiment of this invention, the wire to be coated is drawn from a supply spool directly by a capstan. It is then successively passed around individual idler pulleys mounted in a receptacle containing enameling material through an oven around the same capstan, and so on until the wire has made a predetermined number of passes through the enameling receptacle and oven and thence from the same capstan to a take-up spool. The common capstan is provided with individual grooves for receiving the wire from the supply spool and from each of the idler pulleys. The ten-

sion introduced into the wire in advancing it through the apparatus is thus of a definite predetermined order substantially equally divided among the passes and independent of any variations in tension in the wire being supplied to or withdrawn from the apparatus. This is due primarily to the fact that the wire being supplied to the apparatus and withdrawn therefrom is subjected to the drawing force of the same capstan. The individual grooves of the capstan may also be of slightly increasing diameters or steps of substantially equal amounts, thus producing a definite and equal percentage of elongation being given to the wire during each of the passes.

Other objects and advantages of this invention will more fully appear from the accompanying drawings which illustrate one embodiment thereof in which

Fig. 1 is a fragmentary side elevation of a strand coating apparatus with the invention applied thereto;

Fig. 2 is a front elevation of the mechanism shown in Fig. 1, and

Fig. 3 is an enlarged detail view of the idler pulleys mounted in the enameling receptacle.

Referring now to the drawings in detail, 10 indicates generally a wire coating apparatus, schematically illustrated, of the type disclosed in Patent 1,303,070, granted to Kochendorfer and Blount, May 6, 1919. This apparatus comprises essentially a framework 11 which carries what may be termed an oven 12 within which are disposed a plurality of vertical tubes 13, only one of which is illustrated (Fig. 1). These tubes may be heated electrically by suitable means (not shown) such as that fully illustrated and described in the aforementioned patent.

The apparatus illustrated herein is particularly designed for applying and baking an insulating enamel coating upon the wire, the enameling material being disposed within a receptacle 14 secured to the framework 11. Revolvably mounted within the receptacle 14 are a series of idler pulleys 15, all of the same diameter, and mounted upon a stud shaft 16 secured to the end walls of

the receptacle 14 in such a manner as to be independently free to rotate on the shaft. In the particular embodiment of the coating apparatus illustrated eight idler pulleys 15 are provided, one for each pass of the wire through the apparatus, as will be more fully described hereinafter. The pulleys 15 are so disposed within the receptacle that a portion of their peripheral surface is submerged within the liquid enamel in the receptacle (Fig. 3). Disposed above the oven 12 is a capstan 17 provided with a series of grooved peripheral drawing faces 18 which are positioned in vertical alinement with the idler pulleys 15, the diameter of the drawing faces being of equally increasing diameters toward the right or "let off" end (Fig. 2), the capstan 17 being journaled upon a shaft 21 which in turn is journaled in a supporting bracket 22 carried upon the top surface of the oven 12. The shaft 21 may serve a plurality of coating units, as shown, and in the operation of the apparatus may be driven by any suitable driving means (not shown), the capstans being operatively connected or disconnected from the shaft 21 by a jaw clutch of any well known type individual to each coating unit and indicated generally by the numeral 23. A driving member 24 of the clutch is splined to the shaft 21 as indicated at 25, and as shown in the drawings the drawing face is engaged with a driven member 26 provided upon one end of the capstan 17. Pivoted to the front wall of the oven 12 is a clutch operating lever 27, which is operatively connected at its upper bifurcated end to the driving member 24 of the clutch by pins 28 extending inwardly from opposite faces of the bifurcations and into a circular channel 29 formed in the driving member 24.

The wire to be treated is carried upon a supply spool 30 rotatably carried upon a stud shaft 31 projecting from the front wall of the oven 12. To provide for a sufficient drag or tension upon the wire while it is being drawn from the spool 30, a compression spring 32 may be mounted upon the shaft 31 between collars 33 thereon engaging the oven wall and a head of the spool respectively, the spool being retained upon the shaft against the compression of the spring 32 by a hand nut 34 screw threaded upon the shaft. A take-up spool is indicated at 37 supported from the front wall of the oven 12 by a stud shaft 38, the spool 37 may be driven by any suitable driving means, for instance by a belt connection 39, which belt may also drive a mechanism (not shown) for distributing the treated wire as it is wound upon the spool 37 in even layers. The take-up spool 37 is retained upon the shaft 38 in a manner similar to that hereinbefore described in connection with the supply spool 30. Guide sheaves 40 and 41 are suitably supported upon the

front wall of the oven 12 and the bracket 22, respectively, for guiding the wire between the supply spool 30 and the capstan drawing face of smallest diameter and between the capstan drawing face of greatest diameter and the take-up spool 37, respectively.

Associated with the capstan 17 and entered within each of the grooved peripheral drawing faces 18 at the lower portion thereof is a spring pressed cleaning and polishing device indicated generally by the numeral 43. The purpose of this device is to keep the faces 18 free from coating material or other matter, and thereby prevent abrasions or pitting of the successively applied coatings upon the strand passing therearound from coating material which otherwise might adhere to the faces 18. The device 43 comprises a suitable pad 44 of felt or other suitable material carried upon the upper surface of an arm 45 pivoted as indicated at 46 to the front wall of the oven 12. A tension spring 47 fixed at one end to the arm 45 and at its other end to the bracket 22 serves to retain the pad 44 against the revolving capstan faces with enough pressure to continually clean and polish the faces 18 as they revolve. At the point where the pad 44 engages the faces 18 the wire is not entered therein with the exception of the first face around which passes the uncoated oncoming wire from the supply spool 30 so that the pad is not at any point pressing upon the coated wire.

The operation of this apparatus is as follows:

The wire to be coated is fed from the supply spool 30 threaded around the guide sheave 40 and looped around the drawing face 18 of smallest diameter at the left end of the capstan 17 (Fig. 2), thence downwardly and around the first aligned independently rotatable pulley 15 carried in the enameling receptacle 14 at the left end thereof (Fig. 2) at the bottom of the machine, thence upwardly through the heating tube 13 and around the next drawing face 18 of increasing diameter and thence downwardly and around the next independently rotatable pulley 15 in the receptacle 14. This wire stringing operation through the heating tube 13 around the successive faces 18 of equally increasing diameter of the capstan 17 and back down the front of the machine is continued for the number of coatings it is desired to bake upon the wire, which in the present embodiment of the apparatus is seven. After the wire has been strung through the heating tube 13 for the last time, it is looped about the drawing face 18 of greatest diameter at the right end of the capstan 17 (Fig. 2) and is then threaded over the guide sheave 41 from which it is served to the take-up spool 37. Upon completion of the stringing of the wire through the apparatus from the supply

spool and the take-up spool as just described, the clutch operating lever 27 is rocked clockwise about its pivot to cause the engagement of the driving member 24 of the clutch 23 with the driven member 26 thereof, as indicated in the drawings.

As the apparatus operates it will be apparent that each pass of the wire through the apparatus between its individual freely rotatable idler pulley 15 and the capstan 17 is subjected to the drawing effect of its individual drawing face 18 formed upon the capstan 17, and thereby the tension required to advance the wire is substantially equally divided among the passes and a definite uniform elongation is given to the wire during each pass, thus avoiding the variable or excessive elongation of the last loop of the wire which in some instances is subjected to the entire tension necessary to move the wire. The cumulative effect of this elongating of the wire is approximately the same as that produced heretofore in apparatus of this type, but it is introduced in gradual amounts for each pass, and is always the same. In this way a greater uniformity of movement and a uniform predetermined amount of tension is imparted to the wire throughout its length, as well as a definite and predetermined amount of elongation, all tending to produce a more uniformly coated wire.

Inasmuch as the wire is supplied to and withdrawn from the coating apparatus by the same capstan or drawing means, the force required to pass the wire through the apparatus may be definitely predetermined and the tension therein maintained at a constant fixed value. Such tension is also rendered independent of variations of tension in the wire before passing around the first groove of the capstan or after leaving the last groove, thus reducing to a minimum the uneven tension and vibration of the wire which is passing through the coating apparatus. This permits a reduction of the supervision of the operation of the apparatus and at the same time gives an improved quality of coating.

What is claimed is:

1. In a strand coating apparatus, means for coating a strand comprising a bath, an oven for baking successive coatings thereon, means for advancing and guiding the strand repeatedly through the coating bath and oven, said means comprising a plurality of independently rotatable idler pulleys carried in the coating bath disposed adjacent one end of the oven, a common capstan positioned above the idler pulleys provided with a plurality of peripheral drawing faces of gradually increasing diameter toward the delivery end disposed at the opposite end of the oven whereby the tension on the strand occasioned by the advancing thereof is uniformly distributed throughout its length and a gradual increase in speed

thereof is effected as it is advanced through the apparatus to maintain a predetermined uniform tautness in the strand, and means for driving the capstan.

2. In a strand coating apparatus, a coating bath, an oven for baking successive coatings thereon, a plurality of independently rotatable idler pulleys in the bath, a capstan positioned above the pulleys and provided with a plurality of peripheral grooves of gradually increasing diameters for continuously advancing and stretching successive portions of a strand with a tension uniformly distributed among the successive portions thereof as the portions pass through the oven.

3. In a strand coating apparatus, a coating bath, an oven for baking successive coatings thereon, a plurality of independently rotatable idler pulleys having their peripheries extending into the bath, and a driven capstan positioned above the pulleys and provided with a plurality of peripheral drawing faces of gradually increasing diameters toward the delivery end for continuously advancing and stretching successive portions of a strand with a tension uniformly distributed among the successive portions thereof as the portions pass through the oven.

4. In a strand coating apparatus, a coating bath, an oven for baking successive coatings thereon, a plurality of independently rotatable idler pulleys having their peripheries extending into the bath, and a driven capstan positioned above the pulleys and provided with a plurality of peripheral drawing faces of gradually increasing diameters toward the delivery end for positively advancing successive portions of a strand and adapted to cooperate with the pulleys to maintain in the strand a tension uniformly distributed among the successive portions thereof as the portions pass through the oven.

In witness whereof, I hereunto subscribe my name this 9th day of April, A. D. 1926.

RICHARD DALE JESSUP.

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