

Feb. 18, 1930.

J. M. G. FULLMAN ET AL

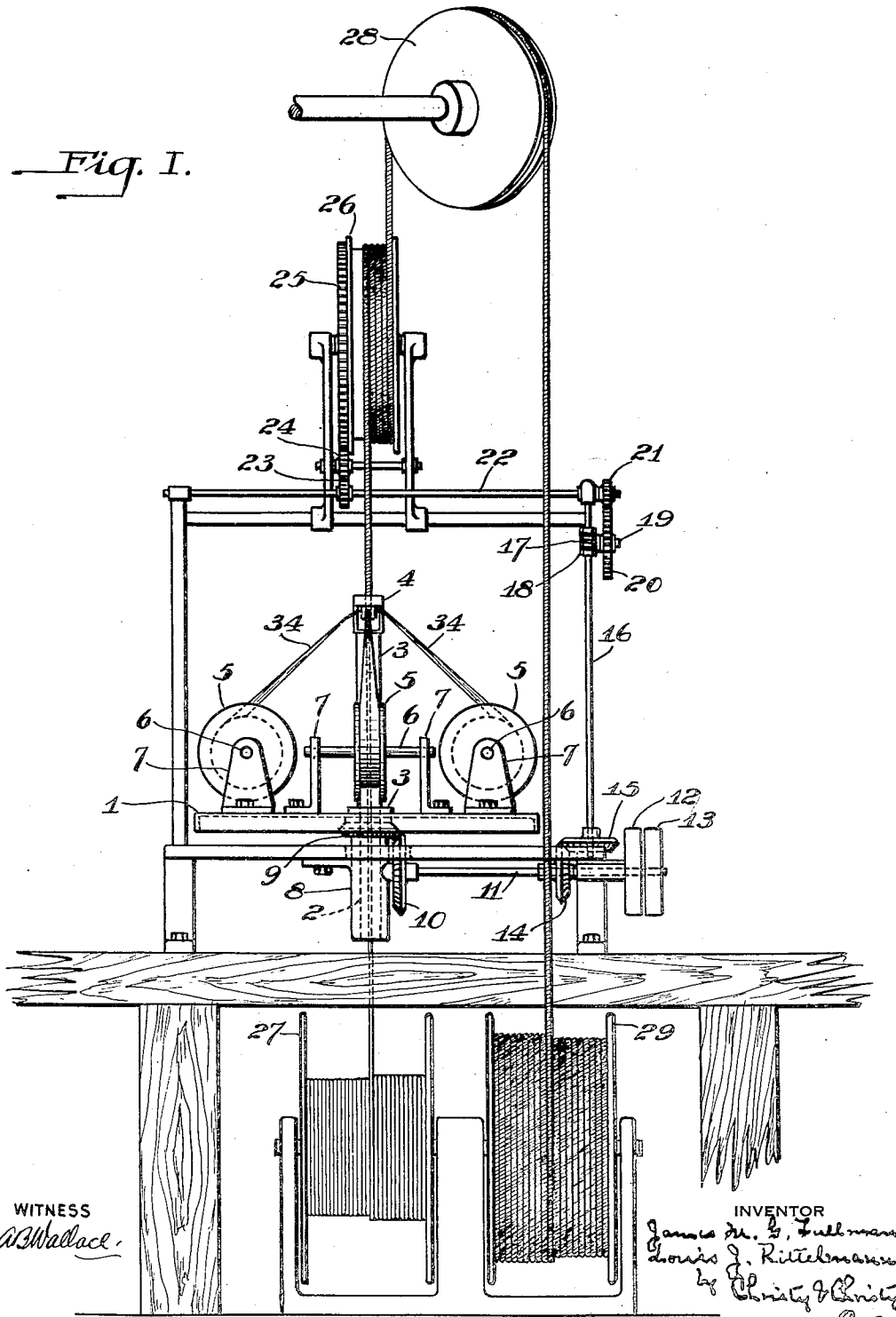
1,747,769

APPARATUS FOR THE MANUFACTURE OF ELECTRICAL CONDUCTORS

Filed June 4, 1928

2 Sheets-Sheet 1

Fig. I.



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Fig. 2.

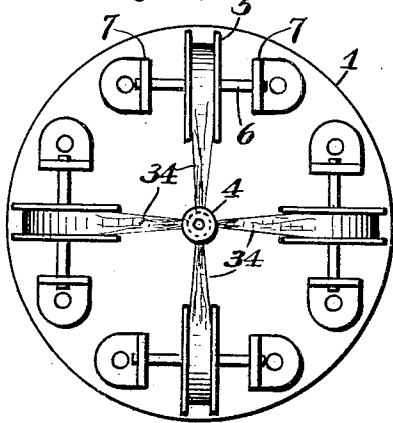


Fig. 6.

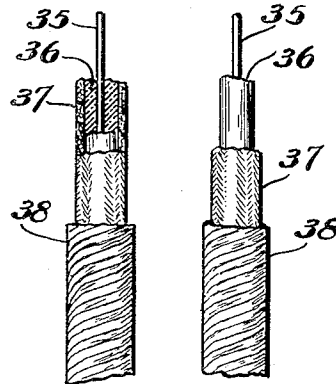
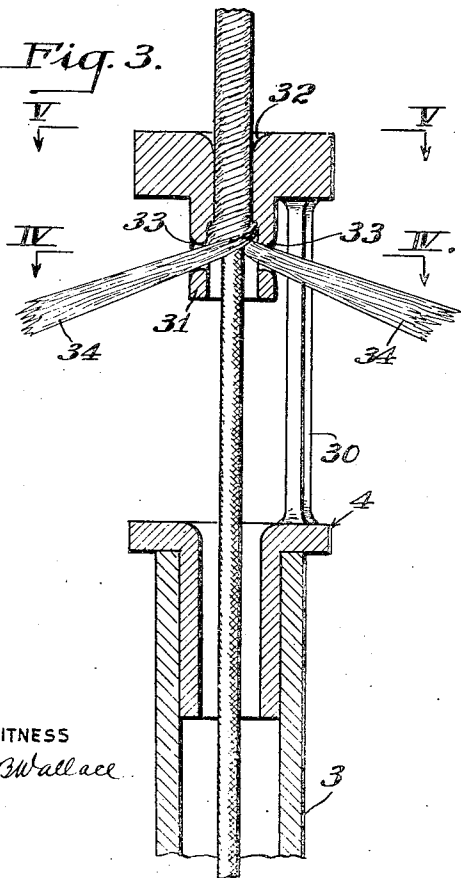


Fig. 3.



WITNESS
C. B. Wallace

Fig. 5.

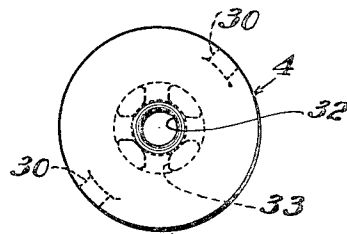
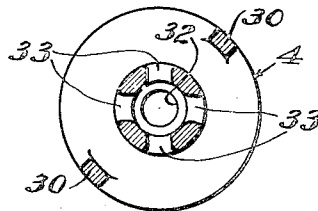


Fig. 4.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR THE MANUFACTURE OF ELECTRICAL CONDUCTORS

Application filed June 4, 1928. Serial No. 282,649.

It is the object of the present invention to provide an improved apparatus for the production of insulated electrical conductors, by means of which an electrical conductor may be efficaciously and economically equipped with an insulating jacket of a novel character.

In the accompanying drawings Figure 1 is a view in elevation of an apparatus embodying the invention in its preferred form. Figure 2 is a plan view of the table and the supply reels. Figure 3 is an enlarged sectional elevation of the combined coiling and compressing die. Figure 4 is a view in cross-section on the line IV—IV of Figure 3. Figure 5 is a view in cross-section on the line V—V of Figure 3. Figure 6 is a view in elevation showing the conductor with successive layers of its covering cut away in order to show the interior construction.

The table 1 is rotatably mounted on a supporting frame and has a central opening 2. Secured to the upper face of the table around the opening 2 is the base of the hollow spindle 3 which carries at its top the die 4 to be hereinafter described. Symmetrically disposed around the central spindle 3 are the radially arranged reels 5 having journals 6 rotatably mounted in bearings 7 mounted upon the upper face of the table. Secured centrally to the under face of the table in line with the opening 2 is the hollow sleeve 8 carrying the bevel gear 9, which meshes with a bevel pinion 10 on the transverse shaft 11, which carries at its outer end the fast and loose pulleys 12 and 13 for connection with the source of power. The shaft 11 also has secured to it near its outer end a second bevel pinion 14 which meshes with the bevel pinion 15 on the vertical shaft 16. Secured to the upper portion of the shaft 16 is the worm 17 meshing with and driving a worm-wheel 18 on the short shaft 19, which carries the gear-wheel 20 meshing with the pinion 21 on the upper transverse shaft 22. The shaft 22 also carries the pinion 23, which is connected through the intermediate pinion 24 with the circumferential teeth 25 on one edge of the surface of the capstan 26, which is supported above the die 4 in position to receive the

conductor issuing from the die 4, and the driven capstan 26 thus operates to draw the conductor in a vertical line from the reel 27, which is rotatably supported underneath the table, up through the sleeve 8, the hole 2 in the table, the spindle 3 and the die 4. The jacketed conductor is continuously drawn off the capstan 26, over the sheave 28, and down around the winding-reel 29, which is driven by any suitable means, of which several are well known, for the performance of that function.

The material used for the insulating sheath or jacket of the conductor is a fibrous material which is initially supplied in the form of long strips, is then crumpled transversely into a continuous loose and compressible bundle which is wound about the conductor in a continuous series of helical coils, and such compressible helical coils finally are compressed tightly upon the surface of the conductor in such manner that the successive convolutions are caused to overlap and interlock, so that there is supplied a very tightly compressed and uniform insulating jacket or sheath on the conductor.

The fibrous insulating material which we prefer for this purpose is paper. Strips of the paper to be used are wound upon the reels 5 and are drawn from these reels into and through the die 4, as shown in Figures 1, 2 and 3. The die 4 is a sleeve-like structure supported on the top of the hollow spindle 3 by the legs 30. Its lower portion 31 has a bore somewhat larger than the conductor to be jacketed, while its upper portion 32 is of such reduced size as to operate to compress and iron down the successive coils which are applied to the conductor as it passes through the lower portion 31. In the wall of the portion 31 are formed openings 33 arranged in line with the respective reels 5 on the table 1, and which openings 33 are sufficiently constricted in size with relation to the width of the paper strips 34 as to crumple or somewhat bundle up the strips as they pass through the openings, and these bundled or crumpled strips are, by the rotation of the table and die, wound in successive closely contacting helical coils upon the conductor as it is being drawn

through the die. As these bundled compressible coils are wound upon the conductor, the conductor and coils are drawn on through the constricted cylindrical portion 32 of the die and the coils are ironed out and tightly compressed upon the surface of the conductor. In this operation a portion of each coil in advance is necessarily pressed down in overlapping contact with the immediately following portion of the jacket, and by reason of the crumpled and irregular formation of the compressible coils they engage with one another bodily in interlocking folds, so that finally the compressed coils form what is substantially a continuous unitary jacket, with the effect that, no matter upon how short a radius the jacketed conductor may be bent, there will be no separation or break in the substance of the jacket, but it will continue to be a substantially integral structure.

We have shown in Figure 6 of the drawings an elevation of the jacketed conductor with successive layers of its covering cut away, in order to show the interior construction. In this figure the conducting wire is indicated by the numeral 35. Upon this wire there has been applied the usual inner insulating rubber jacket 36, and around this rubber jacket there has been formed the woven or braided fibrous covering 37. In the practice of the present invention the conductor, consisting of the wire, the rubber insulation and the enveloping fibrous covering, is supplied from the reel 27 and is covered with the compressed fibrous insulating jacket 38, as herein described. Subsequently the completed jacketed conductor may be drawn through a bath of waterproofing compound, as is usual, and may then be utilized in any of the ways well known in the art.

It will of course be understood that in the specific mechanism herein shown and described, the driving elements will be so arranged and proportioned relatively to one another, that the speed of rotation of the capstan 26 will be so related to the speed of rotation of the table and the die as to coil the crumpled paper strips upon the conductor in the most effective arrangement and sequence of coils. In case the mechanism used should be so modified as to twist the strips, in addition to transversely crumpling them, the twist should be a loose one, so as not to substantially affect the softness or compressibility of the crumpled strands.

While we have herein shown and described the coiling of four crumpled strips upon the conductor, the invention is not limited to the employment of any particular number of strips, and one strip alone, of proper texture and size, may be utilized with good results. However there is an advantage in using a plurality of strips as shown, in that if one of the strips should break, as will sometimes happen, no serious harm will be done

until this break shall be repaired, since the continuity of the insulating jacket will not be broken. The coils as wrapped around the conductor may be in more or less overlapping relation or they may be non-overlapping. In the latter case the operation of compression will cause them to overlap and become united to form a continuous jacket, and in either case the product of the compression will be a uniform continuous jacket.

The surface of the completed insulating jacket is substantially smooth and uniform, and its structure is such as to effectively prevent leakage through it of any of the compounds which may be employed, and consequent discoloration of the fabric layer underneath.

No claims is made herein to the method of manufacture described, since that constitutes the subject of a companion application for Letters Patent filed by us on June 4th, 1928, Serial No. 282,650.

We claim as our invention:

1. In a machine of the class described, the combination with a rotatably mounted table having a central opening, a tubular die secured to the table in line with said central opening, said die having an enlarged entry chamber open toward the table and a constricted outlet, a spool carrying a flat strip of fibrous material rotatably mounted on the table, an opening in the wall of the enlarged portion of the die for the passage of the strip and of a diameter less than the width of the strip, means for continuously drawing an electrical conductor axially through the central table opening and the die, and means for rotating the table and die and thereby wrapping and compressing the fibrous material around and upon the traveling conductor.

2. In a machine for wrapping and compressing into a unitary jacket upon and around an electrical conductor a crumpled strip of fibrous material, a tubular die having an enlarged inlet chamber, a constricted outlet, and an opening through the wall of the inlet chamber of a size adapted to crumble the fibrous strip, means for axially rotating the die, and means for continuously drawing an electrical conductor axially through the die.

In testimony whereof we have hereunto set our hands.

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