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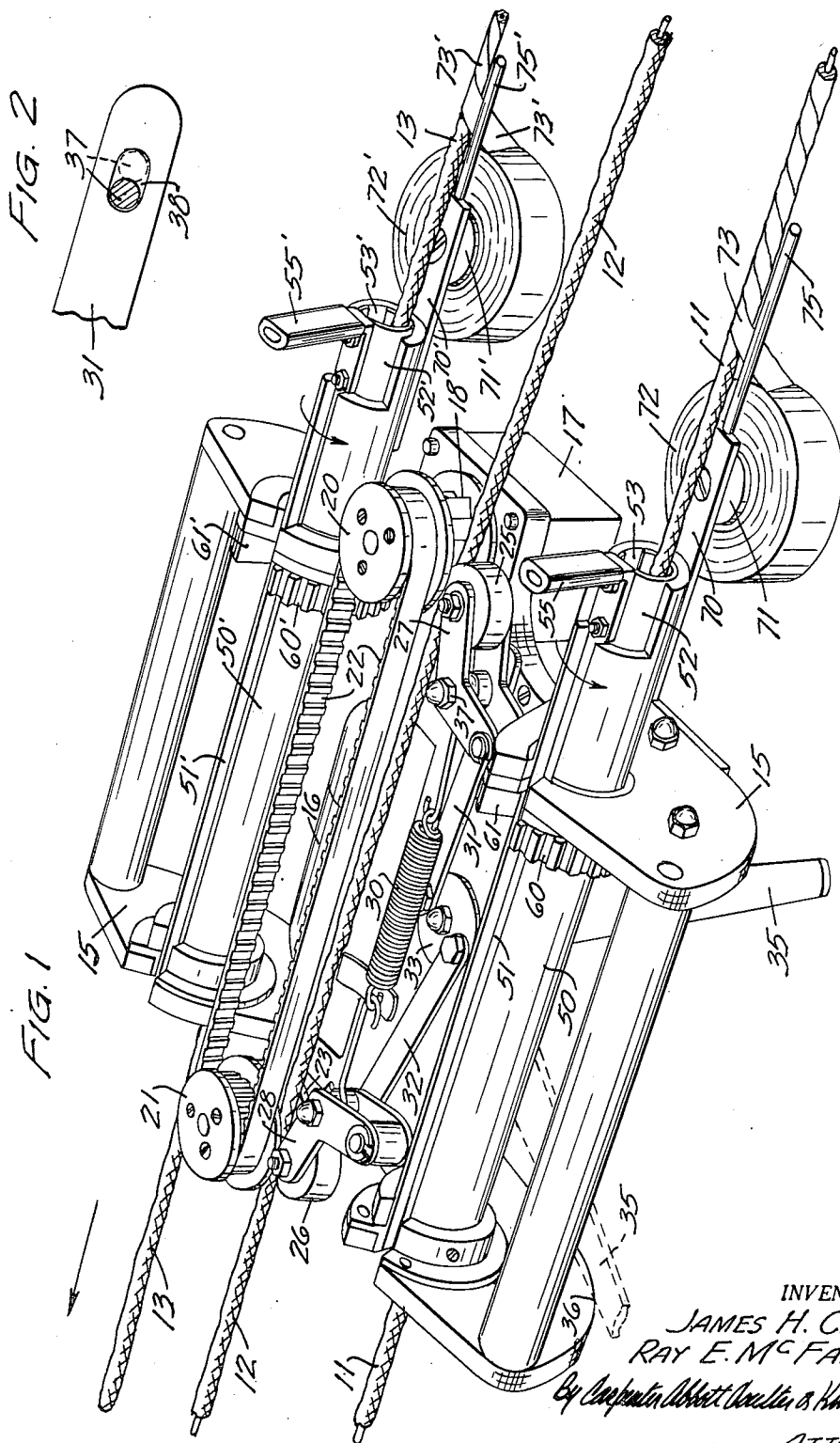
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2,804,907

HELICAL TAPE APPLYING APPARATUS

Filed June 27, 1955

2 Sheets-Sheet 1



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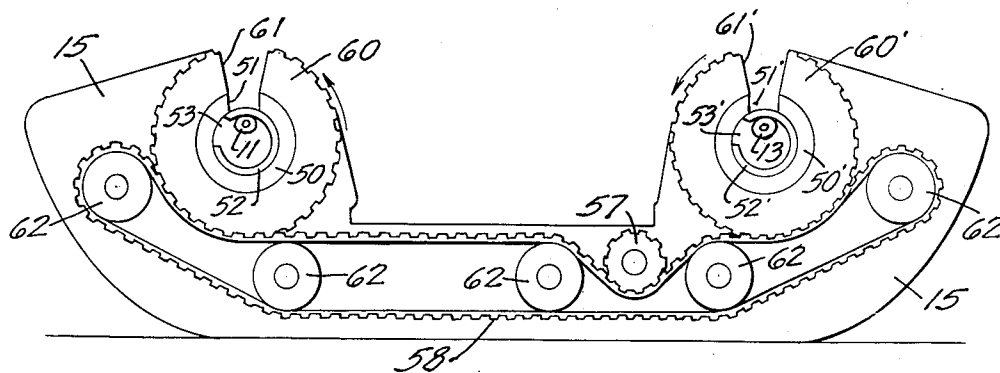
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FIG. 3



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HELICAL TAPE APPLYING APPARATUS

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6 Claims. (Cl. 154—1.8)

This invention relates to apparatus for the application of a helical wrap of tape around an elongate object for a distance along its length; particularly to apparatus that travels along and applies pressure-sensitive adhesive electrical insulating tape around, one or more wires, such as power lines strung between two supports.

The invention finds utility in the type of apparatus exemplified by the machine shown in the co-pending application of John H. Schlesselman and Desiderius D. Blaskovitz filed November 23, 1951, as Serial No. 257,755, now Patent No. 2,733,753. The said machine comprises a member that rotates around the object being taped, drive means that rotates the member and at the same time propels the machine along the object, and a means on the rotating member for carrying a supply roll of tape from which tape is withdrawn and applied to the object.

Objectives of the present invention will be apparent from the description and explanation.

The present invention provides improved tape applying means, improved means to facilitate rapid mounting and dismounting of the applying apparatus on and off from objects being taped, and improved traction means; also other improvements disclosed herein.

An illustrative machine is described below and shown in the accompanying drawings in which:

Figure 1 is a perspective view of a power driven machine embodying the improvements provided by the present invention;

Figure 2 shows a pivotal connection; and

Figure 3 is a diagram of the taping cylinder drive, looking in the direction of the machine's travel.

Figure 1 shows the machine mounted on a set of three substantially parallel wires 11, 12 and 13, along which it travels, the wires passing through the machine.

A frame 15 supports all of the parts of the machine.

A motor 16, through a speed reducer 17, rotates a toothed flanged traction wheel 18 at the rear of the machine, which in turn, through pulleys 20 and 21 and a belt 22, rotates a second toothed flanged traction wheel 23 at the front. The traction wheels 18 and 23 are spaced apart and aligned to be in peripheral engagement with the middle wire 12.

Two spaced presser rollers 25 and 26 are positioned to press the wire 12 against the toothed peripheries of the traction wheels 18 and 23, the presser rollers and the traction wheels serving as a pair of wire grippers 18—25 and 23—26. The traction wheels rotate in a direction to propel the machine forwardly (to the left in Figure 1) along the wires 11, 12 and 13.

The presser rollers 25 and 26 are rotatably mounted on the free ends of two roller arms 27 and 28, respectively. The arms 27 and 28 are pivotally mounted at their other ends to the frame 15. A spring 30 is connected to the mid-portion of each of the two roller arms 27 and 28, to impel or draw them toward each other and thereby to bear or press the presser rollers 25 and

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26 against the wire 12. The wire grippers 18—25 and 23—26 are then said to be "closed," which is the position in which they are shown in Figure 1.

The roller arms 27 and 28 are moved apart so as to withdraw the rollers 25 and 26 from their wire-engaging position (i. e., so as to "open" the grippers 18—25 and 23—26), by two toggle arms 31 and 32 whose outer ends are pivotally connected to the mid-portion of each of the two roller arms, respectively. To enable the spring 30, which holds the wire grippers closed, to serve also to hold them open, the inner ends of the toggle arms 31 and 32 are pivotally connected to an over-center toggle joint 33. An operating lever 35, fixed to the joint 33, is manually moved from its closed position adjacent the rear wall of the frame 15 shown in Figure 1, forwardly against the force of the spring 30, thereby turning the toggle joint 33 clockwise (Figure 1), until the joint has turned beyond its operating center, following which the forward movement of the lever 35 and the clockwise rotation of the joint 33 are by virtue of the force of the spring 30, which movement and rotation continue until the lever contacts the forward wall 36 of the frame and is stopped thereby. The wire grippers 18—25 and 23—26 and the entire toggle assembly, including the lever 35, are then in open position.

The pivotal connection between the rear toggle arm 31 and the rear roller arm 27, is by a pin 37 in the arm 27 which extends downwardly into an aperture 38 in the arm 31. Were the pin 37 and aperture 38 closely fitted, a movement of the rear presser roller 25 in a direction away from its wire-engaging position in response to unevenness in the wire, would be transmitted through the toggle assembly to the front presser roller 26 so that it too would move away from its wire-engaging position an approximately equal distance and its desired pressure against the wire 12 would be interrupted. To prevent such transmittal, the aperture 38 is in the form of an elongate slot (Figure 2). The roller arm 27 is then free to move away from the wire 12 until the pin 37 occupies the position shown in dotted lines in Figure 2, without disturbing the front presser roller 26.

The pivotal connection between the front toggle arm 32 and the front roller arm 28 is the same as the connection between the arms 31 and 27.

Thus either of the presser rollers 25 or 26 may move in a direction away from its wire-engaging position independently of the other in response to unevenness in the surface of the wire 12.

To apply tape to the wire 11, a taping member is provided in the form of an elongate hollow cylinder 50 rotatably mounted in the left side of the frame 15. The cylinder 50 has a slot or aperture 51 that extends the full length of the cylinder, through which slot the wire 11 is admitted or inserted into and removed from, the cylinder. To hold the wire in the cylinder, a hollow closure cylinder 52 is rotatably fitted within the taping cylinder 50. The closure cylinder 52 also has a slot or aperture 53 that extends the full length of the cylinder. When the closure cylinder 52 is manually turned counter-clockwise (Figure 1) by means of the handle 55 until the apertures 51 and 53 are in register, the taping cylinder 50 is open for admission or removal of the wire 11.

A taping cylinder 50' for the wire 13, in the right side of the frame 15, is of the same construction and operation as the cylinder 50, the primed reference numerals in the drawings indicating corresponding parts.

Referring to Figure 3, the taping cylinders 50 and 50' are rotated counter-clockwise (Figures 1 and 3) and at the same speed, by a driven gear wheel 57 through a toothed belt 58 and two annular shaped gears 60 and 60'. The two gears 60 and 60', respectively, surround the cyl-

inders 50 and 50', fixed thereto and concentric therewith, and are respectively interrupted or notched at 61 and 61' in register with the cylinder slots 51 and 51' to permit admission or removal of the wires 11 and 13. The belt 58 is supported by a series of five idler pulleys 62, the two pulleys on either end being above the level of the others to produce a wrap of the belt for a sufficient distance around the cylinder gears 60 and 60' to bridge the notches 61 and 61' as the gears 60 and 60' rotate.

The gear wheel 57 is driven by the motor 16 through the speed reducer 17. Thus, operation of the motor 16 produces concurrent rotation of the taping cylinders 50 and 50' and propulsion of the machine along the wires 11, 12 and 13.

A tape support bar 70 is fixed to the hollow taping cylinder 50 and projects rearwardly beyond the rear end of the cylinder, parallel with the axis of the cylinder but sufficiently spaced from the axis to be out of alignment with the hollow portion of the cylinder. On the side of the bar that faces away from the axis of the cylinder, and at a point beyond the rear end of the cylinder, a tape roll holder drum 71 is rotatably mounted, its axis being at an angle of 90° to the axis of the cylinder 50.

Extending rearwardly from the rear end of the support bar 70 is a smooth-surfaced elongate tape applying finger here shown in the form of a slender cylindrical rod 75 of polished steel that is fixed to the bar 70 parallel with the axis of the cylinder 50 but sufficiently spaced from the axis to be out of alignment with the hollow portion of the cylinder. In Figure 1 a roll 72 of pressure-sensitive adhesive electrical insulating tape 73 is shown mounted on the drum 71. The tape leads from the roll to the finger 75 with its non-tacky side in contact with the finger and thence to the wire 11 with its tacky side in contact with the wire. The counter-clockwise revolution of the roll 72 around the wire 11 together with its concurrent movement or travel along the wire, by the operation of the machine as hereinabove described, applies a helical wrap of the tape 73 around the wire as shown in Figure 1. Where the tension on the tape between the roll 72 and the wire 11 that is produced by the tape's resistance to unwinding and by its passage around the finger 75, is insufficient to produce a desired tautness of wrap, a brake means (not shown) may be employed to retard the rotation of the drum 71.

A tape support bar 70' together with the taping assembly attached thereto, is fixed to the taping cylinder 50' for the wire 13, and is of the same construction and operation as the bar 70 and its attachments, the primed reference numerals in the drawings indicating corresponding parts.

After taping the wires 11 and 13, the wire 12, which has served as the traction wire, may be taped by replacing the machine on the wires with either of the taped wires 11 or 13 serving as the traction wire and with the wire 12 passing through either the taping cylinder 50 or the taping cylinder 50', the unused taping cylinder idling. Thus the illustrated machine may be used to tape any one or more wires in any set of two or more wires.

It is advisable to make the machine as a whole a non-conductor by the use of dielectric materials in its construction.

Previous machines of this type, though useful with firm traction wires, have frequently failed to achieve a constant rate of travel on wires where the insulation is so badly worn that the insulation has loosened in a manner to cause temporary loss of traction. In such instances the tape rolls would of course continue to rotate. The tape would then foul at the point of application, and it would seldom flatten out upon resumption of travel. An increase in the strength of the spring sufficient to produce a grip on the traction wire that would maintain the locomotion notwithstanding loose insulation, would render the grip difficult to open and/or dent the wire enough to weaken it.

The improvements provided herein largely solve these and other problems.

The improved traction means of the present invention, with a toggle assembly that provides good leverage and automatic locking of the grippers in open position, permits the use of a stronger spring for a tighter grip on the traction wire, and at the same time ease and speed in opening and closing the grippers when mounting and dismounting.

At the same time, the spring strength can be kept down to where there still will be no denting of the traction wire from the toothed traction wheels 18 and 23, because the applying fingers 75 and 75' almost completely prevent harmful fouling of the tape at the point of application should there be a temporary loss of traction sufficient to interrupt locomotion.

Enroute from the supply roll to the wire, the tape passes over the finger 75 with its non-tacky surface contacting the finger. As the operation proceeds, the finger and the wire are drawn closely together, frequently into contact, and remain that way as the tape roll goes around and around the wire. At such close quarters, the action of the finger may be said to be to "wipe" the tape directly onto the wire, so that if there is a halt in locomotion, the result is simply a continued application of smooth wraps of tape around the wire, though now as convolutions at one point on the wire rather than as an elongated helical wrap. There is seldom any fouling of the tape. The finger continues to wipe it smoothly down. When locomotion resumes, the desired normal helical wrap along the length of the wire also resumes.

If however, the tape does happen to foul, as it sometimes does, the finger, once the locomotion and the normal position of the finger in close proximity to the wire are resumed, acts to restore the normal even passage of smooth flat tape from the roll to the finger to the wire.

Where no finger is employed, the tape roll 72 is usually not equidistant from the wire 11 at all times as the roll turns in its orbit, with the result that the tape that extends from the roll to the wire becomes slack (sometimes forming a loop) each time the roll moves from the farther portion of its orbit into the nearer portion. This creates the danger of fouling or loose wrapping.

With the finger however, the distance between the wire and the roll does not vary appreciably as the roll turns, because, as pointed out hereinabove, the finger and the wire become drawn closely together, frequently into contact, and the distance between the finger and the roll is a fixed distance. Slack between the roll and the wire at anytime is thus almost completely eliminated by the finger.

The relative positions of the taping elements, such as the tape drum 71, the finger 75 and the taping cylinder 50, may be varied as long as the desired co-action of the parts is produced. For example, although the finger 75 is here shown as being parallel with the axis of the taping cylinder 50, it is seldom parallel with the wire 11 because the wires sag under the weight of the machine, and they lead upwardly from the machine at an angle to the cylinder's axis at the point where tape is being applied. Thus the finger need not be parallel with the cylinder's axis but may vary therefrom.

The finger 75 need not be cylindrical but may be of shapes other than circular in cross-section, as long as it provides a firm smooth elongate surface where the tape passes over it.

If desired, the taping cylinder 50 may be equipped to carry a second tape roll on the side of the wire 11 opposite from the tape roll 72. Such an arrangement produces two helical wraps, one on the other, and provides an improved balance for the assembly of taping parts that revolves around the wire.

Other variations and equivalents within the scope of the invention as herein described and/or claimed, and other embodiments, are contemplated.

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We claim:

1. Apparatus for the application of a helical wrap of tape around an elongate object which is held against rotation, comprising a taping member mounted to revolve around the object, drive means for concurrently rotating the taping member and propelling it along the object, means for mounting a supply roll of tape on the taping member, and a smooth-surfaced elongate tape applying finger attached to the taping member adjacent the object, over which the tape passes from the supply roll to the object; the taping member comprising two elongate hollow concentric cylinders, one within the other, the inner cylinder being rotatable within the outer cylinder, and each cylinder having an aperture that extends the full length of the cylinder to admit the object into the inner cylinder when the inner cylinder is turned so as to bring the apertures in register.

2. Apparatus according to claim 1 wherein the drive means includes two spaced driven traction wheels aligned to be in peripheral engagement with an elongate object along which the apparatus travels, and two spaced presser rollers positioned to press the elongate object against the peripheries of the two traction wheels, the traction wheels and the presser rollers serving as a pair of object grippers; the presser rollers being rotatably mounted in a toggle assembly; the toggle assembly comprising two roller arms, each roller arm being pivoted at one end and having one of the presser rollers rotatably mounted on the other end, spring means connected to impel the roller arms about their pivoted ends toward each other and thereby to bear the presser rollers against the object, an over-center toggle joint between the roller arms, two toggle arms pivotally connected to the joint and respectively pivotally connected to the mid-portion of each of the two roller arms, an operating lever fixed to the joint for manual movement of the roller arms away from each other against the force of the spring to open the object grippers by withdrawing the presser rollers from their object-engaging position, and a stop means positioned to hold the lever against spring-impelled movement when the lever has been manually moved to turn the joint beyond its operating center.

3. Apparatus according to claim 2 wherein, in respect to each of the pivotal connections between the toggle arms and the roller arms, the connection comprises an elongate

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slot in one arm and a pin in the other arm extending into the slot, to permit movement of either presser roller in a direction away from its object-engaging position independently of the other presser roller in response to unevenness in the surface of the object.

4. Apparatus according to claim 1, wherein the drive means includes two annular gears respectively surrounding each of the two taping cylinders, fixed thereto and concentric therewith, each annular gear being interrupted to form a notch in register with the apertures in the cylinders, and a pulley-supported driving belt toothed on its outwardly facing surface, the supporting pulleys being arranged to produce a wrap of the belt for a sufficient distance around each of the gears to bridge the notches as the gears rotate.

5. Apparatus for the application of a helical wrap of tape around an elongate object which is held against rotation, comprising a taping member mounted to revolve around the object, drive means for rotating the taping member, means for mounting a supply roll of tape on the taping member, and a smooth-surfaced elongate tape applying finger attached to the taping member adjacent the object, over which the tape passes from the supply roll to the object.

6. Apparatus for the application of a helical wrap of tape around an elongate object which is held against rotation, comprising a taping member mounted to revolve around the object, drive means for rotating the taping member, and means for mounting a supply roll of tape on the taping member, the taping member comprising two elongate hollow concentric cylinders, one within the other, the inner cylinder being rotatable within the outer cylinder, and each cylinder having an aperture that extends the full length of the cylinder to admit the object into the inner cylinder when the inner cylinder is turned so as to bring the apertures in register.

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