Feb. 19, 1957 J. W. OLSON ET AL 2,782,138

WIRE TAPING MACHINE

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FIG. 1

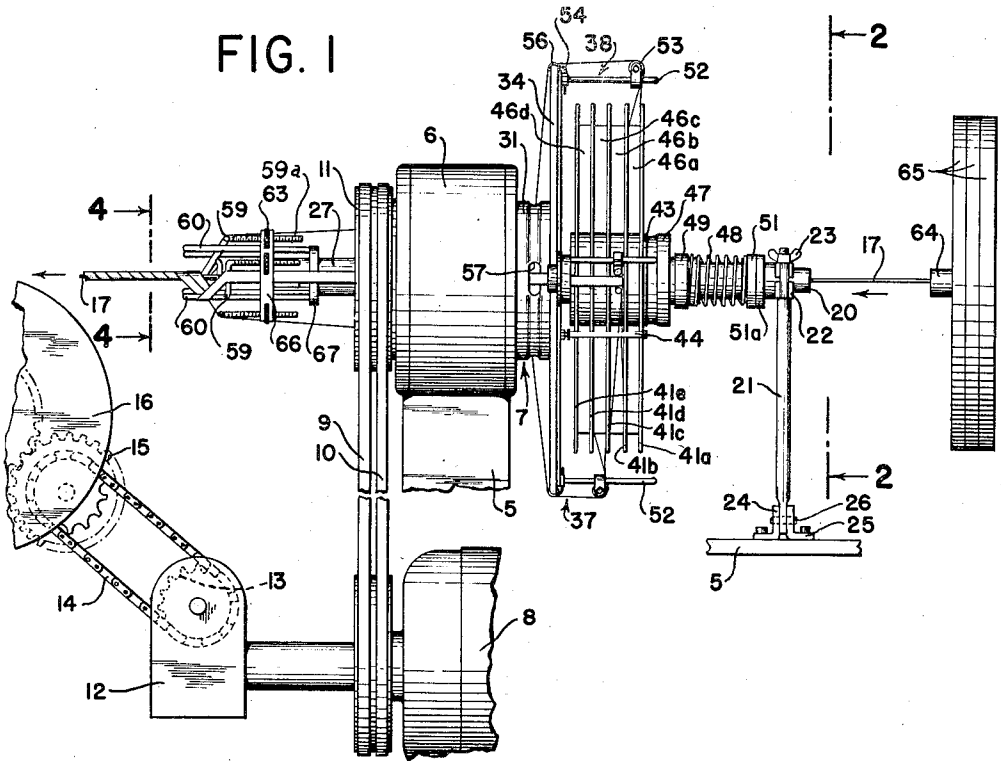
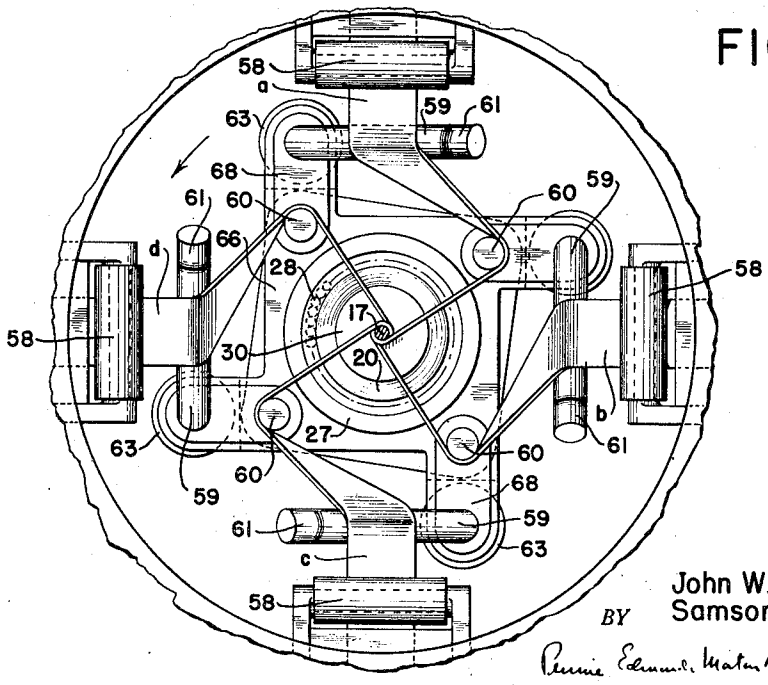


FIG. 4



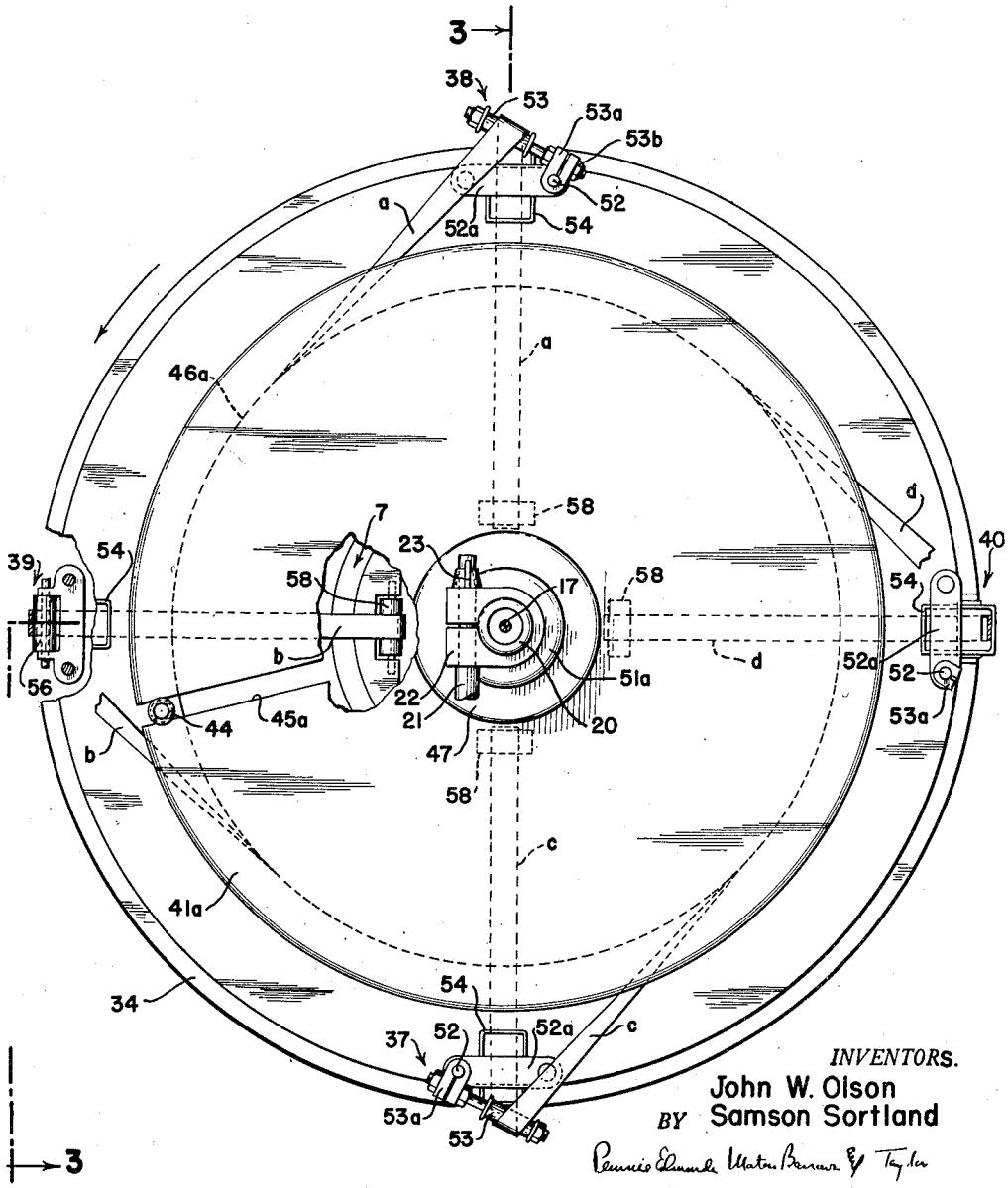
INVENTORS.
John W. Olson
Samson Sortland
BY
Pennie Edmonds Morton Barrow & Taylor
ATTORNEYS

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FIG. 2



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WIRE TAPING MACHINE

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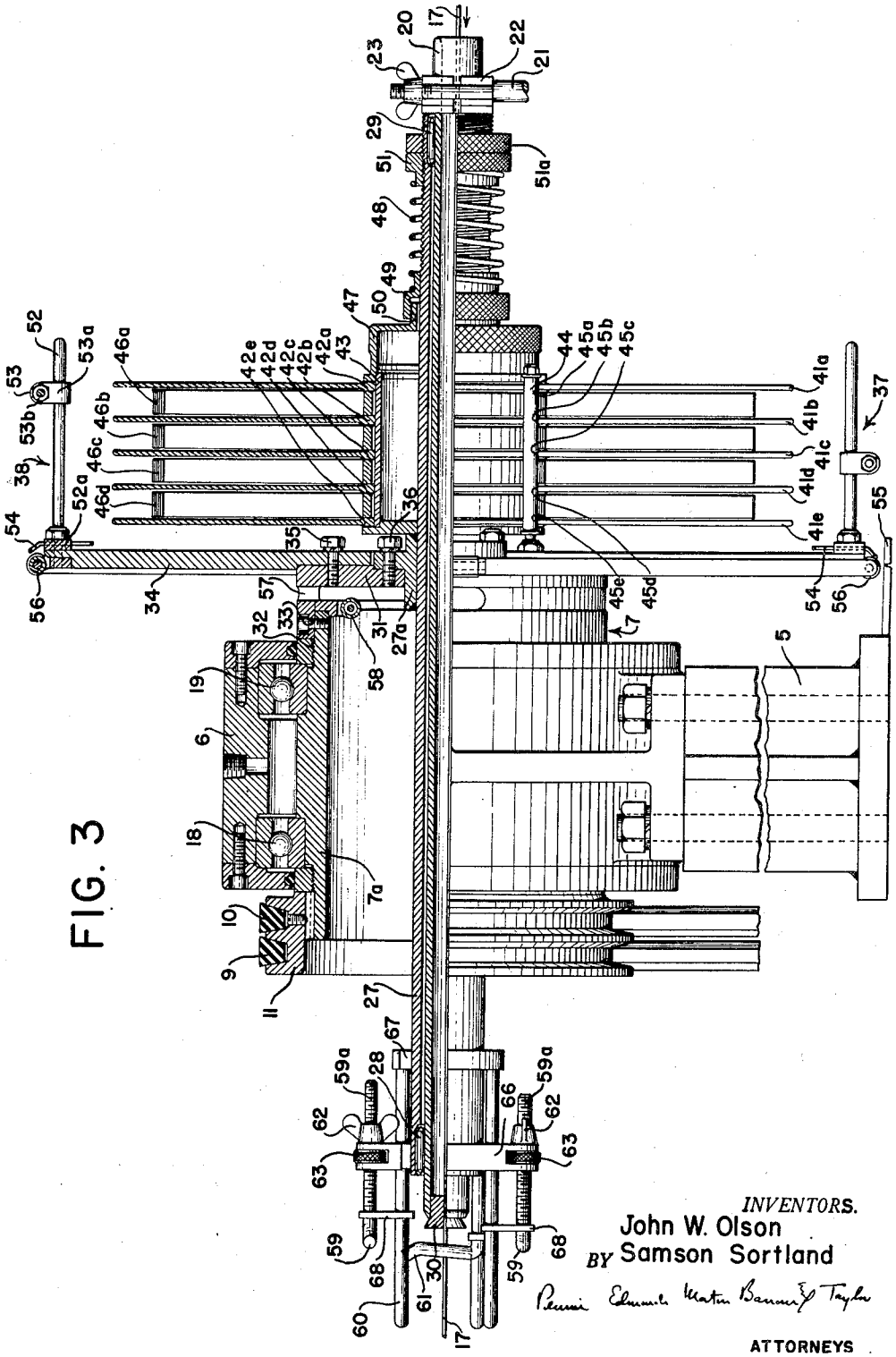


FIG. 3

INVENTORS.
John W. Olson
BY Samson Sortland

ATTORNEYS

United States Patent Office 2,782,138
Patented Feb. 19, 1957

2,782,138

WIRE TAPING MACHINE

John W. Olson, Hastings on Hudson, and Samson Sortland, Dobbs Ferry, N. Y., assignors to Anaconda Wire and Cable Company, a corporation of Delaware

Application May 22, 1953, Serial No. 356,852

7 Claims. (Cl. 154—2.27)

This invention relates to wire taping machines. More particularly, the invention provides an improved device adapted to impose a plurality of helical layers of paper tape upon metallic wires of round, square or rectangular cross section.

The apparatus that has been heretofore generally available to apply paper tape to electrical conductors usually incorporates a taping head having mounted thereon a series of rolls of paper tape individually positioned uniformly about the periphery of the taping head. In such apparatus all the rolls of paper are rotated with the taping head orbitally about the wire passing centrally therethrough, so that the tape is unwound from rolls and wound directly on to the wire. One of the principal difficulties with this type of apparatus results from the positioning of the paper tape rolls about the periphery of the taping head. The rolls being so positioned, the speed at which such a head can be operated is greatly limited because of the unwieldiness of the head caused by its large radius. This type of head cannot be effectively operated at a speed much greater than 400 R. P. M. Another disadvantage lies in the fact that it is extremely difficult to apply the different layers of paper tape under the same tension. This is caused by the fact that the diameter of the wire increases upon the application of each successive layer of paper tape and therefore the outside layers require more material than the initial layers. Because of this, the rate of unwinding of each roll of tape is different from and uncoordinated with the other tapes, thereby causing the tension under which the several layers are applied to be different. Still another disadvantage results from the dynamic unbalance of the head that is caused by, and changes continually in consequence of, the different rates at which paper is taken from the different rolls.

The present invention provides an apparatus having the rolls of paper tape positioned coaxially with a rotating member on which a new and novel taping head is mounted, thereby producing a compact apparatus of small radius. It also provides a tape dispenser which is adapted to supply a plurality of tapes to the taping head so that the tension on each of the tapes being supplied will be substantially the same. The positioning of the rolls of tape coaxially with respect to the rotating member and wire being covered keeps the radius of the entire rotating member at a minimum, thereby permitting the operation of the apparatus at rates of speed of upwards of 1700 R. P. M. Since the rolls are mounted on the axis of rotation of the apparatus, it is at all times maintained substantially in dynamic balance.

The apparatus of this invention is adapted to apply a plurality of layers of paper tape to wire. However, the apparatus may be equally advantageously used in the application of helical layers of any sort of strip material to any sort of an elongated body or bodies. Hence, the term "paper tape" is used herein and in the appended claims to include other materials such as cloth, felt, and synthetic resinous compositions in filamentary or sheet form.

The apparatus of this invention comprises a supporting frame upon which a supporting base member is firmly mounted. A cylindrical casing assembly mounted for rotational movement about its longitudinal axis is supported within said base member. An immobile tubular member is mounted coaxially within said cylindrical casing assembly. Fixedly mounted on one end of said cylindrical casing assembly is a taping head, and also mounted on said cylindrical casing assembly is a tape dispenser. Means are provided for guiding the paper tape from said tape dispenser to the taping head. Means for pulling the wire through said immobile tubular member, and means for rotating said cylindrical casing assembly, are also provided. The driving means is preferably geared to coordinate the speed of rotation of the cylindrical casing assembly with the speed of the wire passing through the apparatus, as their relative speeds govern the extent to which the successive turns of the tape being wound on the wire overlap.

The taping head of the apparatus comprises one or more pairs of guiding fingers fixed about the periphery of one end of the rotating assembly, one pair being provided for each tape that is to be applied. Each pair of guiding fingers comprises one finger which extends substantially perpendicular to the path of the wire through the taping head, and another finger which extends substantially parallel to said path. Each perpendicular finger also advantageously is adjustable longitudinally of the wire, whereby the relative positions of the individual paper tapes in relation to each other on the wire may be adjusted. An aligning die may also be advantageously inserted in the central opening at the end of the immobile tubular member. The aligning die has an inside diameter slightly larger than the outside diameter of the wire passing therethrough, and supports the wire close to the point where the tapes are applied, eliminating excessive oscillation or "whip" of the wire at the position where the winding operation takes place.

An important feature of the new apparatus is the tape dispenser, comprising a plurality of annular separating plates which are positioned adjacent to and coaxially about an extension of the axis of the rotating cylindrical casing. Said plates have an annular section of greater thickness at their inside circumferences where they come into contact with the rotating member. When rolls of paper tapes are placed in the machine between the separating plates, the thicker annular sections come into frictional contact with only the spools upon which the paper tape is supplied. An adjustable means is provided by which the amount of friction between the separating plates and the paper tape spools may be regulated, which in turn varies the tension under which the paper tape is applied to the wire. Locking means hold the separating plates in a stationary position in relation to the rotating member.

An advantageous embodiment of the invention is described below with reference to the accompanying drawings, in which:

Fig. 1 is an elevation of the apparatus of the invention;

Fig. 2 is an end view of the tape dispenser taken substantially along line 2—2 of Fig. 1;

Fig. 3 is an elevation, partly in section taken substantially along line 3—3 of Fig. 2, showing the rotating assembly including both the taping head and the tape dispenser; and

Fig. 4 is an end view of the taping head taken substantially along line 4—4 of Fig. 1.

Referring particularly to Fig. 1, a supporting frame 5 supports the entire apparatus. A base member 6 is mounted on the frame 5 and rotatably supports a cylindrical casing assembly 7. An appropriate power source, such as an electric motor 8, drives the cylindrical casing assembly 7 by belts 9 and 10 connected to a pulley 11 which is affixed to the cylindrical casing assembly 7. The motor 8 is also connected through a power transmission mechanism 12 to a sprocket wheel 13 which, through a driving chain 14 and gearing 15, drives a capstan 16. The wire 17 on which the tapes are being wound is passed one or more complete turns around the capstan, which pulls it through the apparatus. The capstan 16 is geared so that the linear rate of travel of the wire 17 is in proper relation to the speed of rotation of the cylindrical casing assembly 7 to insure the desired amount of overlap of the tape being applied to the wire 17. Advantageously the transmission 12 is a variable speed drive mechanism, so that the rate of linear travel of the wire can be varied relative to the rate of rotation of the cylindrical casing assembly 7. Thereby any desired degree of overlap, or of negative butt lap, may be obtained.

As best shown in Fig. 3, a cylindrical casing 7*a* which forms a part of the casing assembly 7 is rotatably supported within the base member 6 by bearings 18 and 19. Extending through the base member 6 and coaxial therewith is an immobile tube 20 which is held in a stationary position by a rod 21 which is affixed to the tube 20 by a clamp 22. A thumb screw 23 which is threaded on to the upper end of said rod 21 releasably secures the clamp 22 about the tube 20. The lower end of the rod 21 is firmly anchored to brackets 24 and 25 (Fig. 1) affixed to the frame support 5 by a removable pin 26. The wire 17 being covered is drawn through the immobile tube 20, and through an aligning die 30 which is inserted into the end of the immobile tube 20 to keep the wire in proper alignment while the paper tape is being wound thereon and to eliminate excessive oscillation of the wire.

Rotatably mounted about the immobile tube 20, on needle bearings 28 and 29, and as a part of the cylindrical casing assembly 7, is a sleeve 27. A flange member 27*a* is welded to the sleeve 27 near its mid point, and a supporting plate 31 which is fastened by bolts 36 to the flange member connects the sleeve 27 with the cylindrical casing 7*a*. The casing 7*a* and sleeve 27, together with the supporting plate 31 and pulley 11, form the rotating casing assembly upon which the taping head and tape dispenser (described below) are mounted. The supporting plate 31 is affixed to the cylindrical casing 7*a* by means of a threaded joint 32 and lock screws 33.

A circular plate 34 is secured to the supporting plate 31 by means of bolts 35 and 36. At the periphery of the circular plate 34, and uniformly spaced 90° apart from each other, are paper strip guides generally indicated at 37, 38, 39 and 40 (Figs. 1 to 3). The strip guides are four in number, since the specific embodiment of the invention shown in the drawings is adapted to apply four paper tapes upon a wire. The mechanism can be modified in order that any number of layers of paper tape may be applied, and the number and arrangement of rolls of paper tape and tape guides may be varied accordingly. Adjacent the circular plate 34 are five annular separating plates 41*a*, 41*b*, 41*c*, 41*d* and 41*e*, each having relatively thick annular hub sections 42*a*, 42*b*, 42*c*, 42*d* and 42*e* at their inside circumferences. These plates 41*a*, 41*b*, 41*c*, 41*d*, and 41*e*, are mounted movably on a cylindrical member 43 which is coaxial with the rotating sleeve 27. A locking means in the form of a bar 44 is securely mounted on the circular plate 34 and extends into slots 45*a*, 45*b*, 45*c*, 45*d* and 45*e*, one of which is formed in each of the separating plates. Thereby the separating plates are restrained from rotating with the paper tape rolls as the rolls unwind. This enables each roll to unwind independently of the others.

It is to be noted that only the thicker annular hub sections 42*a*, 42*b*, 42*c*, 42*d*, and 42*e*, of the separating plates are in contact with the spools 46*a*, 46*b*, 46*c*, and 46*d* upon which the paper tape rolls are wound. A friction adjustment means is provided to adjust the amount of friction between the annular hub sections 42*a*, 42*b*, 42*c*, 42*d*, and 42*e*, and the spools 46*a*, 46*b*, 46*c* and 46*d*, of the tape rolls in order to regulate the tension under which tape is drawn from the rolls. This means comprises a collar 47 which bears against the outside separating plate 41*a* at its thick annular hub section 42*a*. Such force as is exerted by the collar 47 on the hub of the plate 41*a* is transmitted to the adjoining spool 46*a*, and through it to the hub of the next plate 41*b*, and so on, so that substantially the same amount of pressure is exerted by the several separating plates 41*a*, 41*b*, 41*c*, 41*d*, and 41*e* on the respective spools 46*a*, 46*b*, 46*c*, and 46*d* which carry the rolls of tape. The collar 47 is divided longitudinally in two halves so it can be easily and quickly removed from the apparatus even when the wire 17 extends therethrough. A coil spring 48 presses against the collar 47 through ring 49. The ring 49 engages a slightly tapered neck 50 on the collar 47 so as to hold the halves of the collar securely together. The compression of the spring 48 is adjusted by means of an adjustment nut 51 which is threaded on to the end of sleeve 27. By tightening up or backing off the nut 51, the force exerted by the spring 48 on the collar 47, and thence transmitted through the thick hub sections of the separating plates to provide substantially equal frictional drag on each of the spools 46*a*, 46*b*, 46*c* and 46*d*, can be adjusted to produce the desired tension upon the paper tape being unwound from the rolls. A lock nut 51*a* is provided to lock the nut 51 in any desired position.

As the tapes *a*, *b*, *c* and *d* are unwound from the rolls, they respectively pass over the tape guides 37, 38, 39 and 40 mounted upon the circular plate 34. Each guide comprises a rod or bar 52 which is screw threaded to the circular plate 34 through a spacer bar 52*a*. A roller 53 is secured to the bar 52 by means of a split bracket clamp 53*a*. The bracket clamp is slidably and rotatably mounted on the bar 52 to enable the positioning of the roller 53 immediately over the appropriate tape spool, and may be locked in the desired position by tightening up on a clamp nut 53*b*. The roller is generally set at an angle of about 60–75° to the tangential path of the tape as it is unwound from its roll. The roller 53 is adjusted at an angle so the tape upon being twisted through about 90° will pass over the roller 53 in proper position and not run off the roller. The tape then passes over a U-shaped arm 54 which is slidably mounted through the spacer bar 52*a*. The arm 54, when a roll of tape runs out or when the tape breaks, is released from the restraint imposed by the tape and is thrown out into an extended position by centrifugal force. In its extended position it actuates a switch 55 mounted on the supporting frame 5. The switch, when thus actuated, causes the motor to be deenergized so that the apparatus stops. Another tape must then be threaded into the apparatus before it can be put back into operation.

The tape next passes over a roller 56 mounted adjacent the periphery of the circular plate 34 in substantial alignment with the roller 53, and thence through an opening 57 in the supporting plate 31 around a roller 58 mounted adjacent the lower surface of the supporting plate. The tape then passes through the annular space between the cylindrical casing 7*a* and the rotating sleeve 27 to the taping head.

The taping head is provided with at least one pair of guiding fingers for each tape being supplied. Each such pair consists of a first finger 59 extending substantially

perpendicularly to the path of the wire **17**, and a second finger **60** extending substantially parallel to said path. As illustrated in Fig. 4, the tape *a* after passing over the roller **58** passes over the first guiding finger **59** and thence over the second guiding finger **60**, by which it is directed helically on to the wire **17** which is being pulled through the central opening of the guiding die **30**. Each perpendicularly extending guiding finger **59** is formed with a slight bend **61** near the end thereof, to help keep the tape from running off the finger. Each such finger also is secured to a supporting collar **66**, which is fixedly mounted on the sleeve **27**, by a micrometer adjustment mount comprising an adjusting nut **63** screw-threaded on the stud **59***a* which is integral with the finger **59**, and a wing nut **62** which locks the finger in the desired position. By this mounting the position of each perpendicular finger may be adjusted along the length of the wire in relation to the position of the other perpendicular fingers, so that the spacing of the tapes on the wire **17** can be adjusted in relation to each other. Each parallel extending finger **60** is securely set in a collar **67** fixedly mounted on the sleeve **27** adjacent to and rearwardly of the supporting collar **66**. Each of these fingers **60** further passes through the supporting collar **66**, and through a spacer member **68** which holds the finger **60** in proper relation to the cooperating perpendicularly extending finger **59**. The spacer member **68** may be fixedly secured to either the stud **59***a* or the finger **60**, but not to both, in order that the finger **59** may be freely adjusted.

In operation, the wire **17** is fed to the apparatus from a supply reel or other supply means. It passes through an elongated supporting and straightening die assembly **64** (Fig. 1) into the immobile tube **20**, and thence through the aligning die **30** adjacent the taping head. Before the wire is started through the apparatus, an ample supply of spare rolls **65** of paper tape are placed over the elongated die **64**. These spare rolls can be used to replace rolls in the tape dispenser without removing the wire **17** from the apparatus.

When any of the rolls of tape mounted in the tape dispenser are exhausted, the thumb screw **23** is removed to loosen the clamp **22**. The pin **26** is then removed from the bottom end of rod **21**, to free it from the brackets **24** and **25**, so that it can be easily and quickly removed from the clamp. The clamp **22** can be left in place, or if desired it can be removed by sliding it over the wire **17** and then sliding the wire laterally through its slot. The ring **49** is then pressed back against the compressive force of the spring **48**, to release it from the neck of the collar **47**. Thereupon the two halves of collar **47** are easily removed, and the separating plates **41***a*, **41***b*, **41***c*, **41***d*, and **41***e* can be slid back over the wire **17** where it enters the apparatus. The separating plates are then removed by passing the wire **17** laterally through the slots **45***a*, **45***b*, **45***c*, **45***d* and **45***e*; and the remnants of the rolls of tape and their supporting spools are torn or cut radially and are removed from the apparatus. A roll of paper tape is then moved from the elongated die **64**, along the wire **17**, into position against the last separating plate **41***e*. Then the next separating plate **41***d* is replaced, so that its annular hub section **42***d* is in frictional contact with the new spool and its slot **45***d* is in engagement with locking bar **44**. Then another roll of tape is brought forward. By repeating these operations for each roll of tape, the tape dispenser is completely replenished with tape. The collar **47** is then replaced, the ring **49** is returned into position to clamp together the two halves of collar **49**, and the rod **21** is replaced and clamped to the tube **20**. The tape dispenser is thus replenished without having to cut or remove the wire **17**.

Thus the improved apparatus of the invention functions to apply uniform helical layers of paper tape upon a wire more rapidly and with greater efficiency than has been heretofore possible. Also the supply and application of these tapes to the wire is greatly facilitated through the operation and relationship of the improved taping head and tape dispenser mounted on the apparatus.

We claim:

1. A wire taping device adapted to superimpose a plurality of helical layers of paper tape upon a wire comprising a sleeve member, an immobile tubular member mounted coaxially within said sleeve member, said tubular member providing a path for wire to be taped, said sleeve member being rotatable about said immobile tubular member, an aligning die having a central opening adapted to have a wire pass therethrough mounted on said immobile tubular member at one end thereof, a taping head fixedly mounted on said sleeve member at the same end as said die, said taping head including at least one pair of guiding fingers affixed about the periphery of said sleeve member adjacent said die, each said pair of guiding fingers comprising one finger extending substantially perpendicular to the path of said wire and one finger extending substantially parallel to said path, whereby a tape which passes from a position parallel to the wire first over said perpendicular finger and thence over said parallel finger is guided thereby helically on to the wire as it emerges through said central opening in said die, a tape dispenser fixedly mounted on said sleeve member, means for guiding tape from said tape dispenser to said taping head, means for pulling the wire through said immobile tubular member and said die, and means for rotating said sleeve member.

2. A wire taping device adapted to superimpose a plurality of helical layers of paper tape upon a wire comprising a sleeve member, an immobile tubular member mounted coaxially within said sleeve member, said sleeve member being rotatable about said immobile tubular member, an aligning die having a central opening adapted to have a wire pass therethrough mounted on said tubular member at one end thereof, a taping head fixedly mounted on said sleeve member at the same end as said die, a tape dispenser fixedly mounted on said sleeve member, said tape dispenser including a plurality of annular separating plates slidably mounted on said sleeve member, said plates having annular sections of substantially greater thickness at their inner circumferences than at their outer periphery, each said plate having a narrow slot extending from its center so as to permit the removal of said plate while a wire extends substantially axially through said sleeve member, spring means mounted on said sleeve member urging said plates toward each other, means for guiding tape from said tape dispenser to said taping head, means for pulling wire through said immobile tubular member and said die, and means for rotating said sleeve member.

3. In a wire taping device, an improved taping head comprising in combination a rotating member having a central opening adapted to have a wire pass therethrough, and a plurality of pairs of guiding fingers affixed about the periphery of said rotating member, each said pair of guiding fingers comprising one finger extending substantially perpendicular to the path of said wire and one finger extending substantially parallel to said path, whereby a tape which passes from a position parallel to the wire first over said perpendicular finger and thence over said parallel finger is guided thereby helically on to the wire as it emerges through said central opening in said rotating member, the perpendicularly extending finger of at least one pair being independently adjustably movable longitudinally of said wire to vary the overlap of tape wound upon the wire.

4. In a wire taping device, an improved taping head comprising in combination a rotating member having a central opening adapted to have a wire pass therethrough, an aligning die inserted in said central opening, and a plurality of pairs of guiding fingers affixed about the periphery of said rotating member adjacent said die, each said pair of guiding fingers comprising one finger extend-

ing substantially perpendicular to the path of said wire and one finger extending substantially parallel to said path, whereby a tape which passes from a position parallel to the wire first over said perpendicular finger and thence over said parallel finger is guided thereby helically on to the wire as it emerges from said aligning die, the perpendicularly extending finger of at least one pair being independently adjustable in a direction longitudinally of the wire to vary the overlap of tape wound upon the wire.

5. In a wire taping device, an improved tape dispenser comprising in combination a rotating member adapted to carry a plurality of rolls of tape, a plurality of annular separating plates slidably mounted on said rotating member and adapted to be positioned one between each adjacent pair of rolls of tape, said plates having hubs of greater thickness than the plates projecting toward said rolls of tape from their inner circumferences to engage the central portions of said rolls of tape, each said plate having a narrow slot extending from its center to its periphery so as to permit removal of said plate while a wire extends substantially axially through said rotating member, means for establishing frictional contact between the hubs of said plates and the central portions of the rolls of tape, and means to lock said separating plates in a stationary position in relation to said rotating member.

6. In a wire taping device an improved tape dispenser comprising in combination a rotating member adapted to carry a plurality of rolls of tape, a plurality of annular separating plates slidably mounted on said rotating member, and adapted to be positioned between each adjacent pair of rolls of tape, said plates having annular sections of substantially greater thickness at their inner circumference than at their outer periphery, each said plate having a narrow slot extending from its center so as to permit removal of said plate while a wire extends substantially axially through said rotating member, spring means mounted on said rotating member urging said plates into frictional contact with the rolls of tape, an adjustment nut positioned on said rotating member controlling the pressure exerted by said spring means, and a locking bar extending from said rotating member through said slot in each said plate, whereby said plates are held in a stationary position in relation to said rotating member.

7. A wire taping device adapted to superimpose a plurality of helical layers of paper tape upon a wire comprising a sleeve member, an immobile tubular member mounted coaxially within said sleeve member, an aligning die having a central opening therethrough mounted on said tubular member, said sleeve member being rotatable about said immobile tubular member, a taping head fixedly mounted on one end of said sleeve member, a tape dispenser fixedly mounted on said sleeve member, said tape dispenser including a pair of annular separating plates slidable relative to one another and mounted on said sleeve member and adapted to receive a roll of tape between them, each of said annular plates having a hub of greater thickness than the plate projecting toward said roll of tape from the inner circumference thereof to engage the central portion of said roll of tape, means for guiding tape from said tape dispenser to said taping head, means for pulling wire through said immobile tubular member and aligning die, and means for rotating said sleeve member.

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