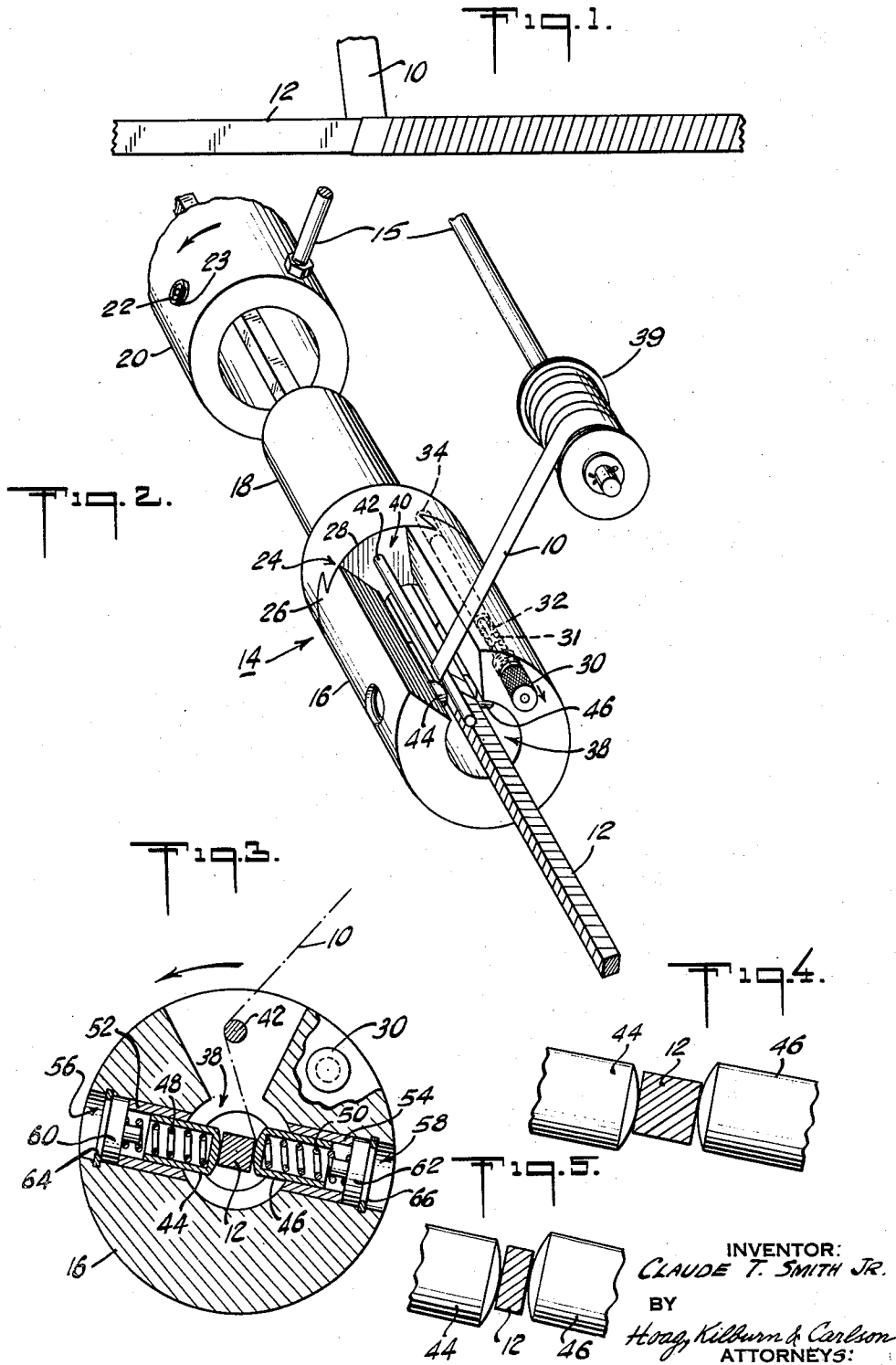


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 APPARATUS FOR APPLYING THIN TAPE TO
 RECTANGULAR WIRE OR OTHER CORE
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APPARATUS FOR APPLYING THIN TAPE TO RECTANGULAR WIRE OR OTHER CORE

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This invention relates to apparatus for applying a covering of thin tape to a travelling member or core with the tape tensioned lightly, and more particularly to apparatus for applying thin tape to a rectangular core with an overlap of fifty percent or more of the width of the tape. Application of the invention for taping a wire is contemplated and the term wire is used herein broadly, and includes a single strand or a core comprising a bundle of strands.

In the past the application of thin tape to a core such as rectangular wire with an overlap of greater than fifty percent of the tape width, for example, seventy-five percent, has been accompanied by several undesirable results. Among these undesirable results are improper register of the lap, slippage of the tape along the wire, and excessive wrinkling of the tape, all of which defeated the purpose of construction. In addition, tensioning and excessive breakage of the tape occurred. These factors were particularly undesirable in the application of thin tapes to square or other rectangularly shaped wire for use in winding inductors and transformers and for other purposes.

Therefore an object of this invention is to provide improved apparatus for wrapping tape around wire and the like.

A more specific object of this invention is to provide improved apparatus for applying thin tape to rectangular wire with an overlap equal to or greater than fifty percent of the tape width.

Another object of this invention is to provide improved apparatus for covering rectangular wire with thin tape without tension and/or excessive breakage of the tape.

Still another object of this invention is to provide a tool for covering a rectangular member with a thin tape with a uniform lap equal to or greater than fifty percent without excessive wrinkling of the tape or slippage of the tape along the member.

A more specific object of the invention is to provide improved apparatus for applying around rectangular wire a thin insulative tape with an overlap of around seventy-five percent and in such a manner that the tape covering is tight, wrinkle-free and nonslipping, and without tensioning leading to breaking the tape.

In accordance with the invention, apparatus for applying thin tape to a core comprises means for moving the core in a longitudinal direction, means for supporting a roll of tape and revolving it around the core, means for feeding the tape to the core, presser means provided adjacent where the tape is applied to the core, and means for moving the presser means with respect to the core whereby the presser means presses the tape against the core as it is applied to the core, and deforms it as required by the tape overlap.

In a preferred embodiment of the invention illustrated in the drawings, a wire is moved through a passage in a nose piece assemblage comprising part of a rotating taping head of a wire insulating machine. A pair of finger-

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like presser members are resiliently mounted on opposite sides of the passage and in resilient contact with the wire at the area where the tape is applied to the wire. As the nose piece assemblage rotates around the wire thus wrapping the tape around the wire in regular turns with even overlaps the presser fingers travel around the wire over the tape as it is being applied and serve to iron out any wrinkles, deform the tape by pressure rather than by tension, and keep each turn of the tape tightly applied. Thus, the tape fed to the nose piece assemblage may be under tension low enough so that stretching or breaking of the tape is avoided.

Another feature of the invention is the assembly comprising a shank and a nose piece interengaged by means which permit ready removal and substitution of the nose piece, making it possible to replace a nose piece with others of different types and sizes.

The invention will best be understood if the following description is read in connection with the drawings wherein:

Figure 1 is an elevational view of wire having a square cross-section in the process of being taped and illustrating an overlap of about seventy-five percent.

Figure 2 is a perspective view of a nose piece assemblage adapted for use with a wire insulating machine for applying thin tape, with a substantial overlap, to a square wire in accordance with the preferred embodiment of the invention.

Figure 3 is a cross-sectional view of the nose piece assemblage shown in Figure 2 particularly illustrating the presser members which smooth and press tape along the sides of the square wire.

Figure 4 is an enlarged end view of a square wire between opposed presser members illustrating how the presser members move over and around the periphery of the wire, and

Figure 5 is an end view similar to Figure 4 but showing a pair of opposed presser fingers in conjunction with a rectangularly shaped wire which is not square.

Figure 1 illustrates tape 10 being applied to the wire 12, which is rectangular in cross-section. The tape 10 preferably is thin paper tape and is wound with an overlap of seventy-five percent, called a three-quarter lap, on the wire 12 which has a rectangularly-shaped cross-section.

The tape 10 is applied to the wire 12 utilizing the nose piece assemblage 14 (Fig. 2) which comprises the nose piece 16 and shank 18. The nose piece assemblage 14 is rotated as part of the taping head of a tape insulating machine by attachment to a taping head chuck 20 projecting from the taping head. The nose piece assemblage 14 is assembled to the taping head by inserting shank 18 into the tubular chuck 20 and locking these parts together by the set screw 22, which is inserted through an aperture 23 in chuck 20 into contact with the periphery of shank 18.

The nose piece 16 and the shank 18 are attached together by means of the dovetail slide joint 24 comprising the matching dovetailed positions 26 and 28 respectively. A locking pin 30 passes through a hole 32 in the nose piece 16 and is spring pressed by spring 31 into the aligned hole 34 in the shank 18. This dovetail construction feature of the invention permits the easy removal of a nose piece 16 and its replacement by other types and sizes of nose pieces.

The wire 12 passes through the taping head chuck 20, the shank 18 and the nose piece 16, all of which are tubular, providing a continuous passage when these parts are assembled through which the wire is continuously advanced by means not shown, at a speed synchronized with the rotation of the head. The passage through the nose piece 16 is made larger than is required to pass the

core being wound and comprises the taping chamber 38. The tape 10 is fed to the taping chamber 38 from the reel 39, supported by the chuck 20 in any suitable way as by bracket 15, via a segmental opening 40 in the nose piece 16. A guide pin 42 is mounted in the opening 40, projecting from the shank 18 parallel to the axis of the nose piece and provides a guide for the tape 10 which is fed from a tape supply reel 39 to the wire 12 which passes through the taping chamber 38. Since, the reel 39 is supported on chuck 20 which forms part of the head it rotates with the nose piece.

Two presser fingers 44 and 46 are mounted in the nose piece for reciprocation toward and away from the wire passing through the nose piece. The fingers project toward the wire from opposite sides of the taping chamber 38 (Fig. 3) and are slightly offset or out of alignment to facilitate travel of their contact ends around the wire.

The members 44 and 46 are hollow and house compression springs 48 and 50 respectively and are themselves installed in sleeve-type bearings 52 and 54 which are pressed into the cylindrical bores 56 and 58 respectively in the body of nose piece 16. The outer ends of compression springs 48 and 50 are retained by the caps 60 and 62 respectively which are in turn held in place by the retaining washers 64 and 66 which may be of the C type and initially partly seated in grooves in the outer periphery of bearings 52 and 54 respectively, becoming seated also in grooves provided in the bores 56 and 58 respectively adapted to register with the grooves in bearings 52 and 54 respectively when the latter are inserted in said bores.

The ends of fingers 44 and 46 (Fig. 4) are preferably of spherical shape which has the effect of causing their front ends to effectively and smoothly travel around the periphery of the wire 12, irrespective of its cross-section and whether it be square (Fig. 4) or a relatively long and narrow rectangle (Fig. 5).

In operation, the tape 10 (Fig. 2) is fed relatively loosely into taping chamber 38 from tape supply reel 39 which rotates with the nose piece assemblage 14 around a wire 12 which is advanced continuously through the taping chamber 38, by any suitable means, not shown. The tape 10 passes over the guide pin 42 and is applied to the wire 12 just ahead of the resiliently mounted presser fingers 44 and 46 which are already pressing on opposite portions of the last previously applied winding of the tape and immediately move against the most recently applied winding due to the steady advance of the wire past the inner ends of said fingers respectively.

As the nose piece assemblage 14 is rotated by the taping head, the wire 12 moves axially through the taping chamber 38 at a predetermined rate which is a function of the overlap desired and the speed of rotation of the taping head. The tape 10 is pressed tightly against the wire 12, by the presser fingers 44 and 46 which slide axially along the moving wire while also travelling around it and spread the tape to compensate for differences in the length of paper required along the leading and trailing edges of turns of the tape.

The fingers 44 and 46 are disposed slightly out of alignment, 46 is shown being slightly above or ahead of 44 whereby 46 reaches an edge of the wire and protrudes partly beyond the edge before 44 reaches an edge. This disposition of the presser fingers facilitates their movement smoothly around the edges of a rectangular core as the head rotates counterclockwise about the wire 12.

Thus, the tape 10 is firmly held against the wire 12 and the tape 10 is wrapped around the wire in regular and even spacing and, since the fingers 44 and 46 provide the pressure necessary to deform portions of the tape as required for a tight, even covering, it is unnecessary for the tape 10 to be held taut. Thus, tape ten-

sioning and resultant tape breakage is avoided, and the formation of wrinkles in the turns of tape 10 wrapped on the wire 12 are reduced to a minimum while the tape is wrapped snugly and is not slideable on the wire 12.

I have obtained very good results using thin paper tapes of from one to four mils in thickness. However the tape thickness and the material of which it is made and the size of the wire around which it is wrapped, may be widely varied and I do not wish to be limited to the examples given herein for the purpose of illustration. For example, I have found that tapes made of asbestos or the cellulose plastic tapes such as cellophane, ethyl cellulose and cellulose acetate butyrate, may be usefully employed wrapped around square wire having thicknesses of about 0.050" to 0.290", or rectangular wire with a thickness of 0.020" to 0.260" and a maximum width to thickness ratio of 15:1 up to a width of 0.750".

In a specific application of the invention I have obtained very good results using thin paper tape lapped seventy to seventy-five percent of its width to give four thicknesses of paper on wire size 7B and S gauge to produce an insulation .0025" thick. The wire is square with each side .1443" wide and the paper is $\frac{5}{16}$ of an inch wide and .0025 inch thick. This produces a paper insulated wire having a minimum adder for insulation of .015 inch and a maximum dimension over insulation of .164 inch. In applying paper tape with 75% overlap, the trailing edge of the paper is wrapped directly around the core while the leading edge is wrapped around a portion of the core over which there are already three layers of tape. Thus, there is an appreciable difference in length required for one turn or convolution along the trailing edge and the length required along the leading edge. This means that the tape must be deformed or stretched according to a non-uniform pattern across its width. As pointed out above, the usual way of doing this has been to apply tension to the tape as it is wrapped and the tension required is very close to the rupture strength of the paper. If insufficient tension is applied, the tape wrinkles badly. If too much tension is applied, the tape breaks. In contrast, the means disclosed herein deforms the tape by pressure rather than by tension and there are no longer any problems of wrinkling or breaking.

There has thus been provided an improved apparatus for applying thin tape to rectangularly-shaped wire or other core. Tape tensioning and breakage is minimized or eliminated and uniform laps are produced without excessive wrinkling of the tape or slippage of the tape along the wire.

As will be noted from the description and drawings, the apparatus is relatively simple in construction, easy to operate, and is of relatively low cost. Further, the nose piece may be readily removed for substitution of a different type or size of nose piece.

Although the invention has been described in detail in connection with only one embodiment, it will be apparent that many modifications and changes may be readily made without departing from the spirit and scope of the invention.

What I claim is:

1. Apparatus for winding tape or the like around a travelling rectangular core which comprises, a rotatable annular cylindrical member having a radial, segmental opening, a support for roll of tape, means for rotating said cylinder and said support around a common axis, bores extending radially through the wall of the cylinder in substantially diametrically opposed relation, cup shaped presser members mounted for reciprocation in said bores respectively, and spring means anchored within said bores and acting to project said members toward the axis of said cylinder and toward substantially diametrically opposed portions respectively of a rectangular core advancing through the cylinder, the inner ends of said members

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being spherical for facilitating travel over the edges of said rectangular core, and means for guiding tape from said reel into the segmental opening in said cylinder just in advance of said presser members whereby the presser members press each winding of tape against and around the core as it is applied to the core.

2. Apparatus for winding tape and the like around a travelling core with an overlap of 50% or more, a rotatable tubular chuck, a tubular nose piece, means for locking the nose piece to the chuck in axial alignment with the chuck, a support for a reel of tape, and means for mounting the support for rotation with the chuck and the nose piece around a common axis, a radial slot in the nose piece, guide means for guiding tape from the reel to be wound spirally around the core, presser fingers having spherical inner end surfaces, and means for mounting said presser fingers within said nose piece to cause them to press against substantially diametrically opposed portions of a core passing through the nose piece with one finger sufficiently in advance of the other along the path of the core to press on the leading edge portion of the tape while the opposed finger is pressing on the trailing edge portion of the tape which overlaps the previous winding.

3. Apparatus for winding tape and the like around a travelling core with an overlap of 50% or more, which comprises, a rotatable tubular member, a support for a

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reel of tape, and means for mounting the support for rotation with the member around a common axis, an access opening in the wall of said member giving access to a core travelling through said member, guide means for guiding tape from a reel on said support into said access opening, presser fingers having spherical inner end surfaces, and means for mounting said presser fingers within said member to cause them to press against substantially diametrically opposed portions of a core passing through the nose piece, said guide means and presser fingers being interrelated to cause said fingers to press each successive winding of the tape against and around the core and to spread the portion of each winding which overlaps one or more previous windings as may be necessary because of the increase in diametrical thickness added to the core by one or more previous windings.

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