W. F. SMITH.

WINDING HEAD.

APPLICATION FILED OCT. 3, 1913.

1,144,618.

Patented June 29, 1915.

4 SHEETS—SHEET 1.

Fig. 1.

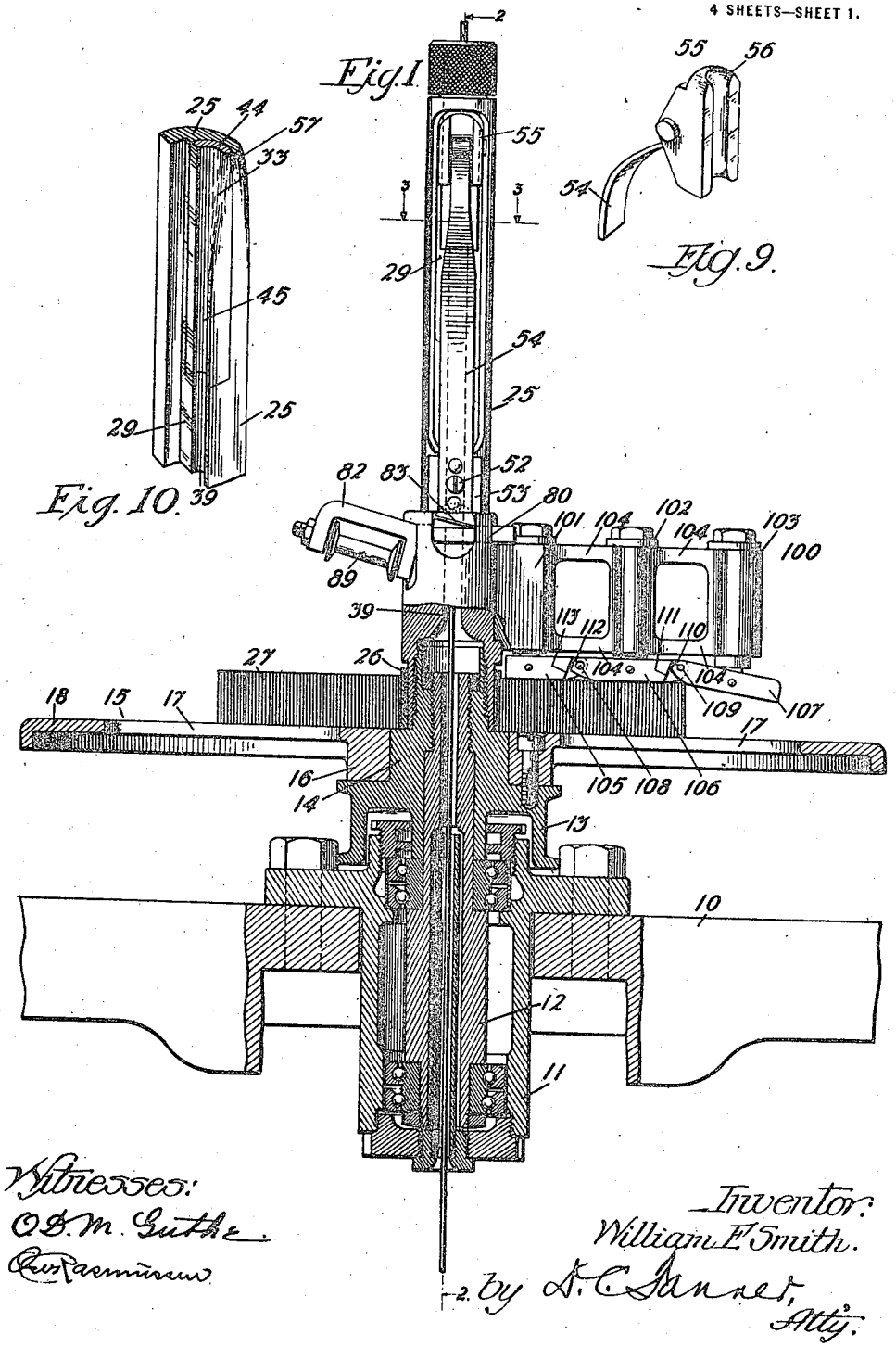


Fig. 9.

Fig. 10.

Witnesses:
O. S. M. Guthe.
C. W. Parmenter.

Inventor:
William F. Smith.
by A. C. Janet,
Atty.

W. F. SMITH.

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4 SHEETS—SHEET 2.

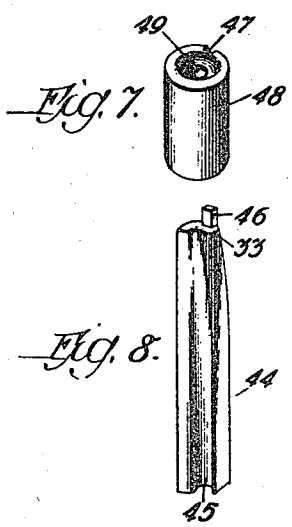


Fig. 7.

Fig. 8.

Fig. 2.

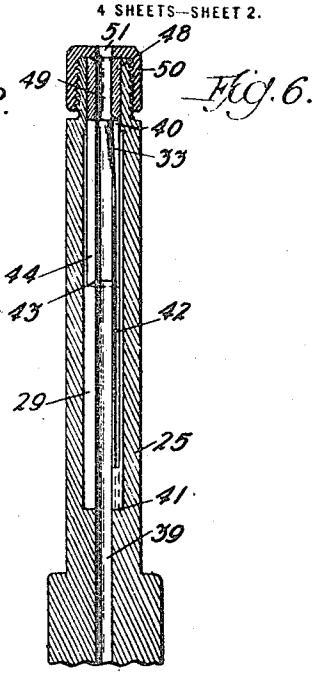


Fig. 6.

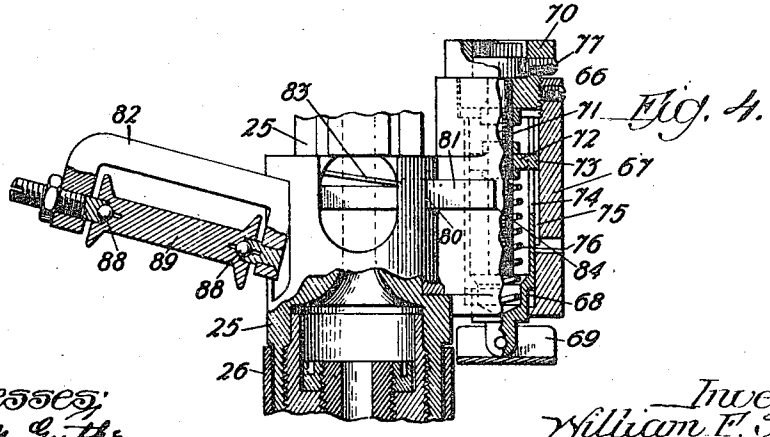


Fig. 4.

Witnesses:
O. D. M. Guthe
C. W. Rasmussen

Inventor:
William F. Smith.
by D. C. Skinner Atty.

W. F. SMITH.
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1,144,618.

Patented June 29, 1915.

4 SHEETS—SHEET 3.

Fig. 3.

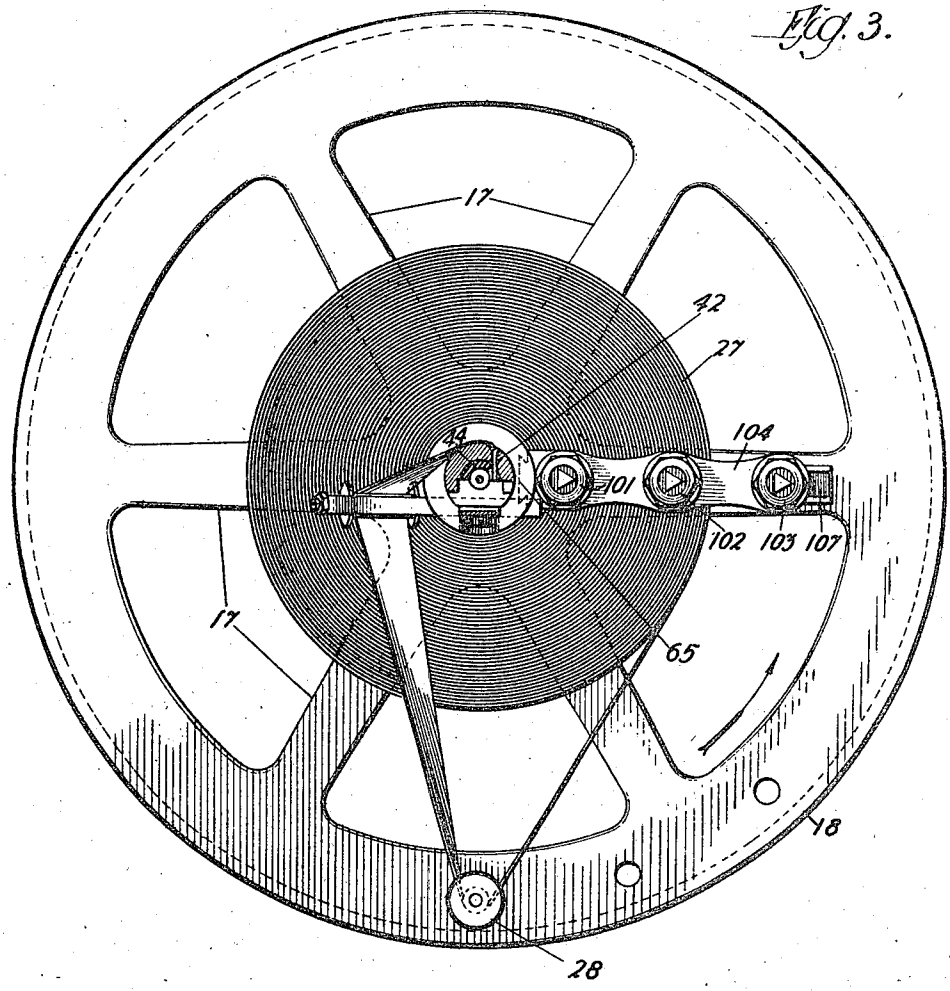
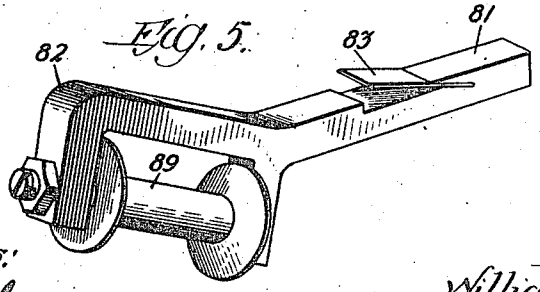


Fig. 5.



Witnesses:
O&M. Guthe.

Inventor.
William F. Smith.
by A. C. Garner, Atty.

W. F. SMITH.

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1,144,618.

Patented June 29, 1915.

4 SHEETS—SHEET 4.

Fig. 11.

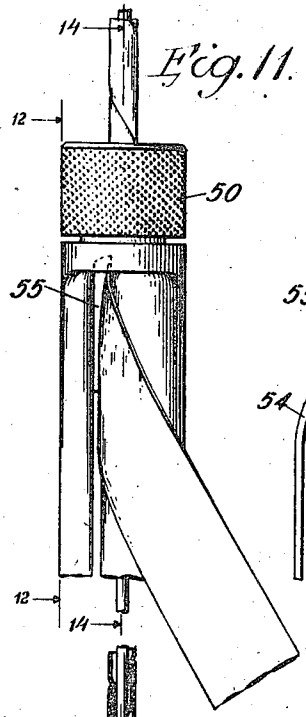


Fig. 12.

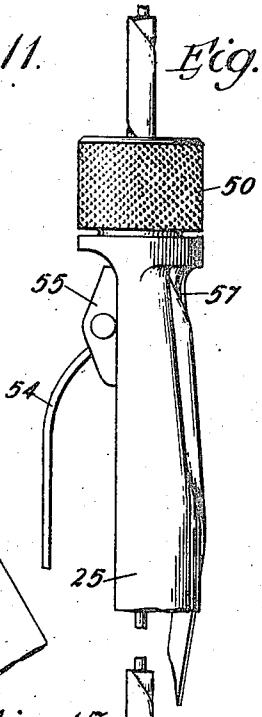


Fig. 13.

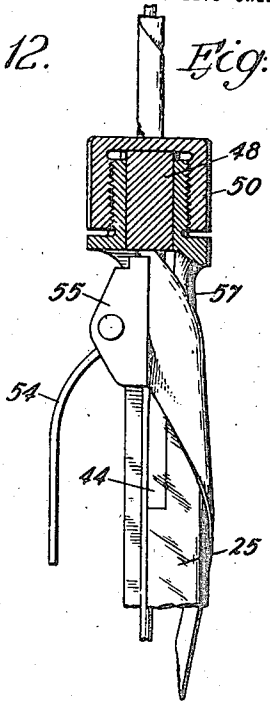


Fig. 14.

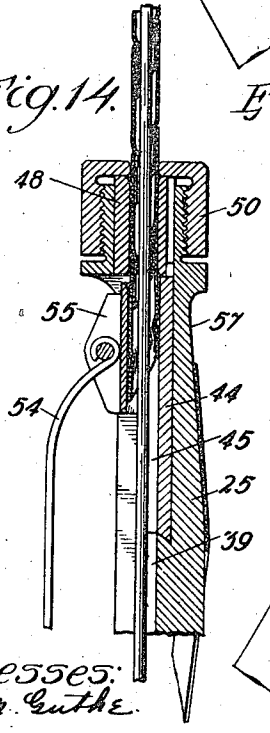


Fig. 15.

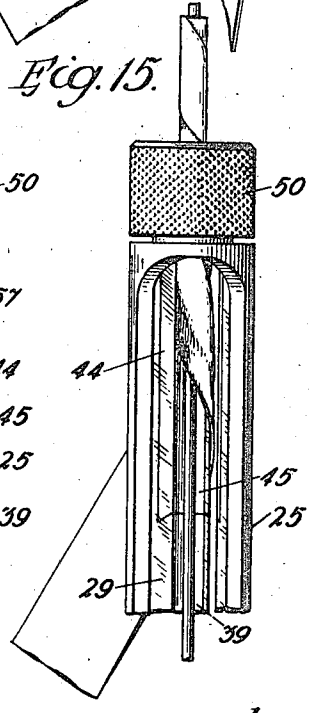
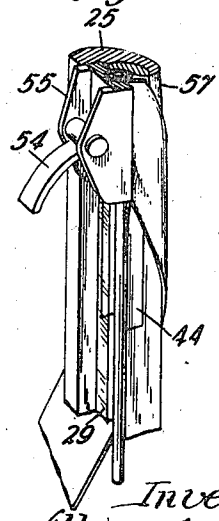


Fig. 16.



Witnesses:
O. B. M. Guthe.
[illegible]

Inventor:
William F. Smith.
by L. C. Garner, Atty.

UNITED STATES PATENT OFFICE.

WILLIAM F. SMITH, OF CHICAGO, ILLINOIS, ASSIGNOR TO WESTERN ELECTRIC COMPANY, OF NEW YORK, N. Y., A CORPORATION OF ILLINOIS.

WINDING-HEAD.

1,144,618. Specification of Letters Patent. Patented June 29, 1915.

Application filed October 3, 1913. Serial No. 793,129.

To all whom it may concern:

Be it known that I, WILLIAM F. SMITH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Winding-Heads, of which the following is a full, clear, concise, and exact description.

This invention relates to tape winding machines for insulating conductors, and more particularly to winding heads for such machines.

The object of this invention is to produce a winding head for applying the tape to a conductor in a novel and advantageous manner.

Among the features of this invention are the improved means for guiding the tape from the roll to the wire, the improved means for applying tension to the tape roll, the means for forming a ridge in the tape and applying said ridged tape to the wire, and other details of structure and combination of parts as will hereinafter more clearly appear.

The insulated conductor produced by this improved winding head is being made the subject of another application by me, Serial No. 793,130, filed October 3, 1913.

This invention is illustrated in the accompanying drawings in which the same reference characters are used throughout to designate the same parts, and in which—

Figure 1 is a front elevation partly in section of a tape winding head embodying this invention, and illustrating one form of tension bracket. Fig. 2 is a sectional view on line 2—2 of Fig. 1. Fig. 3 is a plan view on line 3—3 of Fig. 1. Fig. 4 is a front elevation partly in section of a flier bracket and a form of tension bracket, and a portion of a spindle to which they are attached. Fig. 5 is a view in perspective of a flier bracket. Fig. 6 is a sectional view of the spindle on line 6—6 of Fig. 2. Fig. 7 is a view in perspective of a polisher. Fig. 8 is a view in perspective of an adjustable grooved guide member. Fig. 9 is a view in perspective of a grooved friction shoe. Fig. 10 is a view in perspective of a portion of the spindle with the grooved guide member in proper position, illustrating the registering of the tapered surfaces of the spindle and grooved guide member. Fig. 11 is a back elevation of the upper portion of the spindle, illustrating the tape passing through a slot in the spindle. Fig. 12 is a side elevation on lines 12—12 of Fig. 11. Fig. 13 is a side elevation of the upper portion of the spindle, a portion thereof being removed, illustrating the tape passing on to the wire between the grooved friction shoe and the adjustable grooved guide member. Fig. 14 is a sectional view on lines 14—14 of Fig. 11. Fig. 15 is a front elevation of the upper portion of the spindle with the grooved friction shoe removed, illustrating a ridge formed in the tape and the forming of said ridged tape on the wire. Fig. 16 is a view in perspective of the portion of the spindle and the grooved guide member over which the tape passes and illustrating the starting of the ridge formed in the tape by the coaction of the grooved friction shoe and the grooved guide member.

Referring to the drawings, 10 is a bed plate supporting a housing 11 in which is journaled a hollow shaft 12. A pulley 13 for driving the winding head is secured to the upper end of the hollow shaft 12. A face plate 15 comprising a hub 16, radially extending arms 17, 17, and an outer rim 18, is mounted upon an extension 14 of the pulley 13. The extension 14 of the pulley 13 also carries a hollow spindle 25. The lower end of the spindle 25 is provided with a recessed portion to receive a thin steel collar 26, which forms the revolving central support for the tape roll 27. Mounted upon the outer rim 18 of the face plate 15 is a tape guide comprising a bracket 28 and a guide roller 32 supported between ball bearings 31, 31 in said bracket.

Lengthwise through the center of the spindle 25 is provided a hole 39 through which passes the wire to be wound. The front of the spindle 25 is cut away to the center line thereof for a portion of its length between the points 40 and 41 to form a flat surface 29. Said spindle 25 is further provided with a slot 42, extending from point 40 to point 41 adjacent the hole 39, and at an angle of 90° to the flat surface 29. The spindle 25 is bored out from the top on the center line down to a point 43, and has mounted therein a guide bushing 44. The guide bushing 44, which is provided with a groove 45, registering with the hole 39 through the spindle 25 and with an extension 46 registering with a slot 47 in a pol-

isher 48, is also provided with a tapered portion 33 near its upper end for the purpose hereinafter described. The polisher 48 is provided with a hole 49 which registers with the groove 45 of the guide bushing 44 and the hole 39 through the spindle 25. A lock nut cap 50 is secured to the end of the spindle 25 and engages the polisher 48, thereby holding said polisher and the guide bushing 44 in proper relation. The end of the cap 48 is provided with an opening 51 for the passage of the conductor. Pivoted at 52 on a flat surface 53 of the spindle 25, is a spring 54. To the upper end of the spring 54 is pivoted a friction shoe 55 having a groove 56 in its face, which registers with the groove 45 in the guide bushing 44. The spindle 25 is tapered near its top, as shown at 57 in Fig. 10, to form with the tapered portion 33 of the guide block 44 a guiding surface for the tape as will hereinafter more fully appear.

Referring now to the tensioning device, this is as follows: On the side of the spindle 25 near the bottom thereof, is provided a dove-tailed slot 65 into which fits a tension bracket 66. This tension bracket 66 comprises a hollow cylindrical body portion 67 in which is slidably mounted a hollow plunger 68, upon the bottom of which is pivotally mounted friction shoe 69. A cap nut 70 is mounted upon the top of the body portion 67 and supports an adjustment screw 71 which extends down into the hollow plunger 68. An adjustment nut 72 having a projection 73, which registers with a slot 74 in the wall of the plunger 68 and a groove 75 in the body portion 67, is carried by the adjustment screw 71. Encircling the adjustment screw 71 is a spring 76, one end of which rests against the lower side of the adjustment nut 72, and the other end against the bottom of the hollow plunger 68. A set screw 77 is provided in the cap nut 70 for locking the adjustment screw 71 in any desired position.

The lower end of the spindle 25 is provided with a slot 80 into which fits an extension 81 of the flier bracket 82. The extension 81 is provided with a spring latch 83 which locks the flier bracket 82 to the spindle 25 when the extension 81 is inserted within the slot 80. The end of the extension 81 engages a slot 84 in the body portion 67 of the tension bracket 66 and locks the tension bracket to the spindle. A guide roller 89 is supported upon ball bearings 88, 88 between the ends of the bracket member 82.

In Fig. 1 is shown another and preferred form of tension bracket 100. This tension bracket 100 comprises three hollow cylindrical body portions 101, 102 and 103, separated and supported by web portions 104, 104. In each of the body portions 101, 102 and 103 there are a plunger, an adjustment screw, an adjustment nut and a spring similar in every respect to those contained in the tension bracket 66 which has been hereinbefore described. To the bottom of the plunger of the body portion 101 is pivoted a friction shoe 105, of the body portion 102 a friction shoe 106 and of the body portion 103 a friction shoe 107. The shoes 105 and 106 are pivotally connected at 108 and the shoes 106 and 107 at 109. The shoe 107 has an extension 110 which engages a projection 111 of the shoe 106 to limit the downward movement of the shoe 107 about its pivot point 109. The shoe 106 has an extension 112 which engages a projection 113 of the shoe 105 to limit the downward movement of the shoe 106 about its pivot point 108.

When it is desired to wind tape on a wire, a tape roll is placed in a horizontal position on the face plate 15 as shown in Figs. 1, 2 and 3. The tape is then led around the guide rollers 32 and 89, over the tapered portion 57 of the spindle 25, through the slot 42 in the spindle 25, over the tapered portion 33 of the guide portion 34 and about a wire which passes up through the hollow shaft 12, the hole 39 in the spindle 25, the groove 45 in the guide 44 and the hole 49 of the polisher 48. The tape for the particular size of wire to be wound must have a width somewhat greater than is necessary to form a smooth spiral about the wire in order that sufficient tape may be had with which to form the ridge therein. By reference to Figs. 10 to 16 inclusive, in connection with the following description of operation, it will be readily understood how the ridge is formed in the tape as it is being applied to the wire. As the tape is led over the tapered portion 57 of the spindle 25 and the tapered portion 33 of the guide bushing 44, it is wound about the wire just back of the friction shoe 55, the actual winding about the wire taking place between the groove 56 of the shoe 55 and the groove 45 of the guide bushing 44. In leaving the tapered portion 33 of the guide 44, the upper edge of the tape overlaps the lower edge of the preceding wrap and contacts therewith. Due to the surface of the guide bushing 44 over which the lower edge of the tape passes being at a greater distance from the wire than that surface over which the upper edge passes, there is a tendency for the lower edge of the tape to be at a greater distance from the wire than the upper edge as the tape leaves the guide bushing 44. In other words, due to the taper on the spindle and on the guide bushing, there is a tendency for the tape to cone. The spring pressed friction shoe 55, however, prevents the coning of the tape and forces the lower edge thereof toward the wire, thereby causing the tape to buckle

along the longitudinal line thereof, as the wire with the tape wound thereon is led forward through the machine. This buckling of the tape takes place at a definite portion in the width of the tape, depending upon the angle of application thereof which is controlled by the taper 57 of the spindle 25, and the angle at which the flier bracket 82 is disposed to the spindle 25. The buckled portion of the tape forms a continuous spiral ridge in the tape which contacts with the wire and supports the portion of the tape not formed into the ridge. The wire with the tape wound thereon now passes up through the hole 49 in the polisher 48, which determines the degree of hardness of the ridge and the diameter over the insulated conductor. The lower end of the hole 49 through the polisher 48 is tapered. If this taper is long, the ridge in the tape will be soft and the tape will be loose on the wire. It is highly important that the ridge should be hard and the tape tight on the wire so that the portion of the tape not used in forming the ridge may be properly supported from the wire by the ridge, and so that the wire may be properly centered within the tape, making a uniformly insulated conductor thereof. The taper should be reasonably short in order that the ridge formed in the tape may be hard. In order to facilitate the assembling of the winding head, both ends of the hole through the polisher are provided with tapers.

The advantages of the type of winding head covered by this invention are many, the principal ones being as follows: The face plate is provided with a plurality of radially extending arms 17, 17, which insure a minimum amount of friction between the tape roll and the face plate. The tension bracket 100 with its plurality of spring pressed plungers and connected shoes, insures uniform tension being obtained on the tape regardless of the diameter of the tape roll. The several plungers of the tension bracket control the tension on the particular portion of the type roll covered by the shoe connected to its particular plunger. The arrangement of the three spring pressed plungers and their interconnected friction shoes is such that when the diameter of the tape roll is great enough for all the shoes to rest thereon, the tension on the tape roll will be the greatest, with a definite tension on the tape; as the tape roll decreases in diameter, the tension thereon will be correspondingly reduced, but the same uniform tension on the tape will still be maintained. This is accomplished by means of the pivoting of the friction shoes 105, 106 and 107 to their corresponding plungers and of the pivoting of such shoes one to the other. As the tape roll decreases in diameter, the shoe 107 is forced down, due to the action of the spring pressed plunger, until its extension 110 engages the projection 111 of the shoe 106 when its downward movement is arrested and the tension exerted by the shoe 107 is relieved. As the diameter of the tape roll is still further decreased, the shoe 106 operates in a similar manner. The guide rollers are mounted in ball bearings which tend to still further decrease the tension upon the tape as it is led from the tape roll to the wire. The means provided for the locking of the tension bracket and the guide roller bracket to the spindle, are such that these parts may be readily removed and adjusted. The taper of the spindle and the angle at which the flier bracket is disposed to the spindle, are such that an even strain is placed on the tape across its width, thereby preventing the usual large number of breaks in the tape when there is a greater strain upon one edge than upon the other.

In the operation of the winding head which has been hereinbefore described, it has been found that the best results are obtained by the use of adjustable parts of particular dimensions when insulating different sizes of wire with the corresponding sizes of tape therefor. The parts which are removable and interchangeable for different sizes of wire are: the guide bushing 44, the polisher 48 and the flier bracket 82. For example, assuming that #10 B. & S. gage wire is to be wound with tape 7/8″ in width and .014″ in thickness, it has been found that the best results are obtained by having an angle of 40° between the flier bracket 82 and the spindle 25, a taper 57 in the spindle 25 equal to 5°, the diameter of the groove 45 in the guide bushing 44 equal to 15/64″, the diameter of the groove 56 in the friction shoe 55 equal to 15/64″, and the diameter of the hole 49 in the polisher 48 equal to 15/64″, with the ends thereof terminating in a radius of 1/32″. It will be obvious, however, that this invention is not limited to the particular dimensions herein given.

I claim:

1. In a winding head, a face plate and spindle for supporting a tape roll and having a passage therethrough for the wire to be wound, guides for the tape from the periphery of the roll to the wire, a guide for the wire carried by said spindle, and a spring-pressed shoe carried by said spindle and cooperating with the guide carried by said spindle for forming a ridge in the tape as it is wound on the wire.

2. In a winding head, a face plate and spindle for supporting a tape roll and having a passage therethrough for the wire to be wound, guides for the tape from the periphery of the roll to the wire, a guide for the wire carried by said spindle, a spring-

pressed shoe carried by said spindle and cooperating with the guide carried by said spindle for forming a ridge in the tape as it is wound on the wire, and a polisher carried by said spindle through which the tape-wound wire passes.

3. In a winding head, a face plate and spindle for supporting a tape roll and having a passage therethrough for the wire to be wound, a tension bracket carried by said spindle and having a plurality of spring pressed plungers for applying uniform tension to the tape roll, guides for the tape from the periphery of the roll to the wire, and means for forming a ridge in the tape as it is wound on the wire.

4. In a winding head, a face plate and spindle for supporting a tape roll and having a passage therethrough for the wire to be wound, guides for the tape from the periphery of the roll to the wire, a removable and interchangeable guide for the wire carried by said spindle, and a spring pressed shoe carried by said spindle and coöperating with said removable and interchangeable guide for forming a ridge in the tape as it is wound on the wire.

5. In a winding head, a face plate, a spindle having a tapered portion, said face plate and said spindle for supporting a tape roll and having a passage therethrough for the wire to be wound, guides for the tape from the periphery of the roll to the wire, and means for forming a ridge in the tape as it is wound on the wire, one of said guides being mounted on said spindle and disposed at an angle with respect thereto and coöperating with the tapered portion of said spindle for determining the position of the ridge in the tape.

6. In a winding head, a face plate and spindle for supporting a tape roll and having a passage therethrough for the wire to be wound, a tension bracket carried by said spindle and having a spring pressed plunger for applying tension to the tape roll, guides for the tape from the roll to the wire, one of said guides being mounted upon said spindle and coöperating with said tension bracket to lock it in position, and means for forming a ridge in the tape as it is wound on the wire.

7. In a winding head, a face plate and spindle for supporting a tape roll and having a passage therethrough for the wire to be wound, a tension bracket carried by said spindle and having a spring pressed plunger for applying tension to the tape roll, and guides for the tape from the roll to the wire, one of said guides being mounted upon said spindle and coöperating with said tension bracket to lock it in position.

8. In a winding head, a face plate and spindle for supporting a tape roll and having a passage therethrough for the wire to be wound, guides for the tape from the periphery of the roll to the wire, a removable and interchangeable guide for the wire carried by said spindle, a spring pressed shoe carried by said spindle and coöperating with said removable and interchangeable guide for forming a ridge in the tape as it is wound on the wire, and a polisher for determining the degree of hardness of the ridge coöperating with said removable and interchangeable guide to lock it in position.

9. In a winding head, a face plate, a spindle having a tapered portion, said face plate and said spindle for supporting a tape roll and having a passage therethrough for the wire to be wound, guides for the tape from the periphery of the roll to the wire, a removable and interchangeable guide for the wire carried by said spindle, and a spring pressed shoe carried by said spindle and coöperating with said removable and interchangeable guide for forming a ridge in the tape as it is wound on the wire, one of said guides being mounted on said spindle and disposed at an angle with respect thereto and cooperating with the tapered portion of said spindle for determining the position of the ridge in the tape.

10. In a winding head, a face plate and spindle for supporting a tape roll and having a passage therethrough for the wire to be wound, a tension bracket carried by said spindle and having a spring pressed plunger for applying tension to the tape roll, guides for the tape from the periphery of the roll to the wire, a removable and interchangeable guide for the wire carried by said spindle, and a spring pressed shoe carried by said spindle and coöperating with said removable and interchangeable guide for forming the ridge in the tape as it is wound on the wire.

11. In a winding head having a passage therethrough for the wire to be wound, a support for the tape roll, guides for the tape from the periphery of the roll to the wire, a removable and interchangeable guide for the wire carried by said spindle, and a spring pressed shoe carried by said spindle and cooperating with said removable and interchangeable guide for forming a ridge in the tape as it is wound on the wire, whereby the ridge only comes in contact with the wire and supports the tape.

12. In a winding head, a face plate and spindle for supporting a tape roll and having a passage therethrough for the wire to be wound, a tension bracket carried by said spindle and having a spring pressed plunger for applying tension to the tape roll, guides for the tape from the roll to the wire, one of said guides being mounted upon said spindle and coöperating with said tension bracket to lock it in position, a removable and interchangeable guide for the wire car-

ried by said spindle, and a spring pressed shoe carried by said spindle and coöperating with said removable and interchangeable guide for forming a ridge in the tape as it is wound on the wire.

13. In a winding head, a face plate, a spindle having a tapered portion, said face plate and said spindle for supporting a tape roll and having a passage therethrough for the wire to be wound, guides for the tape from the roll to the wire, a removable and interchangeable guide for the wire carried by said spindle, a spring pressed grooved shoe carried by said spindle and coöperating with said removable and interchangeable guide for forming the ridge in the tape as it is wound on the wire, one of said guides being mounted on said spindle and disposed at an angle with respect thereto and coöperating with the tapered portion of said spindle for determining the position of the ridge in the tape, and a polisher carried by said spindle for determining the degree of hardness of the ridge and coöperating with said removable and interchangeable guide to lock it in position.

In witness whereof, I hereunto subscribe my name this 26th day of September A. D. 1913.

WILLIAM F. SMITH.

Witnesses:
R. R. IRELAND,
A. PRUESSMAN.