

Dec. 5, 1933.

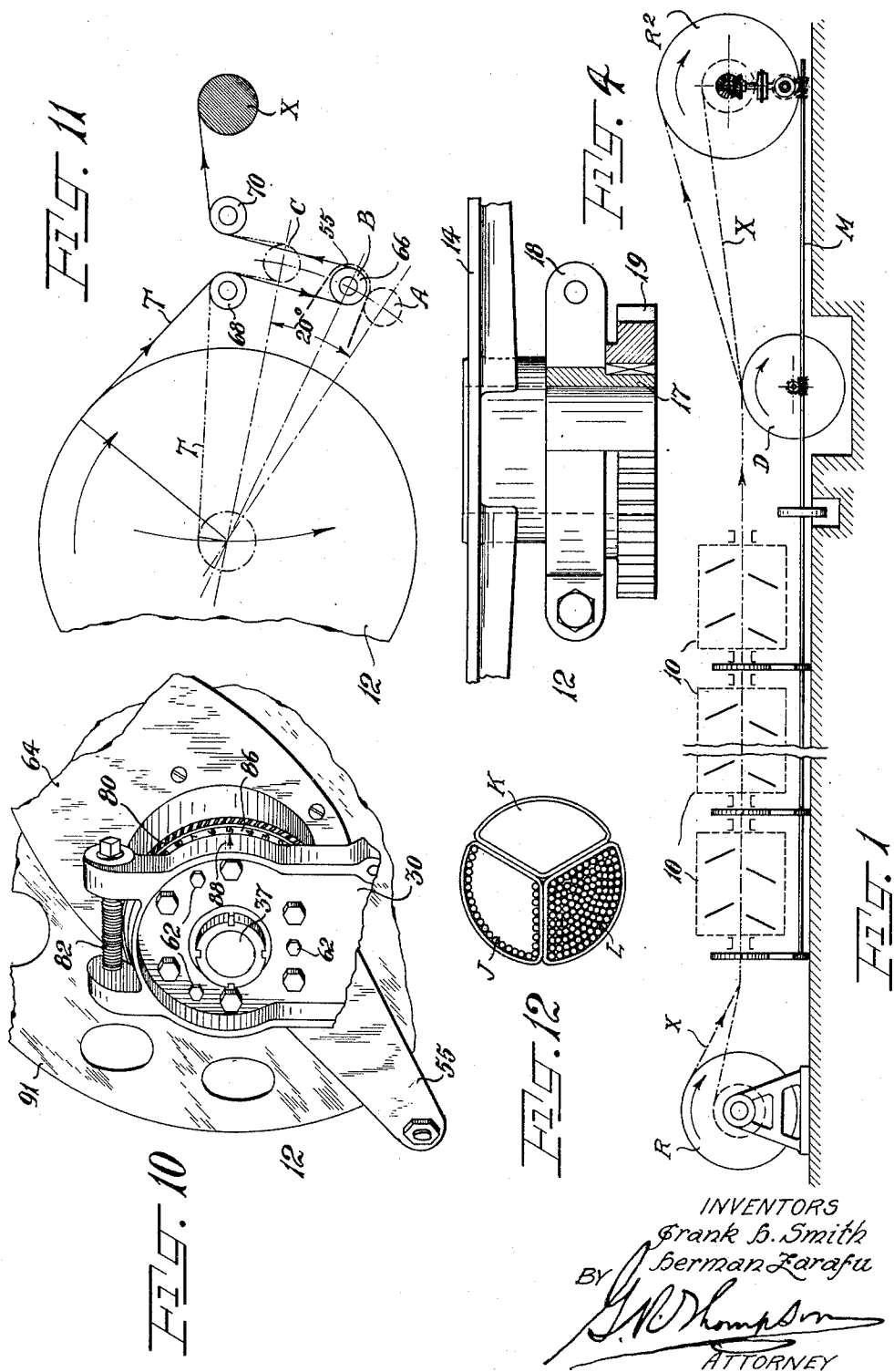
F. H. SMITH ET AL

1,937,918

APPARATUS FOR WINDING TAPE OR THE LIKE

Filed Aug. 12, 1932

4 Sheets-Sheet 1



Dec. 5, 1933.

F. H. SMITH ET AL

1,937,918

APPARATUS FOR WINDING TAPE OR THE LIKE

Filed Aug. 12, 1932

4 Sheets-Sheet 2

FIG. 2

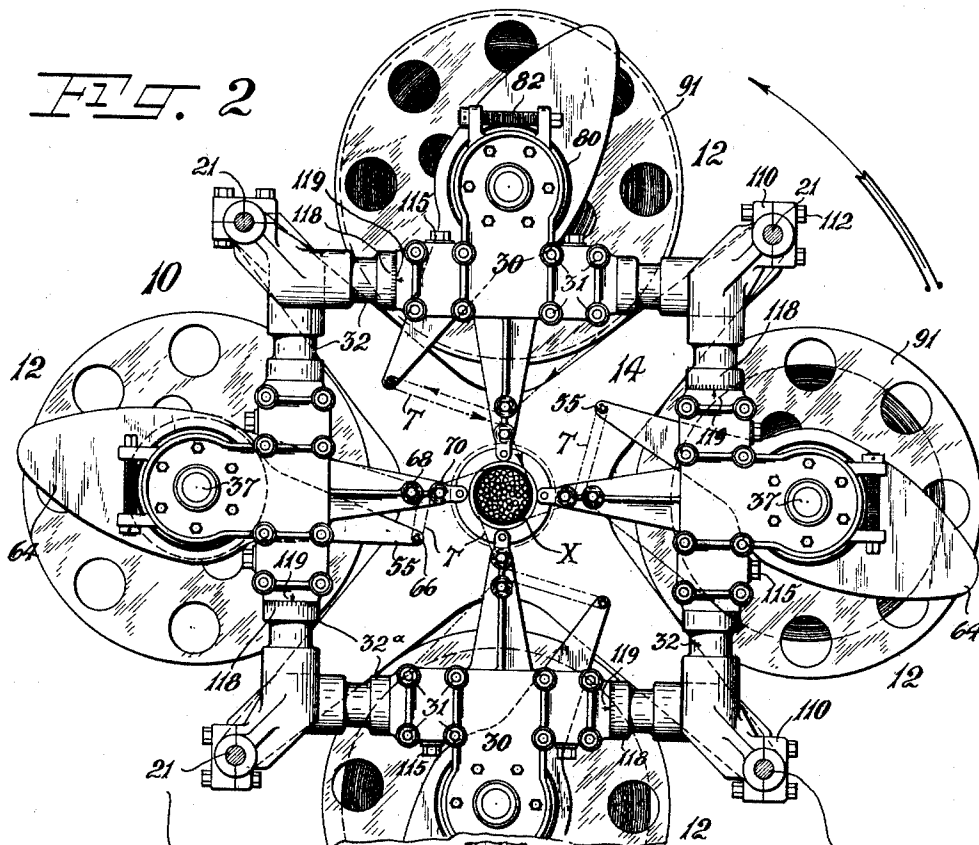
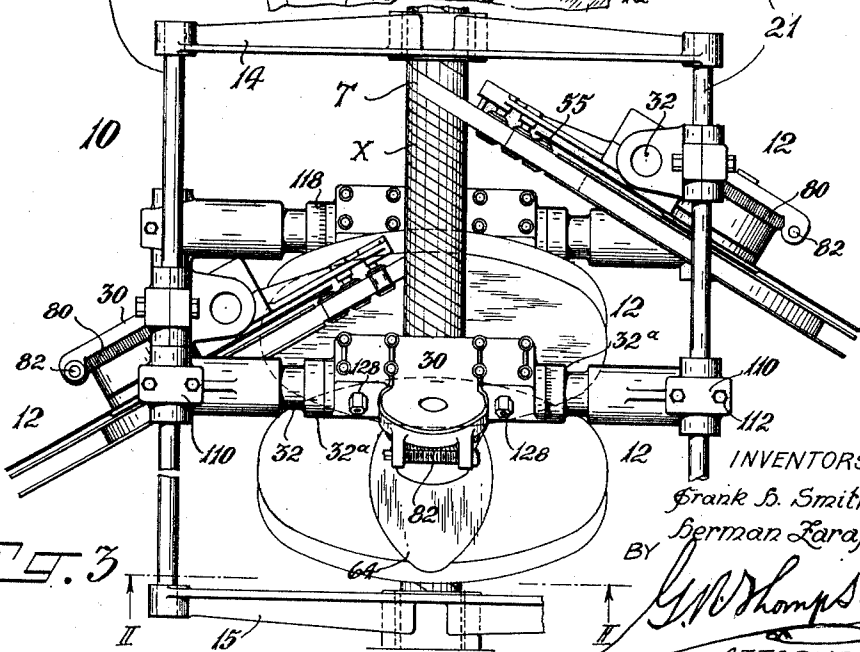


FIG. 3



INVENTORS

Frank S. Smith

German Zarafu

BY

G. W. Thompson
ATTORNEY

Dec. 5, 1933.

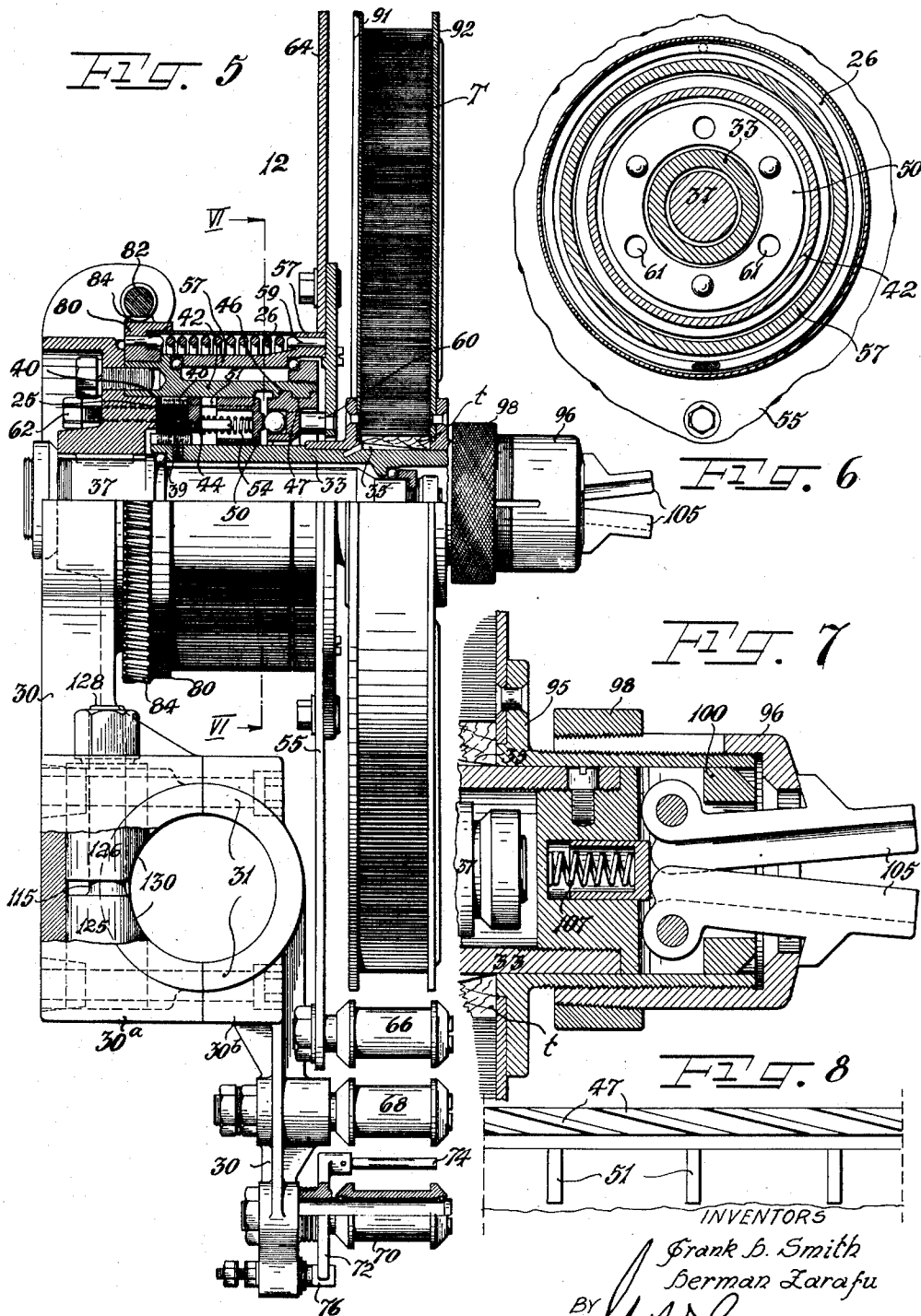
F. H. SMITH ET AL

1,937,918

APPARATUS FOR WINDING TAPE OR THE LIKE

Filed Aug. 12, 1932

4 Sheets-Sheet 3



INVENTORS

Frank B. Smith
Lerman Zarafu

BY

G. H. Thompson
ATTORNEY

Dec. 5, 1933.

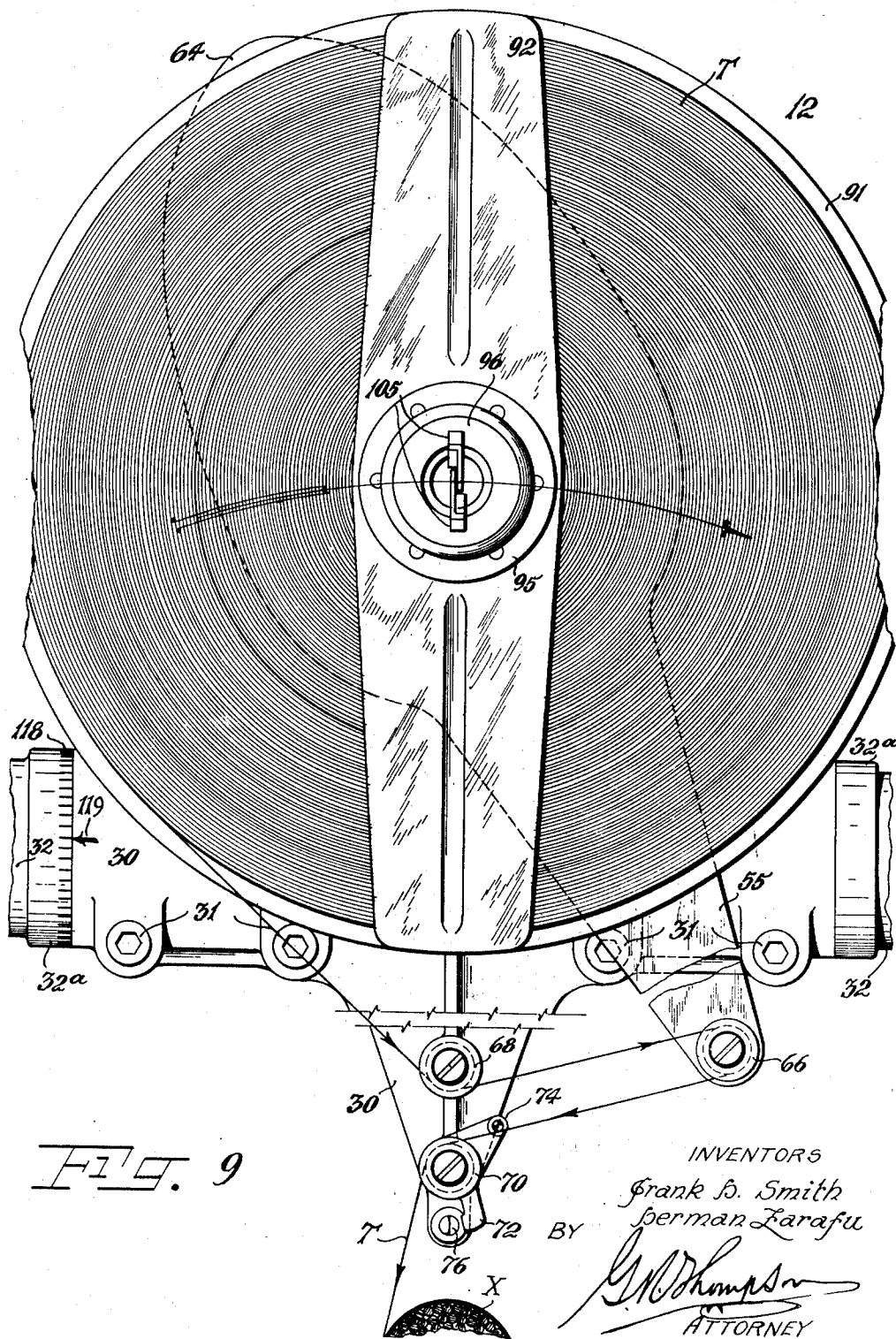
F. H. SMITH ET AL

1,937,918

APPARATUS FOR WINDING TAPE OR THE LIKE

Filed Aug. 12, 1932

4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE

1,937,918

APPARATUS FOR WINDING TAPE OR THE LIKE

Frank H. Smith, Summit, and Herman Zarafu,
West New York, N. J., assignors to Elevator
Supplies Company, Incorporated, Hoboken,
N. J., a corporation of New Jersey

Application August 12, 1932. Serial No. 628,506

10 Claims. (Cl. 117—41)

This invention relates to apparatus for winding tape or the like on cables or the like, and provides improvements therein.

The present invention provides an apparatus for winding tape at a substantially uniform tension and for obtaining on the cable a wound tape-covering best suited to the size and bending or flexing requirements of the cable. It further provides an apparatus wherein variation of tension incident to the working of the apparatus, may be limited to a small fraction of the working tension, and breaking of the tape due to uneven tension virtually obviated.

The invention further provides an apparatus for winding the tape so that it will lie flat and even upon the cable. It further provides an apparatus readily adapted for winding tapes of various sizes on cables of various sizes and shapes, and at various tensions best suited to the size, shape, etc., and use of the cable.

The invention further provides various other features of improvement hereinafter set forth.

Thread, cord, strips and the like may be used for winding as well as tape, and are equivalents of the tape, the word "tape" being used for simplicity and to include equivalents. Likewise rods, wires, strips, tubes may be wound and are equivalents of the cable, the word "cable" being used for simplicity and to include equivalents. The above equivalents are indicated without restriction of the general principle as to equivalents.

An embodiment of the invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a diagrammatic side elevation of the apparatus;

Fig. 2 is a cross-section through one of the frames which carries the head on which are mounted the rolls on which the tape is unwound or payed off in winding the cable, the section being on the line II—II, Fig. 3;

Fig. 3 is a top plan view of the rotating frame shown in Fig. 2;

Fig. 4 is a detail view, partly in elevation and partly in section, showing the bearing, and the pinion through which the frame shown in Figs. 2 and 3 is driven;

Fig. 5 is a view partly in side elevation and partly in vertical section, of one of the heads which carries the tape roll;

Fig. 6 is a section on the line VI—VI, Fig. 5, looking in the direction of the arrows;

Fig. 7 is a longitudinal sectional view, on an enlarged scale, of means for detachably holding

a side of the reel, to permit replacement of rolls of tape;

Fig. 8 is a developed view of the inner circumference of the supporting drum shown in Fig. 5, and showing the threads, and keys thereon.

Fig. 9 is a front elevation of the head shown in Fig. 5;

Fig. 10 is a perspective view from the rear of the head shown in Fig. 5;

Fig. 11 is a diagrammatic view illustrating the action of the tensioning;

Fig. 12 is a sectional view of a type of cable being wound with tape insulation.

Referring to said drawings, numeral 10 designates a rotating frame, which may be made in a plurality of sections, as indicated, on which frame are mounted the revolving heads 12 which carry the tapes T. The number of frames 10 and the number of heads thereon is optional, depending upon the number of tapes it is desired to apply to a cable. A frame may carry eight heads for example, and there may be one, two, three or more frames, and where two or more frames are used it is customary to rotate the frames in opposite directions.

A general arrangement of the apparatus is illustrated diagrammatically in Fig. 1. The cable to be tape-wound (designated by letter "X") is pulled off from a reel R by suitable means as a drum D, passes through the hollow trunnions of the frames 10, and may be taken up after taping on a reel R². The tapes are applied to the cable X from the heads 12, which heads revolve around the cable when the frames 10 are rotated. The frames may be rotated from a main-drive-shaft M through chains and sprockets for example, and the feed-drum D and take-up reel R² may likewise be driven from drive-shaft M through suitable connections, comprising worms and gears, as indicated, the feed of the cable being coordinated with the speed of rotation of the frames 10.

The frames 10 may comprise end-spiders 14, 15 having hollow trunnions 17 (Fig. 4) supported in suitable bearings 18, and having sprockets 19 fastened thereon, through which the frames are rotated. Four parallel rods 21 for example connect the end-spiders 14, 15, and constitute supports for the heads 12, as hereinafter more fully described.

A head 12 comprises a brake 25 which acts to oppose (and hence tension) the running or paying off of the tape. The head 12 further comprises means for relaxing the action of the brake through the action of the tape itself, including a spring 26 through which the pull on the tape in

the paying-off direction is balanced against the force of the brake opposing the paying off of the tape, so that the tension under which the tape pays off is substantially uniform.

5 Referring to Fig. 5 numeral 30, designates a bracket made of two sections 30^a 30^b for convenience of assembly. These two sections are fastened together, as by means of bolts 31, Fig. 5. Numeral 115 designates means for clamping the
10 bracket 30 on a rod 32 which spans two rods 21. The clamping means 115 are used to bind the entire unit 12 on rod 32, and this unit 12, therefore, can be placed at any angle desired in relation to the cable X, as shown on Fig. 3. The fixed
15 collars 32^a (Figs. 3 and 9) on rod 32 are graduated in degrees, as indicated at 118 Fig. 2, to indicate the angle which the unit 12 forms with the cable X. The clamping means 115 may comprise
20 a pair of sleeves 125, 126 on a bolt 128, the sleeves 125, 126, having portions 130 shaped to the contour of rod 32, and which bind on the rod 32 when the nut on bolt 128 is tightened. Numeral 33, designates a spindle forming part of a reel on
25 which a roll of tape T is mounted, the spindle being provided with a tapered spur 35 for biting into a cop t which fits over the spindle and around which the tape is wound. The spindle 33 is conveniently tubular and turns on ball bearings around a stud 37 fixed to bracket 30. The brake
30 25 acts on the spindle, the spindle preferably having a series of disks or plates 39 keyed thereto which fit between other disks or plates 40 keyed to a fixed part, as a drum 42 fastened to the bracket 30. The plates 39 and 40 may be pressed
35 together by a pressure-ring 44, and the pressure on ring 44 is varied by suitable means, as a screw 46 working in threads 47 on the inner side of drum 42 and a ring 50 sliding on keys 51 on the inner
40 side of drum 42, the threads 47 and keys 51 being clearly shown in the developed view Fig. 8. Springs 54 may be interposed between the rings 44 and 50, as shown. The wear on plates 39 and 40 may be taken up by screws 62 bearing on a plate 40 at the adjacent end of the series.

45 The screw 46 is turned to a position to firmly apply the brake 25 to spindle 33, by the spring 26 acting through an arm 55 which may be fastened to a sleeve 57 turning on drum 42. The free end of the spring 26 may also be connected to sleeve
50 57, as indicated at 59. The arm 55 may be connected to screw 46 by a pin and slot connection 60, 61. Numeral 64 designates a counterweight on arm 55. The arm 55 has a roller or part 66 around which the tape T passes or reeves, the tape, as it
55 pays off the roll reeving over a roll 68 on the bracket 30, then reeving over the roll 66, then over another roll 70 on bracket 30, and thence to the cable X. A spring-pressed contact arm 72 having a finger 74 may be provided on bracket 30.
60 The arm 72 is held away from a contact 76 by tape T (Fig. 9) when the tape is intact, but in case the tape breaks, the finger 74 releases the arm 72 and allows it to move, under the action of its spring, to make contact with the contact 76
65 and close a circuit to a suitable means (not shown) for stopping the machine.

70 The fixed end of spring 26 may be fastened to an anchor-ring 80. The anchor-ring 80 may be rotatably mounted on the bracket 30 as shown, and it may be rotated by means of a worm 82 journaled in the bracket 30 and meshing with
75 teeth 84 on the ring 80. By turning the ring 80 one way or the other, the initial tension of the spring 26 may be varied as desired, and a scale 86 and pointer 88 (Fig. 10) may be provided to in-

dicade the distance which the ring 80 must be moved to correspond to an ascertained gain or decrease of spring-force.

The spring 26 is preferably a long spring, so that its deflection within the arc of movement of arm 55 produces only a small change in the force of the spring.

The spindle 33 is preferably provided with means for retaining a roll of tape. A pair of plates 91, 92 may be provided for this purpose.
85 One of these plates, as 92, is made removable, so as to admit of replacement of rolls of tape. Moreover to adapt the means to retaining rolls of different widths, the plate 92 may be carried on a pair of telescoping threaded sleeves 95, 96. The
90 sleeves fit over the end of spindle 33 and by adjusting the position of one sleeve on the other, the distance of plate 92 from the end of spindle 33, and consequently the space between the plates 91, 92, may be adjusted to rolls of different
95 width. A clamp-ring 98 may be provided for binding the sleeves 95, 96 in adjusted position. A latch 100 may be provided on the end of spindle 33 for holding the plate 92 on the spindle. The latch 100 may comprise a pair of retaining fingers
100 105. The fingers 105 engage the end of sleeve 96 and are held in retaining position by a spring 107. By pressing the ends of the fingers 105 against the pressure of the spring, the plate 92 carried by the sleeves 95, 96 may be readily
105 removed.

The rods 32 are provided at their ends with split couplings 110 by which they are attached to the rods 21 of the frame 10. The split couplings 110 enable the rods 32 to be shifted longitudinally on the frame, and to be fastened in
110 desired positions thereon by means of bolts 112 or other suitable means. In setting the machine the rods 32 are fastened in a position to enable the tapes T which pay off from the heads 12 to
115 be wound around the cable in spirals with the edges of the spirals of tape having the desired juxtaposition. Usually it will be desired to wind the tapes T so that there will be a slight clearance between the spirals of tape, so that the insulation
120 provided by the tapes will permit the flexing of the cable without buckling the tapes. The size of the cable, the width of the tapes, and the spacing between the spirals of wound tape are conditions determining the position of the rods 32
125 on the rods 21 of the frame 10.

In order that the tapes T may lie flat in the wound spirals, and that an uneven tension crosswise of the tape during winding may be avoided, the angular position of the heads 12 with relation to the axis of the cable must be adjusted
130 in setting up the machine, and in making changes for different conditions. Clamping means 115 on the brackets 30 of the heads 12, permit of this adjustment on the rods 32, and the proper angularity of the heads being found, the heads
135 may be fixed in this position by tightening the clamping nuts 128 or by other suitable means. A scale 118 and a pointer 119 (Fig. 2) enables the heads to be readily reset to a previously
140 ascertained position corresponding with the given conditions. The adjustment of the heads 12 on the rods 32 will be required usually under the conditions which require adjustment of the rods
145 32 on the rods 21; that is, when the widths of tapes are different; when the sizes of cable are different, and when the spacings between the wound spirals of tape are different.

Operation:—The machine will be assumed to be set up properly for a given size cable X, a
150

given width of tape T, and a given spacing between the adjacent edges of wound spirals of tape, as explained above. To aid and clarify the description, certain quantitative values will be assumed, it being understood of course that such values may be widely varied. The spring 26 will be assumed to have an initial tension of 10 pounds, arm 55 an arc of movement of 20° (Fig. 11), and the increase of force of the spring 26 through 20 degrees of movement of the arm 55 to be five percent of the initial force, and the desired tension on the tape T during winding assumed to be five pounds. When the winding begins, the tape T must pull upon the arm 55 with a force of at least five pounds before the spring 26 begins to flex. As the arm 55 is moved away from position A (Fig. 11) to position B, a pull slightly in excess of five pounds is exerted by the tape T. In moving from position A to position B the arm 55 turns the screw 46, through the pin 60, moving the screw in a direction to retreat from the brake 25 and thereby relax the action of the brake to an extent that the braking action approximately equals the tension on the tape T, so that the reel carrying the roll of tape can rotate to pay off the tape. The spring 26 acting upon the arm 55 constantly balances the action of the brake 26 against the tension of the tape T, so that the tape pays off the reel and winds around the cable X under a virtually uniform tension.

The spring 26 and arm 55 also compensate for the difference in a tape paying off from a full roll (see the full lines, Fig. 11), and a tape paying off from a depleted roll (see dotted lines, Fig. 11). When the tape T is running off a depleted roll, as shown by the dotted lines Fig. 11, the greater pull which would be required of the tape to unwind it from the roll is counteracted by the movement of the arm 55 from position B to position C, for example. In moving from position B to position C, the arm 55 retracts the screw 46 further from the brake 25, and thereby relaxes the brake action to an extent that a tension of the tape but slightly in excess of the initial tension required to flex the spring 26 (and within five percent increase over the initial tension as a maximum), is required to permit paying off of the tape from the roll.

As the cable X in practice does not run through the machine on a true geometric axis, there are jerks upon the tape as the heads 12 revolve around the cable X. The force of these jerks is communicated to the arm 55 which moves against the yielding force of the spring 26 and which movement of the arm 55 simultaneously, through the screw 46, relaxes the brake action, and hence softens and minimizes the jerks on the tape. This provides a substantially uniform tension on the tape during running, and very much minimizes the breaking of tapes encountered in previous tape winding machines.

Referring to Fig. 12, a cable is sometimes made up of a plurality of strands J, K, L, which strands are wound separately with tape prior to assembly in the stranded cable. A strand J for example, of the unsymmetrical section shown produces a series of jerks on the tape during winding, which jerks are minimized through the action of the arm 55, spring 26 and screw 46 in the manner just described.

The winding tension on the tape T may be varied to meet requirements by rotating the anchoring 80 through the worm-feed 82, as previously described. The amount of flexing to which a

cable is to be subjected is a condition determining the optimum tension under which the tape T should be wound on a cable.

The invention may receive other embodiments than that herein specifically illustrated and described.

What is claimed is:

1. In winding apparatus of the character described, the combination of a reel for a roll of tape, a brake acting on said reel to oppose the paying off of tape from said roll, and means for relaxing the action of said brake, said relaxing means comprising a movable arm having a part thereon on which the tape is reeved, a connection between the arm and brake, and a spring opposing the movement of said arm in a direction to relax the brake, said arm during operation assuming a position in which the tension of the tape and the resistance of the brake are virtually balanced by said spring, said connection comprising a screw, a driving connection between said arm and screw, said screw acting to vary the resistance exerted by said brake upon said reel.

2. In winding apparatus of the character described, the combination of a reel for a roll of tape, a brake acting on said reel to oppose the paying off of tape from said roll, and means for relaxing the action of said brake, said relaxing means comprising a movable arm having a part thereon on which the tape is reeved, a connection between the arm and brake, and a spring opposing the movement of said arm in a direction to relax the brake, said arm during operation assuming a position in which the tension of the tape and the resistance of the brake are virtually balanced by said spring, said connection comprising a screw, a driving connection between said arm and screw, and a spring between said screw and brake, said screw acting to vary the compression of said spring and thereby the resistance exerted by said brake upon said reel.

3. In winding apparatus of the character described, the combination of a reel for a roll of tape, a reel-spindle and spindle-support, a brake acting on said spindle to oppose the paying off of tape from said roll, and means for relaxing the action of said brake comprising an arm pivoting around the axis of said spindle, a part on said arm on which the tape is reeved, a connection between the arm and brake, and a spring opposing the movement of said arm in a direction to relax the brake, said arm during operation assuming a position in which the tension of the tape and the resistance of the brake are virtually balanced by said spring, said connection comprising a screw turning around the axis of said spindle and a driving-connection between said arm and screw.

4. In winding apparatus of the character described, the combination of a reel for a roll of tape, a reel-spindle and spindle-support, a brake acting on said spindle to oppose the paying off of tape from said roll, and means for relaxing the action of said brake comprising an arm pivoting around the axis of said spindle, a part on said arm on which the tape is reeved, a connection between the arm and brake, and a spring opposing the movement of said arm in a direction to relax the brake, said arm during operation assuming a position in which the tension of the tape and the resistance of the brake are virtually balanced by said spring, said connection comprising a screw turning around the axis of said spindle, a drum supporting said screw, and a driving-connection between said arm and screw.

5. In winding apparatus of the character described, the combination of a reel for a roll of tape, a reel-spindle and spindle-support, a brake acting on said spindle to oppose the paying off of tape from said roll, and means for relaxing the action of said brake comprising an arm pivoting around the axis of said spindle, a part on said arm on which the tape is reeved, a connection between the arm and brake, and a spring opposing the movement of said arm in a direction to relax the brake, said arm during operation assuming a position in which the tension of the tape and the resistance of the brake are virtually balanced by said spring, said spring being coiled around said spindle.

6. In winding apparatus of the character described, the combination of a reel for a roll of tape, a reel-spindle and spindle-support, a brake acting on said spindle to oppose the paying off of tape from said roll, and means for relaxing the action of said brake comprising an arm pivoting around the axis of said spindle, a part on said arm on which the tape is reeved, a connection between the arm and brake, and a spring opposing the movement of said arm in a direction to relax the brake, said arm during operation assuming a position in which the tension of the tape and the resistance of the brake are virtually balanced by said spring, said spring being coiled around said spindle, an anchor-ring mounted on said support and means for turning said anchor-ring to adjust the tension of said spring.

7. In winding apparatus of the character described the combination of a reel for a roll of tape, a reel-spindle and spindle support, a brake acting on said spindle to oppose the paying off of tape from said roll, and means for relaxing the action of said brake comprising an arm pivoting around the axis of said spindle, a part on said arm on which the tape is reeved, a connection between the arm and brake, and a spring opposing the movement of said arm in a direction to relax the brake, said arm during operation assuming a position in which the tension of the tape and the resistance of the brake are virtually balanced by said spring, said connection comprising a screw turning around the axis of said spindle, a drum supporting said screw, a spring between said screw and brake, said screw acting to vary the compression of said spring, and thereby the resistance exerted by said brake upon said reel, and a driving connection between said arm and screw, said arm having a bearing upon said drum.

8. In winding apparatus of the character de-

scribed the combination of a reel for a roll of tape, a reel-spindle and spindle support, a brake acting on said spindle to oppose the paying off of tape from said roll, and means for relaxing the action of said brake comprising an arm pivoting around the axis of said spindle, a part on said arm on which the tape is reeved, a connection between the arm and brake, and a spring opposing the movement of said arm in a direction to relax the brake, said arm during operation assuming a position in which the tension of the tape and the resistance of the brake are virtually balanced by said spring, said connection comprising a screw turning around the axis of said spindle, a drum supporting said screw, a slide splined on said drum, a spring between said slide and brake, said screw acting through said slide to vary the compression of said spring and thereby the resistance exerted by said brake upon said reel, and a driving connection between said arm and screw.

9. In winding apparatus of the character described the combination of a reel for a roll of tape, a reel-spindle and spindle support, a brake acting on said spindle to oppose the paying off of tape from said roll, and means for relaxing the action of said brake comprising an arm pivoting around the axis of said spindle, a part on said arm on which the tape is reeved, a connection between the arm and brake, and a spring opposing the movement of said arm in a direction to relax the brake, said arm during operation assuming a position in which the tension of the tape and the resistance of the brake are virtually balanced by said spring, said connection comprising a screw turning around the axis of said spindle, a drum supporting said screw, a spring between said screw and brake, said screw acting to vary the compression of said spring, and thereby the resistance exerted by said brake upon said reel, and a driving connection between said arm and screw, said arm having a bearing upon said drum, said first-named spring being coiled around said drum.

10. In apparatus of the character described, a reel comprising a spindle, a tape-roll retainer, and means for removably holding said retainer in place, comprising a sleeve fitting upon said spindle, a sleeve telescoping said first sleeve, and a latch on said spindle for engaging said telescoping sleeve, said telescoping sleeve being adjustable upon the other sleeve to position the tape-roll retainer to accommodate tape-rolls of different width.

FRANK H. SMITH, 130
HERMAN ZARAFU.

60

135

65

140

70

145

75

150