W. F. SMITH.

MACHINE FOR COVERING WIRE.

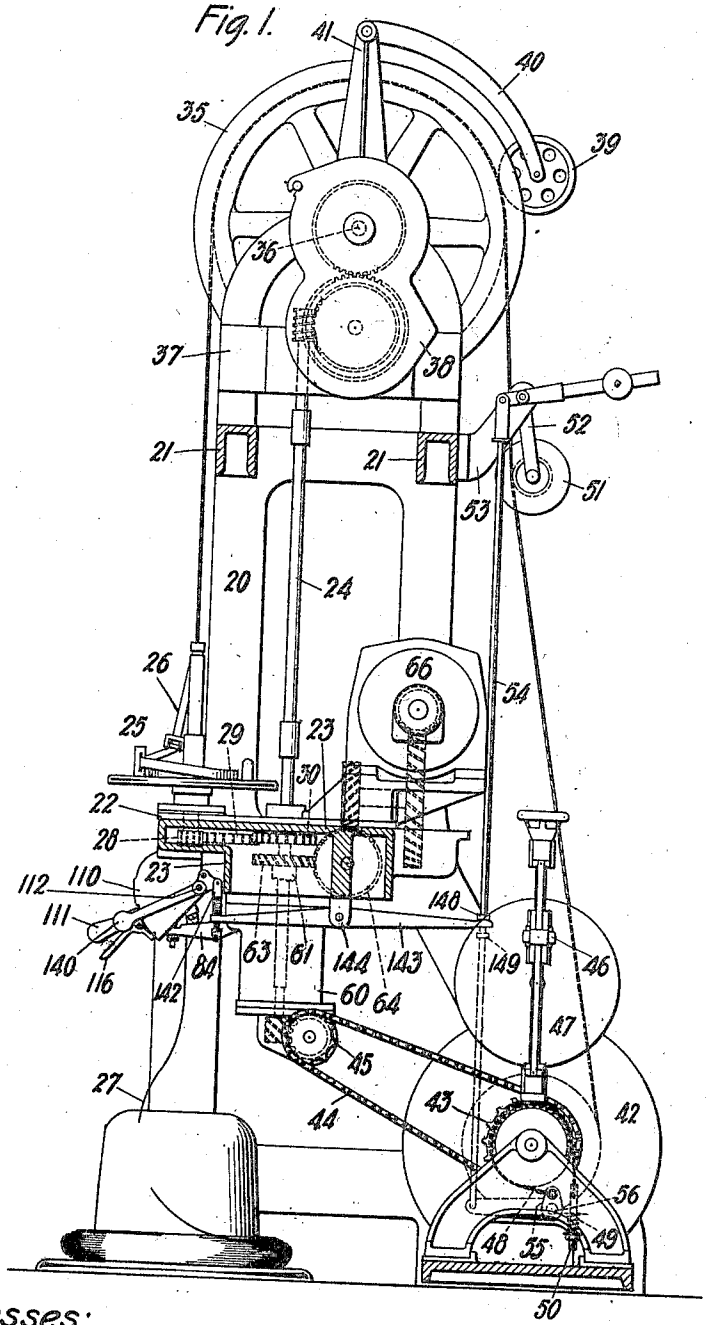
APPLICATION FILED JAN. 21, 1915.

1,182,591.

Patented May 9, 1916.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

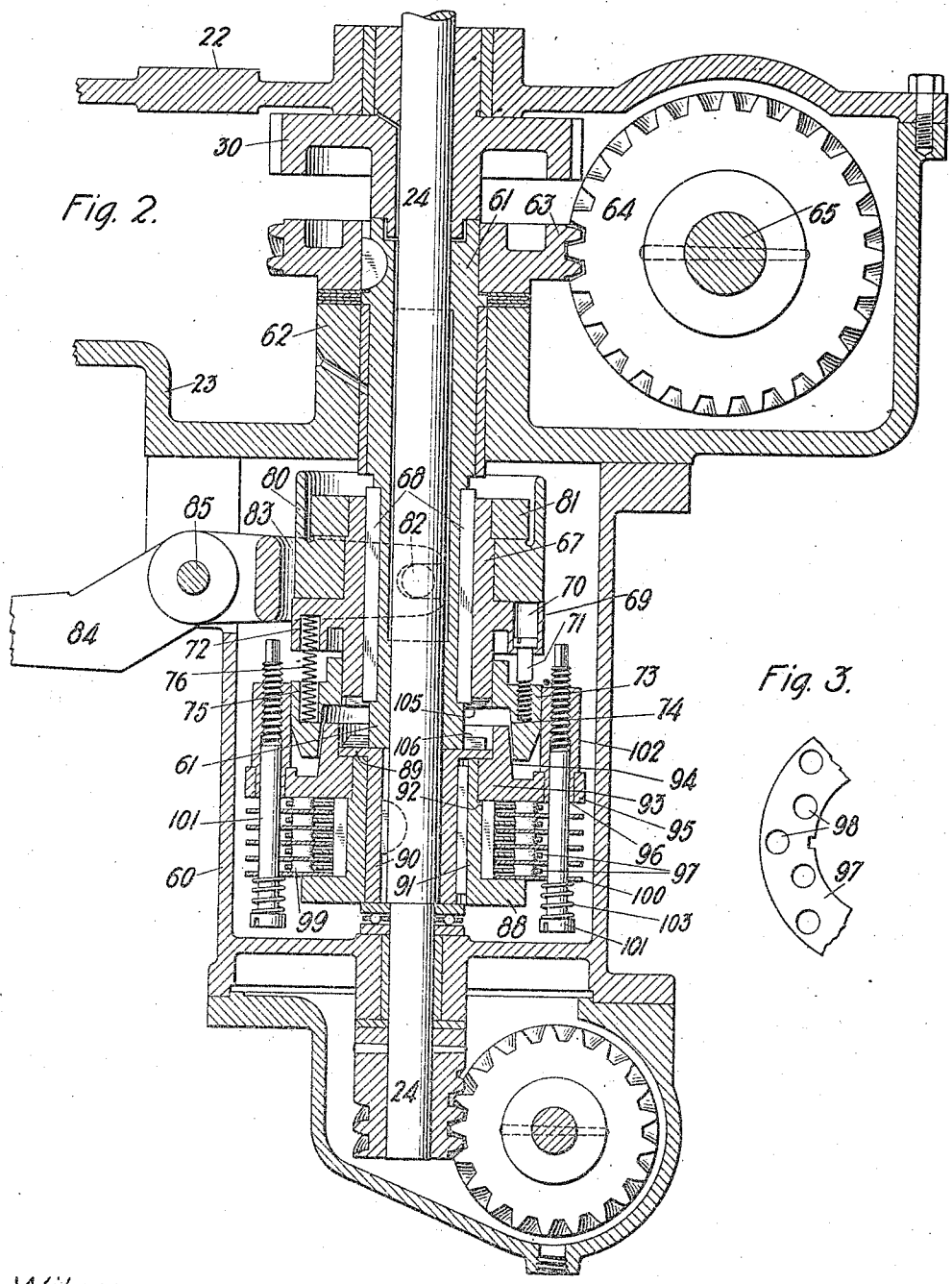

Fig. 3.

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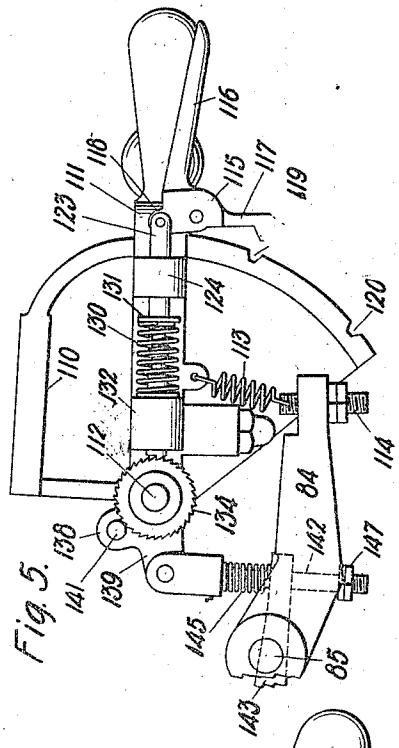

Fig. 5.

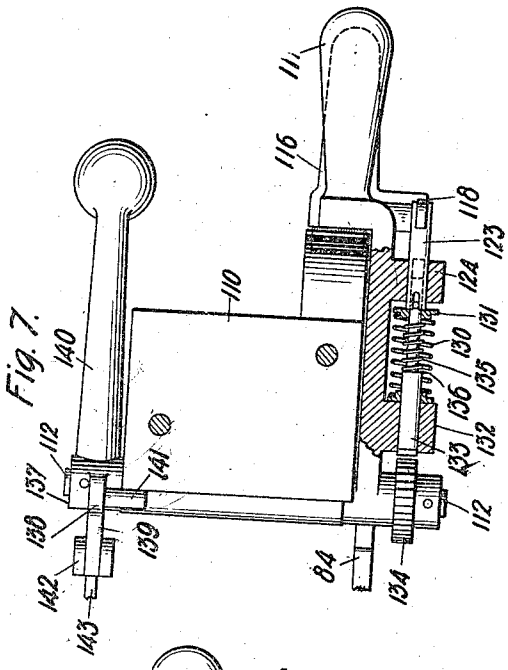

Fig. 7.

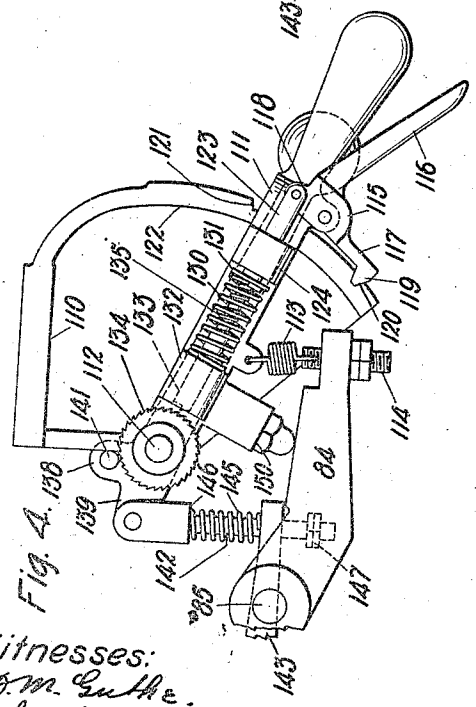

Fig. 4.

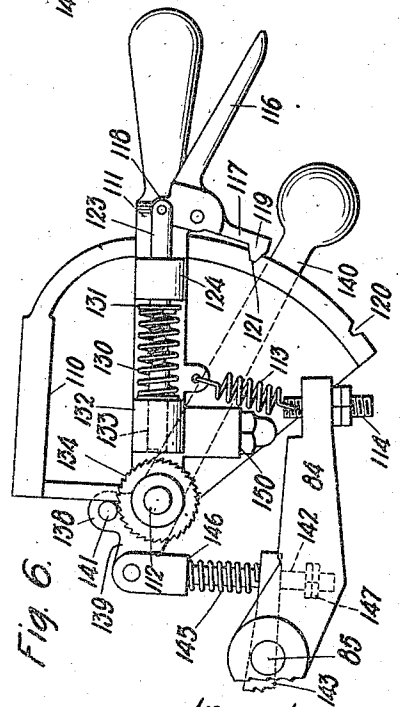

Fig. 6.

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UNITED STATES PATENT OFFICE.

WILLIAM F. SMITH, OF BROOKLYN, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS TO WESTERN ELECTRIC COMPANY, INCORPORATED, A CORPORATION OF NEW YORK.

MACHINE FOR COVERING WIRE.

1,182,591. Specification of Letters Patent. Patented May 9, 1916.

Application filed January 21, 1915. Serial No. 3,430.

To all whom it may concern:

Be it known that I, WILLIAM F. SMITH, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Machines for Covering Wire, of which the following is a full, clear, concise, and exact description.

This invention relates to power transmission systems.

It is an object of this invention to provide means whereby the proper coöperation of various operating mechanisms of a machine is assured.

In accordance with one feature of this invention, a machine having a main shaft from which is driven a revoluble head and a take-up mechanism, a constantly rotating shaft and clutch members interposed between and adapted to operatively connect the shafts, is provided with a starting lever, the operation of which causes the engagement of the clutch members and temporarily increases the speed of the take-up mechanism.

Other features of this invention relate to combinations of parts and details of construction as will hereinafter appear.

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 side elevation of a winding machine embodying this invention; Fig. 2 is a view in section of a portion of a clutch device according to this invention; Fig. 3 is a plan view of a portion of a flat annular friction disk; Fig. 4 is a side elevation of a portion of a starting device showing a starting lever in nonoperating position; Fig. 5 is a side elevation of the portion shown in Fig. 4 showing the starting lever being moved to operating position; Fig. 6 is a side elevation of the portion shown in Fig. 4 showing the starting lever in operating position, and Fig. 7 is a plan view of the portion shown in Fig. 4 giving a view in section of a portion of the starting lever mechanism.

As will be noted from the drawings, a power transmission system, embodying this invention, is shown as applied to a winding machine, which comprises side frames 20 (only one of which is shown) joined by means of upper rail plates 21, 21 and a main supporting frame 23, which form supports for the various parts of the machine to be fully explained hereinafter. A main shaft 24, from which the various parts of the machine are driven, is journaled in the main supporting frame 23. A winding head 25, for winding insulating material 26 about a wire 27, and having an opening therethrough for the wire, is suitably mounted upon a plate 22 secured to the main supporting frame 23, and is connected with the main shaft 24 by means of gears 28, 29 and 30. A capstan 35, for drawing the wire 27 through the winding head 25, is carried by a suitable shaft 36 journaled in capstan brackets 37 (only one of which is shown), which are suitably mounted upon the upper rail plates 21, 21. The capstan shaft 36 is driven from the main shaft 24 by means of suitable gearing contained in a housing 38. To insure that the insulated wire is maintained in the groove of the capstan 35, a jockey pulley 39 is rotatably supported in one end of a jockey pulley arm 40 and in position to ride on the insulated wire in the capstan groove. The other end of the jockey pulley arm 40 is attached to the upper end of an extension 41 of one of the capstan brackets 37.

The insulated wire, after passing over the capstan 35, passes onto a take-up reel 42 mounted on a shaft which is driven through differential gearing, the differential having a main sprocket wheel 43 which is engaged by a chain belt 44. The belt 44 also passes over a second sprocket wheel 45 which is connected through suitable gearing to the main shaft 24, whereby the take-up reel is driven from the main shaft. The differential gearing referred to forms a part of a differential tension regulator for maintaining a uniform tension on the insulated wire as it is fed on to the take-up reel 42, which is shown and described in Patent No. 1,104,078 issued to this applicant. A friction roller 46 and a friction disk 47 form part of means for evenly distributing the insulated wire on the take-up reel 42, such distributing means being identical with that shown and described in Patent No. 1,104,078, above referred to. Referring again to the differential tension regulator, the movement of a brake band 48, which is suitably tensioned by means of a spring 49 and an adjustment screw 50 associated with one end thereof, is

controlled by the insulated wire passing over an idler pulley 51, which acts through a bell crank 52 pivoted on a bracket 53 mounted on the upper rail plate 21, a connecting rod 54 and a bell crank 55 pivoted at 56, the short arm of which is connected to the other end of the brake band 48.

The mechanism hereinbefore described is that found in insulating machines already in use.

There will now be described mechanism embodying the present invention whereby the winding head 25, the capstan 35 and the take-up reel 42 are started at low speed, the rotation of these members being gradually increased to full speed, whereby the breaking of the insulating material is prevented, uniform insulation on the wire and even and uniform winding of the insulated wire on the take-up reel assured.

Secured to the main supporting frame 23 is a clutch housing 60, the lower end of which forms a bearing for the main shaft 24. A hollow shaft 61, encircling the main shaft 24, extends down into the clutch housing 60, and is supported in a bearing 62 formed in the main supporting frame 23. To the upper end of the hollow shaft 61 is keyed a spiral gear 63, which meshes with a spiral gear 64 on a shaft 65 driven through suitable gearing from a motor 66.

The hollow shaft 61 carries a clutch collar 67, which is attached thereto by means of feather keys 68, 68. The collar 67 is provided with a circular flange 69, in which there are three openings 70, 70—spaced 120° apart—for the reception of screws 71, 71. The flange 69 is also provided with three pockets 72, 72, spaced 120° apart, each being 60° from one of the openings 70, 70. A friction cone ring 73 having an inner cone face 74, is secured to the collar 67 by means of the screws 71, 71, and is adapted to move vertically with respect to the collar 67. This friction cone ring 73 is provided with three pockets 75, 75, spaced 120° apart, which are opposite the pockets 72, 72 provided in the flange 69, and coöperate therewith for the reception of cushioning springs 76, 76. A shifting collar 80 is secured to the clutch collar 67 by means of a clutch collar ring 81, and is provided upon opposite sides thereof with projecting pins 82, 82 (only one of which is shown), each of which is engaged by one of the forked ends 83, 83 of a clutch lever 84 which is pivoted to the clutch housing 60 at 85. Immediately below the hollow shaft 61, a bushing 90 is keyed to the main shaft 24. A sleeve 91 is keyed to the bushing 90 and is provided with a shoulder 92, upon which rests a friction cone ring 93 adapted to rotate independently of the sleeve 91. Vertical movement of the friction cone ring 93 is prevented by the shoulder 92 on the sleeve 91 and by a circular flange 89 provided on the bushing 90. The friction cone ring 93 is provided with a cone face 94, adapted for frictional engagement with the cone face 74 of the friction cone ring 73 and to be rotated thereby. A circular flange 95 on the ring 93 is provided with openings 96 spaced at 60°. In order that motion may be transmitted from the friction cone ring 93 to the main shaft 24, there are keyed to the sleeve 91 a plurality of flat annular friction disks 97, each provided with a number of openings 98 for the reception of short cylinders or inserts 99 of cork, wood, leather, fiber, felt or some other similar material. The short cork cylinders 99 have frictional engagement with flat annular friction disks 100, which alternate with the disks 97, and which are secured to the friction cone ring 93 by means of six screws 101 passing through openings in the disks 100 and through the openings 96 in the friction cone ring 93, and having engagement with bushings 102 seated in the openings 96. A circular flange 88, formed on the lower part of the sleeve 91, coöperates with the flange 95 of the cone ring 93 to maintain the friction disks 97, 97 and 100, 100 in proper position with only a minimum amount of pressure between the cork inserts 99, 99 and the disks 100, 100. Between the head of each screw 101 and the lower friction disk 100, there is a tension spring 103 which controls the degree of friction between the ring disks 100 and 97. Movement of the screws 101 adjusts the tension of the springs 103 and, consequently, the degree of friction between the ring disks.

The tension of the springs 103, 103 is adjusted so that the friction between the disks 100, 100 and the cork inserts 99, 99 is greater than the friction between the cone faces 74 and 94 of the cone rings 73 and 93 respectively, when there is a great amount of slip between these cone faces, as at starting, but less than the friction between the cone faces when there is little or no slip between these cone faces. It will be readily apparent therefore that should the cones become jammed when setting the clutch, slipping takes place between the disks 100, 100 and the cork inserts 99, 99. Such an arrangement insures that the main shaft 24 will, under all circumstances, be started at low speed. It is also to be noted that the adjustment of the tension between the disks and the cork inserts is such that, when carrying the full load, some slipping will take place between the disks and the cork inserts.

When the outer end of the clutch lever 84 is raised, the forked extremities 83, 83 of the forward end thereof, engaging the pins 82, 82, move the clutch collar 67 downward, which, through the cushioning springs

76, 76 moves the cone ring 73 downward to cause light frictional engagement between its cone face 74 and the cone face 94 of the cone ring 93. Motion is then transmitted from the cone ring 73 to cone ring 93, which in its turn transmits motion to the main shaft 24 through the frictional engagement of the disks 100, 100 carried by the cone ring 93, and the cork inserts 99, 99 of the disks 97, 97 carried by the main shaft 24. As the friction between the cone rings 73 and 93 increases, due to further raising of the outer end of the clutch lever 84, the speed of the main shaft 24 increases. The cone ring 73 has only a limited vertical movement. The cushioning springs 76, 76 serve to prevent to a degree the jamming of the cone rings 73 and 93, and the friction disks 97 and 100 act to prevent the sudden increase in speed of the main shaft 24 should the cone rings 73 and 93 jam when starting the machine. The clutch collar 67 has considerably more vertical movement than the cone ring 73, with the result that when the main shaft 24 has been started, and its speed gradually increased, the downward movement of the clutch collar 67 may continue until teeth 105, 105 provided on the lower end thereof, engage with teeth 106, 106 provided on the upper face of the flange 89 of the bushing 90, whereby the friction cone rings 73 and 93 and the friction disks 97, 97 and 100, 100 are entirely eliminated from the transmission system, and the main shaft 24 is driven direct from the hollow shaft 61 through only the clutch collar 67 and the bushing 90.

In order to provide for the proper starting of the entire machine, a bracket 110 is mounted on the main supporting frame 23. A starting lever 111 is pivoted to one end of a shaft 112 mounted in the bracket 110. The starting lever 111 is flexibly connected with one end of the clutch lever 84 through a spring 113, there being an adjustment screw 114 interposed between one end of the spring 113 and the clutch lever 84, by means of which the tension of the spring 113 may be adjusted.

In order to insure that the take-up reel 42 will start to revolve at the same time as the insulating head 25 and capstan 35 are started, means are associated with the starting lever 111 whereby it is impossible to start the head and capstan without also starting the take-up reel. To one end of the starting lever 111 is pivoted a bell crank 115 having three arms 116, 117 and 118. On the end of the arm 117 is formed a wedge-shaped projection 119, which is adapted to register with slots 120 and 121 provided on a sector 122 of the bracket 110. The end of the arm 118 is pivoted to one end of a shaft 123, which is adapted for reciprocating movement through an opening in a projection 124 of the starting lever 111. The bell crank 115 and the plunger 123 are normally held in the positions shown in Fig. 4 by the action of a spiral spring 130, one end of which rests against a bushing 131 resting against the end of the plunger 123, and the other against a projection 132 formed on the starting lever 111. A pawl 133, adapted for engagement with the teeth of a ratchet wheel 134 mounted on the shaft 112, and also adapted for reciprocating movement through an opening in the projection 132, is connected at one end to the end of the plunger 123. A spring 135, the tension of which is less than that of spring 130, encircles a portion of the pawl 133 and has one end secured to a shoulder 136 of the pawl 133, the other end thereof being secured to the bushing 131. To the other end of the shaft 112 is secured a bell crank 137 having three arms 138, 139 and 140. The arm 140 forms an auxiliary lever, the raising of which causes a tightening of the brake band 48 of the differential tension regulator, as will hereinafter be more fully explained. The arm 140 also acts as a weight to normally hold the bell crank 137 in the position shown in Fig. 4, with a pin 141 carried by the arm 138 resting against the side of the bracket 110. To the end of the arm 139 of the bell crank 137 is connected a rod 142 which passes through an opening in the end of a lever 143 pivoted to a lug 144 formed on the main supporting frame 23. A spring 145 encircling the rod 142 has one end resting against a shoulder 146 thereon and the other end against the end of the lever 143. The free end of the rod is engaged by a nut 147. The other end of the lever 143 normally floats between collars 148 and 149 provided on the connecting rod 54.

When the starting lever 111 is in the position shown in Fig. 4 with the projection 119 in the slot 120, it is locked in nonoperating position. To start the machine in operation, the starting lever 111 must be raised, but before this can be done, the arm 116 must be moved about its pivot toward the free end of the starting lever to withdraw the projection 119 from the slot 120. When the arm 116 is so moved it causes a forward movement of the plunger 123 which forces the pawl 133 into engagement with one of the teeth of the ratchet wheel 134. Now as the starting lever is raised, after withdrawing the projection 119 from the slot 120, the engagement of the pawl 133 and the ratchet wheel causes the shaft 112 to be rotated in an anticlockwise direction (see Figs. 4, 5 and 6), whereupon the arm 139 and the rod 142 acting through the spring 145 moves the lever 143 (see Fig. 1) in an anticlockwise direction about its pivot point. The free end of the lever 143 there-

upon engages the upper collar 148 on the connecting rod 54 moving said rod upward, and rotates the bell crank 55 in a clockwise direction to effect a tightening of the brake band 48 which insures that the take-up reel will begin to rotate as soon as the insulating head 25 begins to rotate. The raising of the starting lever also causes a clockwise movement of the clutch lever 84 (see Figs. 1 and 2) about its pivot point 85 to move the constantly rotating cone ring 73 downward to engage the cone ring 93. Upon the engagement of these cone rings the main shaft 24 will begin to rotate, and as friction between the cone rings increases, due to increased compression of the springs 76, 76 the speed of the main shaft 24 will be gradually increased. Since the starting lever 111 is flexibly connected with the clutch lever 84 by means of the spring 145, since the downward movement of the cone ring 73 is transmitted from the clutch collar 67 through the compression springs 76, 76 and since the force of spring 113 opposes that of springs 76, 76 the probability of jamming the cone rings 73 and 93, by a sudden raising of the starting lever, is reduced to a minimum. However, since the starting and clutch levers are flexibly connected, it is impossible to cause an immediate engagement of the teeth on the clutch ring 67 with those on the flange 89 of the bushing 90; in other words, a sudden starting of the main shaft 24 at full speed. Should the starting lever be raised too fast, resulting in a great amount of friction between the cone rings 73 and 93, slipping takes place between the disks 100, 100 and the cork inserts 99, 99 carried by the disks 97, 97 whereby the main shaft 24 is prevented from starting at full speed. When the starting lever is raised to the position shown in Fig. 5, the clutch collar 67 is in its lowermost position with the teeth 105, 105 thereof engaging the teeth 106, 106 formed on the flange 89 of the sleeve 90, whereby the friction cone rings 73 and 93 and the friction disks 97 and 100 are eliminated, and the main shaft 24 is driven direct from the constantly rotating hollow shaft 61. When the starting lever 111 reaches the position shown in Fig. 5, the arm 116 is released, whereupon the action of spring 130 causes the bell crank 115 to assume the position shown in Fig. 6, with the projection 119 of the arm 117 in the slot 121 and locking the starting lever in operating position. At the same time, the action of spring 135 causes the pawl 133 to disengage the ratchet wheel 134 and to assume its normal position, as shown in Fig. 6, the shaft 112 thereupon rotating in a clockwise direction due to the weighted arm 140 thereby permitting the lever 143 to assume its normal position of floating between the collars 148 and 149 carried by the connected rod 54. Thereafter the action of the brake band 48 is controlled by the insulated wire in the same manner as it is controlled by the twisted strands, as explained in Patent No. 1,104,078 hereinbefore referred to. To stop the rotation of the insulating head 25, the capstan 35 and the take-up reel 42, the projection 119 is removed from the slot 121 by raising the arm 116 and the starting lever 111 then moved downward. As the starting lever 111 moves downward, a projecting arm 150 formed thereon engages the clutch lever 84, causing it to move in an anticlockwise direction about its pivot point 85 and to thereby cause the disengagement of the teeth 105, 105 and 106, 106 and the friction cone rings 73 and 93.

In machines for winding insulating material about wires, it is of the utmost importance that the winding head which winds the insulating material about the wire be started at very low speed and gradually increased to normal or full speed, in order to prevent the breaking of the insulating material. Furthermore, in such machines, it is also of the utmost importance that the operation of the mechanism which is to receive the insulated wire be started at the same instant as the winding mechanism is started, in order to insure that the insulating material is distributed uniformly on the wire and that the insulated wire is wound uniformly on a take-up reel. The power transmission systems heretofore used in such machines have permitted the winding head to be started suddenly and at such speeds as cause a great amount of breakage of the insulating material. By the use of a power transmission system embodying this invention, the difficulties heretofore experienced are overcome and the desired results accomplished.

What is claimed is:

1. In a power transmission system, in combination a main shaft, a winding head and a take-up mechanism driven therefrom, a brake band associated with said take-up mechanism for adjusting the speed thereof, a constantly rotating shaft, friction clutch members interposed between and adapted to operatively connect said shafts, a starting lever controlling the engagement of said clutch members, and means operable only upon the operation of said starting lever for temporarily increasing the tension of said brake band.

2. In a power transmission system, in combination a main shaft, a winding head and a take-up mechanism driven therefrom, a brake band associated with said take-up mechanism for adjusting the speed thereof, a constantly rotating shaft, friction clutch members interposed between and adapted to operatively connect said shafts, a starting lever controlling the engagement of said

clutch members, means normally preventing the operation of said starting lever, and apparatus controlled by said means in the operation of said starting lever for temporarily increasing the tension of said brake band.

3. In a power transmission system, in combination a main shaft, a winding head and a take-up mechanism driven therefrom, a brake band associated with said take-up mechanism for adjusting the speed thereof, a constantly rotating shaft, friction clutch members interposed between and adapted to operatively connect said shafts, a starting lever controlling the engagement of said clutch members, means normally locking said starting lever in nonoperative position, apparatus controlled in the operation of said starting lever by said means when in non-locking position for temporarily increasing the tension of said brake band, and teeth carried by said shafts and engaged when said starting lever is in operative position whereby said clutch members are eliminated, the movement of said means to locking position locking said starting lever to operative position and permitting the tension on said brake band to return to normal.

4. In a power transmission system, in combination, a main shaft, a revoluble head and a take-up mechanism driven therefrom, means associated with said take-up mechanism for automatically adjusting the speed thereof, a constantly rotating shaft, clutch members interposed between and adapted to operatively connect said shafts, a starting lever controlling the engagement of said clutch members, and means operable only upon the operation of said starting lever and coöperating with said speed adjusting means to temporarily increase the speed of the take-up mechanism.

In witness whereof, I hereunto subscribe my name this 19th day of January, A. D. 1915.

WILLIAM F. SMITH.

Witnesses:
E. EDLER,
K. L. STAHL.