A. FRIEDLANDER.

TWISTING AND WINDING MACHINE.

APPLICATION FILED JUNE 1, 1920.

1,425,084. Patented Aug. 8, 1922.

2 SHEETS—SHEET 1.

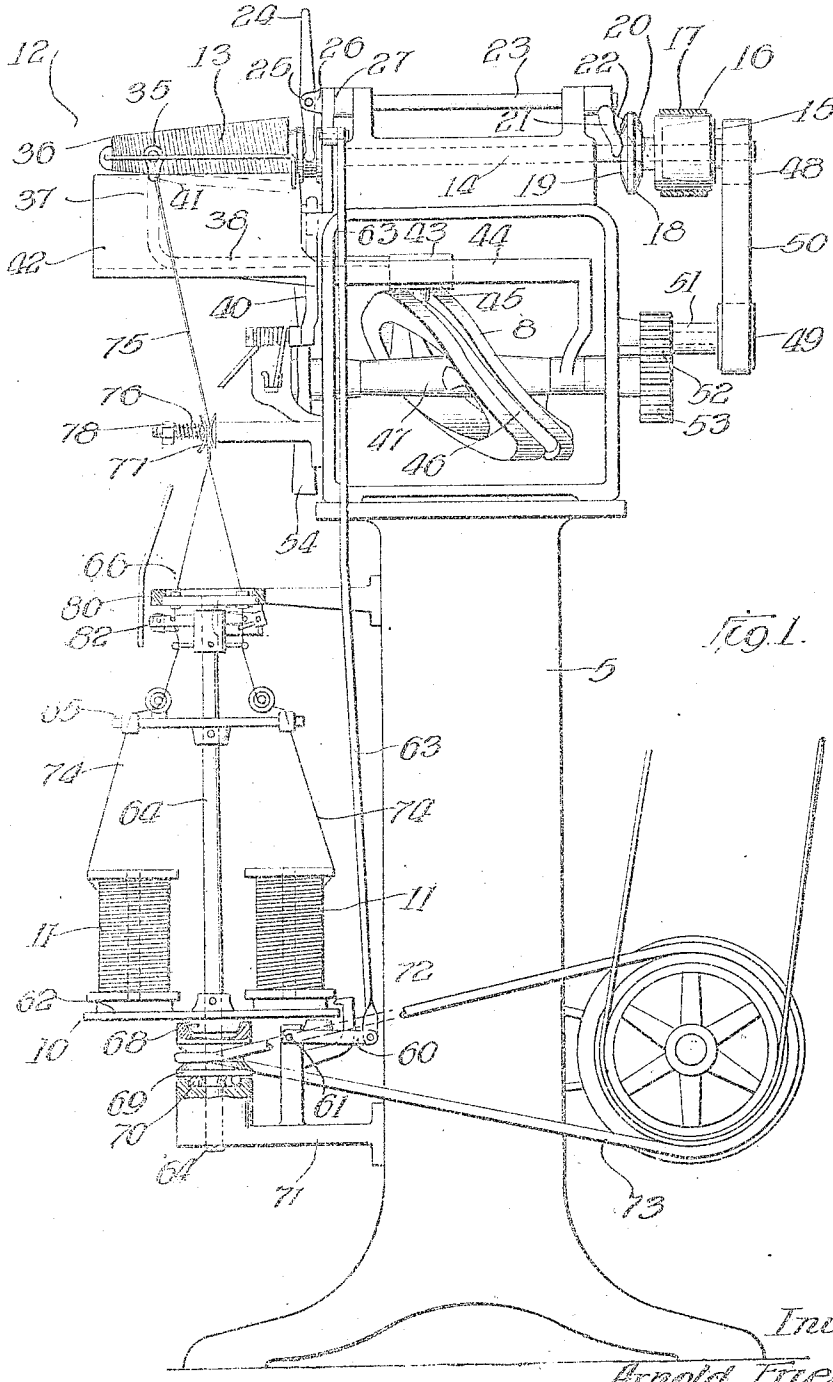


Fig. 1.

Inventor:
Arnold Friedlander
By Brown Porter & Penne
Attys.

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2 SHEETS—SHEET 2.

FIG. 2.

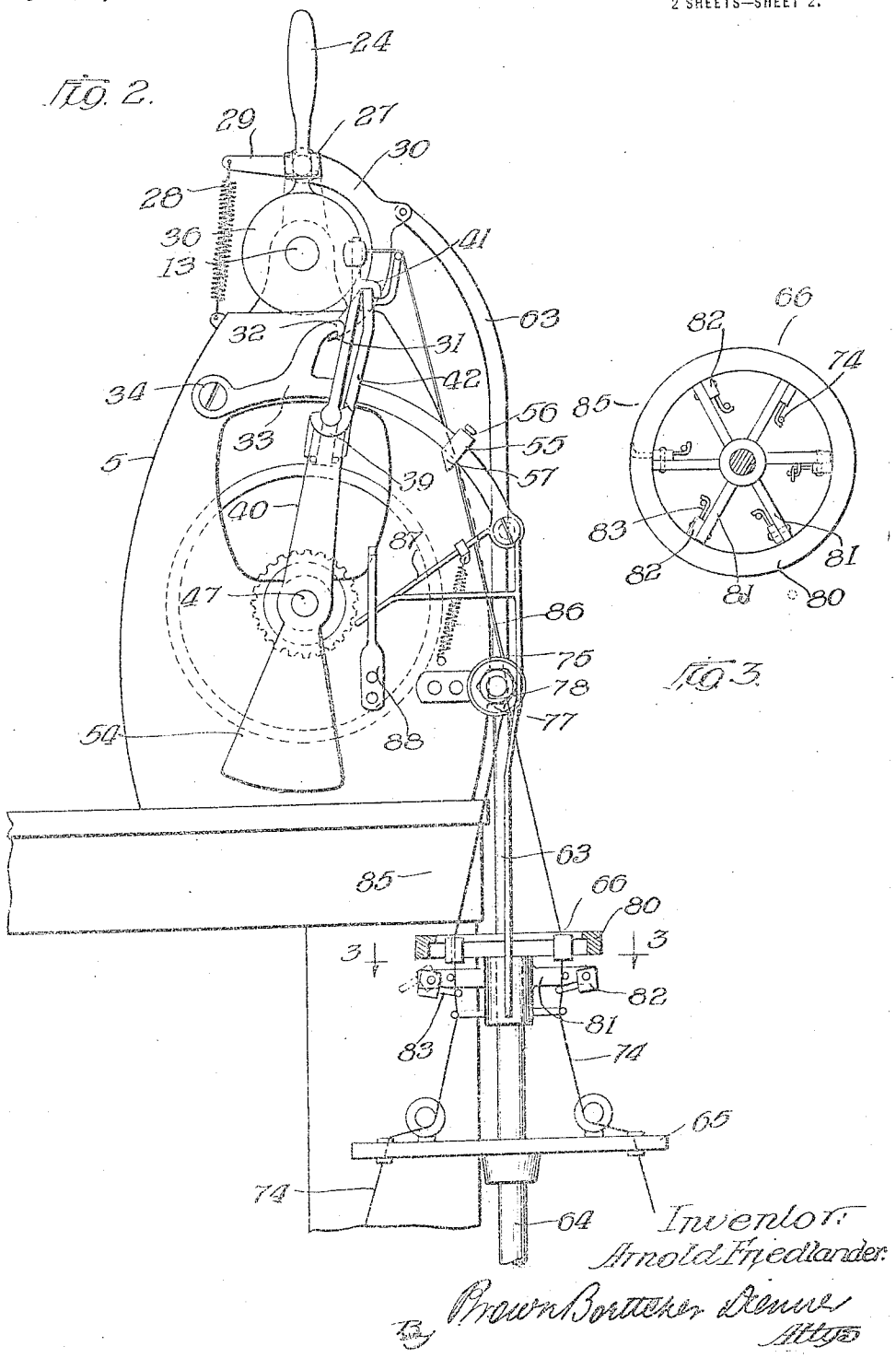


FIG. 3.

Inventor:
Arnold Friedlander.

By Brown Boettcher Dewey
Attys

UNITED STATES PATENT OFFICE.

ARNOLD FRIEDLANDER, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO PHOENIX KNITTING WORKS, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

TWISTING AND WINDING MACHINE.

1,425,084. Specification of Letters Patent. Patented Aug. 8, 1922.

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To all whom it may concern:

Be it known that I, ARNOLD FRIEDLANDER, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Twisting and Winding Machines, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to machines for twisting and winding silk, yarn, thread, cord and the like.

In the manufacture of various fabric articles it has been found that the best results are obtained when the machines are supplied with the desired silk or yarn from conical rolls or cops of a particular structure. These rolls or cops are built up of a single continuous strand wound in such manner as to form in effect a spiral wrapping of layer upon layer of the material, the strands of each layer being inclined in a direction opposite to those in a preceding layer. A cop or roll built up in this manner retains its shape and insures a free and easy unwrapping of the material upon feeding of the strands therefrom. Machines have been built for making up a roll or cop of this character in a satisfactory manner.

In order to obtain a strand of silk or yarn of sufficient coarseness for certain purposes it becomes necessary to unite two or more finer strands by a twisting operation. Various types of machines have been provided for performing this function by twisting the several finer strands together and winding the resulting coarser strand upon a spool or bobbin. However, in order to wind this coarser strand into a roll or cop of the character above described it has been necessary to transfer the ordinary spool or bobbin upon which the twisted strand is wound to a machine especially designed for winding the same into a conical roll. Thus at the present state of the art the formation of a conical roll of silk, thread, yarn or the like of the desired coarseness has required two separate and distinct machines.

The primary aim of my invention is the provision of a machine of simple construction which combines in one machine the functions of two machines of the prior art, i. e., which twists the several finer strands into a strand of the desired coarseness and then winds the resulting coarser strand into a conical roll of the desired character. Thus not only is one machine avoided, but the intermediate steps of winding onto and winding from an intermediate series of spools or bobbins is avoided as well. The saving of time, labor and expense and the consequent efficiency of such a machine is obvious.

A further object of my invention is the provision of a twisting mechanism adapted for embodiment in winding machines now in use to convert the same into combined twisting and winding machines. The expensive replacement of machines is thereby reduced.

A still further object of my invention is the provision of means for automatically stopping the winding operation when the roll has reached a predetermined size.

Another object is the provision of means for automatically stopping the winding and twisting operations upon the breakage or rupture of any one of the several individual strands.

Other objects and advantageous features will appear from the following detail description and the claims, taken with an inspection of the accompanying drawings, in which:

Figure 1 is a side elevational view partly in section of a twisting and winding machine embodying the features of my invention;

Figure 2 is an enlarged fragmentary front elevational view partly in section of the machine illustrated in Figure 1; and

Figure 3 is a horizontal sectional view taken substantially on the line 3—3 of Figure 2.

The machine illustrated in the drawings includes a rotatable twister head 10 adapted to carry a plurality of spools 11, of silk, yarn, cord, thread or the like and a winding mechanism 12 having a rotatable conical mandrel 13 for drawing the strands through the machine.

The winding mechanism may be of any approved construction, but in the present instance is of a well known type. The mandrel 13 is secured to a shaft 14 journaled preferably in the top of the machine. A cone clutch element 15 is fixed to the other end of the shaft 14 and cooperates with a

movable clutch element 16 loosely mounted on the shaft. The outer cylindrical surface of the clutch element 16 is preferably fashioned to receive a driving belt 17 from which the winding mechanism receives its power. The clutch element 16 carries a disk 18 having oppositely beveled edges 19 and 20 whereby the clutch element 16 is moved into and out of engagement wth its co-operating clutch element 15 by means of cam fingers 21 and 22 carried and actuated by a rock shaft 23. Finger 21 is engageable with the beveled surface 19 to move the disk 18 and consequently the clutch element 16 to the right to close or effect engagement between the clutch elements 15 and 16 while the finger 22 is engageable with the beveled surface 20 to open the clutch or disengage the clutch elements 15 and 16.

The position of the rock shaft 23 is controlled by a handle 24 pivotally secured as shown at 25 to the hub 26 of a rock arm 27. The arm 27, carrying the hub 26, is fixed to the rock shaft 23. A tension spring 28 (Figure 2) connected between an arm 29 of the rock arm 27 and the frame 5 of the machine tends at all times to rock the arm 27 and shaft 23 in such direction as to open or disengage the clutch. When the shaft 23 is rocked in the other direction by the manipulation of the handle 24 the clutch is closed or engaged and the mandrel 13 is driven at a speed corresponding to the speed of rotation of the clutch element 16.

Another arm 30 of the rock arm 27 carries a hook or catch 31 for co-operation with a corresponding hook or catch 32 carried by a latch lever 33. The latch lever 33 is mounted upon a fixed pivot 34. When in its lowermost position, as illustrated in Figure 2, the hook 32 is in such position as to interlock with the hook 31 upon rocking the arm 27 through the handle 24 to move the clutch element 16 into engagement with the clutch element 15. The clutch is thus locked in closed position upon manually closing the same until the latch lever 33 has been raised or swung in a counter clockwise direction about its pivot 34. The latch lever may be raised manually or by automatic trip mechanism such as will be later explained, in order to bring the winding mechanism to rest.

During the rotation of the conical mandrel 13 the twisted strand of material is diagonally wrapped thereabout in such manner as to build up a tight conical ball or roll thereon. This is accomplished by causing the strand to pass through a reciprocating or traverse guide that travels back and forth lengthwise along the mandrel. This guide includes an eye 35 that bears lightly against the roll 36 of the material. The eye 35, which eye is perforated to permit of the passage of the strand therethrough, is carried by the upturned end 37 of a reciprocal rod 38. Rod 38 is slidably mounted in a guideway 39 formed in a pivoted arm 40 and is provided with a guide finger or prong 41 co-operating with the upper edge of an upright plate member 42 fixed to the arm 40. The arm 40 is provided with an enlargement 43 reciprocably mounted in a fixed guide 44 and actuated by a cam plate 8. The eye 35 is reciprocated through a pin 45 depending from the enlargement 43 which pin 45 is adapted for co-operation with a groove 46 formed in the cam plate 8.

The cam plate 8 is mounted upon and driven by a shaft 47 operatively connected with the shaft 14 in any suitable or preferred manner such as through the pulleys 48 and 49, belt 50, stub shaft 51 and gears 52 and 53. The arm 40 is loosely mounted upon the forwardly extending end of the shaft 47 and is provided with a weight 54 for maintaining the eye 35 in light engagement with the roll of material being wound on the mandrel 13. Of course, the eye 35 may be otherwise maintained in proper engagement with the roll of material as for example by means of a suitable spring.

It will now be apparent that rotation of the cam plate 45 causes a reciprocation of the eye 35 longitudinally of the mandrel 13 in such manner that the twisted strand is wound into a roll of the desired conical form. As hereinbefore pointed out, the cam is preferably of such formation that the speed of the eye 35 along the mandrel 13 will decrease as the diameter of the mandrel increases to secure an even winding and tensioning of the material upon the roll. At the same time the eye 35 bears lightly against the roll and as the roll increases in diameter the eye moves away from the mandrel causing a rocking of the arm 40 in a clockwise direction (Figure 2). This rocking or swinging of the arm 40 is utilized to effect the stopping of the winding mechanism when the roll has assumed a predetermined diameter, or in other words when a predetermined length of strand has been wound. This is accomplished by the use of a cam block 55 adjustably mounted on the latch lever 33, as by means of a suitable set screw 56 or the like. The block 55 is provided with a cam surface 57 for co-operation with a cam surface 58 with which the arm 40 is provided (see Figure 2). When the diameter of the roll of material upon the mandrel 13 has increased sufficiently to move the arm 40 to such position as to cause engagement of the surface 58 with the surface 57 the latch lever 33 is raised or swung about its pivot 34 disengaging the catches 31 and 32 and thereby releasing the rock arm 27. This arm 27 is thereupon swung by the spring 28 in a counter clockwise direction (Figure 2) about the axis of the

rock shaft 23 rotating the shaft to disengage the clutch elements 15 and 16 and thereby bring the mandrel 13 to rest.

Such counter clockwise movement of the arm 27 at the same time swings a brake arm 60 (Figure 1) upwardly through a link 63, about its pivot 61 into engagement with the under side of a base plate or disk 62 upon the upwardly projecting spindles of which the spools 11 are mounted. The base plate or disk 62 being fixed upon the upright or vertical shaft 64 the lower end of which shaft is slidably mounted in a bearing bracket 71 suitably secured at its inner end to the frame 5 of the machine, it will be apparent that upon engaging the under surface of the base place 62 further swinging of the brake arm 60 about its pivot will move the shaft 64 axially upwardly. This upward movement of the plate 62, which disengages the external cone clutch element 68 carried thereby from the internal cooperating driving clutch element 69 loosely mounted upon the shaft 64 is limited by a prong or stop 72 carried by the bracket member 71. Thus not only is the driving clutch for the plate 62 disengaged, but the plate is clamped between the stop 72 and the brake arm 60 and positively brought to rest. The peripheral surface of the driving clutch element 69 is fashioned to receive a driving belt 73 through which the twisting mechanism receives its power when the clutch elements 68 and 69 are in engagement as shown.

Fixed upon the shaft 64 above the spools 11 is a guide carrying member 65 above which guide carrying member another guiding mechanism 66 is fixed upon the shaft 64. Means associated with the guiding mechanism 66 provides for automatically stopping the winding and twisting mechanism upon the breakage or rupture of any of the strands 74 as will be hereinafter set out. Ball bearings 70, interposed between the driving clutch elements 69 and the bearing brackets 71, in which the lower end of the vertical shaft 64 is slidably mounted, minimize the friction between these parts.

The strands 74 of the yarn, silk or the like, as the case may be, upon being drawn from the spools 11 by the rotatable mandrel 13 of the winding mechanism are guided independently upwardly through the guiding mechanism 66 and thence as a single coarser strand 75 between a pair of guide disks 77, the friction of which, upon the strand 75, may be adjusted through a spring 76 and nut 78. By reason of the rotation of the guiding mechanisms 65 and 66 through which the strands are guided independently and the fixed grasping or holding effect of the disks 77, it will be once be apparent that the finer strands will be effectively twisted into a coarser strand and then fed on to the winding mechanism, the operation of which has been set out. The frequency of the twist is immaterial, being dependent upon the relative speeds of rotation between the mandrel 13 and the shaft 64.

The guiding mechanism 66 includes a guide member carrying frame 80 secured through a suitable arm or bracket to the frame 5 of the machine and a guiding spider 81 to each of the radiating arms of which a detector 82 is pivoted. These detectors 82 are retained in the position shown in full lines in Figure 2 by engagement of the bent or hooked wire fingers 83 thereof with the strands 74 extending up through the guiding mechanism, but are so counterweighted or pivoted as to drop or swing downwardly about their pivotal mounting upon disengagement of the strand 74 from the finger 83. Thus it will be apparent that upon rupture or breakage of either of the strands 74 the detector 82 associated therewith will drop, and by reason of the rotation of the spider 81 carrying the same, will be swung outwardly by the centrifugal action into substantially the position shown in dotted lines in Figure 2. Rotation of the guiding mechanism with the detector in such position will cause the detector to engage a downwardly extending control rod 85, moving the lower end of this rod (Figure 3) from the full to the dotted line position. The upper or opposite end of the rod 85 is operatively connected with the latch lever 33 so that upon such movement of the rod the latch lever will be swung about its pivotal mounting to release the rock arm 27, whereupon the same is swung in a counter clockwise direction by the spring 28 disengaging the clutch elements 15 and 16, the clutch elements 68 and 69, and braking the twisting mechanism against further rotation.

Upon disengaging the latch lever 33 the control rod 85 is returned to its normal or full line position by means of a spring 86 connected at its opposite ends with the end 87 of the rod 85 and a relatively stationary member respectively, such as, for example, the frame 5 of the machine. The end 87 and consequently the control rod 85, is guided and limited in its movement by means of a suitable guide member 88 mounted upon the frame 5. Upon gathering up the broken strand the detector associated therewith is arranged in the position shown in full lines and the arm 27 is rocked against the tension of the spring 28 and locked in the position shown in full lines by engagement of the catches or hooks 31 and 32. Such rocking of the arm 27 throws the clutches 15—16 and 68—69 into engagement and releases the brake arm 60. Of course, means may be provided for automatically stopping the machine upon breakage of the coarser strand 75, although I have not shown the

same, as I find that any breakage invariably occurs in the finer strands 74. When the roll 36 has been completely wound removal thereof from the mandrel 13 is accomplished by rotation of the arm 24 in a clockwise direction (Figure 1) about its pivotal mounting 25. Thus the arm 24 serves as a control arm for the clutches 15, 16 and 68, 69 and for the brake 60, and at the same time facilitates the convenient removal of the wound roll. The operation of the machine is simpler and less expensive, the cost of construction, its installation and maintenance is less, and the efficiency of the twisting and winding process is higher than heretofore attained.

The teachings of the present invention may be embodied in the original construction of the machine or a winding machine of the ordinary or any preferred type may be converted into a combined twisting and winding machine in accordance with the invention in a simple and inexpensive manner.

While I have described my invention in connection with the details of a particular embodiment, I do not intend thereby to limit the invention to such details, as I am aware and contemplate that modifications and changes may be made without departing from the invention which is set out in the appended claims.

I claim:

1. In combination, a source of power, means for twisting two or more strands of material into a single coarser strand, means for winding said coarser strand into a roll or cop and a detector for automatically disconnecting said twisting and winding means from said source of power and from each other upon breaking of one of said strands.

2. In a machine for twisting a plurality of strands together and winding said strands into a roll or cop, a winding member, a driving member therefor, clutch means between said winding member and said driving member, a twisting device, a driving member for said twisting device, clutch means between said twisting device and said last driving member, and a detector for automatically operating said first and last clutch means to disconnect the winding member and the twisting device from their respective driving members, and from each other upon breaking of one of the strands.

3. In a machine of the class described, a winding device, a twisting device, a source of power for said devices, an operating lever for disconnecting said winding device from said source of power, means for disconnecting said twisting device from said source of power, a connecting link between said lever and said last means, a latch arm for holding said winding and twisting devices drivingly connected with the source of power, and a detector for automatically releasing said latch arm to disconnect said winding and twisting devices from said source of power and from each other upon breaking or running out of one of the strands.

4. In a machine for twisting strands of material, a frame, a bracket member carried thereby, a substantially vertical shaft loosely journaled in said bracket member, a driving member loosely mounted upon said shaft, a coaxial spool carrying twister head fixed upon said shaft and adapted for driving engagement with said driving member, means operable to lift the twister head from engagement with said driving member, latch means restraining said last means and means for releasing said latch means, said latch releasing means including a plurality of detectors carried by the substantially vertical shaft and a rod radially beyond the normal path of rotation of the detectors, said detectors being retained within said normal path of rotation by the strands passing through the machine and being adapted to be thrown radially beyond said normal path of rotation to engage said rod and release said latch upon breaking of a strand.

5. In a machine for twisting strands of material, a frame, a bracket member carried thereby, a substantially vertical shaft loosely journaled in said bracket member, a driving member loosely mounted upon said shaft, a coaxial spool carrying twister head fixed upon said shaft and adapted for engagement with said driving member, a stop member and means operable to lift the twister head from engagement with said driving member and into engagement with said stop member upon breaking of a strand.

6. In a machine for twisting strands of material, a source of power, a rotatable shaft, a spool carrying twister head carried by said shaft, a detector carrying member on said shaft, a plurality of detectors pivoted to said member, means radially beyond the normal path of rotation of said detectors for disconnecting the twister head from the source of power upon breaking of a strand passing through the machine, said detectors being retained within said normal path of rotation by said strands and being weighted to swing radially beyond said normal path of rotation to actuate said disconnecting means upon breaking of a strand.

7. In combination, a spindle for winding a strand of material into a roll, clutch means connectible with said spindle to drive the same, and a lever arm movable in one direction to control said clutch means and in another direction to remove the wound roll from the winding spindle.

In witness whereof I hereunto subscribe my name this 30th day of April 1920.

ARNOLD FRIEDLANDER.