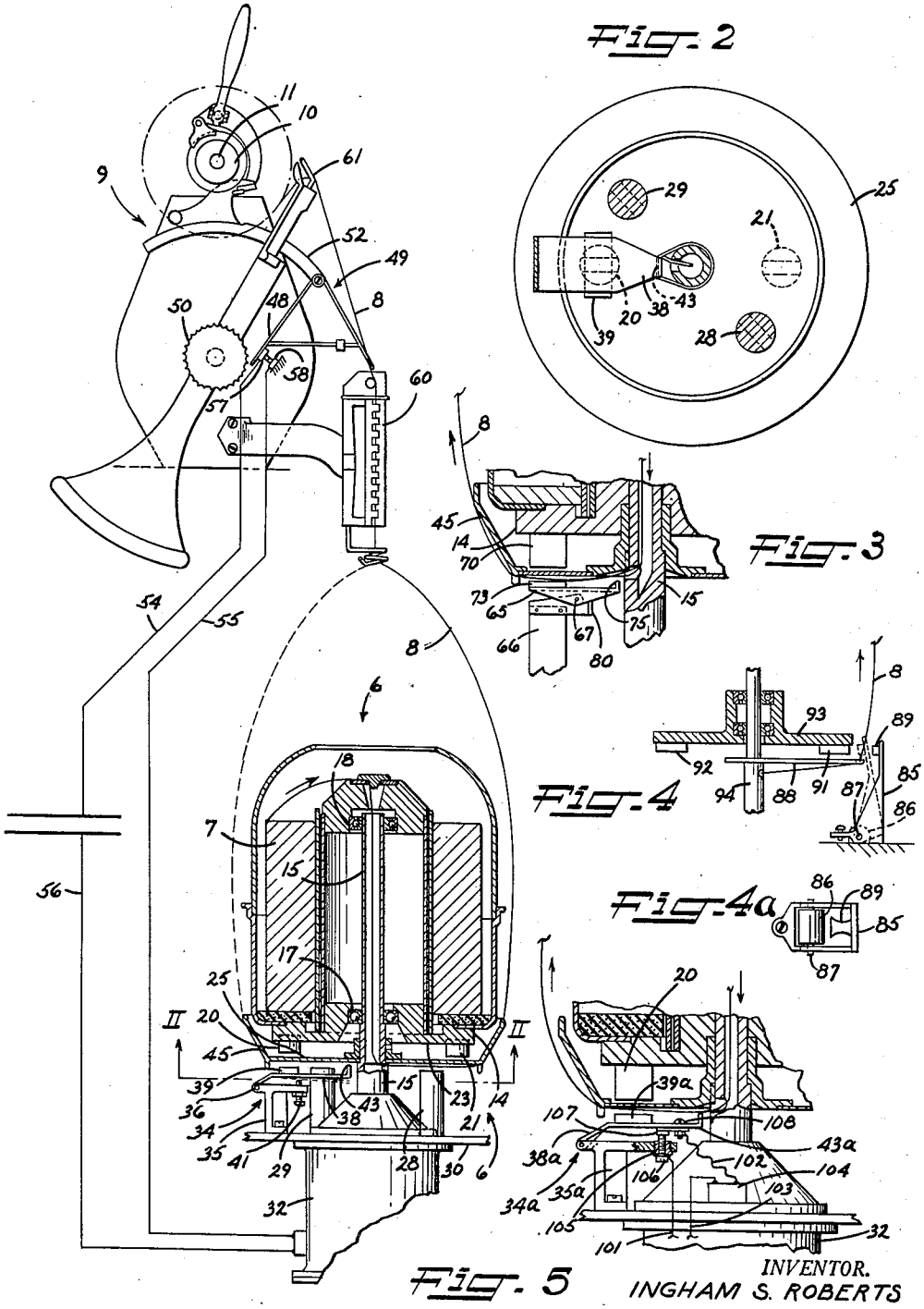
June 2, 1953 I. S. ROBERTS 2,640,310

MAGNETIC STOPPING DEVICE

Filed Dec. 30, 1949 2 Sheets-Sheet 1



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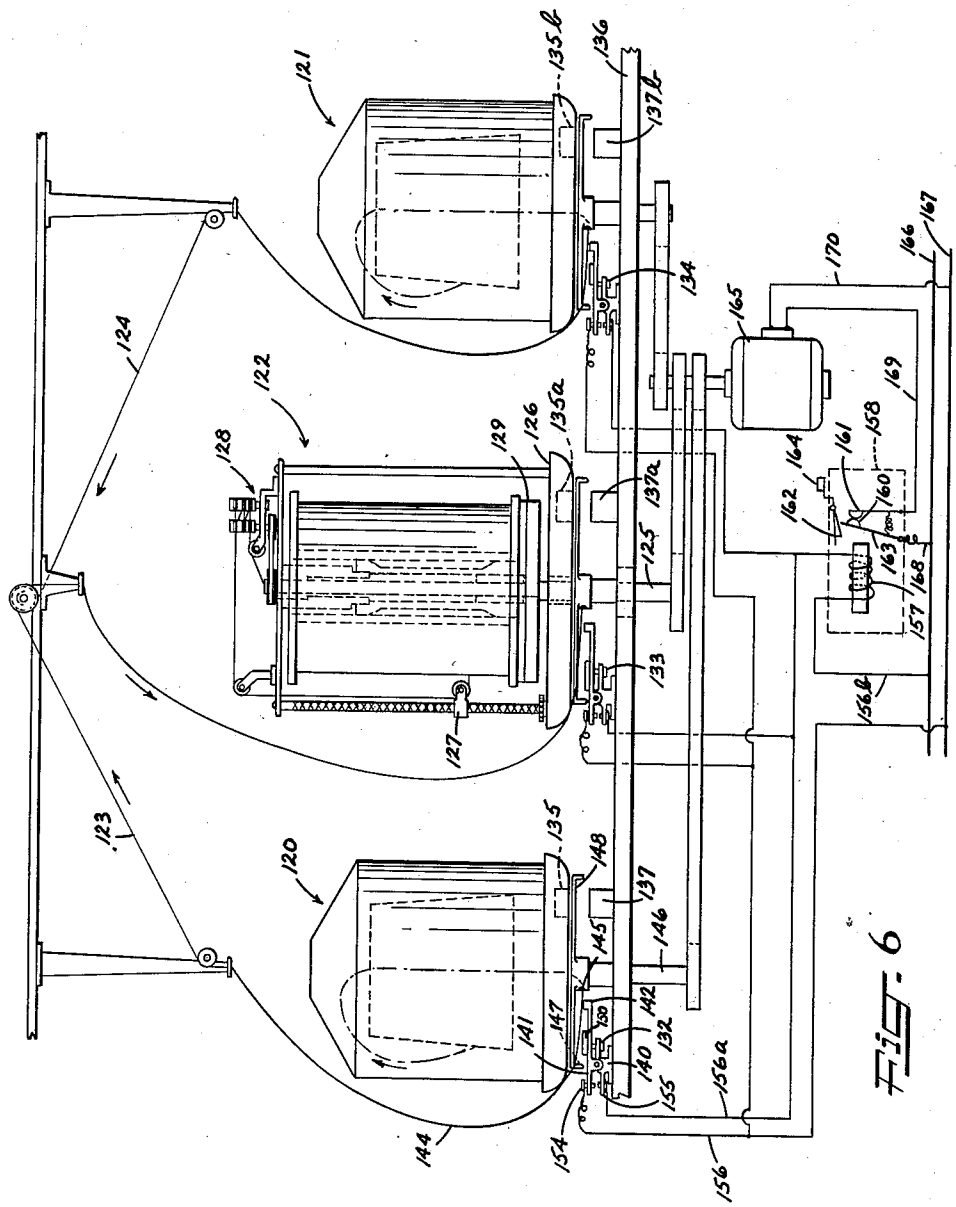

FIG. 6

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MAGNETIC STOPPING DEVICE

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18 Claims. (Cl. 57—81)

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This invention relates to an arrangement for interrupting the delivery of a strand by a multiple twist type of up-twister when the stationary package holding begins to rotate.

A conventional up-twister of the multiple twist type includes a driving motor, the shaft of which is hollow and is extended to support a flyer secured thereto and rotatable therewith, and a package holder that is held stationary on the shaft, such as by gravitational or magnetic systems. The rotational speeds of such a machine are normally in the range of 6000 to 12,000 revolutions per minute. Machines of this type are subject to occasional faulty operation such as may result from bearing seizure or tangling or snarling of the strand as it is drawn from the package and which may cause the normally stationary package holder to rotate. It is desirable to disconnect the twister from its source of power when such faulty operation begins so as to avoid possible damage to the twister and to adjacent machinery and possible injury to the operator. In order to avoid collecting untwisted yarn, it is also desirable that the associated strand collecting means be stopped when the twister is stopped or that the strand be broken. In order to avoid power waste and excessive yarn tangling, it is furthermore desirable that the twister be stopped whenever the strand collecting means is stopped for any reason.

It is an object of the invention to provide alternative control systems for stopping the twister which are responsive to rotation of the package holder from its normal stationary position. It is another object to provide an automatic control system for simultaneously stopping a twisting machine and a strand-collecting machine which handle a common strand. It is another object to provide an automatic device for breaking the yarn if the control system which stops the twister does not also stop its associated yarn collecting means. It is a further object to provide a simple and inexpensive emergency stopping system which may be easily installed on existing series operated twisting and winding equipment without appreciable modification thereof. It is still another object to catch the strand delivered by the up-twister as it emerges from the lower end of the spindle so that it is unnecessary to lace the strand through the spindle when restarting the twister. Other objects, features and advantages will be apparent from the following description of the invention and the drawing relating thereto in which

Fig. 1 is an elevation partly in section of a twister and a winder illustrating one embodiment of the stopping mechanism;

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Fig. 2 is a section of the twister shown in Fig. 1 taken along line II—II;

Fig. 3 is a fragmentary sectional view of the twister shown in Fig. 1 and a modified thread-engaging device attached thereto;

Fig. 4 is a diagrammatic sectional view of twister elements illustrated with relation to another modified thread-engaging device;

Fig. 4a is an enlarged top view of the thread-engaging device of Fig. 4;

Fig. 5 is a view partly in section of twister elements and still another modified strand-engaging device; and

Fig. 6 is an elevation view of ply-twisting apparatus and an emergency control system therefor including a wiring diaphragm.

The invention is first described with reference to a two-for-one up-twister and a precision cone winder which collects a strand passing to it from the twister although the arrangement to be described is readily applicable to winding systems comprising other types of twisters and/or strand-collecting machines. As used on the winding system herein described, the invention comprises a magnetically-controlled mechanism for simultaneously terminating the application of power to a twister and a winder. The mechanism comprises a thread-breaking or catching device mounted on the twister, responsive to a change of magentic force acting on a magnetically-sensitive element thereof when the package holder of the twister is pulled out of the normal position. A device for opening a circuit which energizes a driving motor for the twister is responsive directly to movement of the thread-breaking device or to movement of a tension-sensitive device for disengaging the winder from a driving member.

Fig. 1 illustrates apparatus including a two-for-one twister 6 which supports a supply package 7 while twisting a strand 8 which is pulled therefrom and passed to a winder 9 to be collected as a cone or tube 10 supported on the spindle 11. A package holder 14 is supported on the twister spindle shaft 15 by the bearings 17 and 18. A pair of magnets 20 and 21 are attached to a base member 23 of the holder and extend from its lower surface into close clearance with the upper surface of a flyer 25 which is secured to the shaft 15. The annular portion of the flyer which rotates at close clearance with the magnets 20 and 21 comprises a non-magnetic material although the flyer may be fabricated

entirely therefrom. A pair of stationary magnets 28 and 29 are secured to and extend upwardly from a plate 30 comprising a non-magnetic material attached to the upper end of a driving motor 32 for the twister. The magnets 28 and 29 are spaced oppositely at equal radii from the axis of the twister; the magnets 20 and 21 are similarly spaced with respect to the axis. In their normal alignment, the magnets 20 and 21 are directly over the magnets 29 and 28. However, if the package holder is rotated, the magnets of the package holder are pulled out of superimposition with the stationary magnets 28 and 29.

The package holder of the conventional twister is restrained from turning and for this reason may not be constructed with particular care as to its dynamic balance. A slight imbalance in the holder and/or a package supported thereon may result in destructive vibration if the holder is caused to rotate rapidly. A mechanism hereinafter described is therefore provided for terminating the application of power to the twister as soon as any relative movement occurs between the holder magnets and the stationary magnets. In apparatus, such as herein described, twisting and winding spindles are allowed to coast to a stop after operation of the mechanism of the invention, but the mechanism may also be used to electrically control deceleration devices not shown, such as solenoid-operated brakes.

The stopping mechanism for the winding system includes a device 34 mounted on a stationary portion of the twister, such as the plate 30, and comprising a base element 35 secured to the plate 30 and having a bifurcate portion adapted to receive a pivot pin 36. The pin 36 extends through a swingable lever 38 which supports a magnetically-sensitive element 39. A set screw 41 extends in threaded relationship through the base member to support the lever 38 when it is not lifted upwardly by the attraction of the holder magnets for the element 39. Lever 38 has an upwardly-extending end portion 43 which, during periods of normal operation of the twister, does not extend into the path of revolution of the thread 8 extending from an aperture in a lower portion of the spindle 15 to the frustoconical surface 45 of the flyer. When the holder is rotated out of its normal position, the lever 38 is lifted upwardly by the attraction of one of the magnets 20 or 21 for the element 39. The end portion 43 moves upwardly into the path of the thread to engage the lower surface of the flyer 25. As the flyer rotates, the thread 8 is carried against a lateral surface of the portion 43 (shown in Fig. 2) to be wrapped about the spindle and ultimately broken as the flyer continues to turn and the winder 9 continues to pull on the strand.

The consequent drop in tension in the severed strand 8 passing to the winder allows an arm 48 of the drop wire device 49 to swing into contact with the serrated periphery of a cam 50. The arm 48 is lifted lengthwise to carry upwardly a lever 52 to which the device 49 is pivotally secured which actuates a conventional drive-disengaging mechanism for the winding shaft 11.

To interrupt the flow of power to the twister motor 32 carried in the circuit represented by lines 54 and 55 and 56, an electrical terminal 57 for the circuit is mounted on the drop wire arm 48 and held in contact with a stationarily supported terminal 58 when the winding system is in operation. The terminals, however, separate when the normal tension in the line 8 as it passes between a tensioning device 60 and a traverse guide 61 is relieved; the motor 32 is no longer energized and subsequently coasts to a stop. The terminals 57 and 58 may be used in a circuit for operating a relay switch or other control means for the twister motor instead of being placed in the power circuit for the motor as shown. Such a circuit may also be used to control a solenoid-operated brake for the twister.

In Fig. 3 a modified thread-engaging mechanism is illustrated as being mounted on a twister such as shown in Fig. 1. The mechanism comprises a lever 65 which may tilt with respect to a stationary support 66 on a pivot pin 67. A magnet 70 of the holder 14 acts during operation of the winding system on a magnetically-sensitive element 73 secured to the lever 65 and prevents the up-turning portion 75 from engaging the thread which passes outwardly from the interior of the spindle shaft 15 to the outer surface 45 of the flyer. The magnet 70 is to be distinguished from the holding magnets 20 and 21 of Fig. 1 since it may not be used to prevent the holder from rotating but may be provided in addition to other elements for restraining the rotation of the holder. The magnet 70 remains supported over element 73 during normal operation of the winding system. However, when the package support is rotated to carry the magnet 70 out of its position above the element 73, thereby lessening the magnetic force pulling the element upward, the portion of the lever to which the element 73 is attached, drops downwardly by force of gravity and the tip 75 moves upwardly into the revolving path of the thread 8. The thread 8 is wrapped by the flyer around the portion 75 while subjected to a pull from a winder such as that illustrated in Fig. 1. The lever 65 is constructed so that in the absence of magnetic influences, the portion of the lever supporting the element 73 overbalances portions of the lever on the opposite side of the pivot. Tilting of the lever in the opposite direction such as when the element 73 is attracted upwardly by a magnetic force is limited by an arm 80 of the stationary support which extends laterally under the lever 65. The arrangement for catching thread shown and described with respect to Fig. 3 may be substituted for the thread-catching device 34 of Fig. 1.

Figs. 4 and 4*a* illustrate a modified thread-arresting device which comprises a member 85 which is pivotably supported on a stationary member 86 at the pin 87. The member may be tilted inwardly toward the yarn 8 into the position shown in ghost outline by the magnetic attraction of either of magnets 91 and 92 attached to a package holder 93, for a magnetically-sensitive element 89 attached to the member 85. The element 89 may be provided with concave side surfaces as shown in Fig. 4*a* to catch and retain the yarn as the element moves into the path of revolution of the thread 8. The arrangement illustrated by Figs. 4 and 4*a* may be substituted for the thread-breaking device shown in Figs. 1 and 3.

Fig. 5 illustrates still another embodiment of the invention wherein the thread-catching device 34*a* is similar to that mounted on the twister shown in Fig. 1 and hereinbefore described, except for parts which have been added to open a circuit to a relay trip switch 104 which when

open, opens a power circuit (not shown) for energizing a motor 32. Portions of the device 34a of Fig. 5 which are similar to portions of the device 34 carry the same numeral with the addition of the letter "a." A base member 35a provides pivotably support for a swingable arm 38a which swings upwardly when a magnet 20 is rotated over a magnetically-sensitive element 39a supported by the arm 38a. When the arm 38a swings upwardly, the end portion 43a extends into the revolving path of the yarn 8. The yarn is caught by the tip while subjected to a pull by a winding device operated in conjunction with the twister, and instantly broken. The device 34a performs an additional function not described hereinbefore with respect to another embodiment, that of opening a circuit such as carried through lines 101, 102 and 103 which are connected with a power source to energize the relay switch 104. The circuit under operating conditions of the winding system, extends through an exteriorly and interiorly threaded insulating sleeve 105 extending through the base portion 35a, a set screw 106 in threaded relationship with the sleeve and a terminal 107 secured to the arm 38a by a bolt 108. Lines 101 and 102 are secured to the sleeve 105 and the bolt 108 respectively. Obviously, the circuit is broken when the arm 38a is lifted upwardly by a magnetic force applied to the element 39a. Other yarn breaking devices according to this invention may be similarly provided with circuit-opening terminals.

The strand-catching device according to this invention is applicable to any type of equipment for handling the strand passed along a revolving path. The device may be readily mounted on down-twisters as well as up-twisters and it is readily adapted, for example, to a ply-twister.

Fig. 6 illustrates a machine for twisting cord comprising up-twisters 120 and 121 and a doubling unit 122 of the down-twisting type for receiving strands 123 and 124 supplied by the up-twisters. The up-twisters 120 and 121 are of a general construction similar to that illustrated in the previous figures. Basic parts of the down-twister 122 comprise a hollow spindle shaft 125, and a cage 126 for supporting a reciprocating thread guide 127 and a take-up device such as the capstan rolls 128 driven by the spindle for pulling the strands through the ply-twisting system at a constant rate, said cage being rotatably supported on the spindle and prevented from turning by a magnetic system hereinafter described. Another principal part of the doubler is the package holder 129, also rotatably supported on the spindle independently of the cage 126. While the cage is restrained from turning, the holder 129 is rotated by a conventional torque-transmitting device of which a driving member is mounted on the spindle and may slip or rotate with respect to a driven member mounted in the base of the holder when excessive torque is applied by the driving member to the driven member. By proper adjustment of the torque-transmitting device, a strand may be collected as a package within the doubler at uniform tension. A conventional magnetic drive is ordinarily used for this purpose.

Each of the twisting units 120, 121 and 122 have members which are rotatably mounted on their respective spindles which are restrained from turning, namely, the package holders of units 120 and 121 and the cage of unit 122. The possibility is ever present during operation of the ply-twisting system that bearing failure may occur in one of the units to cause one of the said package holders or the cage to start rotating with its respective spindle. As the spindle speeds of these units, particularly the up-twisters, is sufficiently high to cause almost explosive disintegration of portions of the machine should either one of the package holders or the cage come up to spindle speed, the present invention may be applied to such a ply-twisting system to avoid damage to the equipment and to promote the safety of personnel.

Accordingly, the thread-catching devices 132, 133 and 134 are mounted on a frame member 136 just below the flyer of each unit. Each unit is provided with a magnetic system for restraining the rotation of the package holder or the cage as the case may be. For this purpose, a magnet, such as magnets 135, 135a and 135b, is secured in the base of each of the package holders and the cage at a radius with respect to the spindle of each unit such that it may rotate into superimposition with a magnet mounted on the frame member 136, such as stationary magnets 137, 137a and 137b.

The thread-catching device 132 of unit 120, which is similar to devices 133 and 134, comprises a base 140 secured to the frame member 136 for pivotably supporting a lever 141. The lever 141 is provided with an upwardly-extending portion 142 normally positioned below the path of the thread 144 as it passes from an aperture 145 which connects with the bore of the hollow spindle shaft 146, and an eye 147 of the flyer 148. Secured to the upper side of the lever 141 is a magnetically-sensitive element 150 which is spaced from the twister axis at the same radius as the magnet 135 of the package holder and the stationary magnet 137. If for any reason, the package holder rotates to the extent that the magnet 135 is carried over the magnetically-sensitive element 150, the lever 141 is tilted and the extension 142 is carried into the revolving path of the strand 144. Tilting of the lever may be limited by the engagement of a pair of electric terminals 154 and 155.

The terminals 154 and 155 function to open and close an electrical circuit comprising lines 156, 156a, and 156b which connect with power lines 166 and 167 to energize a solenoid coil 157 of a relay switch designated generally as apparatus within a dotted line 158. Similar terminals of the thread-catching devices 133 and 134 are connected similarly into the same circuit in parallel relationship so that engagement of the terminals of any one of the thread-catching devices will operate the relay switch.

The solenoid of the relay switch when energized produces separation of the switch terminals 160 and 161 of a circuit comprising lines 168 and 169, the motor 165, and the line 170. A movable element 163 to which the terminal 160 is secured is caught by the latch 162 when the terminals are separated. Electrical power is transmitted through the terminals to a driving motor 165 from the power lines 166 and 167. A re-set button 164 must be pushed to release the element 163 to again energize the motor 165. While the motor is illustrated as a two phase type, any suitable type of motor may be used to drive the ply-twisting system and a relay switch having sufficient terminals is then provided for controlling the electrical power supplied thereto. While the motor 165 is shown as connected with separate belts with each of the spindles, a separate motor may be used to operate each twisting

unit and a relay switch provided which will interrupt the transmission of power to such a plurality of motors simultaneously. When rapid deceleration of the ply-twisting system is required, electrically operated braking means may be provided on a common driving motor or at each of the spindles. The braking means may be operated by a suitable relay switch having a solenoid coil which is energized by a circuit arrangement which includes the terminals of the strand-catching devices such as that shown. The strand-catching devices in Fig. 6 serve to prevent collection of improperly twisted strand into doubler 122.

A magnetically-operated mechanism used according to the invention to intercept a strand passing through a revolving path need not be used in a manner to break the strand but may instead be employed to wrap the strand around a portion of the machine on which the mechanism is mounted while rotating portions of the machine come to a stop. To obtain this result, the switch on an electrical control circuit for the driving motor is preferably actuated directly by motion of the strand-catching device, such as illustrated in Figs. 5 and 6. So that the strand is not broken by a take-up device, such as the winder of Fig. 1, the winding spindle is driven by a member which permits the shaft to stall when a predetermined tension is reached in the strand short of its breaking strength. Means for producing a predetermined maximum torque, such as a slip-clutch or a torque motor of known design are satisfactory for this purpose. In an apparatus which wraps the strand instead of breaking it while rotating parts in which the strand-collecting device is mounted are decelerating, the movement of strand to the take-up device may actually be reversed momentarily and result in withdrawal to a small extent of strand from a package being formed by the take-up means. An advantage of such a winding system is that the wrapped strand may be unhooked from the strand-catching device and the wraps of the unbroken strand pulled, for example, from around a twister spindle without the necessity for relacing any portion of the system.

While preferred embodiments of the invention have been shown and described, it is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. In a winding and twisting system, a machine having a hollow spindle for passing a continuous strand, a take-up means for moving the strand lengthwise of itself, an element attached to and extending radially from the spindle to rotate the strand in a revolving path as it moves toward the take-up means, a member for supporting a wound package, bearing means for rotatably mounting the member on the spindle, means for restraining the member from rotating, and strand-catching mechanism comprising a lever which is movable into and out of the revolving path of the strand, said lever having magnetically-sensitive means associated therewith, magnetic means mounted on the member at a radius which permits rotation of the magnetic means to a position closely spaced with respect to the magnetically-sensitive means, said magnetic means having sufficient attraction for the magnetically-sensitive means when rotated closely thereto to move the lever.

2. In a winding and twisting system, a machine having a hollow spindle for passing a continuous strand, a driving means for the machine, an electrical circuit for controlling the drive means, a take-up means for moving the strand lengthwise of itself, an element extending radially from the spindle to rotate the strand in a revolving path as it moves toward the take-up means, a member, bearing means for mounting the member on the spindle, means for restraining the member from rotating, and strand-catching and switching mechanism comprising a lever which is moveable into and out of the revolving path of the strand, said lever having magnetically-sensitive means associated therewith, magnetic means secured to the member at a radius which permits rotation of the magnetic means to a position closely spaced with respect to the magnetically-sensitive means, said magnetic means having sufficient attraction for the magnetically-sensitive means to move the lever toward said means when the member is rotated to bring the means into proximity to the magnetically-sensitive means, and switch means associated with the lever for opening and closing the control circuit.

3. In a winding and twisting system, a twister, an electrical driving means for the twister, an electrical circuit for supplying power to the driving means, a winder disposed to receive a strand from the twister, and driving means for the winder; mechanism for stopping the transmission of power to the twister and the winder; said twister having a hollow spindle, a package holder supported in relatively coaxial and rotatable relationship with the spindle, means for revolving about the holder a strand passing from the spindle in a direction lateral with respect to the linear direction of movement of the strand whereby the strand passes from the spindle in a revolving path, bearing means for mounting the holder on the spindle in coaxial and rotatable relationship, stationary magnetic holding elements spaced adjacently with respect to the holder, and magnetically-sensitive elements attached to the package holder and disposed for superimposition with said stationary elements in normal operating position to prevent rotation of the holder; said winder having a strand-tension-responsive device for disengaging the driving means for the winder; said mechanism for stopping the system comprising a movable magnetically-sensitive element positioned to be moved into said path of a strand when the package holder is rotated out of operating position; and means mounted on the winder for opening the circuit, said circuit-opening means being responsive to movement of the drive-disengaging means of the winder.

4. In a winding and twisting system, a twister, electrical means for driving the twister, an electrical circuit for energizing the driving means, a winder disposed to receive strand from the twister, driving means for the winder, and mechanism for stopping the transmission of power to the twister and the winder; said twister having a hollow spindle, a stationary strand-guide spaced endwise from the spindle, means attached to the spindle for revolving a strand passing between the spindle and the guide laterally of itself, and a package holder supported in relatively coaxial and rotatable relationship with the spindle; said winder having a strand-tension-responsive device for disengaging the driving means for the winder; said mechanism

for stopping the system comprising a magnetic element mounted in the base portion of the package holder, a magnetically-sensitive reciprocable member positioned to be moved into and out of the revolving path of a strand passing from the spindle to the guide, said member also positioned with respect to a circular path traversed by the magnetic element for movement in response to a variation in magnetic force exerted on the member by the magnetic element as the holder is rotated, and means for opening the circuit, said circuit-opening means being mounted for engagement with the strand passing into the winder from the twister and being responsive to variation in tension of the strand.

5. A strand-catching mechanism for a twister having a hollow spindle, a stationary strand-guide spaced endwise from the spindle, means attached to the spindle for revolving laterally of itself a strand passing between the spindle and the guide, and a package holder mounted in coaxial and rotatable relationship with the spindle, means for restraining the holder from rotating, said mechanism comprising a magnetic element mounted in the holder, a reciprocable element positioned to be moved into and out of the revolving path of a strand passing between the spindle and the guide, said element also positioned with respect to a path of the magnetic element for movement in response to a variation of magnetic force exerted upon it by the magnetic element of the holder when the holder is rotated.

6. In a winding and twisting system, a twister, electrical means for driving the twister, an electrical circuit for supplying power to the driving means of the twister, a winder, means for driving the winder, and means for stopping the transmission of power to the twister and the winder, said twister having a hollow spindle, a stationary strand-guide spaced endwise from the spindle, means attached to the spindle for revolving a strand passing between the spindle and the guide laterally of the lengthwise direction of the strand, and a package holder supported in coaxial and rotatable relationship with the spindle, said mechanism comprising a magnetic element mounted in the holder, a magnetically-sensitive reciprocable member positioned to be moved into and out of the revolving path of the strand passing from the spindle to the guide, said member also positioned with respect to a path of the magnetic element for movement in response to a variation in magnetic force exerted upon it by the magnetic element of the holder as the holder is rotated, and means for opening the circuit connected with the member and responsive to the movement thereof into said revolving strand path.

7. Mechanism for stopping the transmission of power between a twister and an electrical driving means therefor, said twister having a hollow spindle, a stationary strand-guide spaced endwise from the spindle, means attached to the spindle for revolving a strand passing between the spindle and the guide laterally of itself, and a package holder supported in relatively coaxial and rotatable relationship with the spindle, said mechanism comprising a magnetic element supported in the holder and a magnetically-sensitive reciprocable member positioned to be moved into and out of the revolving path of a strand passing from a spindle to the guide, said member also positioned with respect to a path traversed by the magnetic element for movement in response to a variation in magnetic force exerted by the magnetic element on the member as the holder is rotated, and means connected with the member for opening the circuit, said circuit-opening means being responsive to movement of the member into said revolving yarn path.

8. In a winding and twisting system, a twister, electrical means for driving the twister, an electrical circuit for engergizing the driving means, a winder, means for driving the winder, mechanism for stopping the transmission of power to the twister and the winder; said twister having a hollow spindle, a flyer and a package holder supported in relatively coaxial and rotatable relationship; said winder being disposed to receive a strand from the twister and having a strand-tension-responsive device normally in contact with the strand passing from the twister to the winder for disengaging the driving means for the winder, said mechanism comprising a stationary magnet mounted in closely-spaced relationship with, and below, said holder and flyer, at least one magnet attached to the downwardly-facing surface of the holder and normally positioned over the stationary magnet, a reciprocable lever pivotably supported by one portion thereof underneath the flyer and having an upwardly-projecting portion which is swingable into and out of the revolving path of a strand passing from the spindle to a peripheral surface of the flyer, a magnetically-sensitive element supported by the lever at a distance from the spindle axis approximately equal to that of the stationary magnet but spaced therefrom, said element having sufficient attraction for the holder magnet to move the lever toward the flyer when the holder magnet is approximately over the element, a stationary terminal for the circuit mounted on the winder, a movable terminal for the circuit mounted on the strand-tension-responsive device of the winder in engagement with the stationary terminal during operation but separable therefrom by movement of said device in response to a reduction in strand tension.

9. In a winding and twisting system, a twister, electrical means for driving the twister, an electrical circuit for energizing the driving means, a winder, driving means for the winder, mechanism for stopping the transmission of power to the twister and the winder, said twister having a hollow spindle, a flyer, and a package holder supported in coaxial and rotatable relationship with the spindle, a downwardly-facing surface on said holder, and means for restraining the rotation of the holder, said winder disposed to receive strand from the twister and having a drop-wire device for engaging a strand passing from the twister to the winder and being responsive to strand tension for controlling a drive-disengaging means of the winder, said mechanism for the system comprising a magnetic element attached to the downwardly-facing surface of the holder, a tiltable lever supported intermediately of its ends on a stationary pivot having a magnetically-sensitive element secured to it to one side of the pivot at substantially the same radius from the spindle axis as the magnetic element of the holder and the lever having an upwardly extending portion on the side of the pivot opposite said sensitive element which is swingable into the path of a strand passing from the spindle to the flyer periphery but is normally positioned below said path by tilting of the lever caused by the magnetic attraction of the holder element for the magneti-

cally-sensitive element, a stationary terminal for the circuit supported in the winder, and a movable terminal supported on the drop-wire device and held in engagement with the stationary terminal when the dropwire device is in operating position by engagement of the strand therewith as the strand passes from the twister to the take-up means of the winder.

10. In a winding and twisting system, a twister, electrical means for driving the twister, an electrical circuit for energizing the driving means, a winder, driving means for the winder, mechanism for stopping the transmission of power to the twister and the winder, said twister having a hollow spindle, a flyer, a stationary strand-guide spaced endwise from the spindle, a package holder supported in coaxial and rotatable relationship with the spindle and means for restraining the rotation of the holder, said winder having a drop-wire device for engaging a strand passing from the twister to the winder and being responsive to strand tension for controlling a drive-disengaging means of the winder, said mechanism comprising a magnetic element attached to the base of the holder near a peripheral portion of the flyer, a lever pivotably supported on a fixed axis and having a portion extending into a region located upwardly and radially outwardly of the surface of the flyer from which the strand passes from the flyer to the guide to form a balloon about the holder, a magnetically-sensitive strand-engaging member attached to the said portion of the lever, means for urging the said portion of the lever and member to a position which is radially outwardly of the strand path, said means exerting a force which is less than that exerted on the strand-engaging member by the magnetic element of the holder when the element is rotated into close proximity with the member, a stationary terminal of the circuit supported in the winder, and a movable terminal of the circuit supported on the drop-wire device and held in engagement with the stationary terminal when the drop-wire device is in operating position by engagement of the strand therewith as the strand passes from the twister to the take-up means of the winder.

11. In a winding and twisting system, a twister, a winder, electrical means for driving the twister, an electrical circuit for energizing the driving means, an electrical means for stopping the system, said twister having a hollow spindle, a flyer, a package holder supported in coaxial and rotatable relationship with the spindle and means for restraining the rotation of the holder, said winder having a drop-wire device for engaging a strand passing from the twister to the winder and being responsive to strand tension for controlling a drive-disengaging means for the winder, said stopping mechanism comprising a magnetic element attached to the base of the holder near a peripheral portion of the flyer, a lever pivotably supported on a fixed axis and having a portion extending into a region located upwardly and radially outwardly from the surface of the flyer along which the strand leaves the flyer to form a balloon, a magnetically-sensitive member attached to said portion of the lever, an extension of said portion for engaging the strand, said lever being weighted to normally assume a position in which the extension is positioned radially outwardly from the strand path, a stationary terminal of the circuit supported in the winder, and a movable terminal of the circuit supported on the drop-wire device and held in engagement with the stationary terminal when the drop-wire device is in its normal operating position resulting from engagement of the strand therewith as the strand passes from the twister to the take-up means of the winder.

12. In a winding and twisting system, a twister, a winder, electrical means for driving the twister, an electrical circuit for energizing the driving means, a mechanism for stopping the system; said twister having a hollow spindle, a flyer, a package holder, a downwardly-facing surface on said holder, bearing means for mounting the holder on the spindle in rotatable and coaxial relationship therewith, and means for restraining the rotation of the holder; said winder having a drop-wire device for engaging a strand passing from the twister to the winder and being responsive to strand tension for controlling a drive-disengaging means of the winder; said stopping mechanism for the system comprising a stationary magnet mounted in closely-spaced relationship with, and below, said holder and flyer, at least one magnet attached to the downwardly-facing surface of the holder normally positioned over the stationary magnet, a reciprocable lever pivotably supported underneath the flyer and having an upwardly-extending strand-engaging portion which is swingable into and out of the revolving path of a strand passing from the spindle to a peripheral surface of the flyer, a magnetically-sensitive element supported on the lever between the pivot and the strand-engaging portion at a distance from the spindle axis approximately equal to that of the stationary magnet but spaced from the magnet, said element having sufficient attraction for the holder magnet to move the lever toward the holder when the holder is rotated to carry the magnet over the element, an electrically-operated switch for the circuit which energizes the means for driving the twister, a second circuit for energizing the switch to open the first-named circuit, and a pair of terminals in the second circuit, one of which is stationary and the other is mounted on the lever to engage the stationary terminal when the lever is in its normal position out of engagement with the strand.

13. In a winding and twisting system, a take-up device, a strand-supplying device, at least one of said devices being a twister comprising a hollow spindle, an element attached to and extending radially from the spindle to rotate the strand in a revolving path as it moves lengthwise of itself, a member, bearing means for rotatably mounting the member on the spindle, means for restraining the member from rotating, and strand-catching mechanism comprising a lever which is supported for movement into and out of the revolving path of the strand, a magnetically-sensitive element mounted on the lever, magnetic means mounted on the member at a radius which permits rotation of the magnetic means to a position closely spaced with respect to the magnetically-sensitive element, said magnetic means having sufficient attraction for the magnetically-sensitive element when rotated closely thereto to move the lever.

14. In a winding and twisting system, a strand-supplying means, a multiple twist type of take-up twister comprising a hollow spindle, an element attached to and extending radially from the spindle to rotate the strand in a revolving path as it moves lengthwise of itself, a member, bear-

ing means for rotatably mounting the member on the spindle, means for restraining the member from rotating, and strand-catching mechanism comprising a lever which is supported for movement into and out of the revolving path of the strand, a magnetically-sensitive element mounted on the lever, magnetic means mounted on the member at a radius which permits rotation of the magnetic means to a position closely spaced with respect to the magnetically-sensitive element, said magnetic means having sufficient attraction for the magnetically-sensitive element when rotated closely thereto to move the lever.

15. In a winding and twisting system, at least one strand-supplying twister, a multiple twist type of take-up twister comprising a hollow spindle, an element attached to and extending radially from the spindle to rotate the strand in a revolving path as it moves lengthwise of itself, a member, bearing means for rotatably mounting the member on the spindle, means for restraining the member from rotating, and strand-catching mechanism comprising a lever which is supported for movement into and out of the revolving path of the strand, a magnetically-sensitive element mounted on the lever, magnetic means mounted on the member at a radius which permits rotation of the magnetic means to a position closely spaced with respect to the magnetically-sentitive element, said magnetic means having sufficient attraction for the magnetically-sensitive element when rotated closely thereto to move the lever.

16. In a winding and twisting system, two strand-supplying twisters, a multiple twist type of take-up twister comprising a hollow spindle, an element attached to and extending radially from the spindle to rotate the strand in a revolving path as it moves lengthwise of itself, a member, bearing means for rotatably mounting the member on the spindle, means for restraining the member from rotating, and strand-catching mechanism comprising a lever which is supported for movement into and out of the revolving path of the strand, a magnetically-sensitive element mounted on the lever, magnetic means mounted on the member at a radius which permits rotation of the magnetic means to a position closely spaced with respect to the magnetically-sensitive element, said magnetic means having sufficient attraction for the magnetically-sensitive element when rotated closely thereto to move the lever.

17. In a winding and twisting system, a machine having a hollow spindle for passing a continuous strand, a flier attached to and extending radially from the spindle to rotate the strand in a revolving path about the spindle, a support for a wound package, bearing means for rotatably mounting the support on the spindle, means for restraining the support from rotating, a strand-catching mechanism comprising a member movable into and out of the revolving path of the strand, said member comprising an element of magnetic material, and another element of magnetic material being mounted on the support in such spaced relationship with respect to the spindle axis as to be rotatable to a position closely-spaced with respect to the element of the member, at least one of said elements being magnetized and having sufficient attraction for another of said elements in rotatable relationship therewith to move the member into the path of the strand.

18. In a winding and twisting system, a machine having a hollow spindle for passing a continuous strand, a flier attached to and extending radially from the spindle to rotate the strand in a revolving path about the spindle, a support for a wound package, bearing means for rotatably mounting the support on the spindle, means for restraining the support from rotating, a strand-catching mechanism comprising a member movable into and out of the revolving path of the strand, an element of magnetic material mounted on the member, and another element of magnetic material mounted on the support in such spaced relationship with respect to the spindle axis as to be rotatable to a position closely-spaced with respect to the element of the member, at least one of said elements having sufficient attraction for another of said elements in rotatable relationship therewith to move the member into the path of the strand.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,907,551	Kraft	May 9, 1933
2,053,645	Weaver	Sept. 8, 1936
2,148,665	Wolfe	Feb. 28, 1939
2,364,808	Nelson	Dec. 12, 1944
2,400,323	Winslow	May 14, 1946
2,410,674	Nelson	Nov. 5, 1946
2,482,654	Cochran et al.	Sept. 20, 1949
2,487,837	Uhlig	Nov. 15, 1949