Feb. 19, 1946. E. J. ABBOTT ET AL 2,395,028

WINDING MACHINE

Filed March 11, 1944 8 Sheets-Sheet 1

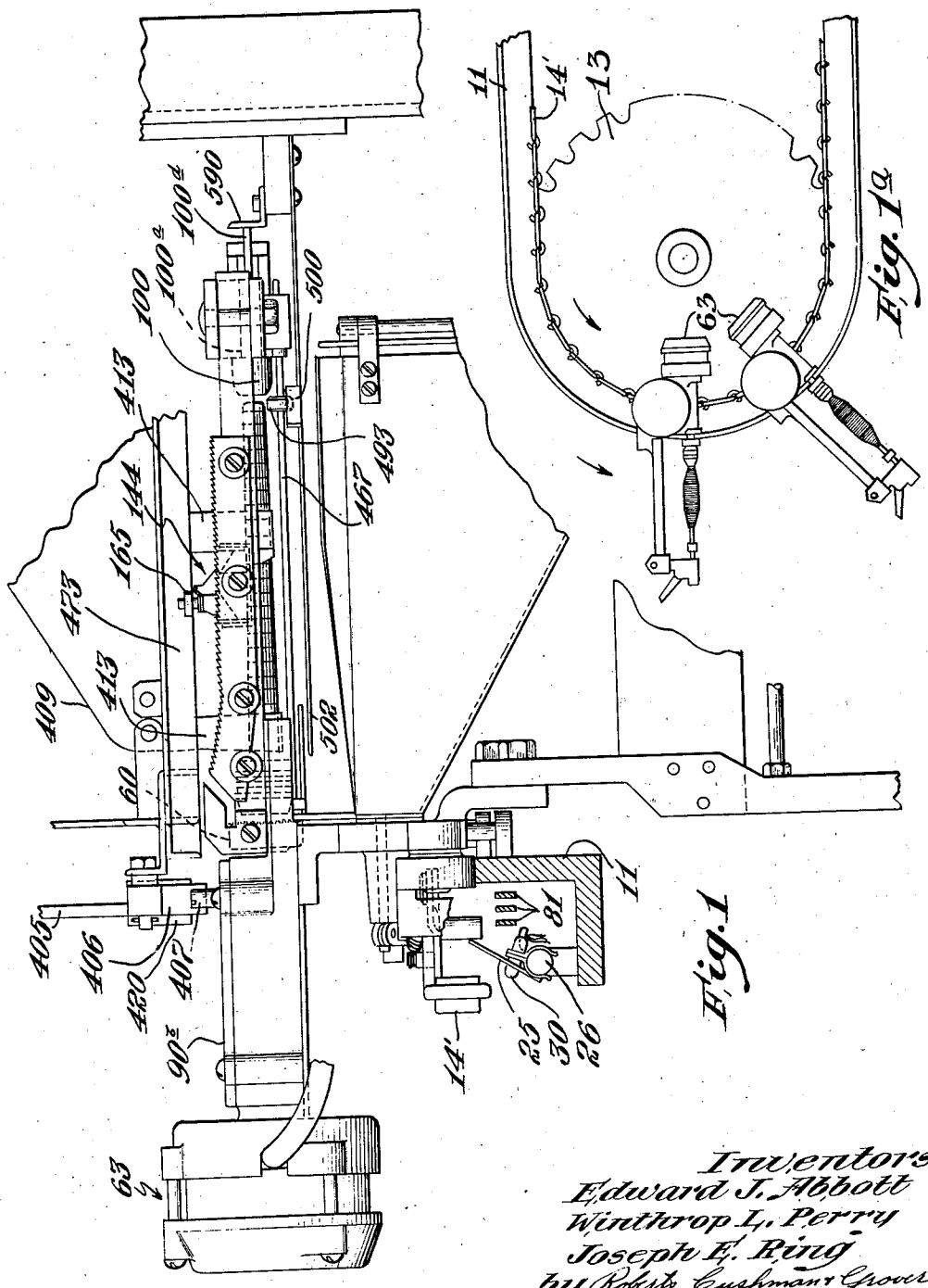


Fig. 1a

Fig. 1

Inventors
Edward J. Abbott
Winthrop L. Perry
Joseph E. Ring
by Roberts, Cushman & Grover
Att'ys.

Feb. 19, 1946. E. J. ABBOTT ET AL 2,395,028

WINDING MACHINE

Filed March 11, 1944 8 Sheets-Sheet 2

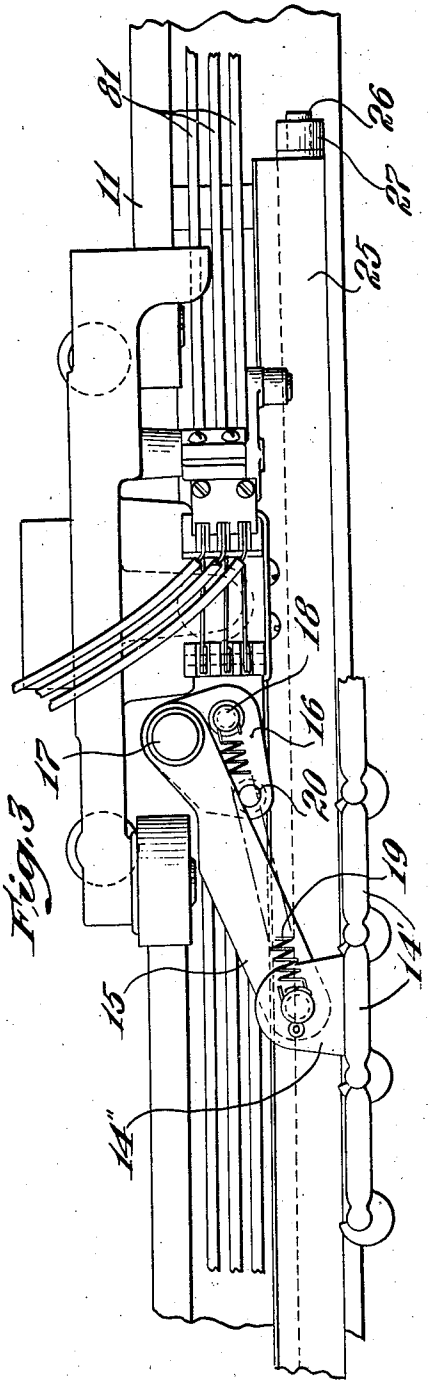


Fig. 3

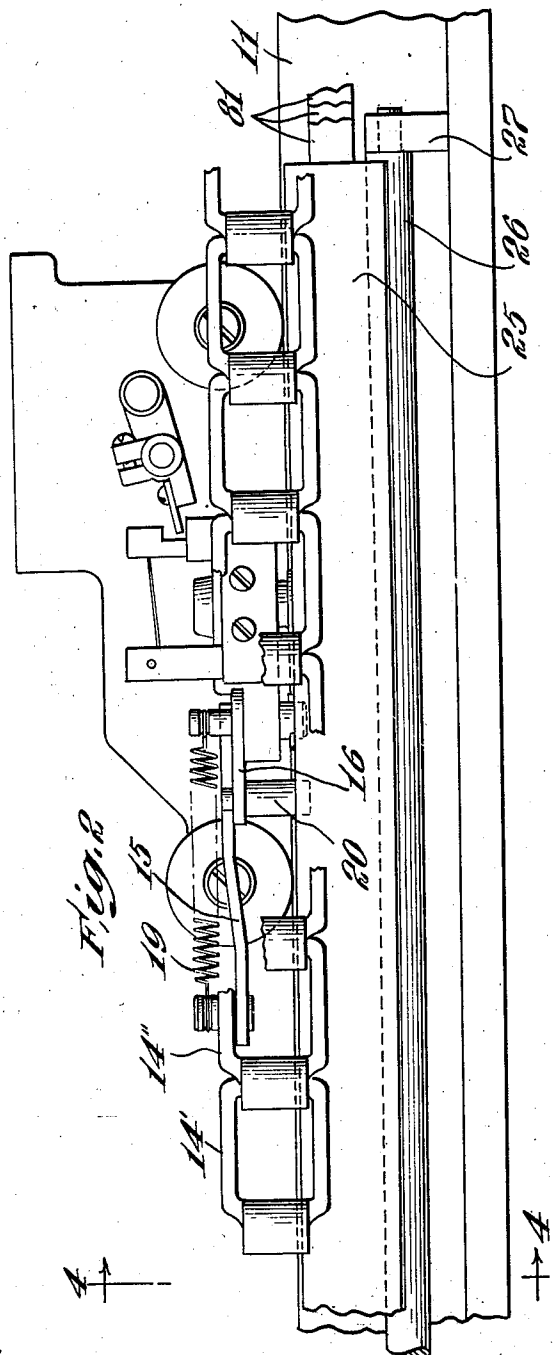


Fig. 2

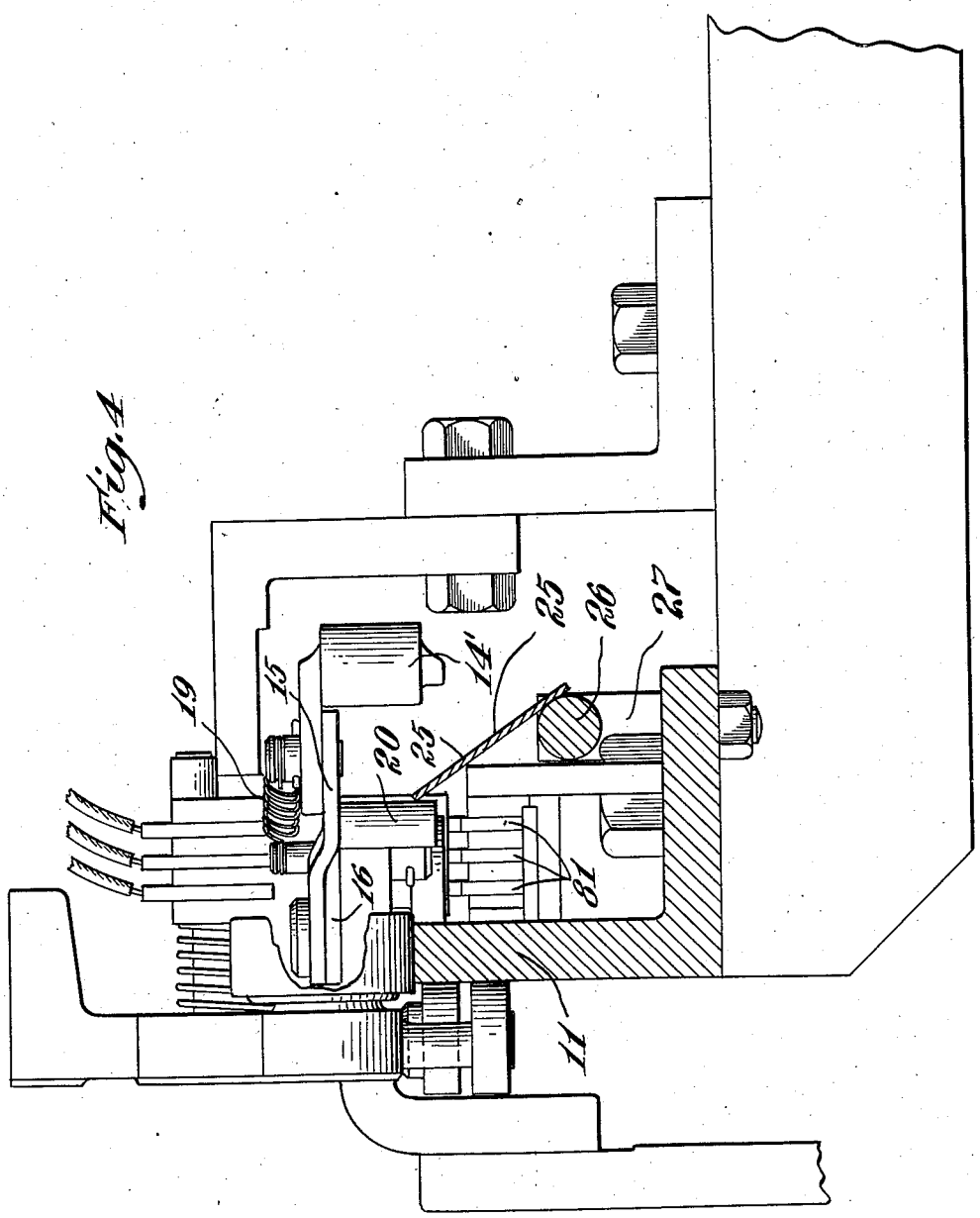
Inventors
Edward J. Abbott
Winthrop L. Perry
Joseph L. Reng
by Pollock Cushman & Grover
Att'ys.

Feb. 19, 1946. E. J. ABBOTT ET AL 2,395,028

WINDING MACHINE

Filed March 11, 1944 8 Sheets-Sheet 3

Fig. 4



Inventors
Edward J. Abbott
Winthrop L. Perry
Joseph E. Ring
by Roberts, Cushman & Grover
Att'ys.

Feb. 19, 1946. E. J. ABBOTT ET AL 2,395,028

WINDING MACHINE

Filed March 11, 1944 8 Sheets-Sheet 4

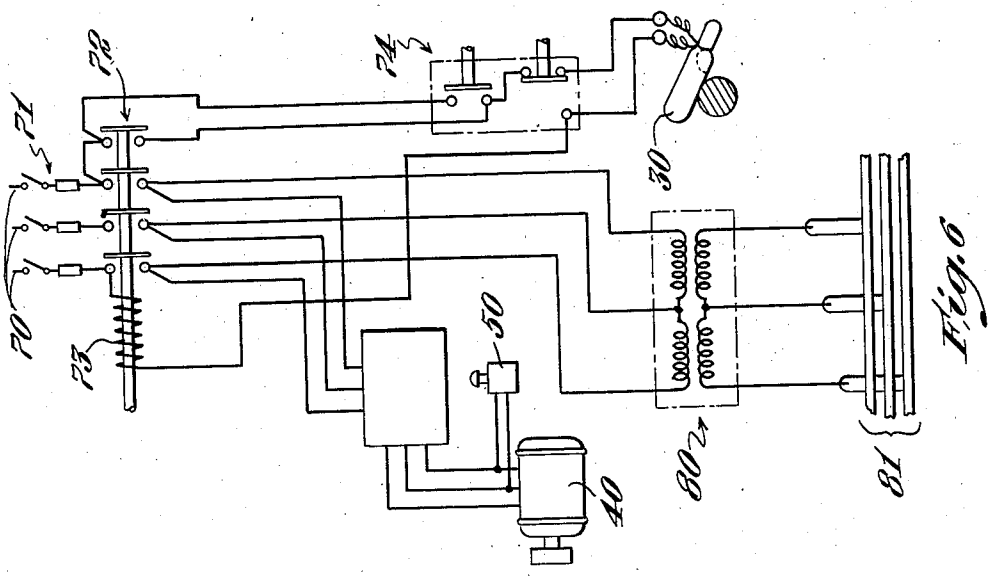


Fig. 6

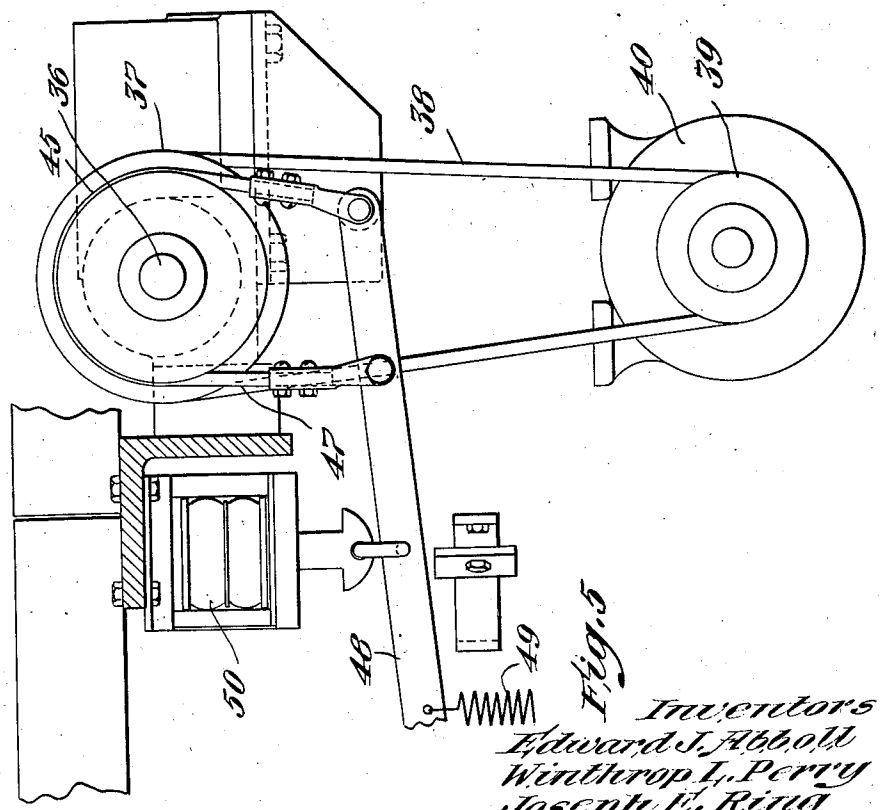


Fig. 5

Inventors
Edward J. Abbott
Winthrop L. Perry
Joseph L. Ring
by Roberts, Cushman & Woodward
Att'ys.

Feb. 19, 1946. E. J. ABBOTT ET AL 2,395,028

WINDING MACHINE

Filed March 11, 1944 8 Sheets-Sheet 5

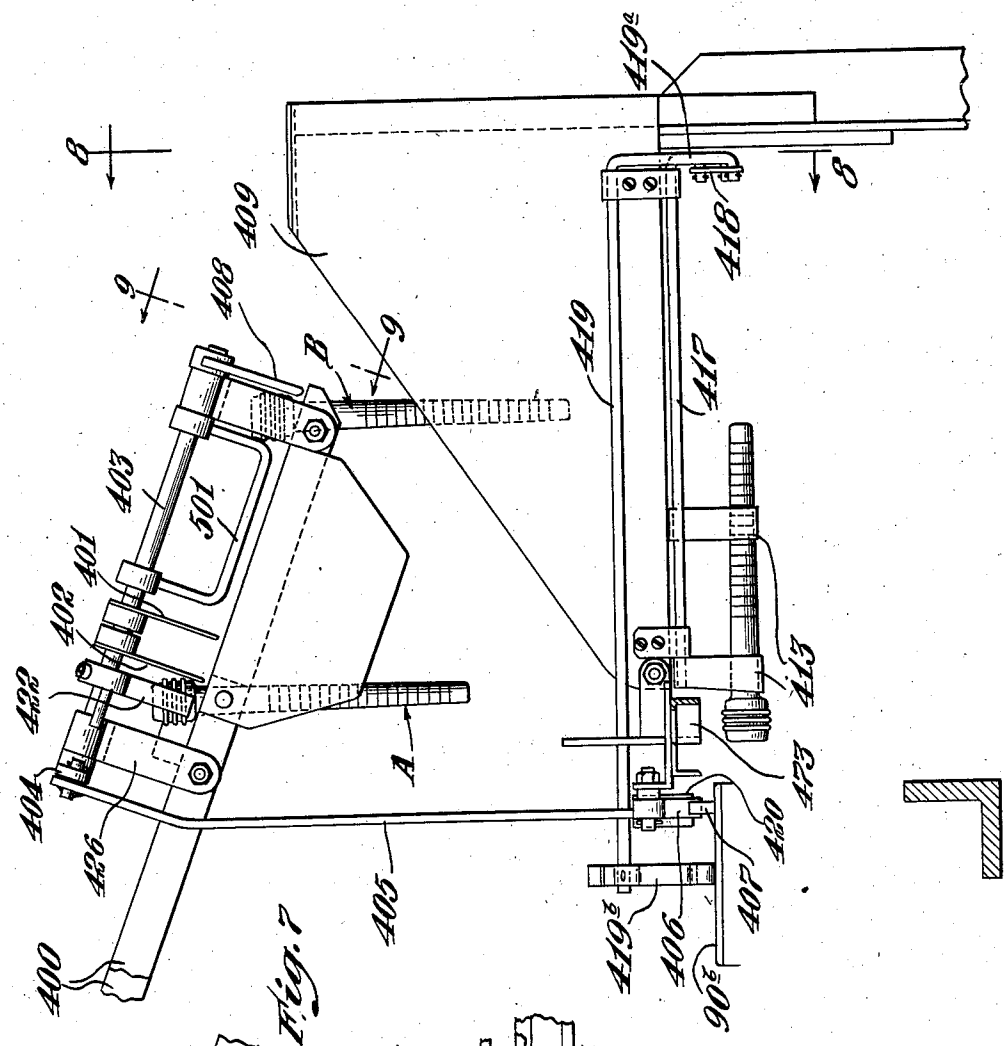
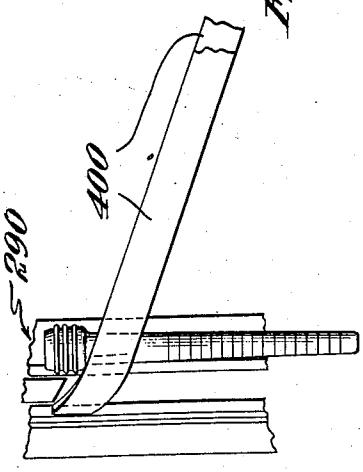


Fig. 7



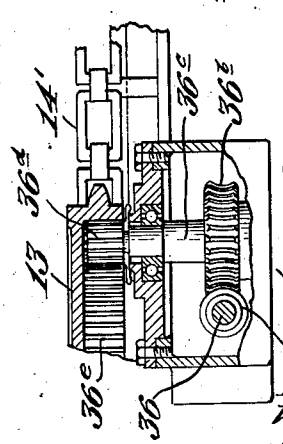


Fig. 5a

Inventors
Edward J. Abbott
Winthrop L. Perry
Joseph E. Ring
By Pollock, Cushman & Grover
Att'ys.

Feb. 19, 1946. E. J. ABBOTT ET AL 2,395,028

WINDING MACHINE

Filed March 11, 1944 8 Sheets-Sheet 6

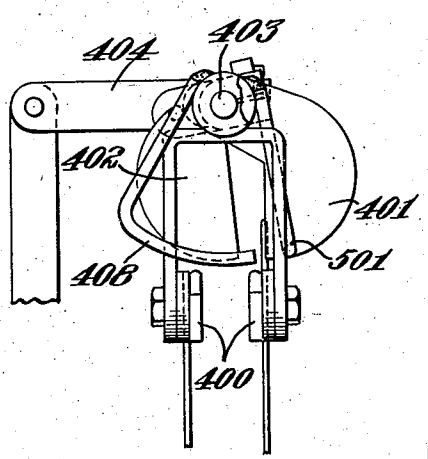


Fig. 9

Fig. 8

Inventors
Edward J. Abbott
Winthrop L. Perry
Joseph E. Ring
By Pollock, Cushman & Glover
Att'ys.

Feb. 19, 1946. E. J. ABBOTT ET AL 2,395,028

WINDING MACHINE

Filed March 11, 1944 8 Sheets-Sheet 7

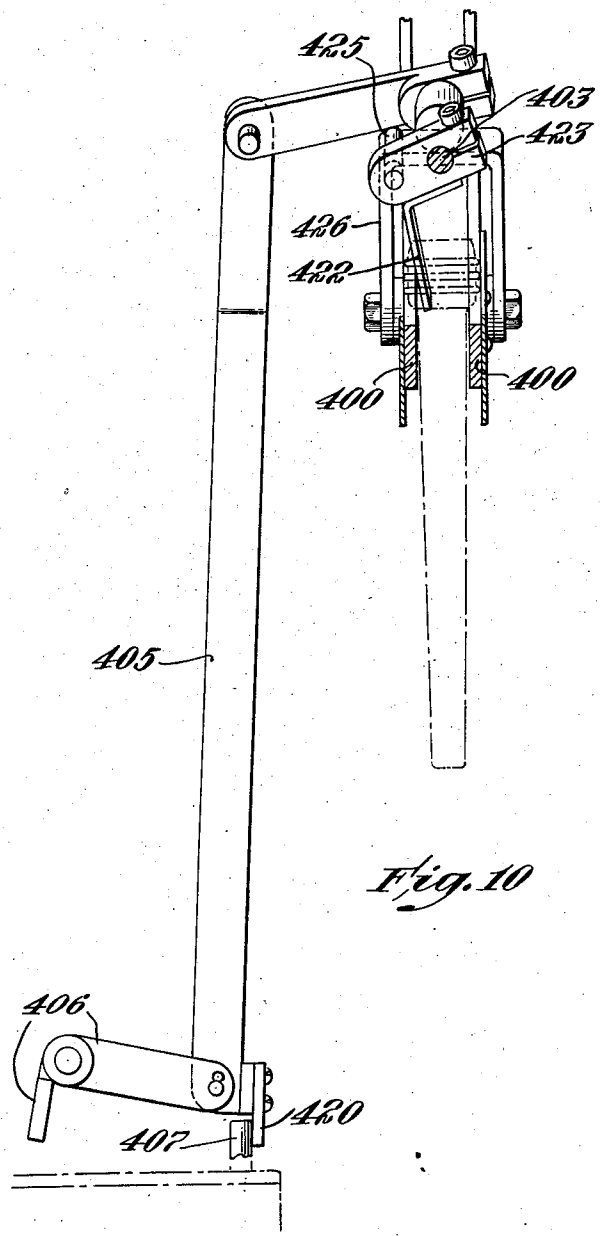


Fig. 10

Inventors
Edward J. Abbott
Winthrop L. Perry
Joseph E. Ring
by Pobats, Cushman & Groves
Att'ys.

Feb. 19, 1946. E. J. ABBOTT ET AL 2,395,028

WINDING MACHINE

Filed March 11, 1944 8 Sheets-Sheet 8

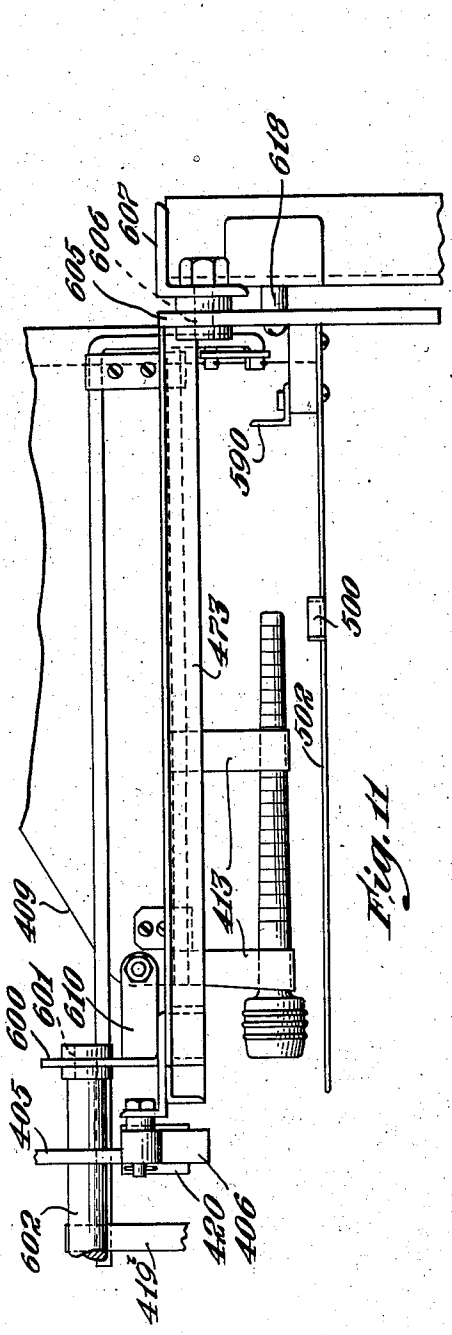


Fig. 11

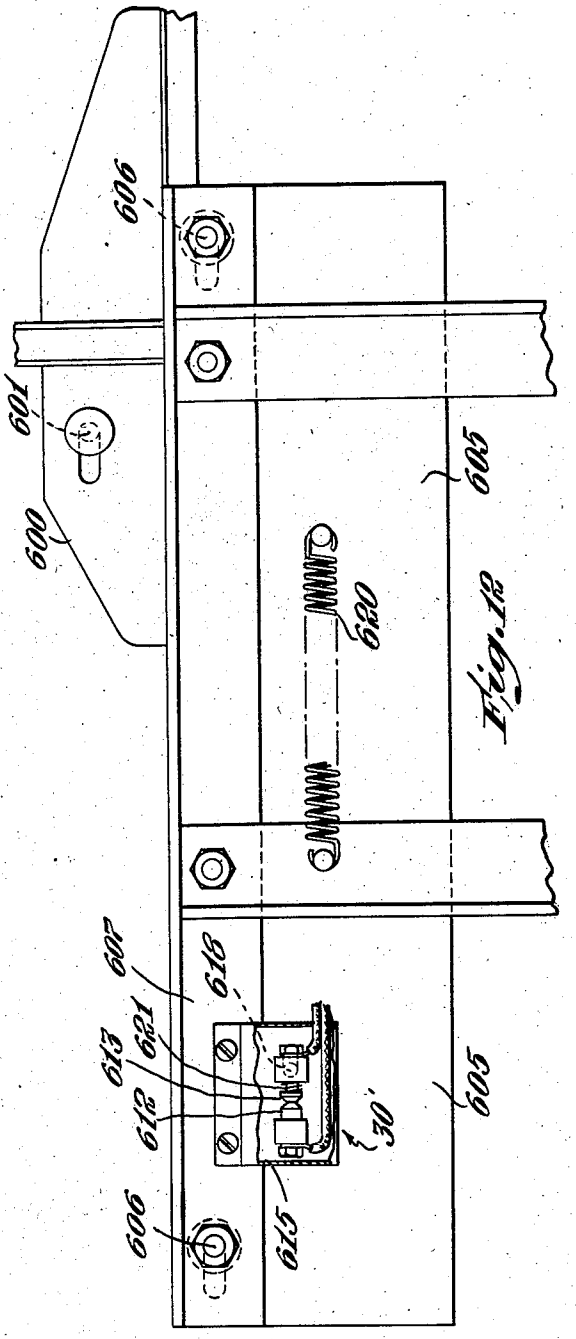


Fig. 12

Inventors
Edward J. Abbott
Winthrop L. Perry
Joseph E. Ring
By Pabst, Cushman & Green
Attys.

Patented Feb. 19, 1946 2,395,028

UNITED STATES PATENT OFFICE

2,395,028

WINDING MACHINE

Edward J. Abbott, Winthrop L. Perry, and Joseph E. Ring, Wilton, N. H., assignors to Abbott Machine Company, Wilton, N. H., a corporation of New Hampshire

Application March 11, 1944, Serial No. 526,016

41 Claims. (Cl. 242—32)

This invention relates to machines which wind yarn and the like, and is particularly applicable to machines in which the winding units are supplied with bobbins by automatic mechanism. The invention is also particularly applicable to winding machines in which parts of the machine are conveyed in a circulatory path about the machine and other parts of the machine do not so circulate around the machine, there being thus a relative movement between the parts that circulate and the parts that do not circulate. The invention is shown by way of example as applied to a multiple unit winding machine in which the several winding units are conveyed in a procession past a relatively non-traveling bobbin-supplying mechanism, as for example, a winding machine such as described in the application of Edward J. Abbott and Winthrop L. Perry, for Winding machine, Serial No. 386,136, filed March 31, 1941, now Patent No. 2,377,367, dated June 5, 1945.

Among the objects of the invention are to provide improved mechanism for stopping the relative movement between the circulating parts and the non-circulating parts such for example as the winding units and the bobbin-supplying mechanism; to provide such stop mechanism that will operate quickly with the minimum of continued relative movement after actuation of the stop mechanism; and to provide such stop mechanism that will be effective upon a variety of accidental occurrences that might tend to jam or break parts of the machine.

Further objects of the invention are to provide improved bobbin-supplying mechanism adapted to deliver bobbins to the several winding units in a more reliable manner; to provide for holding a reserve bobbin in such place and in such manner that it can be most expeditiously delivered to the winding unit and to insure that the successive bobbins delivered to the successive winding units will reach their intended positions in the winding units at uniform time intervals; and to provide for holding a further or second reserve bobbin in position to be delivered to the final or first reserve position. Further objects are to detect the presence of any accidentally misplaced bobbin in the bobbin-supplying mechanism; to detect the lack of a supply of bobbins; and to stop the winding and to prevent further discharge of bobbins from their winding positions in the several winding units upon either of these occurrences.

A further object is to anticipate the eventual absence of a bobbin in the first reserve position by detecting the presence or absence of the bobbin in the second reserve position which is next to pass the first reserve position, and to stop the winding and to prevent further discharge of the bobbins from their winding positions in the several units before there can be any failure of a winding unit to receive a bobbin from the first reserve position.

Further objects of the invention and features of advantage will be apparent from this specification and drawings wherein the invention is illustrated by way of example.

In the drawings:

Fig. 1 is a vertical transverse sectional view through the upper part of the track of a traveling spindle winding machine such as shown in the aforesaid application Serial No. 386,136, showing the upper portion of the winding unit, the upper rail of the track, and the lower portion of the bobbin-supplying mechanism which is being approached by the winding unit;

Fig. 1ª is a fragmentary diagrammatic plan view of a portion of the machine, showing two of the winding units, portions of the frame, a portion of the chain for pulling the winding units around the machine, and the sprocket wheel which drives the chain;

Fig. 2 is a fragmentary view looking from inside of the frame of the machine outwardly, that is, from left to right in Fig. 1, showing the upper rail of the track, a fragment of the chain for pulling the winding units around the machine, the upper portion of a winding unit, and a portion of the stop mechanism of the machine with portions of the winding unit omitted;

Fig. 3 is a plan view of the mechanism of Fig. 2;

Fig. 4 is a vertical sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a diagrammatic view of the electric motor for furnishing the power to operate the sprocket wheel which drives the chain which pulls the winding units, the cross shaft driven by the motor and brake mechanism for quickly stopping the movement of the sprocket wheel and chain;

Fig. 5ª is a fragmentary view showing suitable gearing connecting the motor-driven cross shaft and the chain-driving sprocket wheel;

Fig. 6 is a wiring diagram of the machine;

Fig. 7 is a vertical sectional view similar to Fig. 1 but omitting many parts of the winding unit and showing particularly the bobbin-supplying mechanism;

Fig. 8 is a vertical sectional view on the line

8—8 of Fig. 7 with certain parts omitted and broken away;

Fig. 9 is a fragmentary sectional view on the line 9—9 of Fig. 7;

Fig. 10 is a diagrammatic view similar to Fig. 8 but with numerous parts omitted to expose the detector finger that feels for a bobbin in the second reserve position, this view showing the position of the parts when there is an absence of a bobbin in the second reserve position, the position of a bobbin in the second reserve position being shown in broken lines;

Fig. 11 is a vertical sectional view similar to Fig. 1, showing a modified form of mechanism; and

Fig. 12 is a right side elevation of the mechanism of Fig. 11.

Referring to the drawings, the winding units, frame, and automatic mechanism for tending the several winding units may for example be such as described in the above application Serial No. 386,136. Thus the several winding units (of which two are shown diagrammatically in Fig. 1[a]) preferably travel around a suitable guideway, of which the upper rail 11 is shown, the guideway defining opposite straight and semi-circular runs as in said application and the patent to Abbott, No. 2,160,810. The units are preferably conveyed around the guideway by conveying mechanism which includes an endless chain 14' running on sprocket wheels 13 (of which one is shown in Fig. 5[a]).

The winding units which are shown as embodying the construction described in said application, may be of any desired construction adapted to wind yarn into packages upon bobbins that are automatically fed to and discharged from the several units. Thus the winding unit shown in Fig. 1 includes a hollow driving head 60 (shown in dotted lines) driven by an electric motor 63, and adapted to receive the base of the winding bobbin, a reciprocating traverse assembly indicated generally by the reference character 144, and a hollow outer bobbin-holding center 100. The outer center 100 is mounted on a plunger 100[a] adapted to be retracted by a bell crank 100[d]. Fig. 1 shows the winding unit at a position where the bobbin has been completed and doffed from the centers 60 and 100, with the center 100 held retracted by engagement of the bell crank 100[d] with a stationary angle piece 590 as described in said application.

The winding units are further shown as being of the kind described in said application constructed and arranged to wind filling wound bobbins, the traversing thread guide assembly having a reciprocating movement of short length coupled with a progressive advance from the base end of the bobbin to the tip end thereof so as to distribute the yarn on the bobbin in the form of nested conical layers. Each individual winding unit is shown as provided with a rod 467 spring-pressed toward the left in Fig. 1 and adapted when tripped to the right to actuate winding-stopping mechanism on that winding unit. A collar 493 fastened on the trip rod 467 is adapted to be engaged by a stationary cam 500 to trip the rod 467 and stop the winding on the unit if winding has not already been stopped by the time the unit reaches the cam 500. In Fig. 1, the winding unit is shown as having passed the cam 500. For carrying the thread guide assembly to the inner center 60 after the completion and doffing of a bobbin, there is provided a stationary cam 473 in the form of an angle piece disposed diagonally across the path of travel of the units and adapted to react on a roller 165 on the thread guide assembly to force the thread guide assembly to the left preparatory to the reception of a new empty bobbin between the centers 60 and 100 of the unit. A stationary plate-like cam element 502 is adapted to engage the run of yarn which extends from the thread guide to the discharged bobbin and force this yarn over to the left in Fig. 1, toward the inner center 60 of the winding unit.

The bobbin-supplying mechanism of Fig. 7 (which the unit of Fig. 1 is about to reach), embodies certain features of the form of bobbin-supplying mechanism of Figs. 13, 14 and 15 of said application. More particularly, the bobbin-supplying mechanism includes a bobbin magazine of which a fragment is indicated at 290 adapted to deliver bobbins to an inclined slide in the form of spaced parallel bars 400 down which the bobbins slide, hanging by their enlarged ends. From the parallel bars 400, a bobbin is received between parallel plates 409 having inclined upper edges, and slides down these inclined upper edges until detained in a horizontal position by fingers 412, 413 in position to be engaged between the opposed centers 60 and 100 of a passing winding unit.

The centers 60 and 100 of a passing winding unit grasp the new bobbin and withdraw it from the fingers 413, winding of the new bobbin begins, and a further new bobbin is fed to the fingers 412, 413.

As shown in Fig. 8, the fingers 412, 412 are mounted on a horizontal shaft 416 having a down-turned crank extension 416[a] and the fingers 413, 413 are mounted on a horizontal shaft 417 having a down-turned crank extension 417[a]. The two crank portions 416[a] and 417[a] engage in recesses in a connecting link 418 to which is connected a down-turned crank portion 419[a] of a horizontal shaft 419. At the opposite end of shaft 419 it carries a finger 419[b] adapted to be lifted by the upper surface of the cam cover plate 90[b] of the passing winding unit, thus turning the shaft 419, shifting the link 418 to the right in Fig. 8 and turning the shafts 416 and 417 and the fingers 412, 413 in a counterclockwise direction to cause the fingers to open and discharge the bobbin to the winding unit which has grasped the bobbin in its centers 60, 100. A spring 419[c] restores the fingers to their normal position of Fig. 8 as soon as the cover plate 90[b] of the winding unit has passed out from under the finger 419[b].

The invention is particularly concerned with preventing injury to any of the winding units or to the bobbin-supplying mechanism in case of failure of any of the bobbins to move to and from the winding units at the proper time and in the proper position. Defective bobbins may be encountered, extraneous threads may be present or some part of the apparatus or one or more bobbins in the apparatus may become stuck, with a consequent tendency to force some part of the traveling winding unit against some unyielding object, such as a misplaced bobbin, with consequent tendency to break or injure the bobbin-supplying mechanism or the traveling unit which is involved. This danger is averted by this invention which provides for quickly stopping the relative movement between the winding units and the bobbin-supplying mechanism when there is any tendency to jam or break any part of the machine.

A yieldable connection is provided for permitting momentary continued movement of at least a portion of the conveying means when movement of a circulatory part of the machine is abnormally resisted by a non-circulatory part of the machine, and means actuable in response to yielding of such connection is provided to stop the conveying means, preferably also applying a brake thereto and de-energizing both the electric motor drive for the conveying means and the individual electric motors of the winding units. Such yieldable connection is interposed in the conveying mechanism in the preferred form of mechanism illustrated. Thus, in Figs. 2 and 3 the conveyor chain 14' is shown as connected by extensible links to the several winding units. Such link may for example comprise a part 15 pivoted to a lug 14'' on a link of the chain 14', a part 16 pivoted at 17 to the part 15 and pivoted at 18 to the frame of the traveling unit, and a tension spring 19 reacting on the chain and on the traveling unit to oppose but yieldingly permit retarding of the winding unit with respect to the chain. In the normal operation of the machine, the extensible link occupies the position shown in Figs. 2 and 3. When an abnormal force is exerted on the winding unit tending to retard it with respect to the chain, the extensible link lengthens, permitting momentary continued movement of the chain, the part 16 pivoting about the pivot point 18. By way of example of mechanism for stopping the relative movement, there is shown a form of stop mechanism particularly adapted for use in machines where the possible interference with a traveling unit may be expected to occur at only one zone in the path of travel around the machine. It will be apparent that, especially if it is desired to guard against jams or interferences occurring anywhere in the path of the units, stop mechanism may be provided to respond to an elongation of an extensible link occurring at other places in the path of travel of the units around the machine.

As illustrated herein, the part 16 of the link carries a vertical pin 20 (Figs. 2, 3 and 4), and along the path of travel of the winding unit passing the bobbin-changing mechanism there is provided a blade 25, Figs. 2, 3 and 4, attached to and supported by a rod 26 which is pivotally mounted at its ends in brackets 27 on the upper rail 11. This blade 25 is normally inclined toward the path of travel of the downwardly projecting pins 20 of the extensible links of the traveling units as shown in Fig. 4. Upon extension of one of these links and consequent movement of its pin 20 to the right in Fig. 4, the blade 25 is rotated about its pivot points. The rod 26 which carries the blade 25 also carries a mercury switch 30, Fig. 1, which is closed in the normal position of the blade 25. Swinging of the blade 25 by a pin 20 of a passing winding unit thus turns the switch 30 to an open position, operating suitable stop mechanism to stop the traveling movement of the winding units.

Referring to Figs. 5 and 5a the driving sprocket 13 for the chain 14' is driven through suitable gearing from a cross shaft 36, the cross shaft in turn being driven through a pulley 37, belt 38, pulley 39 and electric motor 40.

Fig. 5a shows by way of example suitable gearing for connecting the cross shaft 36 and the sprocket 13, such gearing comprising a worm 36a, a worm wheel 36b, shaft 36c, pinion 36d, and internal teeth 36e on the sprocket 13.

On the cross shaft 36 there is provided a brake drum 45 adapted to be frictionally braked by a brake band 47. A brake lever 48 to which is attached a tension spring 49 tends to apply the brake to the drum, but is normally held in inactive position by a solenoid 50 which is actuated during driving of the motor 40. When the motor 40 is de-energized the solenoid 50 is also de-energized and the tension spring 49 instantly becomes effective to apply the brake to the brake drum 45 and stop the movement of the sprocket 13 and chain 14'.

Referring to the wiring diagram of Fig. 6, three-phase current is supplied to the machine by main conductors 70 through a main switch 71 and a magnetically closed switch 72, the magnet 73 for closing the switch 72 being controlled by a push button stopping and starting switch 74 in conventional manner. The mercury switch 30, adapted to be opened by the extensible links of the traveling units, is interposed in the starting switch circuit which includes the magnet 73. Thus opening the mercury switch 30 de-energizes the magnet 73 in the same manner as pressing the stop button of the starting switch, allowing the main magnetic switch 72 to open. As will be seen from the wiring diagram, when the switch 72 is thus opened, the chain-driving motor 40 and solenoid 50 are both de-energized, thus stopping the chain of the machine instantly. Likewise the transformer 80 that furnishes current of reduced voltage to the rails 81 for driving the individual motors of the winding units is also de-energized.

In operation, whenever any one of the winding units passing the winding-unit tending mechanism is subjected to an unusual retarding action, for example by a bobbin becoming misplaced or one of the parts of the unit becoming stuck and unduly resisting its usual movement by any of the stationary cams of the tending mechanism, the extensible link which connects the unit to the chain 14' lengthens. The pin 20 then swings the blade 25 to open the mercury switch 30, and the electric circuit of the machine is de-energized, the progress of the chain being instantly arrested by the spring-actuated brake mechanism. When the condition which brought about this stoppage is corrected and the extensible link of the unit again shortens to its normal length, the mercury switch 30 closes and the machine can be energized by pressing the starting button of the starting switch 74.

The machine also includes an improvement in the bobbin-supplying mechanism and provision for use of the stop mechanism to de-energize the machine in case of any failure of the bobbins to pass through the bobbin-supplying mechanism in the intended manner.

The bobbin-supplying mechanism shown in Fig. 7 includes a pair of fingers 401 and 402 mounted on a shaft 403 and adapted to be oscillated by a crank 404 and lifter rod 405 to release the endmost one of the row of bobbins lying in between the rails 400 at the position A in Fig. 7. It will be understood that the bobbin magazine 290 supplies bobbins to the rails 400 in sufficient quantity normally to keep the space between finger 402 and the bobbin magazine full or nearly full of bobbins, although for simplicity of illustration only the bobbin at finger 402 and the bobbin just leaving the magazine 290 are shown in this space.

The lower end of the lifter rod 405 is connected to a bell crank 406 of which one arm lies in the path of an upwardly projecting pin 407 on the cam cover plate 90b of each of the traveling winding units, so that as each winding unit reaches

the bell crank 406 the above-described linkage is actuated to release a bobbin.

The fingers 401 and 402 are shaped and disposed on their actuating shaft 403 differently than in the machine of the above application Serial No. 386,136. As shown in Figs. 7 and 9, which show the lifter rod 405 and associated mechanism in its normal position before it is actuated by a traveling unit, the finger 402 is shaped and positioned to block the progress of bobbins on the rails 400, while the finger 401 is shaped and positioned to be clear of the path of bobbins on the rails 400. Thus the stack of bobbins on the rails 400 is normally supported by the finger 402 as shown in Fig. 7. Lifting of the lifter rod 405 by the passing winding unit removes the finger 402 from the path of the bobbins, allowing a bobbin to descend to and be detained by the finger 401 which is simultaneously moved into the path of the bobbins. In the return movement of the lifter rod and shaft 403, the finger 401 releases the bobbin it has temporarily detained, and the finger 402 simultaneously returns into position to support the following bobbins, one of which is shown so supported in Fig. 7.

Moreover, in the present machine, instead of allowing a bobbin to pass without interruption from the finger 401 to the holding fingers 412, 413, the bobbin is detained at the lower end of the rails 400 by a further finger 408 which is mounted on and actuated by the shaft 403. As shown in Figs. 7 and 9 this further finger 408 is so shaped and positioned on the rod 403 as to block the passage of a bobbin on the rails 400 when the lifter rod 405 is not lifted to its elevated position, thus holding a bobbin in the position indicated at B in Fig. 7.

After one winding unit removes a bobbin from the holding fingers 412, 413, the next following winding unit actuates the lifter rod 405 and shaft 403 to release the bobbin from the position B, allowing it to pass down, guided by the plates 409, 409 to the holding fingers 412, 413. Return movement of the lifter rod 405 and shaft 403 permits another bobbin to pass down the rails 400 to position B at the finger 408. This position B may be referred to as the first reserve position, while the position A of a bobbin retained by the finger 402 may be referred to as the second reserve position.

The space between these two reserve positions is utilized not only to keep the bobbins separate but also to provide a space for a detector adapted to feel for any bobbin that may have become misplaced or stuck in passing between these positions. As shown in Figs. 7, 8 and 9 a detector element 501 in the form of a U-shaped loop of wire fastened to the rod 403 is located in the space between the finger 401 and the place occupied by a bobbin at the position B, and by sweeping across this space will strike any bobbin which has become misplaced on the rails 400. Thus if by any misplacement of the bobbin approaching position B the bobbin does not extend down vertically between the rails 400 as intended, it will be struck by the detector element 501 and movement of the rod 403, crank 404, lifter rod 405 and bell crank 406 thus blocked. The downwardly extending arm of the bell crank 406 then detains the winding unit, retards the winding unit with respect to the chain 14' and brings about operation of the stop mechanism as above described to stop the chain and de-energize the machine.

As explained above the lifter rod 405 is raised when the pin 407 of a winding unit engages the bell crank 406. When the pin 407 of the winding unit has passed the downwardly extending arm of the bell crank 406 the lifter rod 405 drops. Instead of allowing the lifter rod to drop to the same position each time, provision is made for checking the downward motion of the lifter rod at one position when there is a bobbin in between the rails 400 in advance of finger 402, and allowing the lifter rod to drop to an abnormally low position when any failure in the supply of bobbins is so imminent that no bobbin is present at finger 402. In this abnormally low position of the lifter rod 405 as shown in Fig. 10 a lug 420 at the lower end of the lifter rod drops into position in front of the pin 407 of the passing winding unit and detains the pin and winding unit actuating the stop mechanism as above described to stop the chain and de-energize the machine.

Normally the lifter rod is prevented from dropping to the abnormally low position shown in Fig. 10 by a feeler 422 engaging the head of the bobbin just in advance of the finger 402 on the return or downward stroke of the lifter rod 405. If a bobbin is present in this position the downward movement of the lifter rod is checked at the position shown in Fig. 8 where the lug 420 will clear the passing pin 407. However, if a bobbin has failed to reach the position at which the feeler 422 operates, the feeler 422 can swing to the position shown in Fig. 10, allowing the lifter rod 405 to swing downwardly far enough so that the lug 420 lies in front of the traveling pin 407. The feeler 422 is secured to the rod 403 by a bracket 423 clamped onto the rod 403 and carrying a pin 425 (Figs. 7 and 10). In the absence of a bobbin at the feeler 422, the downward movement of the lifter rod 405 is finally checked by engagement of the pin 425 with the top of a stationary yoke 426 as shown by Fig. 10, allowing the lug 420 to occupy the position shown in Fig. 10.

It will now be seen that the invention prevents the winding units from discharging their bobbins in case there is any failure or imminent failure in the supply of bobbins in the bobbin-supplying mechanism. The winding on the several units is stopped and the relative movement which causes their bobbins to be released by action of the cam 590 is stopped. Thus if the supply of new bobbins fails, or is about to fail, the winding units cannot discharge their old bobbins from winding position until this condition is corrected, and thus cannot lose the end of yarn that should be clamped to the next new bobbin.

Although the mechanism described above is preferred, certain advantages can be secured by the mechanism now to be described. In the mechanism of Figs. 11 and 12, the yieldable connections between the winding units and the conveyor chain 14' can be omitted and replaced by non-yieldable connections such as ordinary links. In Figs. 11 and 12 the automatic mechanism for tending the several winding units is provided with a yieldable connection to the frame of the machine, so that in case the tending mechanism offers, either directly or through a misplaced bobbin, an abnormal resistance to travel of the winding units, the tending mechanism can yield and move slightly in the direction of travel of the winding units. The yielding of such connection and the slight shift of the tending mechanism are employed to actuate stop mechanism to stop the conveying means.

Referring to Fig. 11 a plate 600 is held by and is longitudinally slidable on a pin 601 which is carried by a rod 602 connected to a suitable part of the stationary frame of the machine. Another plate 605 is held by and is longitudinally slidable on pins 606 (Figs. 11 and 12) which are held by an angle piece 607 constituting part of the stationary frame.

The two longitudinally slidable plates 600 and 605 constitute the support for the various portions of the automatic tending mechanism which are encountered by the passing winding units. Thus the bobbin delivering plates 409, 409 are secured at one end to the longitudinally slidable plate 605 and are connected by brackets 610 to the longitudinally slidable plate 600. As in the construction shown in Fig. 8 bobbin-supporting fingers 412, 413 are supported from the bobbin-delivering plates 409, 409, and hence in this construction of Figs. 11 and 12 are in turn supported by the slidable plates 600 and 605. The angle piece 473 that acts as a cam to shift the thread guides of the several units to the left, is connected at its opposite ends to the two plates 605 and 600. The lifter-rod crank 406 is connected to the angle piece 473 and hence to the plates 605 and 600. The cam 500 for tripping the trip rod 467 of the winding units to stop winding, and the cam element 502 which acts on the run of yarn extending from the thread guide to the discharged bobbin, are both suspended from the right-hand plate 605. Likewise the angle piece 590, which acts as a cam to open the centers of the passing winding units, is suspended from the plate 605.

An electric switch 30' consisting essentially of two contact elements 612 and 613 adapted to be opened, is contained in a casing 615 which may conveniently be mounted on the angle piece 607 of the frame. Contact element 612 is mounted upon the casing 615 and hence remains stationary. Contact piece 613 is carried by a pin 618 which is carried by the longitudinally slidable plate 605. A tension spring 620 connected to the stationary frame and to the slidable plate 605 normally retains the plate 605, the plate 600, and the parts carried by these plates in the position shown in Fig. 12, in which the swtich 30' is closed. The plate 605 and spring 620 thus constitute a yieldable or extensible connection between the winding tending mechanism and the stationary frame of the machine. The movable contact piece 613 of switch 30' may have a slight freedom of movement with respect to the pin 618 and be normally seated against the stationary contact piece 612 by a spring 621. A shift of the plate 605 to the right in Fig. 12 opens the switch 30'.

The switch 30' is connected in the circuit shown in Fig. 6 in place of the mercury switch 30, and when opened, is adapted to stop the traveling movement of the winding units, apply the brake to the brake drum 45, and de-energize the machine in the same manner as opening of the switch 30.

Thus when a winding unit passing through the winding tending mechanism becomes jammed against any of the parts thereof, or a bobbin becomes misplaced and jammed between the winding unit and any of the parts of the winding tending mechanism, the winding tending mechanism is shifted to the right in Fig. 12 by the motion of the winding unit, the switch 30' opens, the travel of the winding units is quickly stopped, and the machine is de-energized.

Likewise, when there is any misplacement of a bobbin in the bobbin-supplying mechanism and the lifter-rod bell crank 406 is blocked against turning when engaged by a traveling winding unit and also when there is an imminent failure of bobbins at the finger 402 of the bobbin-supplying mechanism and the lug 420 drops into position to engage the pin 407 of the passing unit as in Fig. 10, the relative movement between the units and the winding unit tending mechanism is interfered with, and the plates 600 and 605 and their associated parts are shifted by the motion of the winding unit, with the same result of opening switch 30' stopping the travel, and de-energizing the machine.

We claim:

1. In a winding machine having therein a plurality of winding units, bobbin-supplying mechanism adapted to deliver bobbins to the several winding units, and conveying means for causing relative movement between the winding units and the bobbin-supplying mechanism to associate the latter with the several winding units, the combination of a yielding connection in said conveying means adapted to yield upon the occurrence of a force abnormally retarding such relative movement, and stop mechanism for the conveying means actuated in response to said yielding of said yieldable connection.

2. In a winding machine having therein a plurality of winding units, bobbin-supplying mechanism adapted to deliver bobbins to the several winding units, and conveying means for moving the winding units in a procession past the bobbin-supplying mechanism, the combination of a yielding connection in said conveying means adapted to yield upon the occurrence of a force abnormally retarding a winding unit, and stop mechanism for the conveying means actuated in response to said yielding of said yieldable connection.

3. In a winding machine having therein a plurality of winding units, bobbin-supplying mechanism adapted to deliver bobbins to the several winding units, and conveying means for moving the winding units in a procession past the bobbin-supplying mechanism, the combination of yieldable connections in said conveying means adapted to transmit pull to the respective winding units, each said yieldable connection being adapted to yield upon the occurrence of a force abnormally retarding its respective winding unit, and stop mechanism for the conveying means actuable in response to said yielding of such yieldable connection.

4. In a winding machine having therein a plurality of winding units, bobbin-supplying mechanism adapted to deliver bobbins to the several winding units, and a traveling flexible traction element for pulling the winding units in a procession past the bobbin-supplying mechanism, the combination of extensible connections connecting the several units to the traction element, and stop mechanism for the flexible traction element actuable in response to abnormal extension of the extensible connection between a winding unit and the traction element when such unit is abnormally retarded.

5. In a traveling unit winding machine having ing a flexible traction element and a plurality of winding units pulled thereby, the combination therewith of a spring interposed between a winding unit and the traction element and adapted to

permit said unit to be retarded relatively to the traction element, stop mechanism for the traction element including a movable member located along the path of travel of the units, and means on the said unit for operating the movable element of the stop mechanism upon such retarding of the said unit relatively to the traction element.

6. In a traveling unit winding machine having a flexible traction element and a plurality of winding units pulled thereby, the combination therewith of a spring interposed between a unit and the traction element and adapted to withstand the force of conveyance of the said unit, linkage connected to the said unit and to the traction element, said linkage permitting the unit to be retarded relatively to the traction element, a portion movable by said linkage when the unit is so retarded, and stop mechanism for the traction element including a member located along the path of travel of the units and operated by said movable portion.

7. In a traveling unit winding machine having a flexible traction element and a plurality of winding units pulled thereby, the combination therewith of a spring interposed between a unit and the traction element and adapted to permit said unit to be retarded relatively to the traction element, stop mechanism for the traction element including a movable member located along the path of travel of the units, and an actuating member traveling with the unit and laterally movable when the unit is retarded relatively to the traction element, thereby to actuate the movable member of said stop mechanism.

8. In a traveling unit winding machine having a flexible traction element, driving connections for the traction element including an electric motor, and a plurality of winding units adapted to be moved in a procession by the flexible traction element, the combination of extensible connections connecting the several winding units to the flexible traction element, an electric switch adapted to stop said motor, and means, actuated by abnormal extension of an extensible connection between a winding unit and the traction element, for operating the switch to stop the motor.

9. In a traveling unit winding machine having a flexible traction element, driving connections for the traction element including an electric motor, and a plurality of winding units adapted to be moved in a procession by the flexible traction element, the combination of extensible connections connecting the several winding units to the flexible traction element, an electric switch adapted to stop said motor, a switch-actuating member disposed along the path of travel of the units, and means for moving said switch-actuating member upon abnormal extension of the extensible connection between a unit and said traction element.

10. A multiple unit winding machine having therein a plurality of winding units, means for conveying said winding units in a procession, winding-unit tending mechanism past which the winding units are adapted to move, said winding-unit tending mechanism being yieldably shiftable in the event of interference between said winding-unit tending mechanism and a traveling winding unit, and means for stopping said conveying means upon the occurrence of such shift of the winding-unit tending mechanism.

11. A multiple unit winding machine having therein a plurality of winding units, means including an electric motor for conveying said winding units in a procession, winding-unit tending mechanism past which the winding units are adapted to move, said winding-unit tending mechanism being yieldably shiftable in the event of interference between said winding-unit tending mechanism and a traveling winding unit, and means for stopping said conveying means, said stopping means including an electric switch and means whereby such shift of the winding-unit tending mechanism actuates said switch to stop the motor.

12. In a traveling unit winding machine having a flexible traction element, driving connections for the traction element including an electric motor, and a plurality of winding units adapted to be moved in a procession by the flexible traction element, the combination of extensible connections connecting the several winding units to the flexible traction element, means for braking the movement of the traction element, and means for controlling the braking means so as to render the braking means operative upon the occurrence of abnormal extension of the extensible connection between a unit and said traction element.

13. In a traveling unit winding machine having a flexible traction element, driving connections for the traction element including an electric motor, and a plurality of winding units adapted to be moved in a procession by the flexible traction element, the combination of extensible connections connecting the several winding units to the flexible traction element, means for braking the movement of the traction element, electromagnetic means for retaining the braking means inoperative, a switch for controlling the electromagnetic means, and means operative upon the occurrence of abnormal extension of the extensible connection between a unit and said traction element to actuate the switch to allow the braking means to act.

14. In a winding machine having therein a plurality of winding units, a winding-unit tending mechanism adapted to deliver bobbins to the several winding units, and conveying means for causing relative movement between the winding units and the winding-unit tending mechanism to associate the latter with the several winding units, the combination of stop mechanism for the conveying means responsive to abnormal diminution in the relative movement between a winding unit and the winding-unit tending mechanism, and means for initiating the stopping comprising a member movable to a position to interfere with said relative movement, and a bobbin-controlled detector for controlling such movement of said member.

15. In a traveling unit winding machine having a flexible traction element, and a plurality of winding units adapted to be moved in a procession by the flexible traction element, the combination of extensible connections connecting the units and the flexible traction element, means for stopping the flexible traction element upon abnormal extension of an extensible connection between a unit and the traction element, and means for initiating the stopping comprising a member movable into the path of a winding unit to retard it relatively to the traction element.

16. In a traveling unit winding machine, a plurality of winding units, means for conveying said winding units in a procession, a winding-unit tending mechanism past which the winding units are adapted to move, the winding-unit tending mechanism being yieldably shiftable, means for stopping said conveying means upon such shift of the winding-unit tending mechanism, and means for initiating the stopping com-

prising a member associated with the winding-unit tending mechanism, movable into the path of a winding unit to cause the winding unit to shift the winding-unit tending mechanism.

17. In a traveling unit winding machine having a bobbin-supplying mechanism, a plurality of winding units, and means for conveying the winding units past the bobbin-supplying mechanism, the combination of stop mechanism for the conveying means responsive to an abnormal retardation of a winding unit, a detector responsive to an abnormal condition in the bobbin-supplying mechanism, and means controlled by the detector for detaining a traveling unit and thereby actuating the stopping mechanism.

18. In a traveling unit winding machine having a bobbin supplying mechanism, a plurality of winding units, and means for conveying the winding units past the bobbin-supplying mechanism, the combination of stop mechanism for the conveying means, a detector responsive to an abnormal condition in the bobbin-supplying mechanism, a member controlled by the detector and adapted to be interposed in the path of a winding unit upon the detection of an abnormal condition in the bobbin-supplying mechanism, and connections whereby said member, when moved by a winding unit, actuates said stop mechanism.

19. In a winding machine having therein a plurality of winding units, bobbin-supplying mechanism adapted to deliver bobbins to the several winding units, and conveying means for causing relative movement between the winding units and the bobbin-supplying mechanism to associate the latter with the several winding units, the combination of stop mechanism arranged to stop said conveying means, said stop mechanism being responsive to abnormal diminution in the relative movement between a winding unit and the bobbin-supplying mechanism, and means for initiating the stopping comprising a member movable to a position to interfere with said relative movement, and a bobbin-responsive detector for controlling such movement of said member.

20. In a traveling unit winding machine having a bobbin-supplying mechanism, a flexible traction element, and a plurality of winding units adapted to be conveyed past the bobbin-supplying mechanism, the combination of extensible connections connecting the units and the flexible traction element, a detector responsive to an abnormal condition in the bobbin-supplying mechanism, means controlled by the detector for detaining a traveling unit, and means, responsive to the extension of the extensible connection between the detained unit and the traction element, for stopping the traction element.

21. In a traveling unit winding machine having a bobbin-supplying mechanism, a flexible traction element, a plurality of winding units adapted to be conveyed past the bobbin-supplying mechanism, the combination of extensible connections connecting the units and the flexible traction element, a detector responsive to a misplaced bobbin in the bobbin-supplying mechanism, means controlled by the detector for detaining a traveling unit, and means responsive to the extension of the extensible connection between the detained unit and the traction element, for stopping the traction element.

22. In a traveling unit winding machine having a bobbin-supplying mechanism, a flexible traction element, a plurality of winding units adapted to be conveyed past the bobbin-supplying mechanism, the combination of extensible connections connecting the units and the flexible traction element, a detector responsive to absence of a bobbin at a place in the bobbin-supplying mechanism, means controlled by the detector for detaining a traveling unit, and means responsive to the extension of the extensible connection between the detained unit and the traction element, for stopping the traction element.

23. A winding machine having therein a plurality of winding units and a bobbin-supplying mechanism adapted to supply bobbins to the units in succession, means for causing a relative movement between the winding units and the bobbin-supplying mechanism, the bobbin-supplying mechanism including a portion traversed by the bobbins one at a time in the course of being supplied to the winding units, a detector responsive to failure of a bobbin to complete its passage through said portion of the bobbin-supplying mechanism, and means responsive to detection of such bobbin by the detector for stopping the relative movement between the winding units and bobbin-supplying mechanism.

24. A winding machine having therein a plurality of winding units and a bobbin-supplying mechanism adapted to supply bobbins to the units in succession, means for causing a relative movement between the winding units and the bobbin-supplying mechanism, the bobbin-supplying mechanism including a slideway for the bobbins, means for admitting bobbins one at a time to a portion of the slideway, means for discharging bobbins from said portion of the slideway, a detector responsive to a bobbin which has failed to slide through said portion of the slideway to said discharging means, and means responsive to detection of the bobbin by the detector for stopping the relative movement between the winding units and bobbin-supplying mechanism.

25. A winding machine having therein a plurality of winding units and a bobbin-supplying mechanism adapted to supply bobbins to the units in succession, means for causing a relative movement between the winding units and the bobbin-supplying mechanism, the bobbin-supplying mechanism including a slideway for the bobbins, means for admitting bobbins one at a time to a portion of the slideway, means for discharging bobbins from said portion of the slideway, a detector element movable across the path of bobbins in said portion of the slideway so as to encounter a bobbin therein which has failed to slide to said discharging means, and means responsive to detection of the bobbin by the detector for stopping the relative movement between the winding units and bobbin-supplying mechanism.

26. In a traveling unit winding machine having a bobbin-supplying mechanism, a plurality of winding units and means for conveying the units past the bobbin-supplying mechanism, the combination of a slideway for bobbins in the bobbin-supplying mechanism, means for admitting bobbins one at a time to a portion of the slideway, means for discharging bobbins from said portion of the slideway, a detector element movable across the path of bobbins in said slideway so as to encounter a bobbin therein which has failed to slide to said discharging means, means responsive to detection of a bobbin by the detector, for detaining a traveling winding unit relatively to its conveying means, and stop mechanism for the

conveying means actuated by such detention of a traveling unit.

27. In a traveling unit winding machine having a bobbin-supplying mechanism, a plurality of winding units and means for conveying the units past the bobbin-supplying mechanism, the combination of a slideway for bobbins in the bobbin-supplying mechanism, means for admitting bobbins one at a time to a portion of the slideway, means for discharging bobbins from said portion of the slideway, a detector element movable across the path of bobbins in said slideway so as to encounter and be blocked by any bobbin therein which has failed to slide to the exit thereof, mechanism movable by the traveling winding units for actuating the detector element, whereby when movement of the detector element is blocked by a bobbin in the slideway a winding unit is detained against travel, and stop mechanism for the conveying means actuated by such detention of a traveling unit.

28. A winding machine having therein a plurality of winding units and a bobbin-supplying mechanism adapted to supply bobbins to the units in succession, means for causing a relative movement between the winding units and the bobbin-supplying mechanism, the bobbin-supplying mechanism including a portion adapted to hold bobbins in a reserve position separated from the bobbin next to be supplied to a winding unit, a detector responsive to absence of bobbins in said reserve position, and means responsive to detection of absence of bobbins by the detector for stopping the relative movement between the winding units and bobbin-supplying mechanism.

29. A winding machine having therein a plurality of winding units and a bobbin-supplying mechanism adapted to supply bobbins to the units in succession, means for causing a relative movement between the winding units and the bobbin-supplying mechanism, the bobbin-supplying mechanism including a slideway for the bobbins, means for delivering bobbins to the slideway, means for admitting the bobbins one at a time to a subsequent portion of the slideway, a detector responsive to absence of bobbins in advance of said admitting means, and means responsive to detection of absence of bobbins by the detector for stopping the relative movement between the winding units and bobbin-supplying mechanism.

30. A winding machine having therein a plurality of winding units and a bobbin-supplying mechanism adapted to supply bobbins to the units in succession, means for causing a relative movement between the winding units and the bobbin-supplying mechanism, the bobbin-supplying mechanism including means for holding a bobbin at a second reserve position, means for subsequently holding the same bobbin at a first reserve position farther along toward the position where bobbins are supplied to the winding units, a detector responsive to absence of bobbins in said second reserve position, and means responsive to detection of absence of bobbins by the detector for stopping the relative movement between the winding units and bobbin-supplying mechanism.

31. In a traveling unit winding machine having a bobbin-supplying mechanism, a plurality of winding units and means for conveying the units past the bobbin-supplying mechanism, the combination of a slideway for bobbins in the bobbin-supplying mechanism, means for admitting bobbins one at a time to a portion of the slideway, a detector element adapted to move into the path of the bobbins in advance of said admitting means in the absence of a bobbin thereat, means, responsive to detection of absence of a bobbin by the detector, for detaining a traveling winding unit relatively to its conveying means, and stop mechanism for the conveying means actuated by such detention of a traveling unit.

32. In a traveling unit winding machine having a bobbin-supplying mechanism, a plurality of winding units and means for conveying the units past the bobbin-supplying mechanism, the combination of a slideway for bobbins in the bobbin-supplying mechanism, means for admitting bobbins one at a time to a portion of the slideway, a detector element adapted to move into the path of the bobbins in advance of said admitting means in the absence of a bobbin thereat, a member controlled by said detector element and movable into the path of a portion of a traveling winding unit as the detector element moves into said path of the bobbins, thereby to detain a winding unit against travel, and stop mechanism for the conveying means actuated by such detention of a traveling unit.

33. A winding machine having therein a plurality of winding units and a bobbin-supplying mechanism adapted to supply bobbins to the several winding units, to be wound thereon, the bobbin-supplying mechanism including a portion traversed by the bobbins one at a time in the course of being supplied to the winding units, a detector responsive to failure of a bobbin to complete its passage through said portion of the bobbin-supplying mechanism, and means responsive to detection of such bobbin by the detector for stopping the winding by the several winding units.

34. A winding machine having therein a plurality of winding units each including means for winding a bobbin, a plurality of electric motors arranged to furnish the power for winding, a bobbin-supplying mechanism adapted to supply bobbins to the several winding units, to be wound thereon, the bobbin-supplying mechanism including a portion traversed by the bobbins one at a time in the course of being supplied to the winding units, a detector responsive to failure of a bobbin to complete its passage through said portion of the bobbin-supplying mechanism, and means responsive to detection of such bobbin by the detector for de-energizing the electric motors to stop the winding.

35. A winding machine having therein a plurality of winding units and a bobbin-supplying mechanism adapted to supply bobbins to the several winding units to be wound thereon, the bobbin-supplying mechanism including a portion adapted to hold bobbins in a reserve position separated from the bobbin next to be supplied to a winding unit, a detector responsive to absence of bobbins in said reserve position, and means responsive to detection of such absence of bobbins by the detector for stopping the winding by the several winding units.

36. A winding machine having therein a plurality of winding units each including means for winding a bobbin, a plurality of electric motors arranged to furnish the power for winding, a bobbin-supplying mechanism adapted to supply bobbins to the several winding units to be wound thereon, the bobbin-supplying mechanism including a portion adapted to hold bobbins in a reserve position separated from the bobbin next to be

supplied to a winding unit, a detector responsive to absence of bobbins in said reserve position, and means responsive to detection of such absence of bobbins by the detector for de-energizing the electric motors to stop the winding.

37. A winding machine having therein a plurality of winding units each adapted to hold a bobbin in position to wind thereon, and means for discharging bobbins from their winding position in the unit, a bobbin supplying mechanism adapted to supply bobbins to the several winding units, to be wound thereon, the bobbin supplying mechanism including a portion traversed by the bobbins one at a time in the course of being supplied to the winding units, a detector responsive to failure of a bobbin to complete its passage through said portion of the bobbin supplying mechanism, and means responsive to detection of said bobbin by the detector for preventing the discharge of bobbins from their winding positions in the several winding units.

38. A winding machine having therein a plurality of winding units each adapted to hold a bobbin in position to wind thereon, and means for discharging bobbins from their winding position in the unit, a bobbin supplying mechanism adapted to supply bobbins to the several winding units, to be wound thereon, the bobbin supplying mechanism including a portion adapted to hold bobbins in a reserve position separated from the bobbin next to be supplied to a winding unit, a detector responsive to absence of bobbins in said reserve position, and means responsive to detection of such absence of bobbins by the detector for preventing the discharge of bobbins from their winding positions in the several winding units.

39. A winding machine comprising traveling conveyor structure and winding mechanism associated with the conveyor structure so as to be caused to travel around the machine, frame structure and winder-tending mechanism associated with the frame structure so that the winding mechanism passes the winder-tending mechanism, means yieldingly urging the winding mechanism toward a normal position with relation to a portion of the said conveyor structure, the said winding mechanism being movable relatively to the said portion of the conveyor structure so as to permit momentary continued travel of the conveyor structure notwithstanding interference between the winding mechanism and the winder-tending mechanism, and means actuable in response to such movement of said winding mechanism to stop said conveyor structure.

40. A winding machine comprising traveling conveyor structure and winding mechanism associated with the conveyor structure so as to be caused to travel around the machine, frame structure and winder-tending mechanism associated with the frame structure so that the winding mechanism passes the winder-tending mechanism, means yieldingly urging the winder-tending mechanism toward a normal position with relation to a portion of the said frame structure, the said winder-tending mechanism being movable relatively to the said portion of the frame structure so as to permit momentary continued travel of the conveyor structure notwithstanding interference between the winding mechanism and the winder-tending mechanism, and means actuable in response to such movement of said winder-tending mechanism to stop said conveyor structure.

41. A winding machine comprising traveling conveyor structure and winding mechanism associated with the conveyor structure so as to be caused to travel around the machine, frame structure and winder-tending mechanism associated with the frame structure so that the winding mechanism passes the winder-tending mechanism, means yieldingly urging one of said mechanisms toward a normal position with relation to a portion of the said structure with which it is associated, the yieldingly-urged mechanism being movable relatively to a portion of the structure with which it is thus associated to permit momentary continued travel of the conveyor structure notwithstanding interference between the winding mechanism and the winder-tending mechanism, and means actuable in response to such movement of said yieldingly-urged mechanism to stop said conveyor structure.

EDWARD J. ABBOTT.
WINTHROP L. PERRY.
JOSEPH E. RING.