Dec. 18, 1962 J. R. MARTIN 3,069,104

WINDING MACHINE

Filed June 12, 1961

FIG. 1

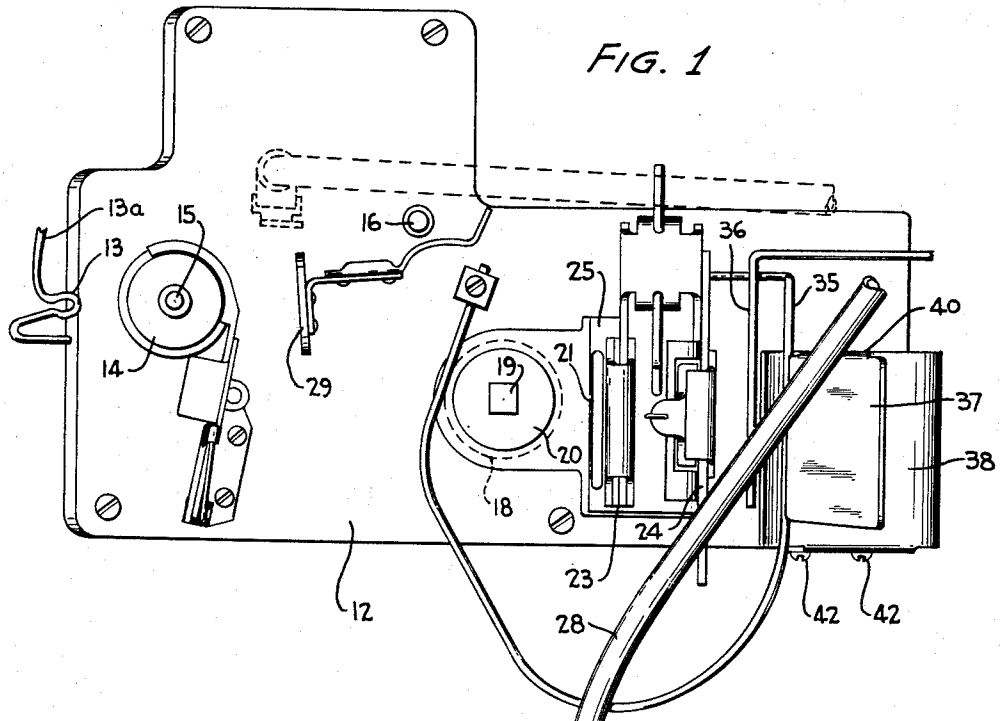
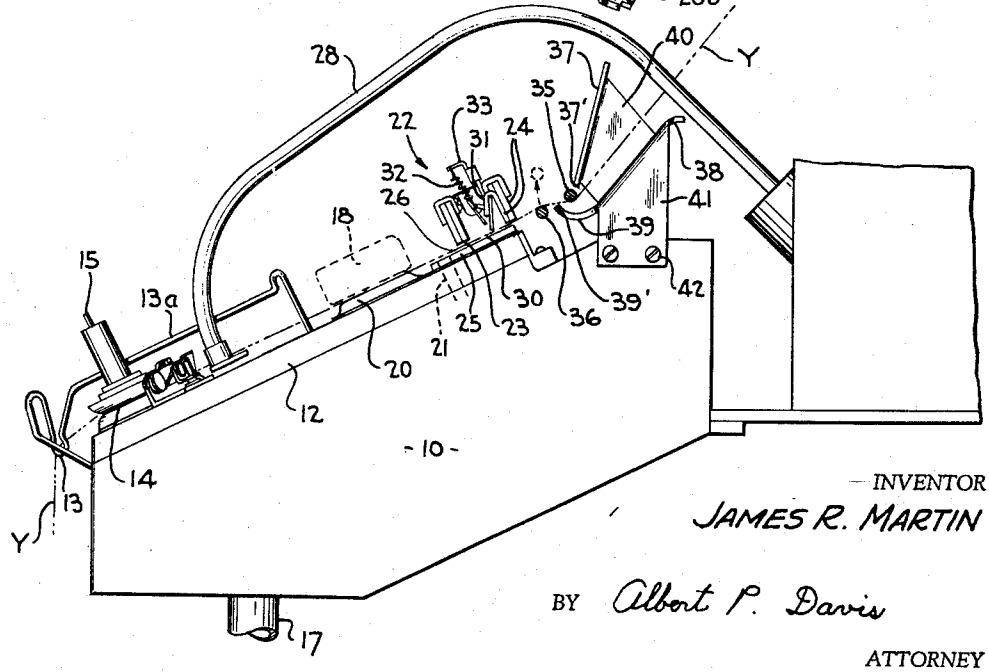


FIG. 2



- 10 -

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3,069,104

WINDING MACHINE

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This invention relates to improvements in a winding machine and, more particularly, to the provision of means in a winding machine for preventing entanglement of broken yarn ends with various parts of the mechanism in such manner as to interfere with or prevent initiation of the free end picking up and tying cycle.

In the conventional yarn winding machines now commercially available, the yarn is wound under tension from a bobbin or other source of supply to form a package. A running length of the yarn extending between the source of supply and the package being wound passes through and is acted upon by various yarn tensioning and servicing mechanisms generally including a slub catcher for detecting and preventing the passage of portions of yarn of abnormally large diameter. A yarn tension sensing element or lever is generally interposed between the slub catcher and the package being wound and is normally maintained in an inoperative position by the tensioned yarn passing thereover. However, it is biased toward an actuating position and moved toward said position incident to loss of tension in the yarn such as is caused by breakage incident to actuation of the slub catcher. The aforesaid movement of the arm or sensing element normally triggers and initiates the cycle of operations during the course of which the free ends of the broken yarn are picked up and laid into a knotter where they are tied together after having first automatically removed the slub.

The yarn normally extends and is guided under tension beneath a pair of relatively spaced hold down elements and over the tension sensing element which is normally positioned between them.

It has been found, however, that where the yarn is thus broken while under tension the free end extending from the source of supply will, due to its tension, tend to rapidly recoil in such manner either as to wind around and become entangled with the hold down bars or guides and/or with the tension sensing element thus preventing actuation of the latter to initiate the tying cycle. In some instances the free end may pass completely over the various yarn hold down or guide means to be received in the usual yarn cleaning suction slot whereby it is held in a manner to maintain the yarn under tension and thereby prevent actuation of the tension sensing element.

With the foregoing factors in mind, it is a primary object of the present invention to substantially eliminate the foregoing types of failure of the pickup and tying mechanism caused by entanglement or engagement of the yarn free end with the various parts of the mechanism.

To this end I have conceived of a novel arrangement and combination of guide plates which cooperate both with the yarn hold down and tensioning elements as well as with each other to prevent such entanglement of the free end and insure that as an incident to its breakage and recoil it will be guided clear of these parts and may be freely withdrawn into the yarn cleaning suction slot without entanglement.

The foregoing objects and advantages are all attained by the preferred embodiment of the invention as illustrated by way of exemplification in the accompanying drawings, in which:

FIGURE 1 is a plan view of a portion of a yarn winding machine having the invention operatively applied thereto; and

FIGURE 2 is a side elevation of the structure shown in FIGURE 1 and also showing a portion of the housing which provides a pivotal mounting for the yarn pickup and transfer arm.

Referring now in detail to the accompanying drawings, the numeral **10** designates a suitable housing of the type which is normally interposed on the winding machine between a bobbin magazine and a winding mandrel whereby the yarn Y is drawn from a bobbin or other source of supply and moved across the flat upper plate **12** of the housing from left to right as seen in FIGURE 2, and thence wound onto a package supported on the winding mandrel. Neither the winding mandrel nor the package are illustrated herein since these are purely conventional elements constituting no part of the present invention.

The flat upper plate of the housing across which the yarn extends and is moved provides support for various yarn servicing mechanisms which are actuated for the most part by mechanisms contained within the housing **10**, the said mechanisms being conventional in nature and, therefore, not illustrated. It will be seen that the yarn is guided across the plate **12** through an eyelet **13** constituting part of a general guide element or bracket which may also have a generally horizontal guide bar **13***a* extending to and merging with the eyelet to guide a reserve free end of yarn from a reserve bobbin into the eyelet in accordance with usual practice. From the eyelet **13** the yarn extends between usual tension discs **14** and has a portion disposed beneath and normally engaged by a sensing pin **15** which is free to move downwardly incident to exhaustion of the yarn from one bobbin whereby to cause indexing of the bobbin magazine to bring the next or reserve bobbin into operative position, all in accordance with usual practice.

Normally, the free end of the yarn from the reserve bobbin will be received and held within a suction nozzle **16** and from thence will pass over the guide bar **13***a* to the reserve bobbin so that the indexing action of the magazine which carries the bobbins may at the appropriate time move it into the eyelet **13**. The suction nozzle communicates in a manner not shown with a main suction pipe **17** shown in FIGURE 2.

From the tension discs **14** the yarn Y normally extends beneath and in engagement with a conventional waxing attachment comprising a disc of wax **18** removably disposed on a rotating shaft having a non-circular cross section upper end portion **19** received in a similarly shaped opening in the wax disc **18**. It will be seen that the yarn passes between the wax disc and a supporting surface **20**, thence in a longitudinal direction across a suction slot **21** which also communicates with the main suction pipe **17** through the interior of the housing **10** in a manner not shown. This suction slot **21** functions to clean the yarn before it is wound onto the package and also functions to draw in and hold the free end of the yarn extending from its source of supply in the event of breakage of the yarn. The slot **21** is disposed just in advance of a yarn hold down and guide mechanism generally designated **22** which is shown as comprising generally horizontally extending longitudinally spaced plates or bars **23** and **24** respectively, both spaced slightly above and parallel to a smooth anvil plate **25** located therebeneath. The lower edges of the plates **23** and **24** thus cooperate with the anvil plate **25** to define guide slots **26** and **27** respectively of substantial lateral extent which may function to maintain the yarn at the desired level while permitting it to freely traverse laterally back and forth while being wound onto the package. These plates **23** and **24** are both supported from one side only, viz., the left hand side, as shown in the plan view of FIGURE 1, so that the slots **26** and **27** defined between them and their coacting anvil plate **25** will open laterally

toward the right hand side, as is apparent in FIGURE 2. This opening of the slots **26** and **27** toward one side, viz., the side about which the yarn transfer arm **28** swings, is conventional to the end that yarn carried by the transfer arm **28** at its free end may be moved laterally into the open end guide slots **26** and **27** incident to the return or retraction stroke of the arm **28** as it lays the free end of yarn from the supply bobbin into the knotter (not shown). The transfer arm **28** in the illustrated embodiment comprises a hollow tube open at its free end to pick up by suction the free end portion of yarn across the path of which it moves. Also at the free end there may be carried a suitable knife or pivoted yarn severing means indicated generally as **28***a* having a follower **28***b* for engagement with a cam element **29** whereby to sever the free end portion of the yarn which carries the slub, which free end portion will have normally been sucked into the tube prior to severance, to be thereafter carried away through the suction tube or arm **28**. This action occurs as is well known during the advance movement of the suction pickup arm or transfer arm **28** while on the return movement thereof the arm acts to pull additional yarn through the tension discs **14** and lay it in the knotter as well as into the slots **26** and **27** and beneath the thread waxing element **18**.

In accordance with usual practice the yarn is passed through a conventional slub catcher as is exemplified in the present instance by the plate **30** cradled in a bearing provided at the juncture of a reversely folded portion **31** of the plate **24**. This reversely folded portion **31** extends at an acute angle to its plate **24** and provides a stop against which the slub catcher blade **30** normally is resiliently maintained as by means of the spring **32** tensioned between the lower end of the blade **30** and a bracket **33**.

The lower edge of the slub catcher blade **30** is disposed parallel to and yet is normally spaced above the flat upper surface of the anvil plate **25** a sufficient distance that yarn of normal diameter may pass freely beneath it. However, it will be engaged by abnormally large diameter portions of yarn commonly termed slubs or by snarls or knots in the yarn and will thus be swung in the direction of yarn movement and toward both the anvil plate **25** and the guide plate **24** whereby to arrest the longitudinal movement of the yarn and cause breakage of the yarn at some location between the slub catcher and the package onto which it is being wound.

Disposed longitudinally beyond the slub catcher blade **30** and the guide plate **24**, in the direction of yarn movement, is a yarn hold down bar **35** which extends parallel to the lower edge of guide plate **24**. The yarn passes beneath and engages both the plate **24** and hold down bar **35** and thence is drawn upwardly to be wound into the package in the usual manner. The yarn thus is normally tensioned between the plate **24** and the hold down bar **35** through tension exerted by the winding action as opposed by the friction of the tensioning discs **14**.

A yarn tension sensing arm or element **36** is swingably disposed for vertical movement between and parallel to the plate **24** and the hold down bar **35**. This arm, in accordance with usual practice, is normally biased upwardly in any suitable manner toward its actuating or triggering position as indicated by broken lines in FIGURE 2, in which position it initiates the yarn pickup cycle of the transfer arm **28** and the ensuing tying cycle or operation of the usual knotter mechanism to which the free end is delivered by the arm **28**.

Normally as long as the yarn extends across the sensing arm **36** under sufficient tension, it maintains the arm depressed in its normal inoperative position. However, release of the tension as by breakage of the yarn permits triggering movement of the sensing arm to occur whereby to initiate the usual operative cycle of the transfer arm **28** and its associated knotter.

The several parts and their mode of operation as thus far described are all conventional and are incorporated in winding mechanisms currently manufactured and sold by Leesona Corporation of Providence, Rhode Island, and are also disclosed in various prior United States patents and pending patent applications owned by that company, including the copending application of Thomas E. Pitts et al., Serial No. 30,346, filed May 19, 1960, and Goodhue et al. U.S. Patent 2,764,362.

In the operation of such a winding machine, however, it has been found that when the tensioned yarn is broken as by actuation of the slub catcher **30**, the free end extending from the bobbin through the slub catcher tends to recoil or whip in a direction generally reversed to its normal winding movement away from the breakage point and such whipping or reverse movement is contributed to by the action of the suction slot **21** tending to draw the yarn thereinto. Thus when a break occurs, if the free end extends substantially past the hold down arm **35** to any considerable extent, it may tend to cause failure of the free end picking up and knotting cycle by becoming wrapped around and/or entangled with other parts of the mechanism. One such cause of failure which has been observed consists in the tendency of the free end from the source of supply recoiling or whipping up over the top of the hold down bar **35**, thence reversely over the tops of the guide bars or plates **23** and **24** and into the suction slot **21**. When this occurs the suction slot maintains the yarn under tension across the sensing arm **36** and prevents the latter from functioning as will be obvious. A second mode of failure which has been observed to occur consists in the winding or wrapping of the free yarn end around the sensing arm **36** and/or hold down bar **35**. Occasionally when this occurs the arm **36** may be free to initiate one tying cycle which obviously will fail due to the entanglement of the free end with the said bars **35** and/or **36** and the ensuing action of the transfer arm **28** in attempting to carry the yarn back to the knotter as well as the action on the yarn of the suction slot **21** tends to draw the yarn taut over the sensing arm **36** to return it to its inoperative position and thereby to prevent the occurrence of a repeated traverse of the transfer arm such as would normally take place.

To overcome such causes of failure there is provided a pair of cooperating yarn guides or plates **37** and **38** respectively, positioned for cooperation with each other as well as with the elements **35** and **36**. The width of both plates is at least equal to the amplitude of the back and forth traversal movement of the yarn as it is wound. The first or upper guide plate **37** is fixedly carried or supported with respect to the hold down bar **35** and has its lower edge **37′** disposed closely adjacent and parallel to the hold down bar **35** at a location just above the latter. From this location it will be seen that the guide **37** extends upwardly or longitudinally through a substantial distance. In other words, the longitudinal extent of the guide plate **37** is sufficient to prevent the free end of yarn from the bobbin from passing over its upper edge and thence back to the slot **21** in the manner earlier referred to. The lower edge **37′** of this guide plate **37** is so closely spaced with respect to the hold down bar **35** as to prevent the free end of yarn from winding upwardly and around the bar **35** and/or the sensing arm **36**.

The lower guard or guard plate **38** prevents winding of the free end around the tension sensing arm **36** in a clockwise direction as seen in FIGURE 2.

This plate **38** is disposed beneath plate **37** and converges generally toward the free lower end **37′** of the plate **37**, though it is spaced therefrom and in fact extends beneath and is curved upwardly around the hold down bar **35** with its upper edge **39′** extending between the bar **35** and sensing arm **36**. The upwardly curved lower edge portion **39** of the lower plate **38** is spaced sufficiently from the bar **35** to permit free passage of the thread between the two and yet extends to a sufficient height with respect to the sensing arm **36** that it func-

tions in the manner of the "ski jump" to cause the end of the yarn to flip upwardly and over the sensing arm **36** without becoming entwined around it. Moreover, it will be apparent that the reversely moving or recoiling yarn end which is directed downwardly beyond the hold down bar **35** by the plate **37** is prevented by the lower guide **38** from winding around the tension sensing arm **36** as above mentioned.

As the yarn free end thus is drawn or recoils in a reverse direction between the guides **37** and **38** and between the hold down bar **35** and the guide edge portion **39'**, it will be carried over the top of the sensing arm **36** and drawn into the suction slot **21** without further danger of entanglement with any of the various parts or elements. As the yarn clears the free end edge **39'** of the lower guide **38**, its length will be insufficient to permit it then to slip back over the guide bars **24** and **23** or otherwise to become entangled.

The guide plates **37** and **38** may obviously be affixed to the other mechanism by any of various obvious expedients though it is quite desirable to form these as a unitary attachment adapted for ready and convenient mounting on the housing **10**. This is accomplished in novel manner in the instant invention in which the two plates **37** and **38** are interconnected and maintained in fixed relative positions by means of an integral web at their left hand edges as seen in FIGURE 1, the web itself being shown in FIGURE 2. The arrangement is such that the plates are thus interconnected along one lateral side only and are spaced apart in a manner to leave a lateral opening space between them at the opposite or right hand side as viewed in FIGURE 1 whereby the yarn may be freely laterally received between them incident to the swinging movement of the transfer arm **28** from the position shown in FIGURE 2 back toward the knotter or in a counterclockwise direction as viewed in FIGURE 1. The two plates **37** and **38** as thus interconnected by their web **40** may be rigidly mounted and supported on the housing **10** by means of a bracket **41** integral with and depending from the lateral right hand edge of the lower plate **38**. This bracket may be secured to the side of the housing **10** as by screws **42**, as is best shown in FIGURE 2.

In this application I have shown and described only the preferred embodiment of the invention though it will be readily apparent that the invention is capable of other and different embodiments and that its various details may be modified in obvious respects, all without departing from the scope of the invention as defined in the appended claims.

Having thus described my invention, I claim:

1. An attachment for a winding machine comprising a pair of relatively spaced upper and lower guide plates, means interconnecting said plates at one lateral side only of said attachment to leave a laterally opening space between said plates at the other lateral side thereof, bracket means for mounting said attachment on the winding machine, said plates converging in a longitudinal and downward direction, said upper plate having a converging end edge spaced from the surface of said lower plate, and said lower plate having a converging end portion projecting beyond said end edge of the upper plate and curved upwardly generally toward said converging end edge of said upper plate but in spaced relation thereto.

2. An attachment as defined in claim 1 in which the said upper plate is flat and the converging end edge of said lower plate is in substantially the same plane as said flat upper plate.

3. In a winding machine having a yarn hold down bar, a movable yarn tension sensing arm movable in a plane parallel to said bar and normally held at one extremity of its movement by yarn tensioned over said sensing arm and beneath said hold down bar, the combination with said winding machine of a guide plate fixedly carried by said machine and extending upwardly from said hold down bar with its lower edge closely adjacent and parallel to said bar, and a further guide plate also fixedly supported on said machine, said further guide plate converging toward the lower edge of said first mentioned plate, with its converging end portion curved beneath and upwardly partially around said hold down bar, in spaced relation thereto.

4. The combination of elements defined in claim 3 wherein said upwardly curved converging edge portion of the further guide plate projects upwardly between said hold down bar and said yarn tension sensing arm, said curved edge portion being disposed to flip the rearwardly recoiling yarn free end above and clear of said sensing arm, and the first mentioned guide plate preventing the said end from wrapping around said guide bar.

5. The combination of claim 3 in which said machine includes a suction slot in advance of said hold down bar with respect to the normal direction of yarn movement, and the longitudinal extent of said first mentioned plate is such as to prevent the yarn free end from flipping over and reversely around the upper end of said first mentioned plate and into said suction slot.

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