

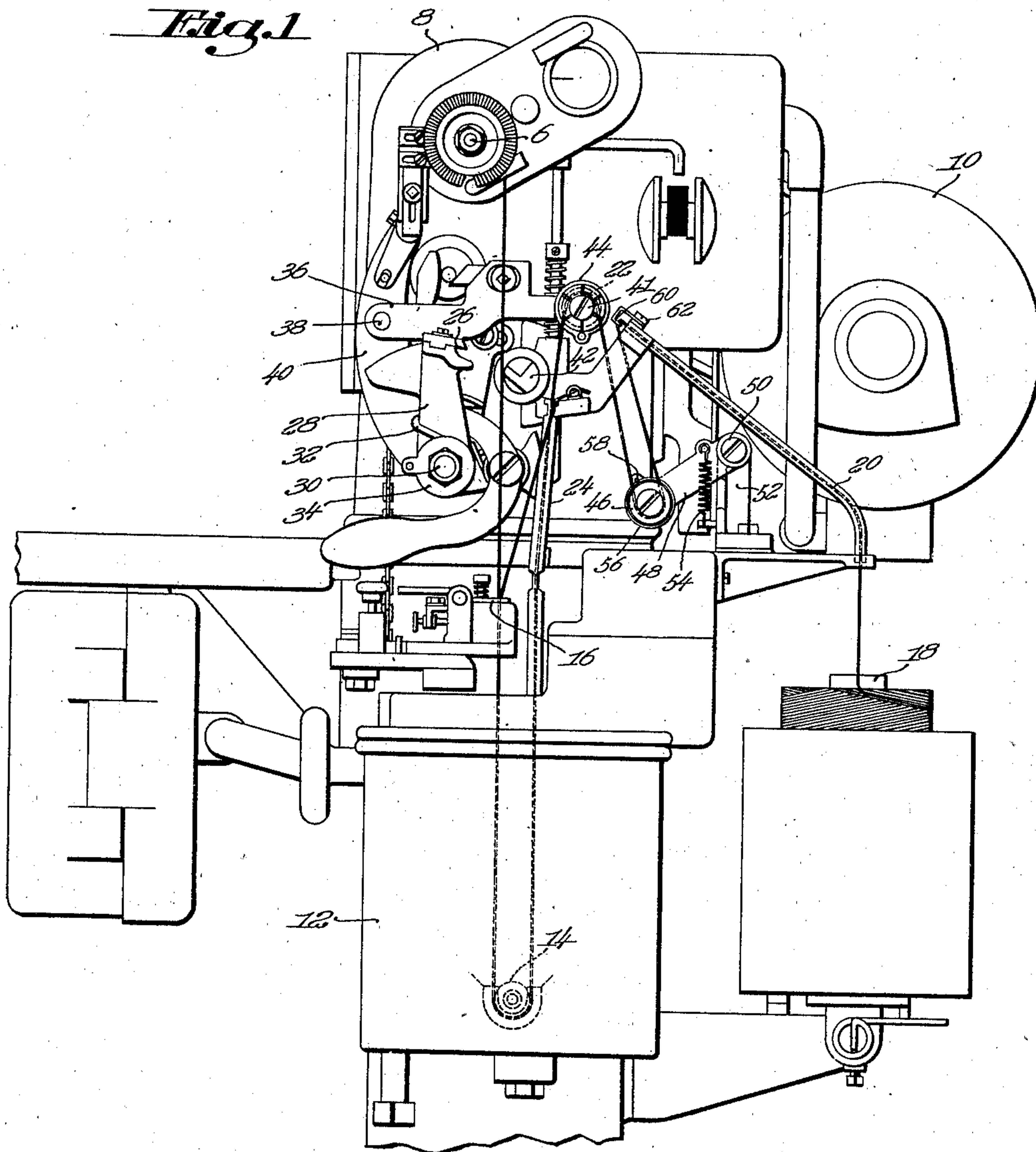
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L. A. HICKOK
WINDING MACHINE

2,430,507

Filed Aug. 3, 1945

2 Sheets-Sheet 1



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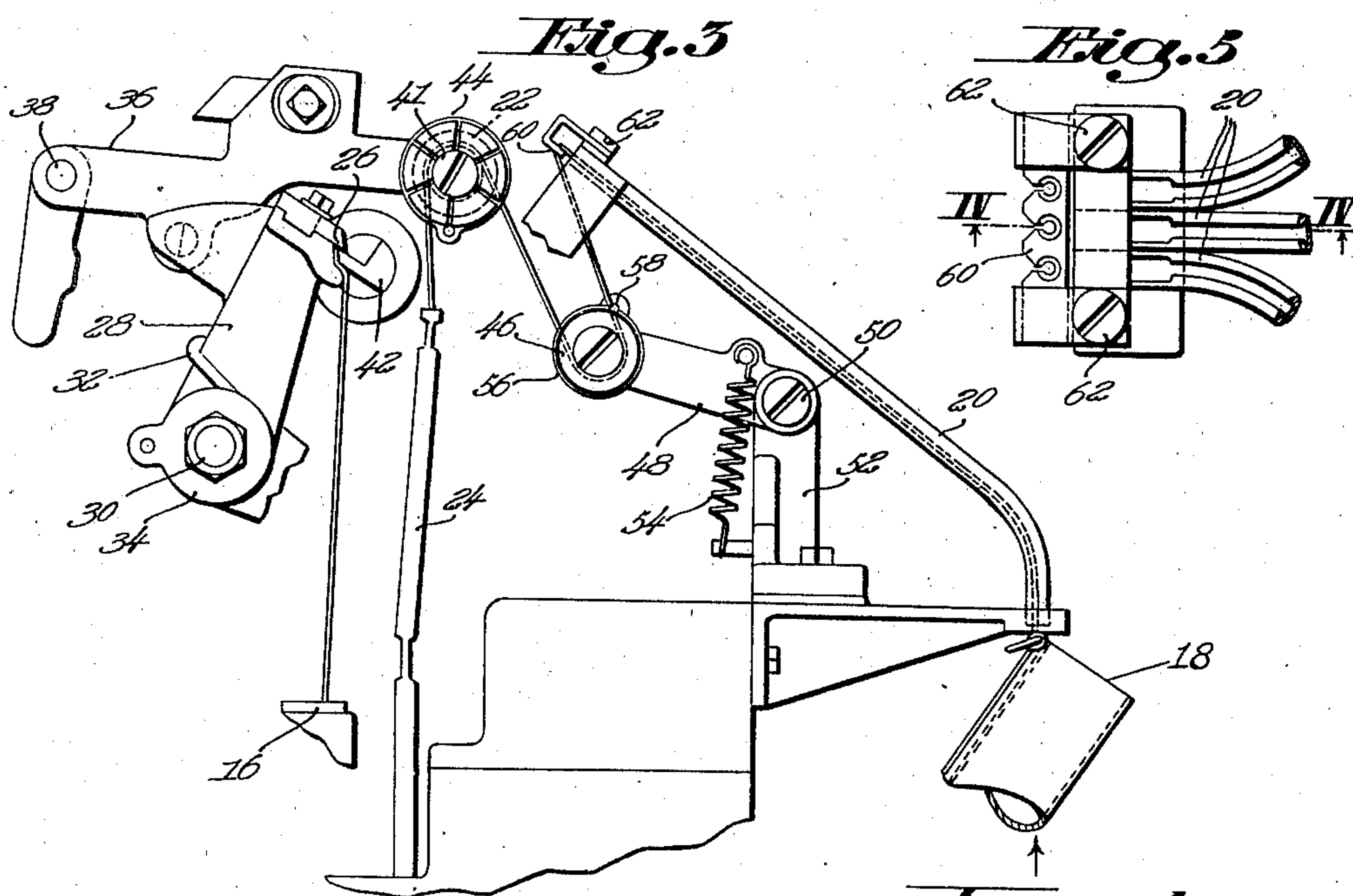
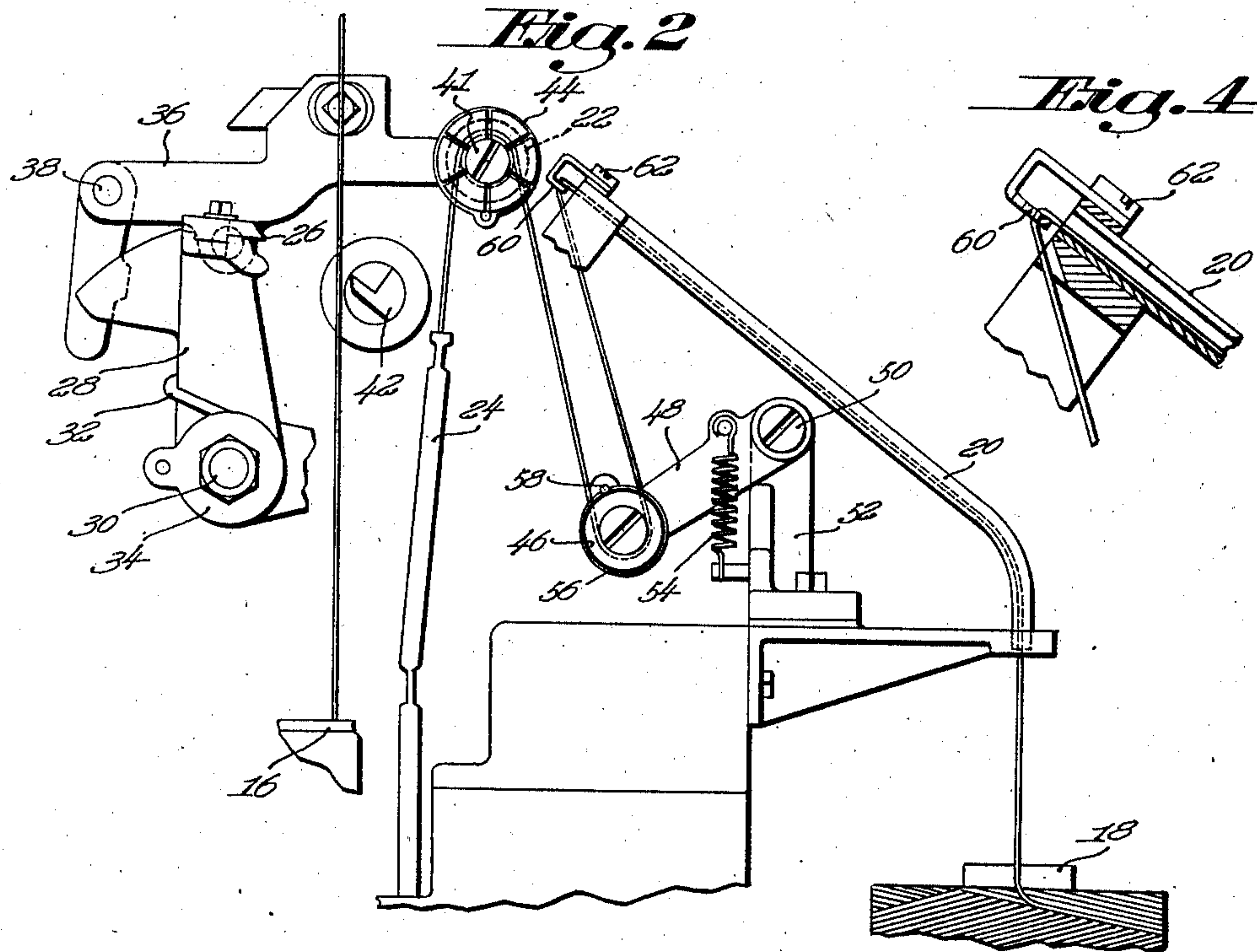
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UNITED STATES PATENT OFFICE

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WINDING MACHINE

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4 Claims. (Cl. 242—20)

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The present invention relates to improvements in machines for winding sewing machine bobbins or other thread packages, of the type comprising a rotating mandrel for drawing thread from a source of supply through a waxing or other thread treating device, of which the machine disclosed in United States Letters Patent No. 2,343,935, granted March 14, 1944, upon an application filed in the name of Paul W. Senfleben, is an example.

The machine of the patent to Senfleben above identified has, in addition to its winding mandrel and waxing device, a thread cutter for severing the thread whenever excessive tension occurs as a result of interruption of the normal thread movement. Interruption of normal thread movement may occur from any of several causes, including exhaustion of the main supply of thread or the presence of an enlargement in the diameter or "slub" of thread such as will interfere with its passage through a close fitting guide or stripper in the waxing device.

The supply of thread is applied initially to the machine in the form of a cop of thread wound upon a central fiber support tube, and the final end of the thread is tied to the tube so that, when the supply is exhausted, movement of thread through the waxing device will be interrupted. To prevent such excessive tension on the thread when the supply is exhausted as will cause thread breakage at a location which will require rethreading the waxing device and thread guides elsewhere in the machine, the thread cutter of the patented machine acts between the waxing device and the winding mandrel so that the severed end of thread will be wound on the mandrel without withdrawing the thread from the waxing device. To cause the cutter to be actuated, a spring is connected thereto and restrained from operation by a latch for the cutter under control of the tension on the thread. In applying a new supply of thread to the machine with the cutter located and actuated in this way, it is necessary only to disconnect the final end which is tied to the support tube and connect that end with the leading end of a new supply, drawing the connected ends manually past the guides and through the waxing device.

As a means to avoid thread breakage within the waxing device upon the presence of an enlargement in diameter, knot or slub in the thread, the latch for restraining operation of the thread cutter has connected to it, in the patented ma-

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chine, a thread guiding pulley surrounded by a split thread retaining cage having a narrow passage for the thread. An enlargement which is not admitted by the cage, therefore, will not pass through the waxing device, and the thread cutter, accordingly, will be actuated by the continued pull on the thread during winding operations.

In the use of the patented bobbin winding machine, however, when the speed of rotation of the winding mandrel has been increased above two thousand revolutions per minute, it has been found in some instances that, upon the interruption of normal movement in the thread from the supply for any cause, the thread cutter is not able to operate with sufficient speed to prevent breakage between the waxing device and the supply. The waxing device must therefore be rethreaded after thread breakage in spite of the thread cutter arrangement referred to, the thread frequently becoming broken within the waxing device where the surfaces are covered with adhesive plastic substance, thus rendering it difficult to locate and remove short or broken thread ends.

It is accordingly an object of the present invention to avoid the difficulties above enumerated and to provide a bobbin winding machine of the type described capable of operating at high winding speeds, in which the thread will, upon the occurrence of an interruption in the normal thread movement from the supply, be severed with certainty between the winding mandrel and the waxing device at a location where there is neither an opportunity for the thread to be broken within the waxing device nor a necessity for rethreading the waxing device.

Other and more general objects of the invention are to improve the construction and mode of operation of a bobbin winding machine such as that disclosed in the patent to Senfleben above identified.

An important feature of the invention hereinafter more fully described, therefore, resides in a winding machine having a relatively high-speed rotating mandrel for supporting a bobbin or other thread package and having a spring-operated cutter for severing the thread when excessive tension occurs, in which there is provided means for limiting the tension on the thread to an intensity below that which will break the thread, so that sufficient time will be given for proper actuation of the cutter after application of tension. In the construction illustrated, the tension limiting means consists of a

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thread engaging member for retaining a length of thread greater than that which is required by the winding operations between the times when the normal supply is interrupted and the thread is cut. The thread engaging member, according to this feature, is acted upon by a spring for yieldingly resisting movement of said member with a force sufficient to cause the cutter to be actuated but with insufficient force to cause thread breakage.

These and other features of the invention relating to certain constructions, combinations and arrangements of parts will be understood more fully from the following detailed description taken in connection with the accompanying drawings, in which

Fig. 1 is a view in right side elevation of the upper portion of a bobbin winding machine embodying the features of the present invention;

Fig. 2 is a detail view on an enlarged scale of certain parts of the machine illustrated in Fig. 1, indicating the operation while movement of thread from the supply is normal;

Fig. 3 is a similar view of the same parts of the machine, taken when the movement of thread is interrupted or otherwise becomes abnormal;

Fig. 4 is a detail sectional view, on a still further enlarged scale, taken on the line IV—IV of Fig. 5, of a thread guide for intercepting enlargements or knots in the thread; and

Fig. 5 is a plan view of the thread guide illustrated in Fig. 4.

The winding machine herein illustrated and more fully disclosed in the Senfleben patent above identified is provided with a rotating winding mandrel or spindle 6 to which a series of empty bobbins may be attached and automatically wound with thread to a predetermined depth, the winding operations being transferred from one bobbin to another successively while the spindle rotates continuously until all the bobbins are filled. The winding spindle is supported in suitable bearings in the main frame 8 of the machine and is connected to an aligned drive shaft (not shown) rotated by an electric motor 10.

In order to insure accurate termination of the winding operations, the thread leading to the mandrel is severed before rotation of the mandrel is stopped, so that the mandrel may come to rest thereafter without requiring the inertia of the rotating parts including the motor to be absorbed abruptly. Before being carried to the winding spindle, the thread is drawn through a heated waxing device comprising a pot 12 having an internal guide 14 and a surplus wax stripper 16.

The thread supply consists of one or more cops each having a central fiber support tube 18, the thread being led endwise from a cop and passing through one of a series of slotted guide tubes 20, upwardly over one of three aligned guides or pulleys 22 and then downwardly through a slotted guide tube 24 into the wax pot 12. In case an enlargement, knot or slub is present in the thread, it will become jammed in the thread guides, particularly in the wax stripper 16, thus causing thread breakage, unless suitable provision is made to prevent it. Such breakage generally will occur in the wax pot 12, and the broken end will be drawn through by the winding operations, thus leaving the other end in the pot where it may be retrieved and the pot rethreaded only by separating the pot from its mountings.

In order to prevent thread breakage when the

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supply of thread is exhausted, a spring actuated thread cutter similar to that indicated at 26 is provided in the patented machine, acting along the lead of the thread between the wax pot 12 and the winding spindle 6. The thread cutter 26 is arranged to be actuated also when all the bobbins on the spindle are filled with thread as well as when undue or excessive tension exists in the thread, following such obstruction to normal passage of thread as would cause thread breakage. Thus, the thread is severed automatically whenever the supply of thread on the cop supporting tube 18 is exhausted or whenever the normal movement of thread is interrupted in any way.

To insure actuation of the thread cutter when the supply on the cop support tube 18 is exhausted, the final end of thread is tied to the tube so as to prevent passage of the end through the guide tube 20, the tube 18 striking the frame beneath the guides if the cutter does not operate soon enough. Interrupting normal movement of thread through the guide tube thus increases the tension sufficiently to cause the thread cutter 26 to be actuated in the manner indicated, leaving a length of thread in the wax pot and both ends outside readily accessible.

The thread cutter 26 comprises a sharp edged plate or knife having a rib secured in a groove at the free end of an arm on a cutter lever 28, rotating loosely on the end of a fixed shaft 30. Coiled about the hub of the cutter lever is a spring 32 for actuating the cutter, one end being hooked around the cutter lever and the other end passing through an opening in the lug of a collar 34 fixed to the outer end of the shaft 30. To restrain the cutter in inoperative position during winding operations, the shoulder formed by the rib on the cutter plate or blade is engaged by a projecting portion of a latch arm 36 pivoted on a pin 38 secured in the arm of a lever 40 also rotatably mounted on the shaft 30. The latching arm 36 is yieldingly maintained in raised position, supporting at its free end a bolt 41 on which the pulleys 22 rotate. When excessive tension is applied to the thread between the supply and the mandrel or spindle 6, the thread acting on the pulley 22 disengages the latching projection from the cutter 26 and enables the cutter to move across the path of the thread between the wax pot and the mandrel or spindle into engagement with an anvil rod 42 shaped to cause the cutter blade to shear the thread and to clamp the severed end of thread extending from the wax pot between the arm of the cutter lever 28 and the anvil rod 42. A similar releasing action of the cutter is effected whatever the cause of tension in the thread whether by an enlargement or slub in the thread becoming wedged within the restricted opening of a thread cage 44 surrounding a pulley 22 on the latching lever 36 or otherwise. As thus far described, the construction of the parts and the operation thereof are similar to those illustrated and described in the Senfleben patent.

When the machine is operated at relatively high speeds with a mandrel rotation above two thousand revolutions per minute, difficulty arises from failure of the cutter to sever the thread before the tension in the thread is built up to the breaking point. The inertia of the cutter lever 28 and the latch arm 36 are such that a greater time is required for the operation of the cutter than for the winding mandrel to withdraw all available slack in the thread and to apply a breaking tension to the thread. Under

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these conditions, the tube 18 will strike the frame beneath the guides, as shown in Fig. 3, and the thread will be broken or pulled loose from the tube in such a manner as to require the machine and wax pot to be wholly rethreaded.

In accordance with the principal feature of the present invention as has been stated, means is provided in the machine of the Senfleben patent for limiting the tension below the breaking point of the thread between the time the supply is interrupted and the thread is severed by the cutter. The means for limiting the tension on the thread below the breaking point whenever interruption of the normal supply in the thread occurs, comprises a yielding thread restraining member, the yielding force of which is sufficient to cause the cutter to be actuated but insufficient to cause thread breakage. Thus, when the supply of thread is exhausted on the support tube 18, tension will immediately be applied to the thread sufficiently to cause the cutter to be actuated but thread will be given up yieldingly for a suitable length of time to enable the cutter to sever the thread with certainty.

Instead of leading the thread directly from a guide tube 20 to a latch arm actuating pulley 22 in the manner described in the machine of the patent referred to, the thread in the present machine is carried downwardly from the upper end of the guide tube 20 beneath one of a series of auxiliary pulleys 46 and upwardly to a corresponding guide pulley 22 on the latch arm, thus holding aside in restrained position a loop of thread of substantial length. The auxiliary pulleys are mounted on an arm 48 pivotally mounted on a screw 50 threaded into an upright block 52 secured to the frame of the machine.

To maintain the auxiliary pulley supporting arm 48 yieldingly in thread restraining position, the arm is held in lowered position by a spring 54 stretched between a pin on the arm and a pin on the block 52. The auxiliary pulleys 46 also are surrounded by a series of cages 56 held in stationary relation with the arm 48 by a pin 58 passing through a projection on the arm 48 and through indentations in the edges of the cages 56. With this arrangement, when the supply of thread is exhausted on a support tube 18, the tension on the thread is immediately increased, causing the arm 48 to rise until the spring actuated cutter has an opportunity to sever the thread.

In order to avoid undue wear at the upper ends of the guide tubes 20 and to prevent passage of enlargements, knots, etc., in the thread to the wax pot, the upper ends of the tubes are fitted with a quick threading guard plate 60 secured by screws 62 to that portion of the machine frame which supports the upper ends of the guide tubes. The guard plate has U-shaped extremities through the ends of which screws 62 pass to secure the plate to the machine frame, and a substantially straight slotted central portion receives the threads from the guide tubes. If an enlargement in the thread of greater diameter than one of the slots attempts to pass the guard plate, it becomes wedged within the slot, causing tension to be applied to the thread and the thread cutter to be actuated in the usual way. By locating the guard plate between the

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auxiliary thread restraining pulleys and the supply, all danger of thread breakage upon interruption of the normal supply is avoided.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A winding machine, having a mandrel for supporting during formation a wound package of thread, a spring-operated cutter for severing the thread when excessive tension occurs, and a thread supply, said machine comprising means for supporting the thread on the supply for delivery to the mandrel and for increasing the tension on the thread upon interruption of normal thread movement, in combination with means for limiting the tension below the breaking point of the thread between the time the supply is interrupted and the time the thread is severed by the cutter.

2. A winding machine, having a mandrel for supporting during formation a wound package of thread, a spring-operated cutter for severing the thread when excessive tension occurs, and a thread supply, said machine comprising means for supporting the thread on the supply for delivery to the mandrel and for increasing the tension on the thread upon interruption of normal thread movement, in combination with a yieldingly restrained thread engaging member for retaining a length of thread greater than is wound upon the thread package between the time the supply is interrupted and the time the thread is cut.

3. A winding machine, having a mandrel for supporting during formation a wound package of thread, a spring-operated cutter for severing the thread when excessive tension occurs, and a thread supply, said machine comprising means for supporting the thread on the supply for delivery to the mandrel and for increasing the tension on the thread upon interruption of normal thread movement, in combination with a thread engaging member for retaining a length of thread greater than is wound upon the thread package between the time the supply is interrupted and the time the thread is cut, and a spring for yieldingly restraining said member with a force sufficient to cause the cutter to be actuated but insufficient to break the thread.

4. A winding machine, having a mandrel for supporting during formation a wound package of thread, a spring-operated cutter for severing the thread when excessive tension occurs, and a thread supply, said machine comprising means for supporting the thread on the supply for delivery to the mandrel and for increasing the tension on the thread upon interruption of normal thread movement, in combination with a yieldingly restrained thread engaging member for retaining a length of thread greater than is wound upon the thread package between the time the supply is interrupted and the time the thread is cut, and a guard plate for interrupting the movement of thread upon the presence of an enlargement in the diameter of the thread, located along the thread between the supply and the yieldingly restrained thread engaging member to prevent passage of such enlargements to the winding mandrel.

LEON A. HICKOK.