

Sept. 26, 1933.

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1,928,365

WINDING MACHINE

Filed July 26, 1929

2 Sheets-Sheet 1

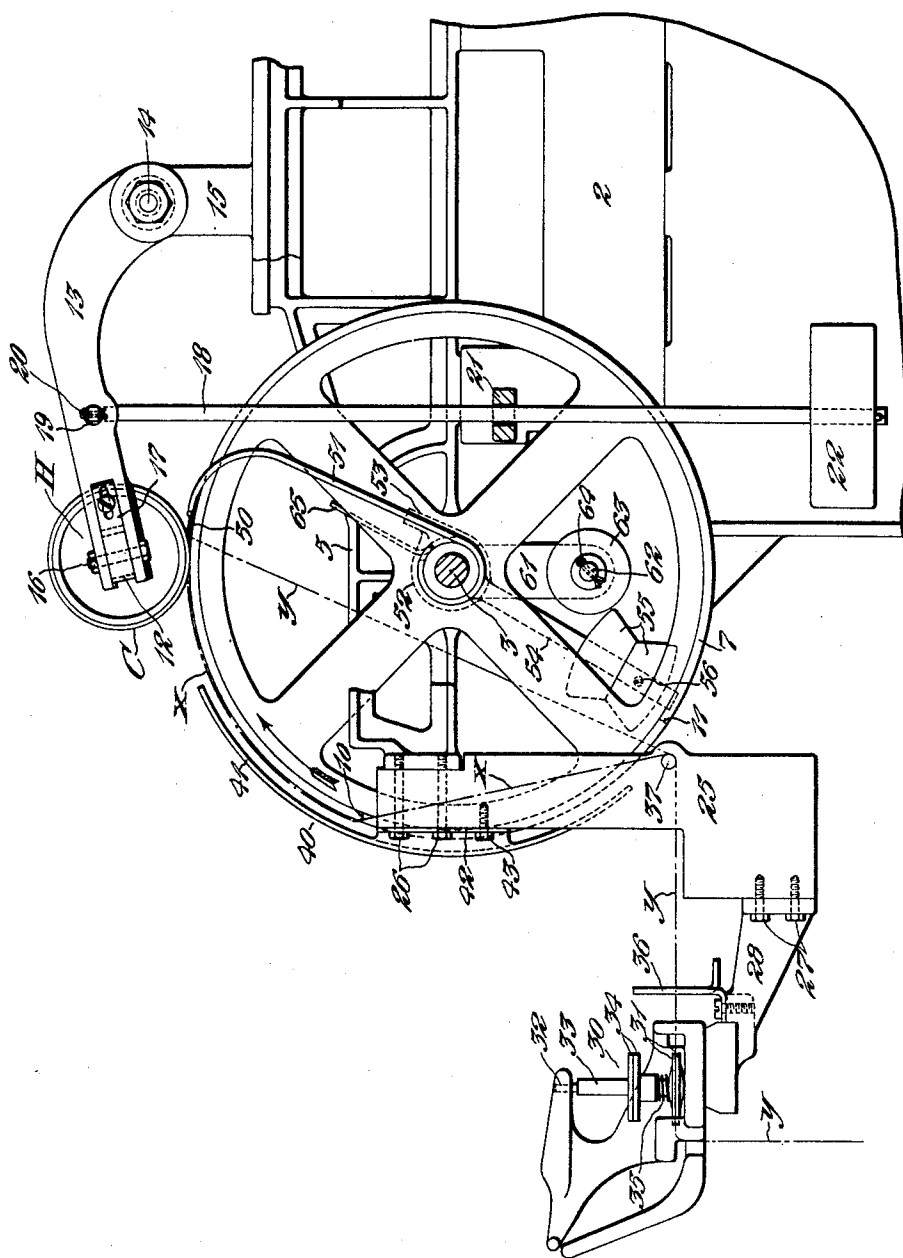


Fig. 1.

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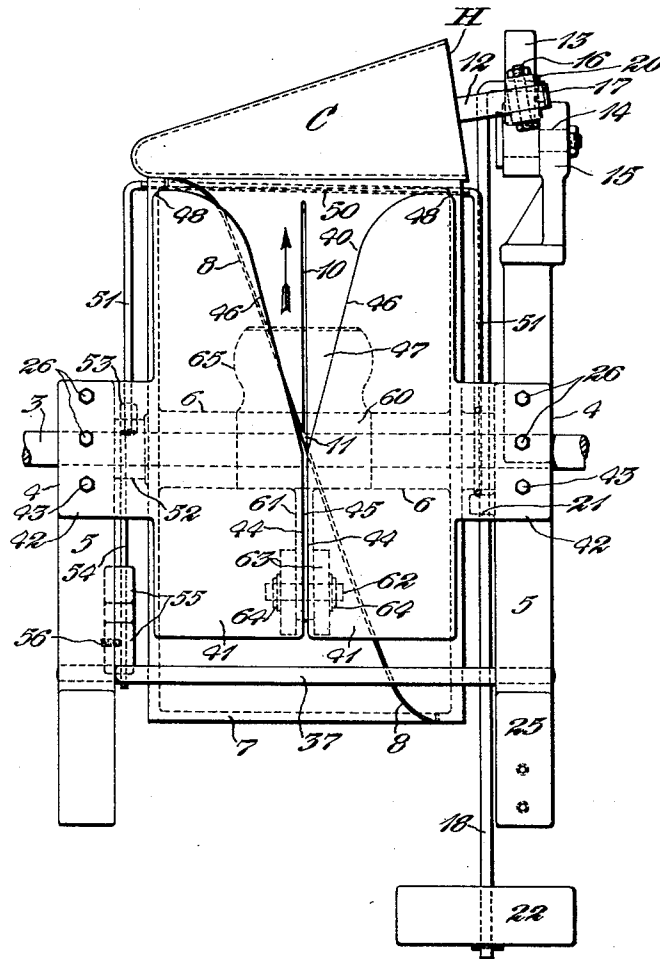


Fig. 2.

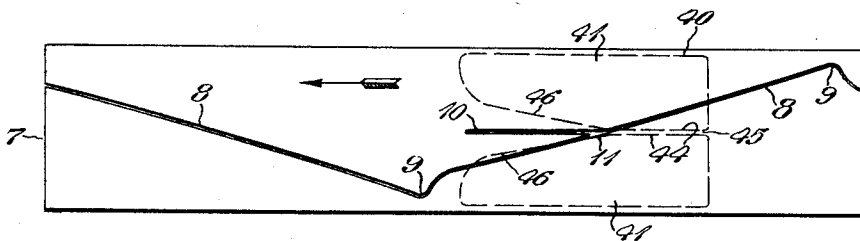


Fig. 3.

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## UNITED STATES PATENT OFFICE

1,928,365

## WINDING MACHINE

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Application July 26, 1929. Serial No. 381,275

9 Claims. (Cl. 242-43)

This invention relates to winding machines and particularly to that type of machine in which the thread, yarn or other strand material is traversed on the cop or package by means of a split drum or roll having a helical slot or groove in its periphery through which the strand draws in feeding to the winding.

One object of the invention is to provide a machine of the type specified having means for automatically threading the strand into the groove or slot in the drum at the start of the winding operation and when the end requires piecing up.

Another object of the invention is to provide a machine of the type specified having means whereby when the strand is laid across the surface of the drum the rotation of the latter will cause the strand to be shifted laterally thereon to introduce it into the slot or groove in the periphery of the drum.

Another object of the invention is to provide a machine of the type specified in which the automatic threading of the strand into the groove or slot in the drum is accomplished quickly and surely without danger of the strand being cut or broken.

Further objects of the improvement are set forth in the following specification which describes a preferred form of construction of the invention by way of example as illustrated by the accompanying drawings. In the drawings:

Fig. 1 is a side elevation of a winding unit showing my invention as applied to use therewith;

Fig. 2 is a front view of the essential elements of the winding mechanism; and

Fig. 3 is a development of the surface of the split drum or traverse-roll showing the peculiar formation thereof which provides for the automatic threading of the strand into the slot of the drum.

The present invention consists in general in providing a winding machine having a split drum for traversing the material on the cop or package to be wound with the slit or slot in the periphery of the drum so formed as to adapt it to pick up the strand as it is laid across the surface of the drum, and including means for guiding the strand into such position on the drum that it will invariably be carried into the slit.

The present invention may be applied to various types of winding machines in which the cop or package to be wound is either driven positively or by surface contact with a drum or drive-roll. In the present embodiment the winding mechanism is illustrated as comprising a split

drum which serves both to traverse the strand longitudinally of the cop or package and to effect rotation of the package through surface contact therewith. In the drawings, 2 designates the main frame of the winding machine as constructed to support a plurality of heads or winding units, only one of which is herein illustrated. Extending longitudinally of the frame 2 is a horizontal shaft 3 which constitutes the main driving-element of the machine. The shaft 3 is journaled in suitable bearings 4 carried on upright brackets 5 which are mounted on and overhang the front of the frame or bed 2.

The drive-shaft 3 carries the split drums 7, one for each winding unit, arranged at intervals along the front of the frame or bed 2. As all of the drums are of the same construction, however, only one is herein illustrated. The shaft 3 may be driven to rotate the drum 7 by means of a suitable belt, chain or gearing, or it may be connected directly with a source of power such as an electric motor.

In the present embodiment of the invention the cop or package is rotated from the drum 7 and for this purpose its axis is arranged to move away from the drum as the winding builds up on the tube or carrier which serves as a central support or core for the package. As herein illustrated the machine is adapted to wind packages of conical form supported on a tapered cop-tube or carrier C. The cop-tube or carrier C is supported from a holder H which is rotatably journaled on a dead-spindle 12 carried at the end of a swinging arm 13, the latter being pivoted at 14 to an upstanding lug or bearing 15 formed as a part of or attached to one of the brackets 5. Preferably, the spindle 12 is hinged to the forked end of the arm 13 at 16 to adapt it to be swung outwardly from above the drum 7 to facilitate the placing of the cop-tube or carrier C on its holder H and the doffing of the completed package therefrom. The spindle 12 is normally maintained in parallel relation with respect to the axis of the drum 7 by means of a flat spring 17 engaging its squared off end beyond the pivot 14 as usually provided.

A rod 18, hooked through a hole 19 in the arm 13 and held by a cotter-pin 20, extends downwardly through a guiding lug 21 on the bracket 5 and carries one or more weights 22 at its lower end. The weight 22 acts as a counterbalance to maintain the cop or package bearing against the periphery of the drum 7 to provide the driving contact therebetween.

Fastened to the outer end of one of the brack-

ets 5 is a depending arm 25 held in place by bolts 26. Attached to the forward side of the arm 25 by means of bolts 27 is a tension-bracket 28 which projects outwardly from the front of the machine. Mounted on the bracket 28 is a tension-device 30 comprising a pair of disks 31 axially supported by a vertical pin 32. A sleeve 33 slidable on the pin 32 carries one or more weights 34 which act through a helical spring 35 to apply pressure to the upper tension-disk to cause it to bear against the strand *y* of yarn or thread drawing between the disks. From the tension-disks 31 the strand *y* draws through a guide 36 and thence around a rod 37 held in the arm 25 whereby it is directed through the groove or slot in the drum 7 to feed directly to the cop or package being wound on the tube or carrier C.

As shown most clearly in Figs. 2 and 3, the drum 7 is formed with its peripheral rim split into two parts by the slit or slot 8, each section being supported by spokes radiating from a hub 6. The slit 8 extends helically of the periphery of the drum in one direction and then reverses to lead back in the opposite direction where it joins the end of the first portion of the helix. Referring to Fig. 3, which shows a development of the surface of the drum, the helical slit 8 is offset at 9 to form a sharp bend where it reverses from one direction to the other. The purpose of this construction is to provide a sharp corner where the slit changes its course from one direction to the other so that the strand traveling in the slit will be reversed abruptly at the ends of its traverse to prevent it from overrunning the ends of the cop or package. Stated briefly, the peculiar formation of the slit as herein shown provides for a quick reversal in the traverse of the strand as it reaches the end of the cop or package so that each coil of winding is laid with a sharp bend to prevent it from sliding off or falling down over the edges of the package.

As one feature of the present invention the periphery of the drum 7 is provided with a secondary groove or slot 10 extending in a direction perpendicular to the axis of the drum and entering the helical slot 8 at 11. The purpose of this auxiliary slot 10 is to provide a guiding passage or pick-up means for receiving the strand as it is laid across the periphery of the drum 7 in leading it from the guide-rod 37 to the package in threading up the machine before the start of the winding operation, and also in piecing up the strand when it breaks or its supply becomes exhausted. The drum 7 turns in the direction indicated by the arrows in Figs. 1, 2 and 3 and the strand *y* is first caused to be entered into the auxiliary threading slot 10. After the strand has been received in this slot it will slide to the end thereof as the drum rotates in the direction indicated by the arrows and will thus be introduced into the helical slot 8 to cause it to be traversed back and forth longitudinally of the package being wound; the automatic threading of the strand into the traversing slot being as hereinafter more fully explained.

In order that the strand may be invariably introduced into the threading-slot 10 from whatever position it may be laid on the surface of the drum, means are provided for causing it to be carried laterally across the face of the drum as the latter is rotated. For this purpose a V-shaped guard or guide 40 is arranged circumferentially of the forward side of the drum 7, being preferably conformed to the cylindrical

surface thereof. As herein illustrated the threading guide or guard 40 is constructed in two halves which are supported from opposite brackets 5. Each half of the guard consists in an arcuately-shaped plate 41 having a laterally extending arm 42 which is offset to adapt it to be fastened to the side of the vertical arm 25. The arms 42 are fastened to the arms 25 by means of the bolts 26 which secure the arms to the brackets 5, an additional screw 43 being also employed for this purpose. The lower portions of the guard-plates 41 have straight edges 44 arranged in opposite relation a short distance apart to provide a narrow slit or opening 45. Above the center of the plates 41 their edges 46 are inclined away from each other to form a V-shaped opening 47, and at the top of the edges round into the sides of the plates at 48. The manner in which the guard coacts with the threading slot 10 in the drum 7 to feed the strand into the helical slot 8 is later more fully explained.

It will be observed by reference to Fig. 1 that when the machine is operating, the strand *y* draws from the rod 37 through the helical slot 8 to a point substantially coincident with the point of contact between the surface of the package and the periphery of the drum. The strand will normally, however, have a tendency to draw tangent to the rearward side of the package and therefore to maintain it feeding toward the point of contact of the package on the drum, a thread-bail 50 is provided along which the strand plays. The bail 50 may consist of a rod or wire bent into U-shape to adapt its legs 51 to straddle the sides of the drum 7 to be supported from the shaft 3. One of the legs 51 of the bail 50 is bent around the end of the hub 6 of the drum 7 while the opposite leg is held by a collar 52 rotatable on the shaft 3 between the end of the hub of the drum and the bearing 4. The collar 52 has a projecting boss 53 formed with a hole, into which the end of the leg 51 is inserted. Depending from the collar 52 is an arm 54, to which are fastened one or more adjustable weights 55. The weights 55 may be slid longitudinally of the arm 54 to provide the proper counterbalance for the thread-bail 50 whereby to normally maintain it in the position as illustrated in Fig. 1, a set-screw 56 being employed to secure the weights in their adjusted position.

Referring to Fig. 2 of the drawings, a sleeve or collar 60 is mounted on the shaft 3 between the opposite hubs 6 of the drum 7. The sleeve 60 is free to turn on the shaft 3 and is provided with a depending arm 61 carrying a cross-pin 62 at its lower end. Held on the cross-pin 62 are counterweights 63 secured in place by cotter-pins 64 or other suitable means. Projecting upwardly from the sleeve 60 is a flat plate or blade 65 which serves as a guard to hold the strand of yarn or thread from catching on the hubs of the drum 7 or the shafts. The guard 65 serves as a means for preventing the end of a broken strand from being caught up by the hubs or the shaft and wound thereon to become entangled in the mechanism.

The construction and arrangement of the mechanism of the improved machine having now been described in detail its method of operation will next be explained. The machine is prepared for the winding operation in the following manner. The strand *y* of yarn, thread or other material is drawn off from its source of

supply, usually arranged below, carried through the guide-opening on the tension-bracket 28 and threaded between the tension-disks 31, whence it is drawn rearwardly through the guide 36 and under the rod 37. The end of the strand is then carried up across the convex surface of the guard 40 and fastened to the cop-tube or receiver C which has previously been applied to position on its holder H on the spindle 12.

When the machine is inoperative the arm 13 carrying the holder H is raised upwardly and held by suitable detent means, not herein shown or described. To start the winding operation the detent means is released and the arm 13 is lowered to bring the surface of the cop-tube or yarn-receiver C into contact with the periphery of the drum 7. Immediately this driving contact is effected the drum 7 will start to rotate the cop-tube or yarn-receiver C and the strand *y* will be wound thereon. As the strand commences to wind onto the receiver C the slack will be taken up and it will be drawn down one edge 46 or the other of the V-shaped opening between the guard-plates 41. It is immaterial as to what point the strand is attached to the cop-tube or receiver C, since in whatever position it may be laid across the guard 40 immediately its draft is started it will be caused to draw down the inclined edge 46 of one of the plates 41 to carry it toward the center of the drum 7 and into the slot 45 between the edges 44 of the guard-plates. When the strand *y* has been drawn into this mid-position the rotation of the drum 7 will bring the threading-slot 10 around opposite the opening 45 between the guard-plates 40 and the strand will be entered into the slot 10 as indicated by the dot-and-dash line *x* in Fig. 1. As the drum 7 then continues to turn and the slit 10 moves toward the top the strand *y* will follow therethrough until it meets the helical groove or slot 8 and is diverted thereinto at the point 11, indicated in Fig. 2.

As the strand enters the slot 8 it will lead between the two halves of the drum in a direct line from the guide-rod 37 to the cross-bar of the bail 50, at which point it feeds onto the rotating cop-tube or carrier C. Thereafter the strand will continue to feed through the helical slot 8 in the drum and thus be caused to follow the latter from one extreme to the other to traverse it longitudinally back and forth on the cop-tube or receiver C. The traverse of the strand is continued to lay the yarn on the cop-tube or receiver in helical coils which form layers to build up a mass of any required form. As shown in the present drawings the layers of yarn are disposed on a tapered cop-tube so that the mass assumes the shape of a cone, and when the latter reaches a predetermined size suitable instrumentalities are brought into play to arrest the winding by lifting the package away from the drum 7. As the package increases in diameter the bail 50 is permitted to swing back to accommodate its growth.

Stopping devices are also usually provided for arresting the rotation of the package when the strand breaks or its supply becomes exhausted, and in piecing up the end the same procedure is followed as in starting the winding. That is to say, the new end is spliced or tied to the broken end on the package and the latter then placed in contact with the drum again with the strand simply laid across the guard 40 and over the top of the drum. As soon as the package starts to rotate the strand will be drawn down along

one of the edges of the V-shaped opening between the guard-plates 41 and through the narrow slit or opening 45 of the guard to bring it into alinement with the threading slot 10. Then, as the latter comes around into position, the strand will draw into the slot 10 and be carried down into the traverse groove or slot 8 in the manner as before explained.

It will be observed from the foregoing that the present improved construction of the traverse-drum and its guard or strand-guiding device insures that the strand will invariably be carried toward the middle of the drum to lead it into the threading slot 10 whereby it will immediately be entered into the helical groove or slot 8 to thereafter be traversed on the cop in helical coils extending from one end of the package to the other and back again in the usual manner of a "V-wind".

The present improvement provides for automatically threading the strand into the slot in the traverse drum without requiring the attention of the operator and thus expedites the operation of preparing the machine for winding while saving time and labor. The invention further insures against defective winding due to carelessness or inattention on the part of the operator as the strand will never remain out of the traversing slot or groove for any length of time and be caused to wind onto the cop to build up a ridge or ring.

The invention thus renders the machine to which it is applied more efficient in operation and capable of a higher rate of production, while also providing for greater economy in its cost of operation.

While I have herein illustrated the invention as embodied in a preferred form of construction and as applied to a certain type of winding machine, it is to be understood that various modifications may be made in the form and arrangement of the parts of the device and in the manner of applying it to use without departing from the spirit or scope of the invention.

Therefore, without limiting myself in this respect, I claim:

1. In a winding machine, the combination of a split drum constructed in two sections with a helical slit between the edges of its rim portions, a shaft for rotatably supporting the drum, a guard pivotally supported on the shaft within the drum and provided with an upstanding portion adapted to catch the end of a broken strand, and a counterweight depending from the guard to sustain the latter in operative position during the rotation of the drum.

2. In a winding machine, the combination of means for rotatably supporting a cop or package, a drum for rotating the package, said drum having a helical slot through which the strand feeds to traverse it on the package, and a bail adapted to yieldingly act against the strand as it feeds from the slot in the drum to direct it onto the package at the approximate point of contact of the latter with the periphery of the drum.

3. In a winding machine, the combination of means for rotatably supporting a cop or package, a drum for rotating the package, said drum having a helical slot through which the strand feeds to traverse it on the package, and a bail pivoted on the axis of the drum and arranged to bear against the strand feeding from the drum to direct it onto the package at the approximate point of contact of the latter with the surface of the drum.

4. In a winding machine, the combination of means for rotatably supporting a cop or package, a drum for rotating the package, said drum having a helical slot through which the strand feeds to traverse it on the package, a bail pivoted on the axis of the drum, and means for yieldingly pressing the bail against the strand as it feeds from the drum to direct it onto the package at the approximate point of contact of the latter with the drum.
5. In a winding machine, the combination of means for rotatably supporting a cop or package, a drum for rotating the package, said drum having a helical slot for guiding the strand to traverse it on the package, a substantially U-shaped bail straddling the drum and pivoted on its axis, and a counterweight on the bail for maintaining it in position bearing against the strand as it feeds from the drum to the package.
6. In a winding machine, the combination of means for rotatably supporting a cop or package, means for traversing strand material on the package comprising a drum having a helical groove through which the strand draws in feeding to the winding, and a guide for leading the strand into the groove when it is laid across the periphery of the drum, said guide having opposite arcuate portions substantially covering the forward upper surface of the drum throughout the whole length of the latter and spaced in concentric relation to its periphery, said guide being formed with a V-shaped opening, the edges of which extend from points at the opposite ends of the drum near the top thereof and converge in a narrow slit extending below the horizontal plane of the axis of the drum.
7. In a winding machine, the combination of means for rotatably supporting a cop or package, a rotary drum having a helical groove through which the strand draws in feeding to the package to cause it to be traversed longitudinally thereof, and a pair of arcuate guide-plates overlying the forward side of the drum and extending from a point near the top thereof to a point below the horizontal plane of the axis of the drum, said plates arranged concentric with the periphery of the drum and spaced at a slight distance therefrom, the upper portions of the plates being cut away to provide opposite edges inclined inwardly from points adjacent the ends of the drum to a point intermediate thereof and continued downwardly to form a narrow slit between the two plates.
8. In a winding machine, the combination of means for rotatably supporting a cop or package, a rotary drum having a helical groove in its periphery through which the strand draws in feeding to the package to cause it to be traversed longitudinally thereof and also provided with a second groove inclined to and leading into the helical groove, and means for directing the strand into the second groove to cause it to be guided thereby to introduce it into the helical groove, said means comprising a pair of plates extending concentrically to and spaced at a slight distance from the periphery of the drum to overlie its upper forward surface, said plates being formed with inclined edges converging from points at the ends of the drum to a point intermediate thereof and extended downwardly to form a narrow slit.
9. In a winding machine, the combination of means for rotatably supporting a cop or package, a rotary drum having a helical groove through which the strand feeds to traverse it on the package and also provided with a supplemental groove arranged at an angle to and leading into the main groove, and strand-guiding means for guiding the strand across the surface of the drum into the supplemental groove thereof, said strand-guiding means having arcuate portions overlying the upper forward part of the drum and provided with inclined portions leading from the ends of the drum to a point intermediate thereof and continued downwardly in a narrow slit.

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