June 22, 1926. 1,589,435

A. D. SCOTT

MECHANISM FOR CONTROLLING THE UNWINDING OF STRAND MATERIAL AND GUIDING THE SAME

Filed Oct. 31, 1923 2 Sheets-Sheet 1

Fig. 1.

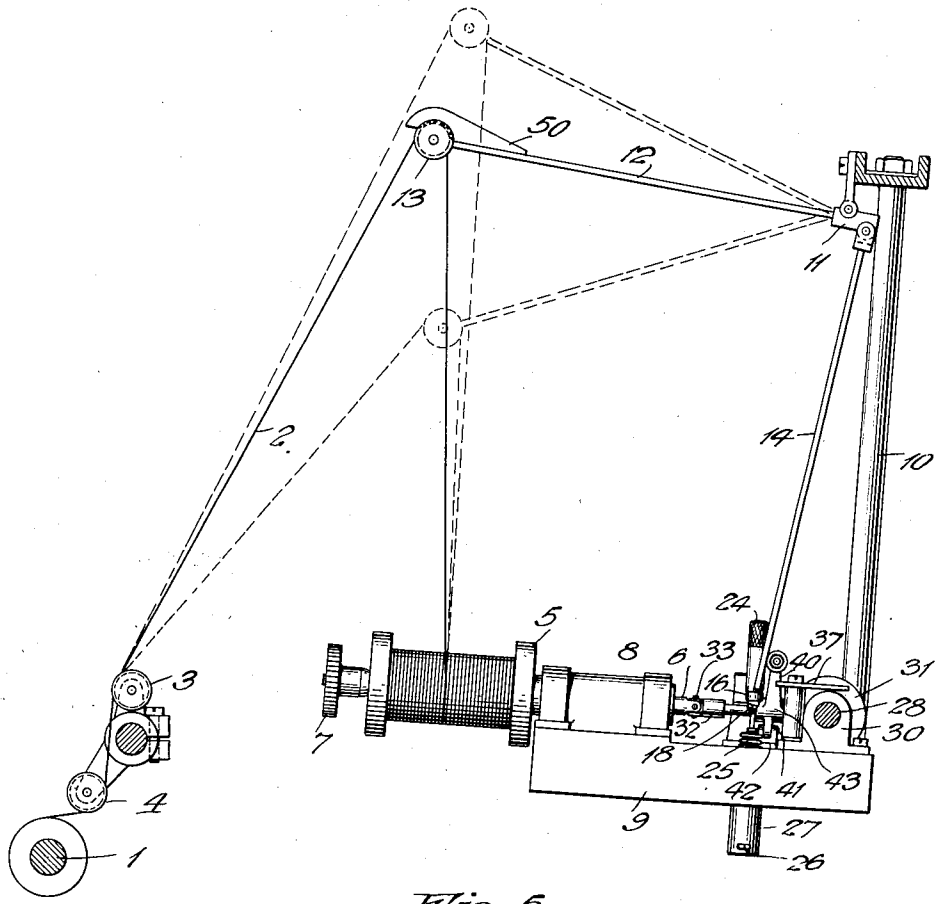
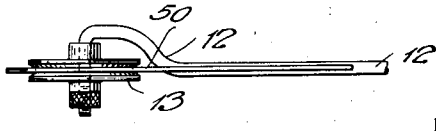



Fig. 5.

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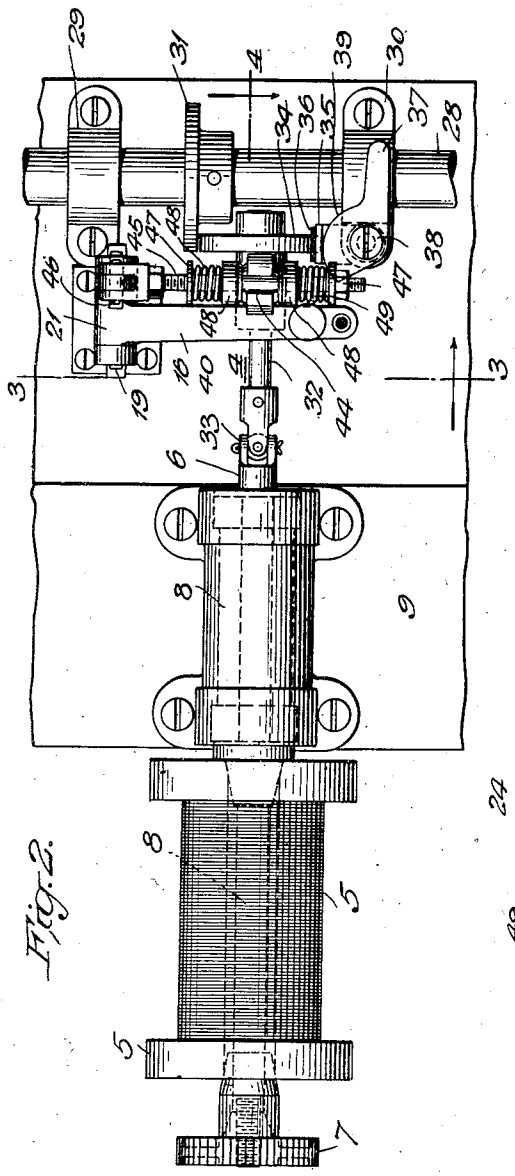

Fig. 2.

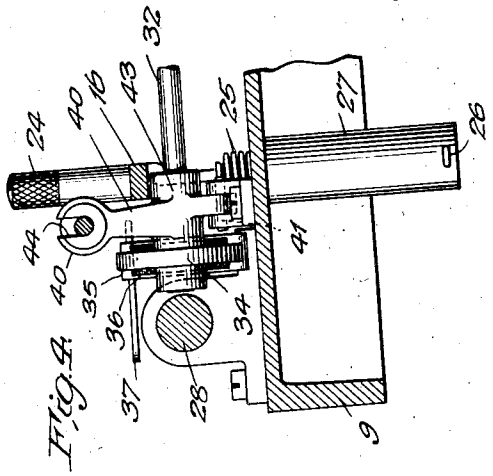

Fig. 4

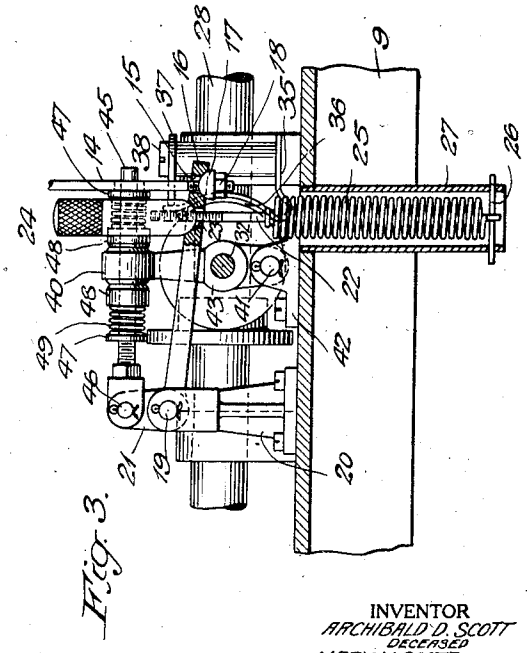

Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## MECHANISM FOR CONTROLLING THE UNWINDING OF STRAND MATERIAL AND GUIDING THE SAME.

Application filed October 31, 1923. Serial No. 671,902.

This invention relates to mechanism for controlling the unwinding of strands of material, such as wire or threads from supply spools or bobbins, and for guiding strands of material. Particularly it relates to machines in which ribbons or filaments are drawn from a supply spool or bobbin and wound upon a mandrel or spindle. The particular invention herein described and claimed is in the nature of an improvement upon machines of the type illustrated in U. S. Patent No. 1,302,121 issued April 29, 1919. In the patented machine, above referred to, power means are provided for rotating the supply spool in opposite directions depending upon whether or not the spool is paying out the filament or strand at a rate faster or slower than the unwound portion is being used. The applying of alternate driving forces to the spool in order to control the rate at which it is paid out has been found to be objectionable, owing to the sudden forces applied thereto, and particularly to the sudden application of a driving force to the spool in a direction to stop or reverse its rotation, which is likely to cause breakage in the delicate strand or filament.

An object of the present invention is to generally improve and simplify machines of the type illustrated in said prior patent, and to provide improved means for accelerating or retarding the rotation of the supply spool in a manner to lessen breakages of the strand or filament, and to cause the spool to pay out the strand or filament smoothly at substantially the rate at which the unwound portion is being used. A further object is to provide a construction which will facilitate the placing of the strand over its guides. Other objects and advantages will be apparent from the following description of an embodiment of the invention, and the novel features will be particularly pointed out hereinafter in claims.

In the accompanying drawings:

Fig. 1 is a side elevation of a portion of a winding machine equipped with mechanism constructed in accordance with the invention;

Fig. 2 is a plan of the mechanism;

Fig. 3 is a sectional elevation of the same taken substantially along the line 3—3 of Figure 2;

Fig. 4 is another sectional elevation of the same taken substantially along the line 4—4 of Figure 2; and

Fig. 5 is a plan of one of the details.

The mechanism illustrated is a portion of a machine for winding very fine copper wire into electromagnet coils. The coils are wound upon a winding spindle 1 from which they may be subsequently removed as will be understood in the art. The wire, strand or filament is conducted over guides 3 and 4 to the winding spindle, the guides 3 and 4 being shifted endwise of the spindle so as to cause the wire to be wound helically in successive superposed layers upon the winding spindle. To each of the coils being wound upon the spindle 1, a strand 2 leads from a supply spool 5. The drawing shows but one of these supply spools, this being sufficient to disclose the principle of the invention involved, but it will be understood that any number of the spools may be employed, with controlling mechanism for each spool.

The spool 5 is removably clutched upon a spool spindle 6 by means of a nut 7, so that the spool will rotate with the spindle. The spool spindle is rotatably supported in a suitable bearing block 8 carried by a frame 9. An upright 10 is provided upon the frame 9 and supports a member 11 for oscillation about a horizontal axis. The member 11 is provided with an arm 12 extending over the spool, and the arm carries upon its free end a pulley 13, over which the strand 2 passes from the spool and thence to the guide 3. A link 14 is connected to the member 11 upon the opposite side of the pivot from the arm 12, and at its lower end passes loosely through an aperture 15 (Fig. 3) in a lever 16. A washer 17 and nut 18 are provided upon the lower end of the link 14 so that when the link moves upwardly the lever 16 will be lifted. The lever 16 is pivoted by a pin 19 to the bearing bracket 20 of the frame 9, and also carries an upright arm 21 for a purpose to be explained hereinafter.

A threaded rod 22 passes upwardly through an aperture 23 in the lever 16 and

has threaded engagement with a button 24 which is adapted to abut against the upper face of the lever. The lower end of the rod 22 is anchored to one end of the helical coil spring 25, the other end of the spring being anchored by a pin 26 to an enclosing sleeve 27 that depends from the frame 9. The spring 25 is normally under tension so as to yieldingly stress the lever 16 downwardly and exert a downward pull upon the link 14. This downward pull tends to elevate the arm 12 and increase the length of wire between the spool and the guide 3. By adjusting the button 24 the tension of the spring may be varied and thereby its downward pull upon the link 14.

A shaft 28 is constantly driven from any suitable source of power (not shown) and mounted for rotation in bearing blocks 29 and 30. A friction driving disc 31 is secured upon the shaft 28 between the bearing blocks 29 and 30. An auxiliary spindle 32 is connected by a universal joint 33 to one end of the spool spindle 6, so that the spindles 6 and 32 will rotate in unison, and at the same time the free end of the spindle 32 may be shifted laterally from side to side to a limited extent. The spindle 32 carries a friction disc 34 which may be moved into driving engagement with the disc 31 of the driving shaft 28, when the free end of the spindle 32 is shifted laterally in one direction.

A leaf spring 35 is secured to one of the bearing blocks 30, and is directed upwardly along the peripheral edge of the disc 34, as shown particularly in Figures 2, 3 and 4. The leaf spring 35, in the portion thereof along the periphery of the disc 34, is concave and carries a friction lining 36 so that when the leaf spring is flexed toward the disc 34 it will apply the friction lining 36 to the periphery of the disc and serve as a brake to retard its rotation. A lever 37 is pivoted at 38 to the bearing block 30, and has an eccentric edge cam surface 39 which is adapted to engage behind the upper end of the leaf spring 35 and flex it toward the disc 34 to an extent dependent upon the angular movement of the lever 39. As the free end of the spindle 32 is shifted laterally from side to side, the disc 34 thereof will be carried alternately into engagement with the driving disc 31 of the shaft 28, or into engagement with the lining of the brake. The direction of rotation of the disc 31 is such that when it has drivng engagement with the disc 34 it will rotate the spool 5 in a direction to unwind the strand therefrom.

An arm 40 is pivoted at 41 to a bearing 42 of the frame 9, and intermediate its ends has a bearing portion 43 through which the spindle 32 passes somewhat loosely, so that when the arm 40 is shifted laterally about its pivot 41, the free end of the spindle 32 will be shifted laterally to carry its disc 34 into engagement with either the driving disc 31 or the brake. The upper end of the arm 40 is slotted as at 44 (see Figures 3 and 4) into which an arm 45, hinged at 46 to the upstanding arm 21, may be swung. A pair of nuts 47 are threaded upon the arm 45, at opposite sides of the arm 40, and washers 48 are disposed between each nut 47 and the arm 40. A coil compression spring 49 is disposed between each nut and adjacent washer 48 so that the washers 48 will be constantly pressed against the opposite faces of the arm 40. By adjusting the nuts 47. the compression of the springs 49 may be varied. The springs 49 will thus yieldingly oppose but permit the lateral movements of the arm 40 after the disc 34 has engaged with either the disc 31 or the brake and the arm 40 is given further movement in the same direction.

The arm 12 is provided upon an edge with a fin 50 which is within the plane of and extends over into the groove of the pulley 13, the fin being of less thickness than the width of the groove of the pulley, so that the strand or wire 2 may be quickly and readily placed in the groove of the pulley by merely bringing it laterally against the side of the fin 50 and thence in the plane of the pulley into the groove. The fin serves to guide the wire into the groove of the pulley so that the operator will not be obliged to use any particular care, or pay special attention, when threading the wire or strand over the pulley.

In the operation of the mechanism constructed in accordance with this invention, the operator mounts a supply spool 5 for each coil to be wound, and threads the loose end of the strand of each spool over a pulley 13, then around the corresponding guides 3 and 4, and secures the end to the form upon the winding spindle 1. As the winding spindle rotates, the wire or strand 2 will be wound thereon, and the pull on the strand by reason of its attachment to the spindle, will cause the spool 5 to rotate freely and pay out the strand.

If the winding spindle is using the paid out portion of the wire or strand more rapidly than the strand or wire is being paid out by the supply spool, the shortening of the portion of the strand between the spool and guides 3 and 4 will cause the arm 12 to be pulled downwardly toward the lower position indicated by dotted lines in Fig. 1, and as the arm 12 descends the link 14 will be lifted. The link 14 in moving upwardly will rock the lever 16 and through the arm 21 and arm 45 will yieldingly stress the arm 40 in a direction to carry the disc 34 into driving engagement with the disc 31, it being understood that the disc 31 is constantly

rotating. The disc 31 will then serve to drive the supply spool 5 in a direction to unwind or pay out the strand therefrom at a rate determined to be in excess of any expected rate.

The acceleration of rotation of the supply spool will cause the wire or strand to be paid out more rapidly than it is being used, and as a result the portion of the unwound stretch of the strand or wire between the supply spool and the guide 3 will be lengthened allowing the arm 12 to move upwardly under the rocking force applied thereto by the link 14 and spring 25. As the arm 12 moves upwardly toward the upper dotted position shown in Figure 1, the link 14 will descend and the lever 16 will be lowered. This will carry the arm 40 laterally in a direction to shift the disc 34 out of engagement with the driving disc 31, and the rotating force applied to the supply spool will be only that of the pull on the strand being unwound thereon.

If the wire or strand is not being wound upon the spindle 1 as rapidly as it is being paid out from the supply spool the arm 12 will continue to move upwardly under the action of the spring 25, and maintain the wire or strand taut. When the arm 12 approaches approximately the upper dotted position shown in Figure 1, the continued lowering of the lever 16 under the pull of the spring 25 will cause a shifting of the arm 40 in a lateral direction until the disc 34 engages with the brake device. The brake device will then retard the rotation of the supply spool until the latter pays out the wire or strand at a rate equal to or less than the rate at which it is being wound upon the winding spindle. The decrease in the rate at which the wire or strand 2 is paid out, will cause the arm 12 to be pulled downwardly and the lever 16 elevated until the arm 40 carries the disc 34 into its intermediate position where it is unaffected by the brake and the driving disc 31.

It will be observed that with this construction, the mechanism will automatically accelerate the rotation of the supply spool if the strand or wire is being wound upon a spindle 1 or is otherwise used more rapidly than it is being paid out by the spool, and will retard the rotation of the spool in case the latter pays out the strand or wire more rapidly than it is being used. At the same time the arm 12 which is stressed upwardly by the spring 25 serves as a yielding take-up device for the paid out section of the strand and serves to maintain it taut under all conditions. The form upon which the coil is being wound is frequently non-circular in cross section, and therefore, the pull upon the wire or strand will not be uniform, the pull being greatest when the wire or strand is being wound upon the portion of the form the greatest distance from the axis of the winding spindle. The yielding take-up device will compensate for these irregular pulls and avoid breakage of the wire or strand which may be very small and delicate. When the machine is started or stopped, a pull is suddenly placed upon the strand, or the strand is quickly released, and the yielding take-up compensates for the sudden changes in tension of the strand in order to avoid breakage thereof.

By adjusting the button 24, the tension of the spring 25 may be varied, and thereby the normal tension in the wire or strand 2 may be varied. By adjusting the nuts 47 upon the arm 45, the compression of the springs 49 may be varied, and by their relative adjustment the position of the arm 40 relatively to the different angular positions of the arm 12 may be varied, so that the disc 34 will be shifted into engagement with the driving disc or the brake when the arm 12 has been moved into any selected angular positions. By adjusting the lever 37, the brake member may be shifted toward or from the disc 34 so as to vary the distance through which the arms 40 must be moved from a normal intermediate position before the brake becomes effective. By slotting the upper end of the arm 40 for the reception of the arm 45, the latter may be quickly disengaged from the arm 40 by merely swinging the arm 45 upwardly, or it may be reengaged by a reverse movement. In case adjustments or repairs are necessary this simple movement will enable the parts to be readily dismounted for inspection or access, without the necessity of taking off individually, the nuts, springs, and washers, or disturbing their adjustment, such as has been necessary in prior machines.

It will be observed that the invention in its broadest aspect contemplates the idea of applying retarding or accelerating forces to the supply spool independently of the pull of the strand, and consequently the invention is not necessarily limited to winding machines of the type illustrated. The invention is equally applicable to the control of the unwinding of spools or strand material for use in any desired manner, and it is immaterial whether or not the strand is rewound.

It will be obvious that various changes in the details and arrangements of parts, herein described and illustrated for the purpose of explaining the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

Claims:

1. In a machine for winding strands, the combination of a supply spool mounted to rotate freely, a winding spindle adapted to

rotate said spool by pulling upon the strand leading therefrom, a source of power independent of the pull of the strand, means effective when the spool fails to feed the strand as rapidly as it is being wound upon the spindle for automatically applying said source of power to the spool to increase the rate of rotation of the latter, and a brake device automatically effective to check the rotation of the spool when the latter feeds the strand faster than it is being wound upon the spindle, said means and brake device permitting free rotation of the spool when the latter is feeding the strand at approximately the rate at which it is being used.

2. In a machine of the character described, a strand supply spool mounted for rotation by the pull of the strand as it unwinds, an element rotatable with said spool, a constantly rotating member, a brake member, and automatic means responsive to tension in the strand for effecting relative movement between said element and the said members whereby the element may operate independently of the said members when the spool is paying out the strand at the rate it is being used, may drivingly engage with the rotating member to be accelerated thereby in paying out the strand when said strand is not being paid out as rapidly as it is being used, or may have contact with the brake mechanism to check the rate at which the strand is paid out when said strand is not being used as rapidly as it is being paid out.

3. In a machine of the character described a strand supply spool mounted for rotation by the pull of the strand as it unwinds, an element rotatable with said spool, a constantly rotating member, a brake member, and automatic means responsive to tension in the strand for effecting movement of the element into driving engagement with the rotating member and cause an acceleration of the rate at which the strand is paid out when the said rate falls below the rate of use of the unwound portion, and for effecting movement of the element into engagement with the brake member and cause a decrease in the rate at which the strand is paid out when said rate exceeds the rate of use of the unwound portion.

4. The machine substantially as set forth in claim 3 in which the brake member is adjustable toward the element to lessen the movement of the latter necessary to be engaged with the brake member.

5. In a machine of the character described, a strand supply spool mounted for rotation by the pull of the strand as it unwinds, an element connected for rotation with the spool, a constantly rotating driving member and a brake member disposed upon opposite sides of the element, and means responsive to the tension in the unwound portion of the strand for shifting said element into engagement with the driving member to cause an acceleration in the rotation of the spool when the strand is not paid out as rapidly as the unwound portion is being used, and into engagement with the brake member to have its rotation retarded when the strand is paid out more rapidly than the unwound portion is being used.

6. The machine substantially as set forth in claim 5 in which the brake member is adjustable toward and from the element.

7. In a machine of the character described, a strand supply spool mounted for rotation by the pull of the strand as it unwinds, a shaft having a universal connection to the spool for rotation therewith while being movable laterally, a spool controlling element carried by the shaft for lateral movement therewith, a lever mounting the free end of the shaft, pivoted at one end and oscillatable in a manner to carry the shaft laterally, the free end of the lever being slotted, an arm mounted to be swung laterally of itself into the slot, spring devices carried by the arm and engaging with opposite sides of the arm, means for accelerating and means for retarding the rotation of said element arranged on opposite sides thereof, and means responsive to tension in the unwound portion of the strand for shifting said arm endwise to oscillate the lever and carry said element into engagement with either the accelerating or retarding means, depending upon whether the strand is being paid out from the spool less rapidly or more rapidly respectively, than the paid out portion is being used.

8. In a machine of the character described, a strand supply spool mounted for rotation by the pull of the strand as it unwinds, an element connected for rotation with the spool, means disposed on opposite sides of the element into engagement with which said element may be shifted alternately for accelerating or retarding its rotation and thereby the rotation of the spool, a lever connected to the element to shift it into cooperation selectively with either the accelerating or retarding means, said lever having a forked free end, a link removably disposed in said forked end, carrying abutments on opposite sides of said forked end, springs on said link on opposite sides of said forked end engaging with said abutments, washers also on said link on opposite sides of the forked end and engaging with opposite faces thereof, with each spring compressed between an abutment and a washer, whereby movement of the forked end along the link will be yieldingly resisted in both directions by said springs, said link and parts carried thereby being disengageable from said forked end

of the lever by movement laterally of itself, and means responsive to the tension in the strand in the unwound section between the spool and the point of utilization for shifting said link endwise, to vary the influence on said element of the accelerating and retarding means.

9. In a machine of the character described, a strand supply spool mounted for rotation by the pull of the strand as it unwinds, an element connected for rotation with said spool, accelerating and retarding means disposed on opposite sides of said element and into which it is engageable alternately, with an intermediate position in which it is free of both, a lever for shifting said element through said three positions, said lever having a forked free end, and operating means for said lever controlled by the tension in the unwound section of the strand, and having a link engageable with and disengageable from the forked end of said lever by moving laterally into and out of the fork of the end, said link having means adjustable thereon to engage the lever and by the adjustment vary the relative positions of the said lever and element for any selected normal tension of the strand, whereby the link may be disconnected from said element without disturbing the adjustment.

In witness whereof, I hereunto subscribe my signature.

MARY V. SCOTT,
*Executrix of the Last Will and Testament of Archibald D. Scott.*