Jan. 23, 1934. E. SNYDER 1,944,581

COIL WINDING MACHINE

Filed Aug. 12, 1930 5 Sheets-Sheet 1

Fig. 1.

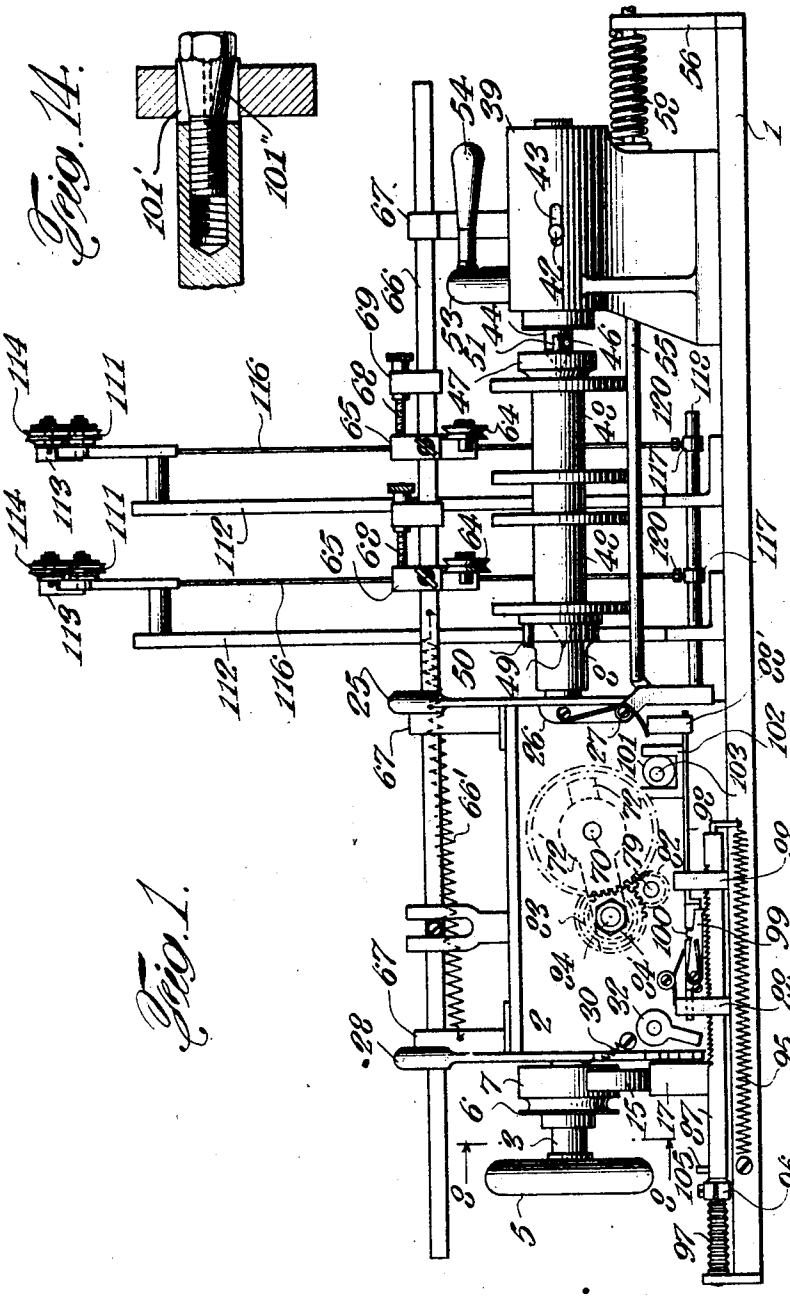


Fig. 1A.

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COIL WINDING MACHINE

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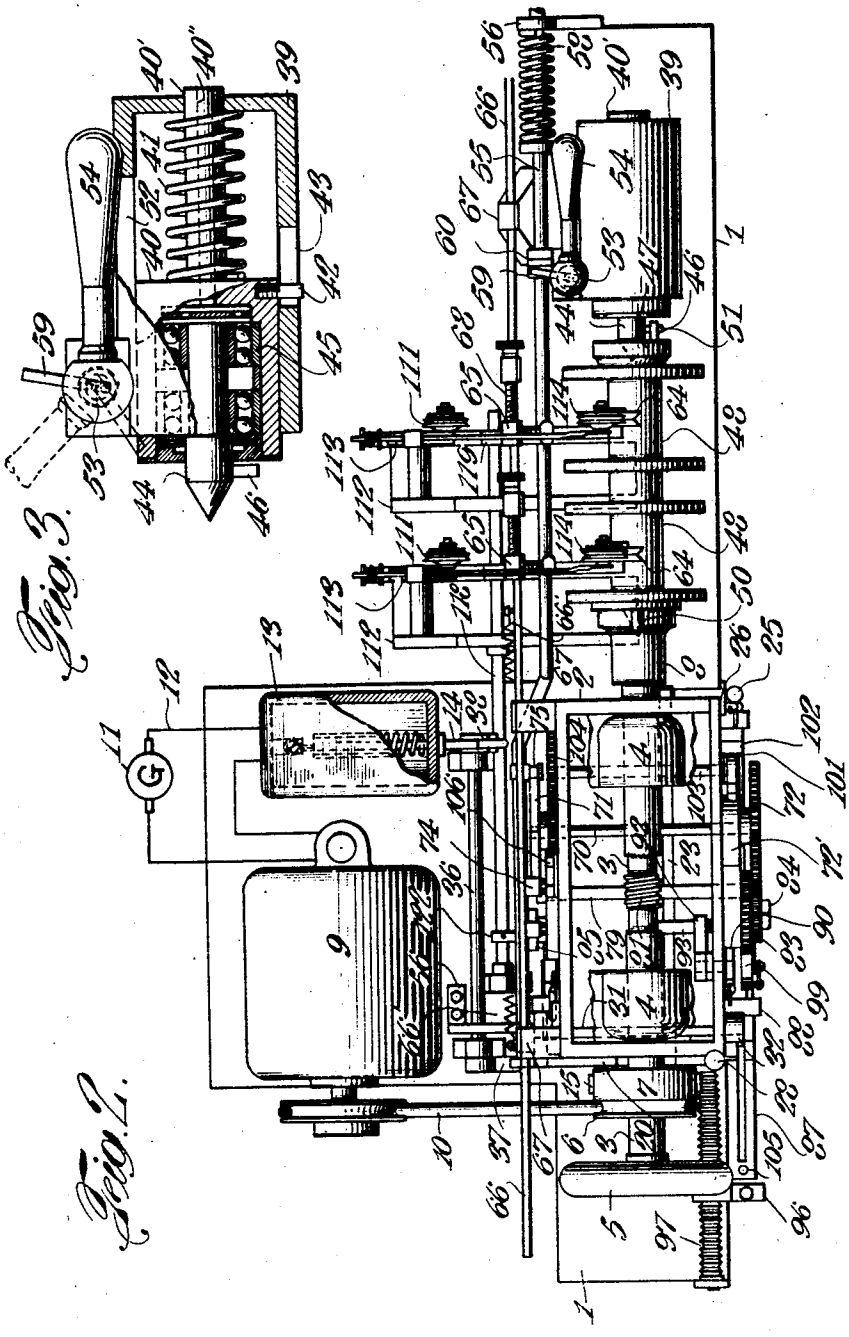


Fig. 2.

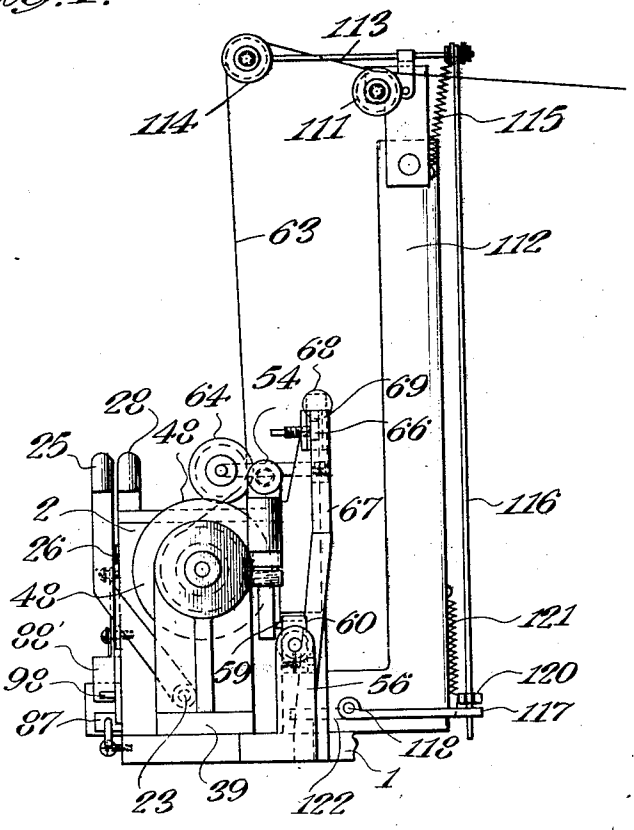
Fig. 3.

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COIL WINDING MACHINE

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Fig. 4.



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COIL WINDING MACHINE

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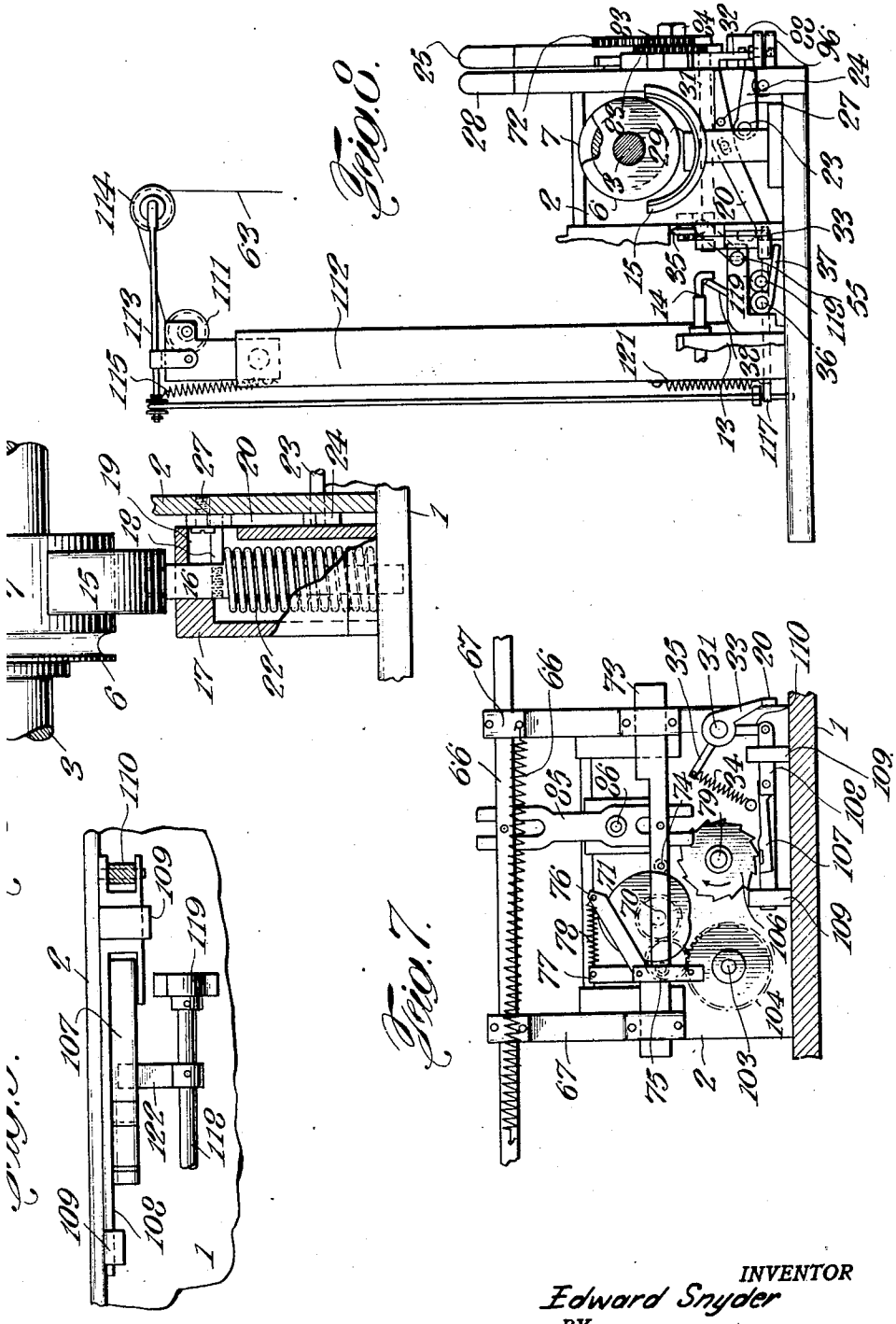


Fig. 6.

Fig. 7.

Fig. 8.

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COIL WINDING MACHINE

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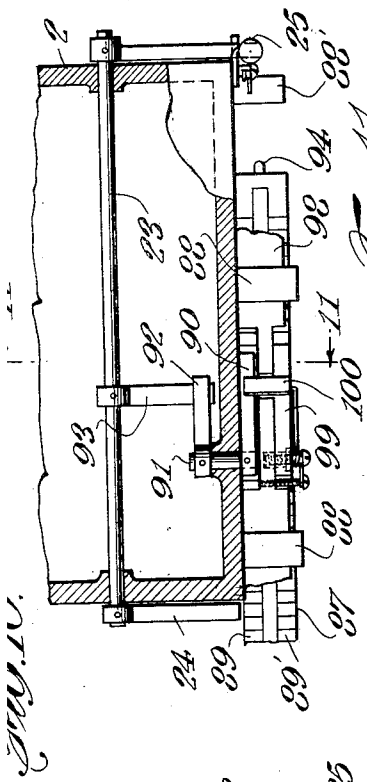


Fig. 11.

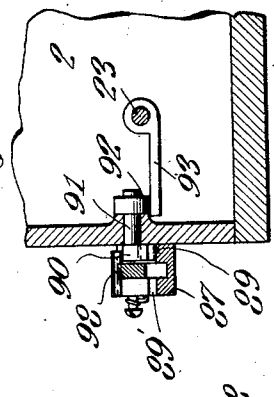


Fig. 17.

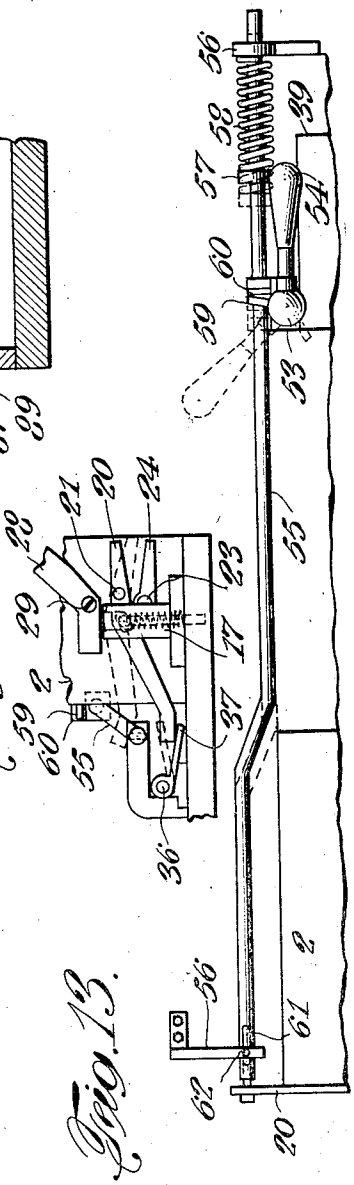


Fig. 12.

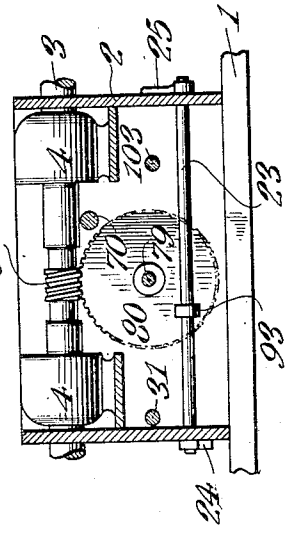


Fig. 9.

Fig. 13.

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UNITED STATES PATENT OFFICE

1,944,581

COIL WINDING MACHINE

Edward Snyder, Fort Wayne, Ind., assignor to General Cable Corporation, New York, N. Y., a corporation of New Jersey

Application August 12, 1930. Serial No. 474,724

8 Claims. (Cl. 242—25)

This invention relates to coil winding machines and an object is to provide a machine of this type having an improved construction of operating and control mechanisms arranged to produce compact, uniformly wound coils of the desired size.

A preferred embodiment of the invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a front elevation of a structure embodying the invention;

Fig. 2 is a plan view projected from Fig. 1;

Fig. 3 is a plan view of the tail stock of the machine, drawn upon an enlarged scale, a portion being broken away;

Fig. 4 is a side end elevation of the machine projected from Fig. 1;

Fig. 5 is a detail plan view upon an enlarged scale showing part of the mechanism by which the machine is thrown out of action upon breakage of the supply wire;

Fig. 6 is a detail view showing a front elevation upon an enlarged scale of the brake mechanism, portions being broken away;

Fig. 7 is a rear elevation of the mechanism for actuating the wire guiding means and also part of the mechanism for throwing the machine out of action upon breakage of the supply wire;

Fig. 8 is a front end elevation, a part being in section on the line 8—8 of Fig. 1;

Fig. 9 is an elevation showing the cam shaft actuating mechanism and other parts contained in the housing, parts being in section;

Fig. 10 is a fragmentary plan view, upon an enlarged scale, of the ratchet mechanism for the automatic stop, parts being broken away;

Fig. 11 is an elevation in section on the line 11—11 of Fig. 10;

Fig. 12 is a detail view showing a front elevation of the minor lever and parts associated therewith;

Fig. 13 is a detail plan view upon an enlarged scale, of the locking means for controlling the minor operating lever; and

Fig. 14 is a view of certain details.

The machine shown in the drawings consists of a platform 1 having mounted thereon a housing 2 in which is longitudinally disposed a drive shaft 3 in bearings 4. The drive shaft 3 has upon its forward end a hand-wheel 5, and also a grooved pulley 6 provided with a brake drum 7, the opposite end of said shaft having thereon a drive head 8. The drive shaft 3 is actuated by means of a motor 9 that has a belt connection 10 with the pulley 6, which motor receives current from a suitable source of energy 11 through a circuit 12 that is controlled by a switch 13. Said switch is of that type having a spring restrained stem 14, which, upon being pulled outwardly, the circuit controlled by the switch is closed.

A brake shoe 15 (Figs. 1, 6 and 8) is located beneath the drum 7 on a stem 16 that is vertically movable in a hollow post 17. Secured in the stem 16 is a pin 18 that extends laterally therefrom through a slot 19 in the post, and has operative engagement with a control lever 20 that is pivoted at 21 on the adjacent end of the housing 2.

A compression spring 22 in the post acts to move the stem 16 upwardly causing the brake shoe to be applied to the drum and the lever 20 to be tilted from its locked position.

A rock shaft 23 extends endwise through the housing, upon one end of which shaft is secured a finger 24 which, when swung upwardly, engages the forward end of the control lever 20 and moves the lever to its locked position, thereby withdrawing the brake shoe from engagement with the drum and compressing the spring 22. Upon the opposite end of the shaft 23 is secured a primary starting lever 25 by which the shaft is rocked to cause the lever 20 to move to its locked position.

A spring pressed latch lever 26 is pivoted at 27 on the housing 2 and has locking engagement with the primary starting lever 25 to hold the lever out of action.

A secondary starting lever 28 is pivoted at 29, there being a spring 30 attached to the lever for holding it out of action (Fig. 1), the function of said lever being to move the lever 20 into locked position.

A rock shaft 31 is mounted transversely in the housing 2, and is provided with a pendant arm 32 on its front end, and a latch 33 on its rear end. Said latch has locking engagement with the lever 20 when the rear end of the lever is moved to its lowermost position. A spring 34 connected with a post 35 on the shaft 31, tends to turn the shaft so that the latch 33 is held in locking position. When the lever 20 is in locked engagement with the latch, the brake shoe 15 is withheld from engagement with the drum 7.

A rock shaft 36 provided with bearings is mounted on the platform 1 back of the housing 2 and has secured on one end an arm 37 that extends beneath the rear end of the lever 20 and is engaged thereby and actuated when said lever is moved to its locked position so that the shaft 36 is rocked accordingly. Upon the opposite end of the shaft 36 is secured another arm 38 that

has operative engagement with the switch stem 14, so that when the lever 30 is in locked position, the motor circuit 12 is closed by the switch 13, whereupon the drive shaft 3 is actuated by the motor and its connections therewith.

Upon the bed 1 is mounted a tail stock 39, having therein a plunger 40 movable longitudinally therein and axially aligned with the drive shaft 3, there being a spring 41 in the tail stock that acts to move the plunger toward the drive head 8. A pin 42 extends laterally from the plunger into a slot 43 in the tail stock which limits longitudinal movement of the plunger. A center 44 is rotatably mounted in suitable bearings 45 in the plunger in axial alignment therewith, and has a laterally extending dog pin 46 spaced from its pointed end. The stem 40' of the plunger 40 has an axial duct 40'' through which a lubricant is conveniently supplied to the center bearings 45.

An arbor 47 having a pair of spools 48 thereon is mounted in connection with the driving head 8 and the center 44 in the tail stock and is axially aligned therewith, one end of the arbor has a center 49 that extends into the drive head, while the opposite end of the arbor receives the pointed end of the center 44. A dog pin 50 located eccentrically at one end of the arbor is engaged in the drive head so that the arbor is revolved accordingly as the drive shaft is turned. The opposite end of the arbor has a similar dog pin 51 that has engagement with the dog pin 46 on the center 44 so that the center is caused to turn in its bearings as the arbor revolves, whereby friction and consequent wear between the arbor and the center is obviated.

The tail stock 39 has made therein a longitudinal slot 52 and is provided with a clamp screw 53 having a handle 54 by which the screw is turned. The clamp screw upon being tightened contracts the head stock about the plunger 40 which sustains the plunger in operating position. When the screw is loosened, the plunger may be conveniently moved rearwardly against the pressure of the spring 41 to permit insertion or removal of the arbor with respect to its supports between the drive head and tail stock center.

To prevent operation of the machine prematurely, or while the plunger is loose in the tail stock, which would entail liability of the arbor becoming thrown violently from its supports, a lock shaft 55 is slidably mounted in brackets 56 and extends back of the tail stock 39 and housing 2, and is provided with a collar 57 and compression spring 58 by which the shaft is moved into the path of the lock lever 20, at the rear end thereof, so as to prevent the lever from being moved to its locked position. The lower end of the clamp screw 53 (Figs. 2, 3 and 12) has a laterally projecting pin 59 that has engagement with a lug 60 which is secured on the shaft 55 and so located thereon that when the screw is tightened and the plunger in the head stock is thereby secured from movement, the shaft 55 is held from interference with the lever 20. When the handle of the screw 53 is turned to the position shown in dotted outline (Fig. 12) the shaft 55 is moved through the action of the spring 58 into engaging position with respect to the lever 20. A slot 61 is made in the shaft 55, and a pin 62 in the bracket 56 projects into the slot, by which turning movement of the shaft is prevented, and longitudinal movement thereof is limited.

A guiding means is provided for controlling the position of the wires 63 as they are supplied to the spools during the winding operation to insure proper formation of the turns and layers of the wires in the coils as they are wound. Such guiding means consists of a pair of guide pulleys 64, one for each spool, said guide pulleys being mounted respectively upon corresponding brackets 65 that are adjustably mounted upon a longitudinally reciprocating traverse bar 66, which bar is slidably supported in brackets 67 and restrained by a spring 66'. An adjusting screw 68 is provided for each of the brackets 65, and is mounted in a corresponding lug 69 secured upon the bar 66, so that the brackets 65 may be accurately positioned on the bar 66. As a means for actuating the traverse bar 66, a cam shaft 70 is mounted transversely in the housing 2 and has mounted on its rear end a cam 71, (Fig. 7) and upon its front end a gear 72. A cam follower has operative relation with said cam and consists of a longitudinally sliding bar 73 mounted in the brackets 67, which bar is provided with a roller 74 that bears against one side of the cam, while a second roller 75 on a pivoted lever 76 bears against the opposite side of the cam. A bracket 77 is secured on the bar 73 upon which bracket the lever 76 is pivoted, and a contracting spring 78 is secured between one end of the lever 76 and the bracket 77 to cause said lever to turn upon its pivot and the roller 75 to press against the cam. By this arrangement lost motion between the cam and the follower is taken up.

A countershaft 79 is mounted transversely in the housing 2 and has mounted thereon a worm wheel 80 that is driven by a worm 81 on the drive shaft 3. On the front end of the countershaft 79 is a pinion 82 that has a driving connection with the gear 72 through the medium of gears 83 which are mounted upon a stud 84 adjustably supported in a slot 84' of a bracket 72' supported on the shaft 72. Movement is imparted to the traverse bar 66 from the sliding bar 73 of the follower through the medium of a rocker arm 85 that is mounted upon a stud 86 which projects from the back of the housing 2. Each end of the rocker arm is bifurcated and has operative relation correspondingly with the sliding bar 73 and the traverse bar 66. A tension spring 66' connected with one of the brackets 67, and the traverse bar 66 prevents lost motion between said bar and its actuating mechanism. As the follower is reciprocated through the action of the cam, the traverse bar is reciprocated oppositely through the medium of the rocker arm 85, and the guide pulleys 64 are moved accordingly along the sides of the respective spools.

The machine is equipped with mechanism for automatically throwing it out of action when the winding of the coils upon the spool reaches completion. This mechanism consists of a saw-toothed feed bar 87 that is mounted in guides 88 on the front of the housing 2 in which said bar has longitudinal sliding movement. The upper face of the bar 87 has two similar longitudinal rows of saw teeth 89 and 89' (Figs. 10 and 11), the rows being spaced apart, the innermost row of teeth 89 being engaged by a pawl 90 that is supported upon a stub shaft 91 which extends loosely through the front of the housing 2 and has secured thereon an arm 92. The rock shaft 23 has secured thereon an arm 93 that extends under and has engagement with the arm 92 on the stub shaft, so that when the rock shaft 23 is actuated by the primary starting

lever 25, the pawl 90 is lifted out of engagement with the teeth 89 on the sliding bar 87.

The front end of the bar 87 has a pendant bracket 94 to which is attached a retracting spring 95 that is secured at its opposite end to the platform 1, by which spring retracting movement is imparted to the bar 87. A stop 96 is adjustably mounted upon a serrated rod 97 that is mounted upon the platform, the stop extending into the path of the bar 87 and being adapted to adjustably limit the retracting movement thereof.

In the guides 88 and 88' is mounted a reciprocating bar 98 upon which is pivoted a spring restrained ratchet 99 that has engagement with the row of teeth 89' on the sliding bar 87, whereby said bar 87 is progressed forwardly in opposition to the tension of its spring 95 upon reciprocation of the bar 98. The pawl 90 by engagement with the teeth 89 on the bar 87 normally prevents retracting movement thereof. The ratchet 99 has laterally extending finger 100 that overhangs the pawl 90, so that when the pawl 90 is disengaged from the teeth 89, the ratchet is lifted from engagement with the teeth 89', thus releasing the bar 87 which permits said bar to retract through the action of its spring 95 into contact with the stop 96.

Movement is imparted to the reciprocating bar 98 by means of an eccentric 101 that is disposed in a slotted lug 102 on said bar, and is secured on a shaft 103 that extends transversely in the housing 2. Movement is imparted to the shaft 103 from the cam shaft 70 through gearing 104 located at the rear of the housing 2.

The eccentric 101 is mounted upon the split end 101' of the shaft 103 and is held in position thereon by a locking stud 101'' which is adapted to be threaded within the split end of the shaft to expand the same into frictional engagement with the bore of the eccentric 101. Obviously, the arrangement is such that any adjustment of the eccentric on the supporting shaft is obtainable.

The follow end of the toothed feed bar 87 has an upwardly projecting pin 105 that moves into contact with and actuates the pendant arm 32 on the rock shaft 31 as said bar reaches the end of its feed stroke, whereupon the lever 20 is released from engagement by the latch 33, and the brake 15 is automatically applied to the drum 7 through the action of its spring, and also the arm 37 is released from engagement with the lever 20, which permits the stem 14 of the switch 13 to move into open position. Thus, the motor circuit is opened and rotation of the drive shaft 3 is stopped. At the same time the end of the feed bar 87 has engaged the latch lever 26 and unlatched the primary starting lever 25.

The action of the traverse bar; movement of the toothed feed bar 87 during the feed stroke thereof; and the rotation of the drive shaft 3 are relative and coterminous. By adjustment of the stop 96 on the rod 97 the permissible stroke of the notched bar 87 may be increased or decreased to protract or decrease the duration of the winding operation, and the number of turns and layers of turns of the wires wound upon the spools to form the coils is dependent upon the length of the stroke of the toothed feed bar 87. By lengthening the stroke of the bar 87 through adjustment of the stop 96, the duration of the winding operation is and the number of turns and layers are increased, or upon shortening the stroke of the bar the duration of the winding operation and the number of turns and layers are decreased.

One of the features of the invention is the provision of means for automatically throwing the machine out of action in the event of breakage of one or the other of the wires 63 being supplied to the spools, in order to permit splicing of the broken wire and to prevent the machine from getting out of step with the winding of the coils, which would thereby cause a decrease in the predetermined number of turns in the affected coil at the completion of the winding operation. Such means consists of a saw toothed wheel 106 secured on the rear end of the countershaft 79 arranged to be engaged by a hook 107 that is pivoted at one end in a slidable bar 108, which bar is supported in guides 109. Normally the hook is out of contact with the notched wheel, but has engagement therewith upon being elevated. The forward end of said bar has connection with an arm 110 that extends radially from the rock shaft 31. During operation of the machine the notched wheel rotates in the direction indicated by the arrow (Fig. 7) and when the hook is raised into engagement with the notched wheel, the bar 108 is moved so that the rock shaft is actuated and the latch 33 is disengaged from the lever 20, which when released, the machine is thrown out of action.

The wires 63 are supplied to the spools, from any suitable source, such as from reels, (not shown) and are withdrawn as they are wound upon the spools. Each wire has provided therefor a tension device of ordinary structure consisting of a frictionally restrained pulley 111 mounted upon a standard 112, around which the wire 63 is strung, and upon which standard is pivotally mounted a boom 113 provided with an idler 114 over which the wire 63 passes, and from which it extends to the corresponding guide pulley 64. A tension spring 115, attached at one end to the standard 112, and at its opposite end to the boom 113, back of its pivotal support, tends to tilt the boom so that the idler 114 is moved upwardly thereby. A pendant rod 116 is connected to the rear end of the boom 113, the lower end of which rod extends loosely through the outer end of an arm 117 that is secured on a rock shaft 118, provided with bearings 119, on the platform 1. Each rod 116 has thereon a nut 120 adjustably secured thereon at a point above the arm 117 with which it has contact and operative relation when the front end of the boom moves upwardly upon breakage of the wire 63, in which event the shaft 118 is actuated. A spring 121 is attached at one end to the standard 112 and at its opposite end to the arm 117 to hold said lever in uppermost position. A finger 122 (Figs. 2 and 5) secured on the rock shaft 118, extends therefrom beneath the pivoted hook 107 by which finger the hook is elevated into engagement with the notched wheel 106 when the rock shaft 118 is actuated. In this manner when one or the other of the wires 63 is broken, the rock shaft is actuated and the hook is engaged by the revolving notched wheel, whereupon the bar 108 is actuated and the latch 33 releases the lever 20, which causes the machine to be automatically thrown out of action.

When the machine is in readiness for operation, the toothed bar 87 is at the end of its feed stroke and bears against the latch 26, so that the latch is held out of engagement with the primary starting lever 25, and the lever 20 is

unlatched, and the brake shoe 15 is in engagement with the drum 7 on the drive shaft. The tail stock clamp lever 54 is then turned to loosen the screw 53, which permits the plunger 40 to be moved against the pressure of the spring 41. The pin 59 on the screw, when the screw is loosened, permits the shaft 55 to move into the path of the lever 20, which prevents the machine from being thrown into action. The arbor containing the spools may then be removed from the machine by applying pressure endwise thereto against the center 44, which causes the plunger 40 to move into the tail stock, and permits the opposite end of the arbor to be removed from the driving head 8. The arbor, with empty spools assembled thereon, is then replaced in similar manner, and when the clamp screw is again tightened, the shaft 55 is withdrawn from interference with the lever 20 and the plunger 40 is held rigidly in operating position.

The wires 63 are then initially applied to the corresponding spools in the customary manner, and the machine is started by moving the primary starting lever 25 inwardly which turns the rock shaft 23 upon its axis, whereupon the arm 92 is raised by the arm 93 (Figs. 2, 10 and 11) and the pawl 90 is raised from engagement with the teeth 89 on the bar 87, and the ratchet 99 is also raised from engagement from the teeth 89' thereon, thus permitting the bar 87 to be drawn back against the stop 96, through the action of the spring 95. Also, upon the same operation of the rock shaft 23, the lever 20 is thrown into latched position through the medium of the finger 24 (Figs. 8, 10 and 12). Upon return of the primary starting lever to normal position, it becomes inoperative through engagement with the latch 26.

When the machine is thus thrown into action, the drive shaft rotates and the arbor is revolved; the traverse bar is reciprocated so that the wires 63 are guided into proper place upon the spools as they become wound thereon; and the notched bar 87 is progressed through the action of the ratchet 99 and is restrained from retracting by the pawl 90. The winding operation continues automatically until the notched bar 87 reaches the end of its feed stroke when the machine is again automatically thrown out of action by engagement of the pin 105 with the arm 32 which causes the latch 33 to release the lever 20.

In the event of one of the wires 63 becoming broken, the machine is thrown out of action as previously described, which permits the operator to repair the break. After the broken wire has been spliced and readjusted in place, the machine is restarted by moving the secondary starting lever 28 inwardly which moves the lever 20 to latched position and the withdrawal of the brake shoe from the drum, whereupon the machine is set into operation. The primary starting lever 25 being locked by the latch 26 prevents disengagement of the pawl 90 and ratchet 99 from the toothed bar 87 until said bar reaches the end of its feed stroke, which is at the completion of the winding of the coils upon the spools.

Although I have described a specific embodiment of this invention in more or less detail, it will be apparent that various changes, additions, omissions and substitutions can be made therein without departing from the spirit of this invention or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. The combination in a coil winding machine of a power shaft, a control switch, a brake, a starting lever, means operated by said starting lever for releasing said brake and actuating said switch, a lock for holding said starting lever against movement after operation thereof, means for disconnecting said switch and applying said brake and a second lever for reactuating said switch and brake independently of said starting lever.

2. The combination in a coil winding machine of a power shaft, a control switch, a brake, a control arm for simultaneously operating said switch and releasing said brake, a starting lever for operating said control arm, a winding arbor, means for delivering wire to said arbor, means operated by a break in said wire for releasing said control arm to stop said machine and a secondary lever for resetting said control arm and restarting said machine.

3. The combination in a coil winding machine, a winding arbor, means for supplying wire thereto, a power shaft, a switch, a brake for said shaft, timing mechanism for operating said switch and brake to stop said machine at a predetermined point in the operation thereof, a brake and switch control arm, a starting lever for operating said arm to start said machine and for simultaneously setting said timing mechanism at the beginning of its cycle, means for stopping said machine prior to completion of a cycle of operation and a secondary lever for operating said arm for restarting the machine without resetting said timing mechanism.

4. The combination in a coil winding machine of a rotary shaft, operating means for said shaft including a brake, a starting lever for releasing said brake and operating said shaft, a mechanism for timing the operation of said shaft, means operated by said starting lever for setting said mechanism at the beginning of its cycle of operation, means for stopping said shaft prior to the completion of its cycle of operation and means for restarting said shaft independent of said starting lever.

5. The combination in a coil winding machine of a winding arbor, a power shaft, a brake for said shaft, a control switch, an arm for operating said switch and controlling said brake, a starting lever for shifting said arm to start said machine, means operated by a break in the wire being wound for stopping said machine and a secondary lever for resetting said arm.

6. The combination in a coil winding machine of a winding arbor, a power shaft for rotating said arbor, means for controlling the operation of said shaft including a control arm, a latch for holding said arm in position to cause operation of said shaft, means operated by breaking of the wire fed to said arbor for unlatching said arm and stopping said shaft, a feed bar for timing the operation of said shaft and means operated by said feed bar for unlatching said arm at a predetermined point in the operation of said shaft.

7. The combination in a coil winding machine of a rotary shaft, operating means for said shaft including a brake, a starting lever for releasing said brake and operating said shaft, mechanism for timing the operation of said shaft, means operated by said starting lever for setting said mechanism at the beginning of its cycle of operation, means operated by a break in

the material being wound for stopping said shaft prior to the completion of its cycle of operation and means for restarting said shaft independently of said starting lever.

8. The combination in a coil winding machine of a power shaft, operating mechanism therefor, a starting lever, means operated by said starting lever for actuating said operating mechanism, a lock for holding said starting lever against movement after operation thereof, means for discontinuing the operation of said shaft and a second lever for reactuating said operating mechanism independently of said starting lever.

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