

Oct. 17, 1933.

E. W. COLLINS
COIL WINDING MACHINE

1,931,061

Filed March 7, 1932

6 Sheets-Sheet 1

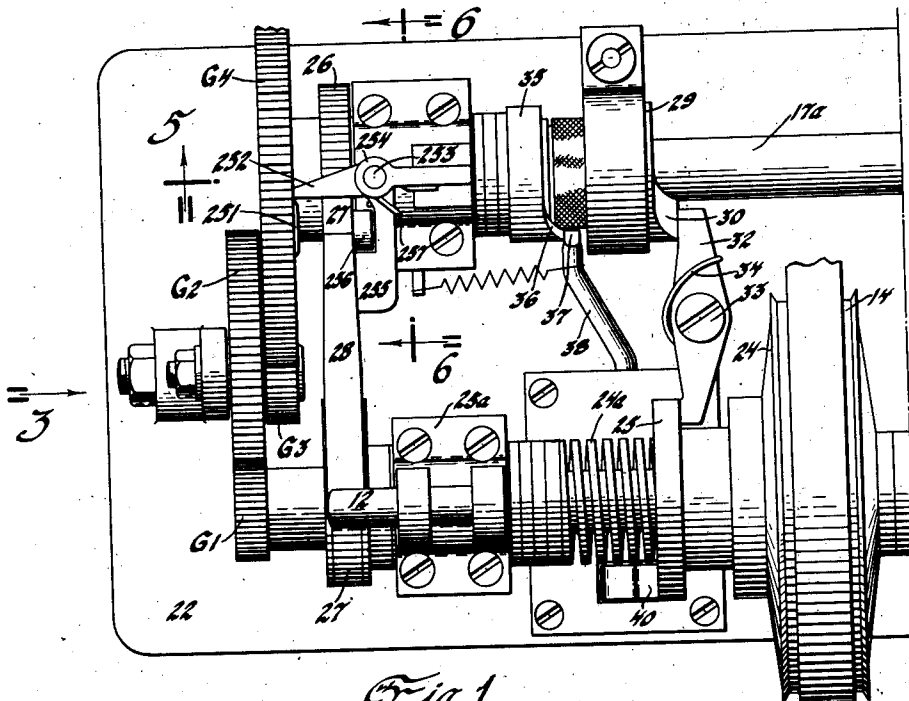


Fig. 1

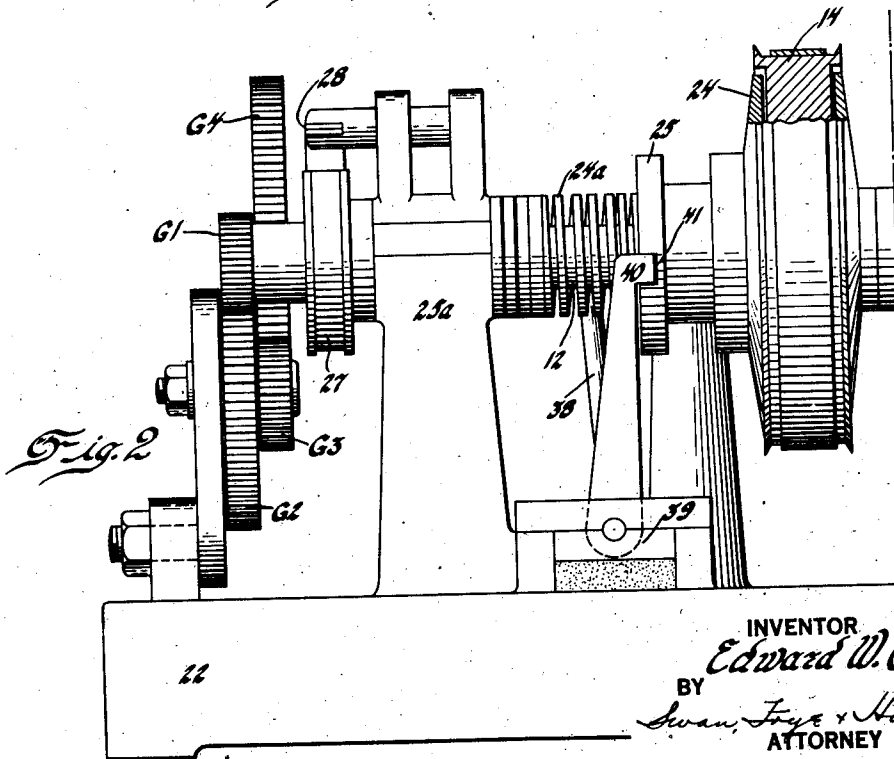


Fig. 2

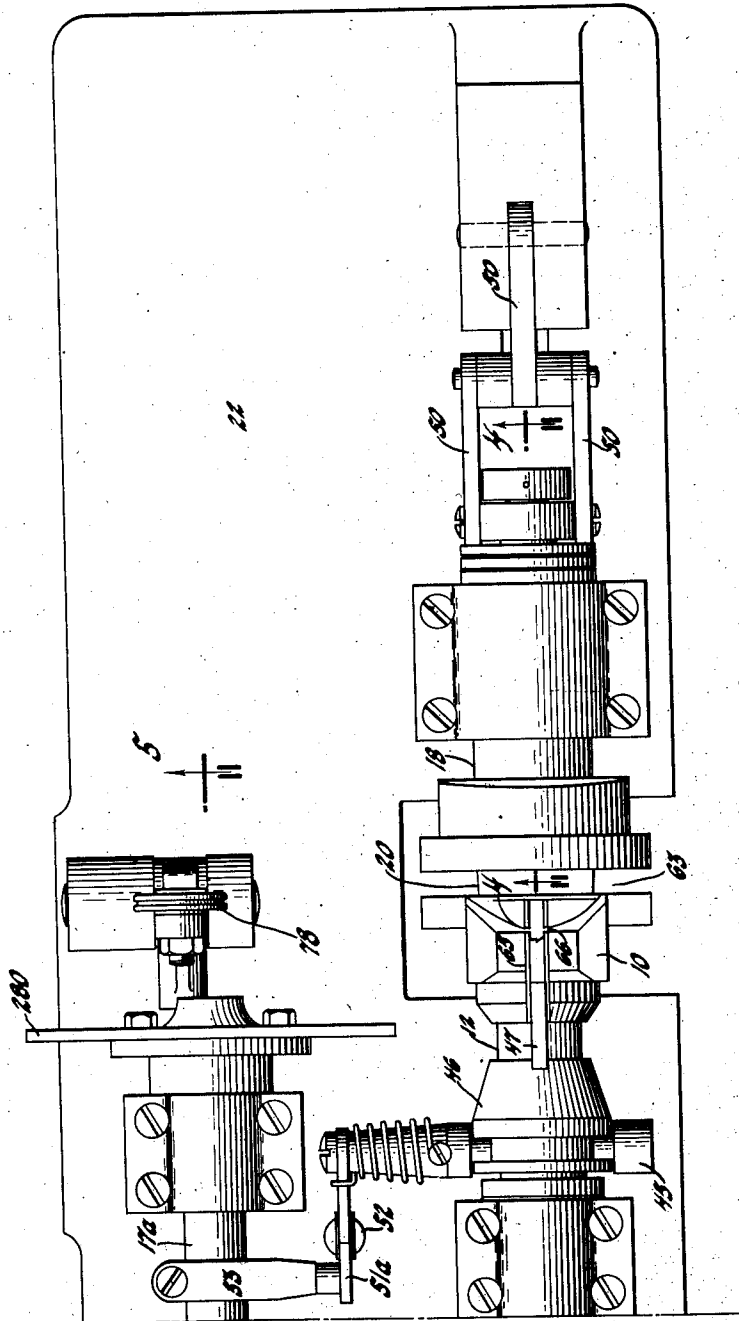
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6 Sheets-Sheet 2



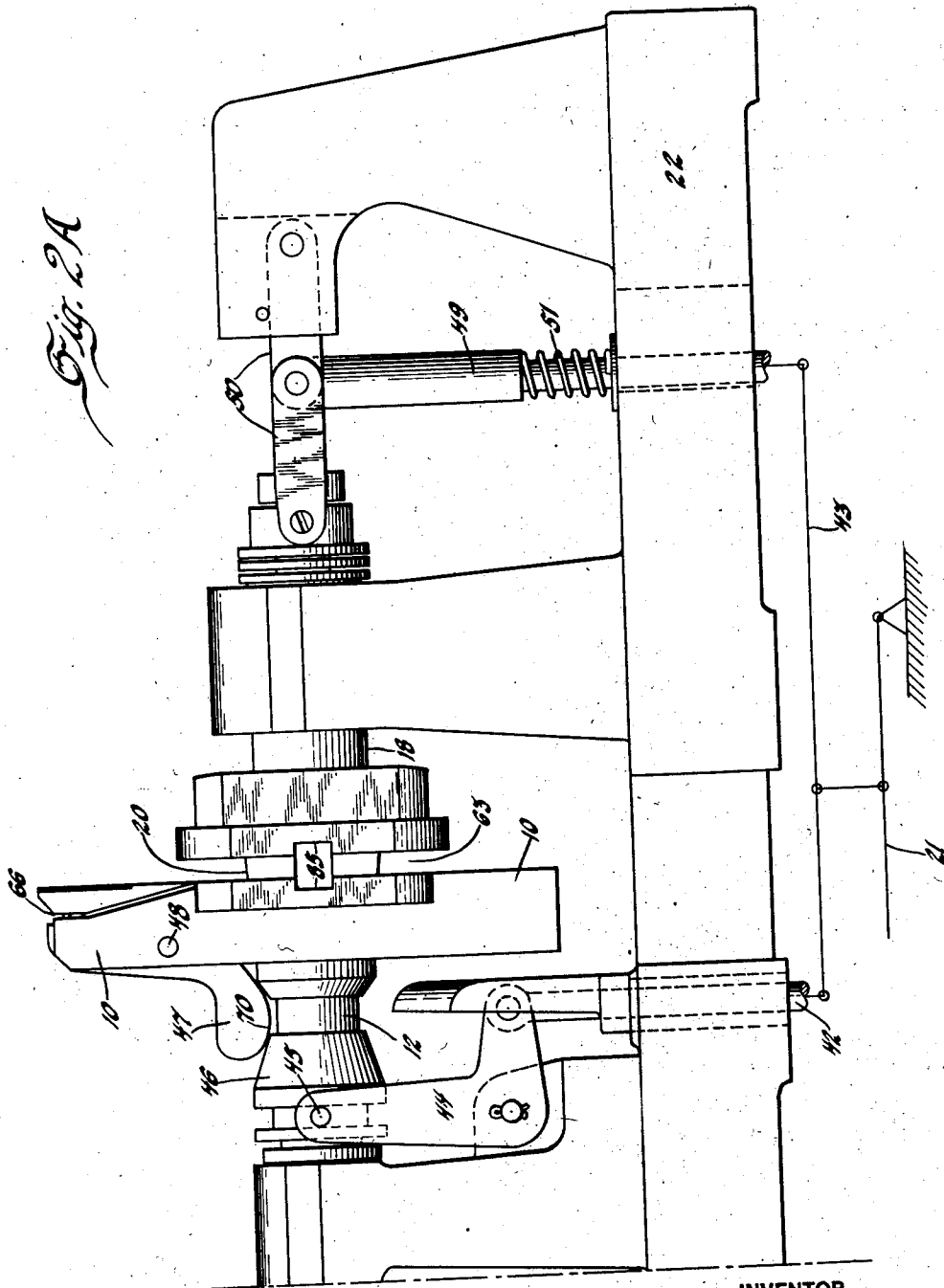
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6 Sheets-Sheet 3



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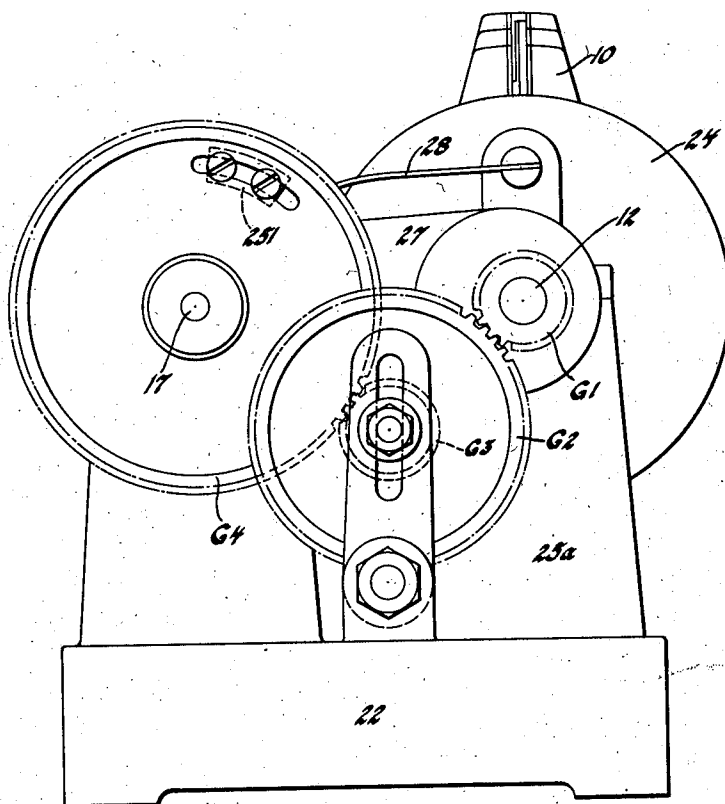
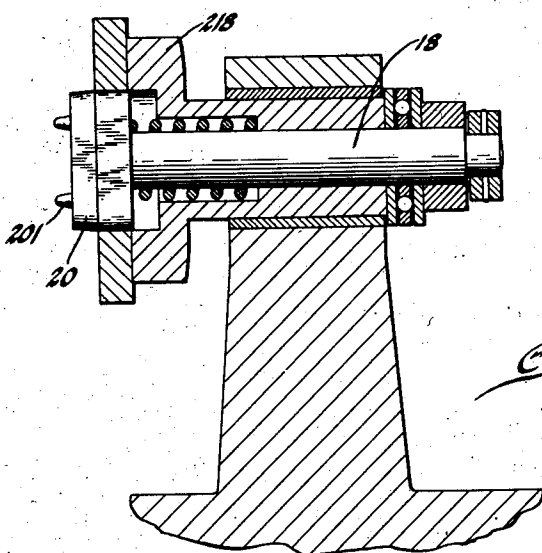
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6 Sheets-Sheet 4

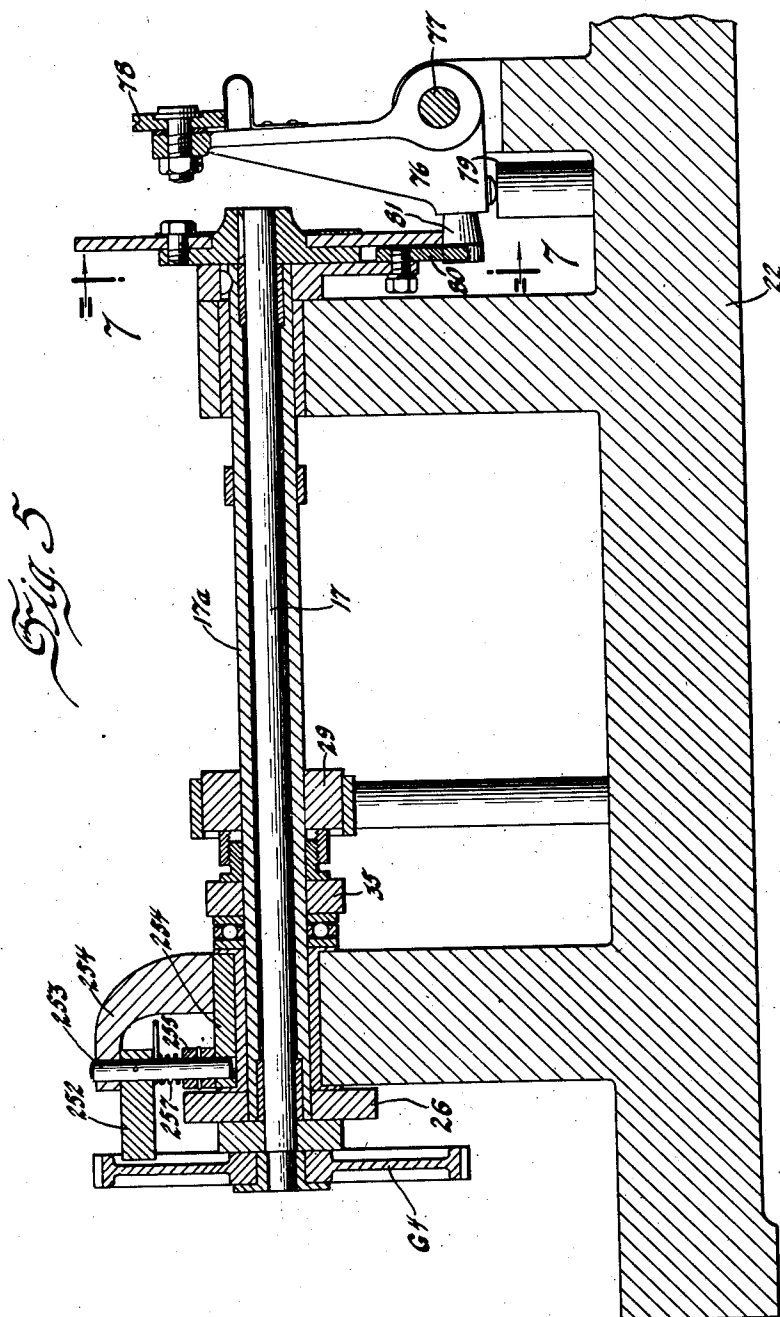


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6 Sheets-Sheet 5



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6 Sheets-Sheet 6

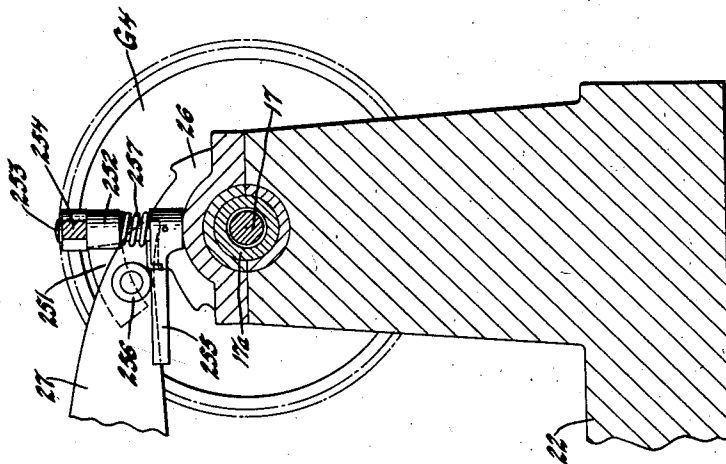


Fig. 6

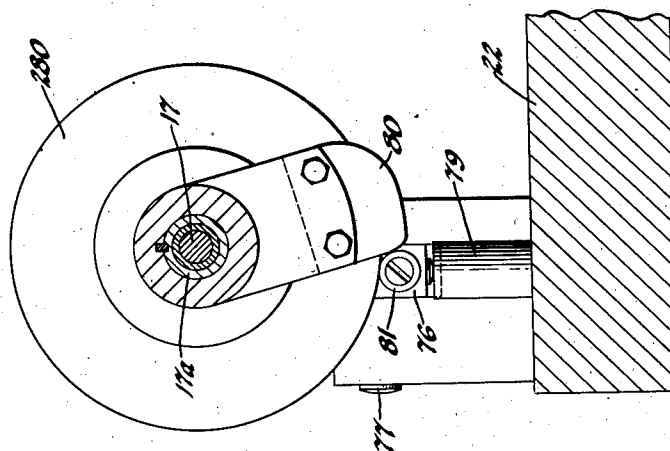


Fig. 7

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UNITED STATES PATENT OFFICE

1,931,061

COIL WINDING MACHINE

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mesne assignments, to Delco-Remy Corpora-
tion, Anderson, Ind., a corporation of Dela-
ware

Application March 7, 1932. Serial No. 597,128

29 Claims. (Cl. 140—92.2)

This invention relates to coil winding machines and more particularly to machines like the one disclosed in my copending application, Serial No. 568,496, filed October 12, 1931.

5 An object of the present invention is a machine which may be operated to wind other forms of coils, besides and in addition to coils like the one disclosed in the Jasper F. Cullin application, Serial No. 277,058, filed May 11, 1928.

10 A further object is a machine which, tho resembling the one of my prior application, differs therefrom in certain details which form the specific objects of the present invention.

15 Still further objects will readily occur to those skilled in the art upon reference to the following description and the accompanying drawings in which

Figs. 1 and 1a together form a top plan view of the machine.

20 Figs. 2 and 2a together form an elevation view of the machine.

Fig. 3 is an end view of the machine.

Figs. 4, 5, 6 and 7 are sections on lines 4—4, 5—5, 6—6, and 7—7 of Figs. 1a, Figs. 1 and 1a, 25 1 and 5 respectively.

The machine

The winding head 10 of the machine is disposed on the end of a head shaft 12, provided with a 30 clutch for connecting it to a constantly rotating belt or chain driven pulley 14, loosely rotating on the head shaft. Locking and operating means for the clutch are also provided and these may, in part be controlled by the operator.

35 Paralleling the head shaft and in back of it is a counter shaft 17 rotatably connected to the main shaft by gearing, and provided with cams, etc. for shifting the wire as it is fed to the head. A hollow counter shaft 17a, telescoping the inner 40 one above mentioned, is provided to control the clutch operating and locking means, automatically and also to shift the wire at the end of a coil winding operation.

45 Aligned with the head shaft and with one end near the head is a tail shaft 18 mounted so as to move axially towards and away from the head shaft. On the end thereof, nearer the head, is the form 20, which may engage the head and rotate with it the two shafts likewise rotating and 50 upon which is wound the coil. The axial movement of the tail shaft is controlled and effected by the operator, thru a foot pedal 21.

55 The shafts are mounted on a suitably supported bed 22, upon which may also be mounted

a motor (not shown) operatively connected to the loose pulley by a belt or chain.

The drive

Slidably mounted on the head shaft 12 and 60 keyed thereto is a clutch 24 whose face may be pressed against the pulley 14 by a heavy coiled compression spring 24a disposed on the shaft between the collar 25 of the clutch and a station- 65 ary bearing 25a in which the shaft is journaled. When the clutch is in, the head shaft is rotated, and thru the removably mounted gears G1—G4, shown in Figs. 1 and 2, the inner counter shaft 17 70 is caused to rotate. The gear G4 has a lug 251 adjustably and removably positioned thereon, adapted to engage the end of a rocker arm 252, 75 fixed to a vertical pin 253, journaled in bearings 254. On the lower end of the pin 253 is fixed a stop 255, the latter projecting horizontally 80 towards the head shaft, as seen in Fig. 1. This stop, when in the position of Fig. 1 serves as a track for the roller 256, fixed to the eccentrically mounted head shaft pawl 27, influenced down- 85 wardly by spring 28, and keeps the latter up and out of contact with the ratchet wheel 26, fixed to 90 the outer counter shaft 17a.

While the gear G4 is revolving and until its lug 251 registers with the rocker arm 252, the pawl is held elevated by the stop 255 and does 85 not engage the ratchet 26. When the gear G4 completes a revolution, lug 251 engages rocker arm 252 rotating it, the pin 253 and stop 255. The latter is thus moved away from under the pawl roller 256, to permit pawl 27 to drop and engage 90 ratchet wheel 26, rotating it one tooth, and consequently rotating outer counter shaft 17a a partial turn. By this time, lug 251 on rotating gear G4 has passed arm 252 and the latter, due 95 to the influence of a spring 257 on pin 253, returns to its original position. At the same time, stop 255 returns to its original position, under roller 256, which by this time has become elevated as it left its ratchet tooth.

When the countershaft 17a rotates a full turn, intermittently, collar cam 29 (Fig. 1) carried 100 thereby presses a high tooth 30 against the end of a horizontal rocker arm 32 to rotate the latter, (clockwise Fig. 1) in a horizontal plane, on its vertical axis pivot 33, against the influence of a coiled spring 34, and thereby to force the clutch 105 out of the loose pulley 14, thus stopping further rotation of the shaft and head.

The cam parts are so proportioned that the head and shaft should stop rotating when a coil 110 is completed; however, due to the momentum of

the shaft and the head, it is possible for the head to be carried beyond its desired final position, and accordingly, means to prevent such excess rotation, due to momentum, are provided.

- 5 Such means includes a collar cam 35 (Fig. 1) mounted on the countershaft 17a and having a high tooth 36 which may press against the end 37 of a shaft locking crank 38. The latter is journaled in a cushioned pedestal 39 and has a hook portion 40 adapted to be disposed in a notch 41 in the periphery of the clutch collar 25. At the proper moment, the locking crank will be moved and its hook 40 will prevent rotation of the clutch and consequently of the head shaft.
- 15 When the head has stopped, the operator presses his foot upon the foot pedal 21 (Fig. 2a) connected to link 42 thru equalizing bar 43 and thereby to draw down the link 42 whose upper end is connected to a bell crank 44, yoked at 45 to a control cone 46, moving the latter to the right (Fig. 2a). Such movement of the control cone causes the bell crank shaped cutting blades 47 to rotate clockwise on their pivots 48 in head 10, and these blades traverse the wires to cut and bend them, in a manner described in my earlier application.

- At the same time, the pressure on the foot pedal pulls down upon a link 49, also connected to the equalizing bar 43, to break the toggle joint formed by links 50 and to pull tail shaft 18 to the right (Fig. 2a), thus drawing the form away from the head, to free the completely wound and clipped coil, which may then be removed by the operator. When the operator releases the foot pedal, a coil spring 51 pulls upwardly on the equalizing bar to cause the bell crank 44 and cone 46 to return to their original position, that shown in Fig. 2a. At the same time, the coil spring causes the tail shaft 18 to be moved towards the head shaft 12 to clutch the form to the head.

- When the yoked end of the bell crank 44 returns to its original position, Fig. 2a, a spring depressed wedge-end starting cam 51a (Fig. 1a) carried thereby slides on a stop rod 52 under a clevis 53 secured to the countershaft 17a to rotate the latter a few degrees, thus freeing high teeth 30, 36 of cams 29, 35 from the clutch control rocker arm 32 and from the shaft locking crank 38. These parts then release the clutch and permit the heavy coil spring 24a to expand and to clutch the head shaft to the loose pulley once more, for rotation of the shafts and the head.

- From the foregoing, it will be seen that immediately upon release of foot pedal pressure by the operator, the winding form parts come together and rotate, continuing so to do, without further attention upon the part of the operator, until the coil is completely wound, at which time the winding head will have assumed its rest position, and will have stopped. Then the operator can press upon his pedal to cut off and free the completed coil, without danger of the head starting to rotate, the shaft being locked until the foot pedal pressure is released once more.

- 65 It will further be seen that the connection between the foot pedal 21, the links 42 and 49, the coil spring 51, and the equalizing bar 43, are such that the application of foot pedal pressure will first move the control cam to sever the wires and will then move the form from the head. Similarly, upon release of foot pedal pressure, the tail shaft will move towards the head shaft first and then the control cone will move to the shaft starting position.

- 75 It will be noted that the tail shaft is provided

with a spring pressed collar 218, journaled in the tail shaft bearing (Fig. 4) and forming a means for stripping the wound coil off the form 20.

The winding parts

The head 10, in general, is elongated, and when in its rest position is disposed with its long dimension vertical. On one face, it is provided with holes, not shown, to receive the dowel pins 201 on the form 20, those pins serving to align and fix the head and the form with respect to each other.

The head and form, when in engagement, define a groove 63 in which the coil is wound on form 20. The upper end of the head is provided with a slot 66 in which the projecting leads of the coil are disposed. A second slot 65, containing the cutting and bending parts, not here described specifically, but denoted generally at 47, traverses the wire receiving slot 66.

In back of the head, near the end of the countershaft is a wire guide and shifter comprising a bell crank 76 pivotally mounted at 77 and having a free wheel 78 under which the wires pass on their way from the spools to the head. The bell crank 100 is biased clockwise by a spring plunger 79 in the bed 22 and tends to guide the wires into the winding groove 63. At the beginning and end of each winding operation the wires are directed into the slot 66, where they are to be cut and bent. Such change in direction is accomplished by a cam 80, on the end of the countershaft 17a, and having a high spot to depress the end 81 of bell crank 76 and to move wheel 78 to the left, Fig. 5, for wire shifting.

In winding the coil, the leading ends of the wires, positioned in the headslot 66 are first shifted by wheel 78, so as to be disposed in groove 63. Then, by means of a plate-like shifting cam 280, fixed to the end of counter shaft 17, the wires are shifted back and forth across the slot 63, a number of times. In one form of coil, the wire is given six passes forward and six return, as contrasted with the coil shown in my previous application, where the wires are given but one pass forward and one return.

By the time the six passes are completed, counter shaft 17a has rotated a full turn and its cam 80 then engages shifter 76 to shift the wires into the slot 66, to form the trailing ends of the coil.

When a coil is to be wound, a leading end of the wire, as it comes from the spool is disposed in the slot 66 of the head 10. The blades at this time are in their outer position. The foot pedal is pressed downwardly and the blades move clockwise to clamp the leading ends in the head. The head starts to rotate, and the shifting wheel 78 shifts the wire into the slot 63 around the form 20. The winding parts continue to rotate, and due to the continuously rotating countershaft 17 and its plate like cam 280, the shifting wheel 78 shifts the wires back and forth across the form until the required number of passes is completed. When the parts have rotated sufficiently so that countershaft 17a has rotated a full turn, cam 80 causes shifting wheel 78 to shift the wire into the slot 66 to form the trailing end of the coil. At the same time the cams 29 and 35 on countershaft 17a cause the head shaft, the tail shaft and the countershafts to stop rotating.

The operator now clasps a side of the wound coil in a spring clamp disposing the latter in notches 85 in the edges of the head and form. While so holding the coil he presses down on 150

pedal 21, which action causes control cone 46 to push blades 47 into the head, the blades then severing the trailing end of the wire from the spool and also bending the leading end of the next coil in place in the head. At the same time form 20 is drawn back and the wound coil is stripped from the form by the tail shaft collar 218. The operator releases the pedal to start the winding operation once more.

It will be observed that the gearing, the inside counter shaft, the wire shifting cams, the head and the tail shaft, are removable and replaceable by corresponding parts, resembling those of my prior machine, whereby the present machine may readily be converted into a machine similar to the one of my prior application.

Now having described the invention and the preferred embodiment thereof, it is to be understood that the said invention is to be limited, not to the specific details herein set forth, but only by the scope of the claims which follow:

What I claim is:

1. In a coil winding machine, a head shaft on which is disposed a winding head, and two countershafts, each provided with means for controlling the shifting of the wire as it is being fed to the head, one of said shafts being continuously rotated by the head and the other being intermittently rotated by the head.

2. In a coil winding machine, a head shaft on which is disposed a winding head, two counter shafts, each provided with means for controlling the shifting of the wire as it is being fed to the head, one of said shafts being continuously rotated by the head shaft and the other being intermittently rotated by the head shaft, and means operatively connected to the continuously rotated counter shaft to time and control the intermittent rotation of the other counter-shaft.

3. In a coil winding machine, a head shaft on which is disposed a winding head, two counter shafts, each provided with means for controlling the shifting of the wire as it is being fed to the head, one of said counter shafts being continuously rotated by the head shaft and the other being intermittently rotated by the head shaft, means operatively connected to the continuously rotated counter shaft to time and control the intermittent rotation of the other counter-shaft, and means operatively connected to the intermittently rotating counter shaft to time and control the rotation of the head shaft.

4. In a coil winding machine, a head shaft on which is disposed a winding head, two counter-shafts each provided with means for controlling the shifting of the wire as it is being fed to the head, one of said counter shafts being continuously rotated by the head shaft, and the other counter-shaft being intermittently rotated by the head shaft, said counter shafts being relatively telescoped.

5. In a coil winding machine, a head shaft and two relatively telescoped countershafts disposed parallel to said head shaft, gearing connecting the inner countershaft and the head shaft, and a ratchet and pawl connection between the outer countershaft and the head shaft.

6. In a coil winding machine, a head shaft and two relatively telescoped countershafts disposed parallel to said head shaft, gearing connecting the inner countershaft and the head shaft, a ratchet and pawl mechanism between the outer countershaft and the head shaft, and means operatively connected to the inner counter shaft for

controlling the operation of the ratchet and pawl mechanism.

7. In a coil winding machine, a head shaft and two relatively telescoped countershafts disposed parallel to said head shaft, gearing connecting the inner countershaft and the head shaft, a ratchet and pawl mechanism between the outer countershaft and the head shaft, and means operatively connected to the inner countershaft for controlling the operation of the ratchet and pawl mechanism, said means comprising a stop for maintaining the pawl out of engagement with the ratchet, and a part connected to the inner shaft for moving said stop to a position where it will permit the pawl to engage the ratchet.

8. In a coil winding machine, a winding head; a mechanism for cutting the end of a coil; a wire shifter; means for causing relative rotation between the winding head and the wire shifter; two rotatable shafts; and means on said shafts for moving the wire shifter laterally to the plane of relative rotation between the winding head and the wire shifter, the means on one of said shafts moving the wire shifter to wind the coil and the means on the other shaft moving the wire shifter so that the end of the coil is moved into operative engagement with the cutting mechanism.

9. In a coil winding machine, a rotatable winding head; a mechanism for cutting the end of a coil; a wire shifter; two rotatable shafts; and means on each shaft for moving the wire shifter, the means on one shaft moving the wire shifter to wind the coil and the means on the other shaft moving the wire shifter so that the end of the coil is moved into operative engagement with the cutting mechanism.

10. In a coil winding machine, a winding head; a mechanism for cutting the end of a coil; a wire shifter; means for causing relative rotation between the winding head and the wire shifter; two shafts rotated in response to relative rotation between the winding head and the wire shifter; and means on said shafts for moving the wire shifter laterally to the plane of relative rotation between the winding head and the wire shifter, the means on one of said shafts moving the wire shifter to wind the coil and the means on the other shaft moving the wire shifter so that the end of the coil is moved into operative engagement with the cutting mechanism.

11. In a coil winding machine, a rotatable winding head; a mechanism for cutting the end of a coil; a wire shifter; two shafts rotated in response to rotation of the winding head; and means on each shaft for moving the wire shifter, the means on one shaft moving the wire shifter to wind the coil and the means on the other shaft moving the wire shifter so that the end of the coil is moved into operative engagement with the cutting mechanism.

12. In a coil winding machine, a rotatable head shaft on which is disposed a winding head; a mechanism for cutting the end of a coil; a wire shifter; means for arresting the head shaft; two counter-shafts rotated in response to rotation of the head shaft; and means on said counter-shafts for successively moving the wire shifter to wind a coil, moving the wire shifter so that the end of the coil is moved into operative engagement with the cutting mechanism and actuating the arresting means.

13. In a coil winding machine, a rotatable head shaft on which is disposed a winding head; a mechanism for cutting the end of a coil; a wire shifter; means for arresting the head shaft; two

so that the end of the coil is moved into operative engagement with the cutting mechanism, for actuating the arresting means and for disengaging the clutch.

lar from the head whereby the collar engages the stop while the form continues its withdrawing movement against the tendency of the spring until a wound coil is stripped off the form due to the relative movement between the form and the collar.

25. In a coil winding machine, a rotatable head forming a wall of the winding groove; a collar rotatable coaxially of the head and being movable axially toward or away from the head and forming the opposite wall of the winding groove; a form axially slidably mounted in the collar, said form constituting the bottom of the winding groove; and means operable for successively withdrawing the collar and form from the head for a predetermined distance and moving the form toward the collar whereby a wound coil is stripped off the form.

26. In a coil winding machine, a rotatable head forming a wall of the winding groove; a collar rotatable coaxially of the head and being movable axially toward or away from the head and forming the opposite wall of the winding groove; a form axially slidably mounted in the collar, said form constituting the bottom of the winding groove; and means operable for successively withdrawing the collar and form from the head for a predetermined distance and causing relative movement between the collar and form whereby a wound coil is stripped off the form.

27. In a coil winding machine, a rotatable head forming a wall of the winding groove; a collar rotatable coaxially of the head and being movable axially toward or away from the head and forming the opposite wall of the winding groove; a form axially slidably mounted in the collar, said form constituting the bottom of the winding groove; a compression spring intermediate the form and a shoulder of the collar for maintaining the form in a certain position relative to the collar; a stationary stop adapted to be engaged by the collar after a predetermined withdrawal of the same from the head; and means connected to the form for withdrawing the form and the col-

28. In a coil winding machine, a rotatable head forming a wall of the winding groove; a stationary bearing; a collar having a reduced portion which is rotatably supported by the bearing coaxially of the head and being movable therein axially toward or away from the head, said collar forming the opposite wall of the winding groove; a form axially slidably mounted in the collar, said form constituting the bottom of the winding groove; a compression spring intermediate the form and a shoulder of the collar for maintaining the form in a certain position relative to the collar; and means connected to the form for withdrawing the form and the collar from the head whereby the collar engages the stationary bearing while the form continues its withdrawing movement against the tendency of the spring until a wound coil is stripped off the form due to the relative movement between the form and the collar.

29. In a coil winding machine, a rotatable head forming a wall of the winding groove; a collar rotatable coaxially of the head, said collar forming the opposite wall of the winding groove; a form axially slidably mounted in the collar, said form constituting the bottom of the winding groove; a compression spring intermediate the form and a shoulder of the collar for maintaining the form in a certain position relative to the collar; and means operable for successively causing axial relative movement between the head and the collar and axial relative movement between the form and the collar whereby a wound coil is stripped off the form.

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