Oct. 14, 1958 J. E. HECKETHORN 2,855,974

AUTOMATIC DECLUTCHING AND CUT-OFF CONTROL DEVICES FOR SPRING WINDING MACHINES

Filed Jan. 28, 1957 3 Sheets-Sheet 1

Fig. 1

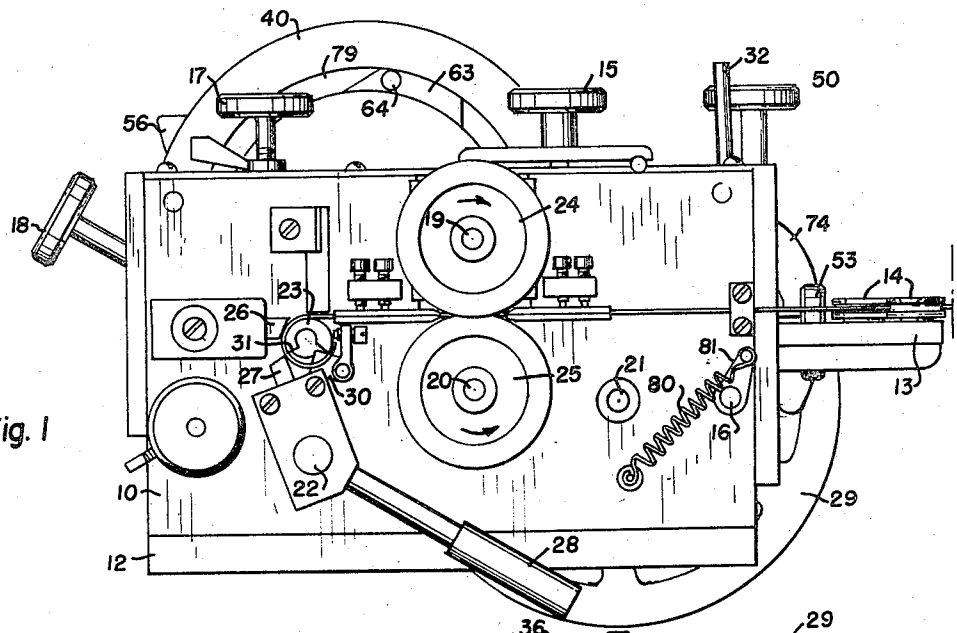
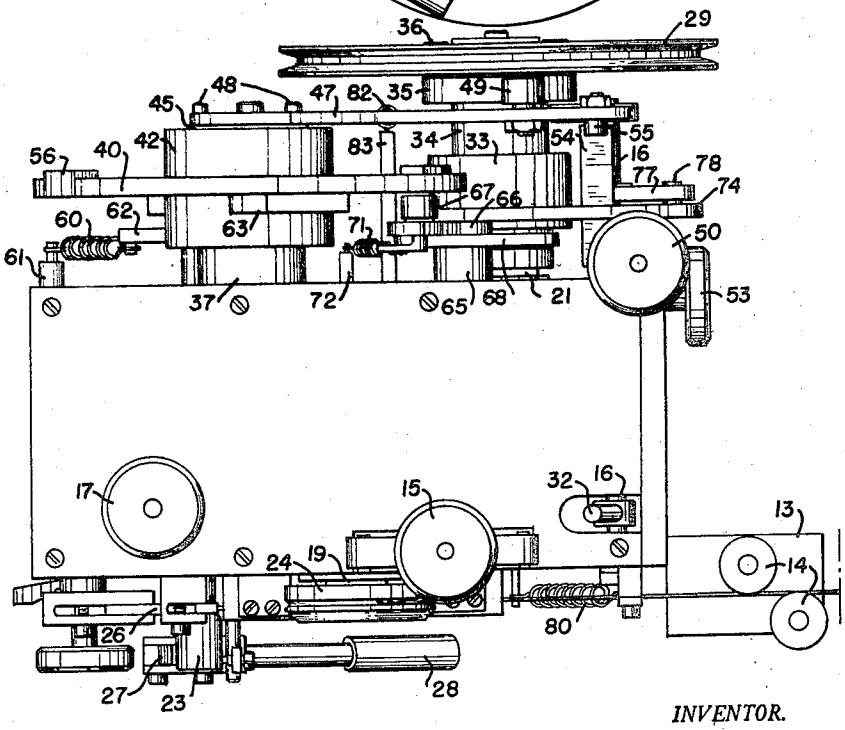


Fig. 2



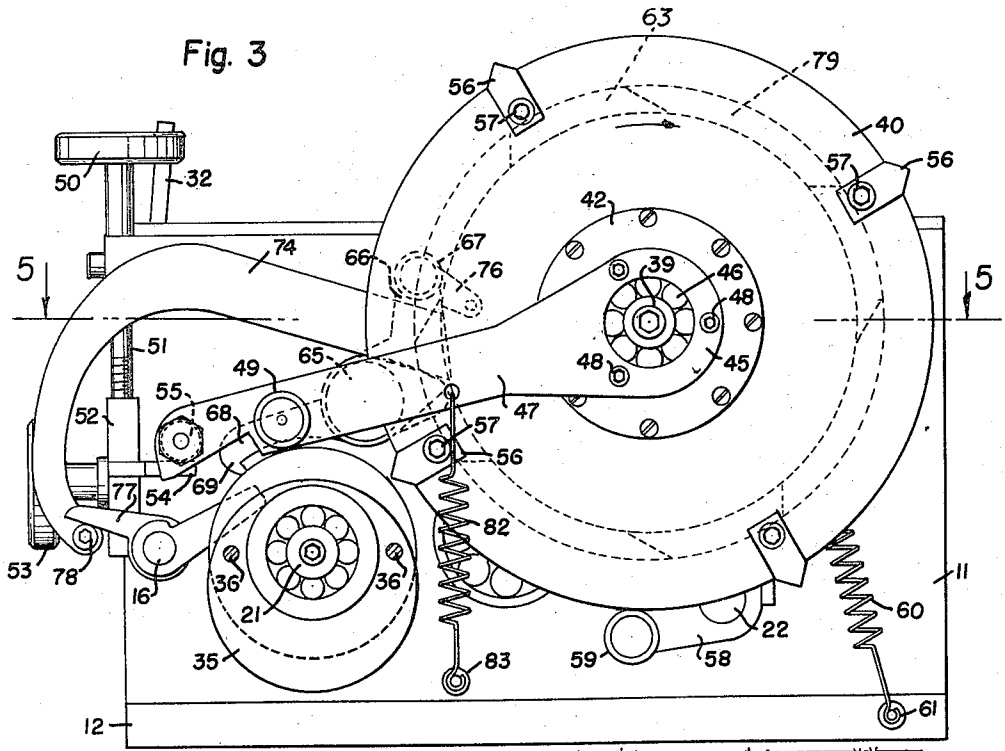
INVENTOR.
JOHN E. HECKETHORN
BY
ATTORNEY

Oct. 14, 1958 J. E. HECKETHORN 2,855,974

AUTOMATIC DECLUTCHING AND CUT-OFF CONTROL DEVICES FOR SPRING WINDING MACHINES

Filed Jan. 28, 1957 3 Sheets-Sheet 2

Fig. 3



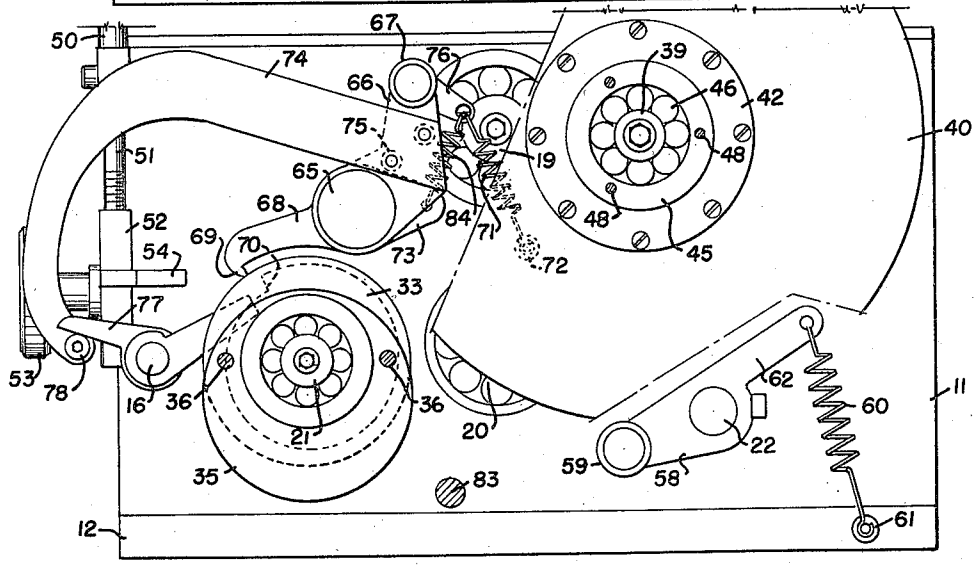


Fig. 4

INVENTOR.

JOHN E. HECKETHORN

BY

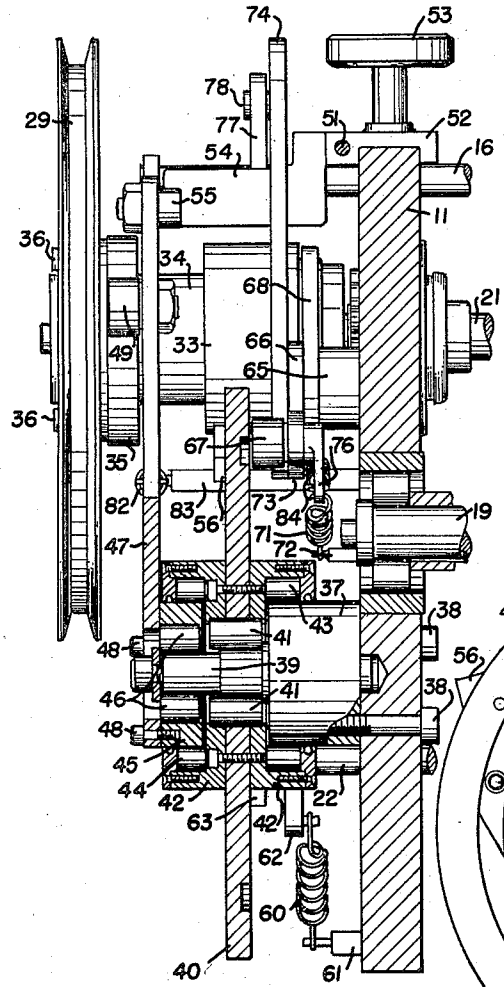
ATTORNEY

Oct. 14, 1958 J. E. HECKETHORN 2,855,974

AUTOMATIC DECLUTCHING AND CUT-OFF CONTROL DEVICES FOR SPRING WINDING MACHINES

Filed Jan. 28, 1957 3 Sheets-Sheet 3

Fig. 5



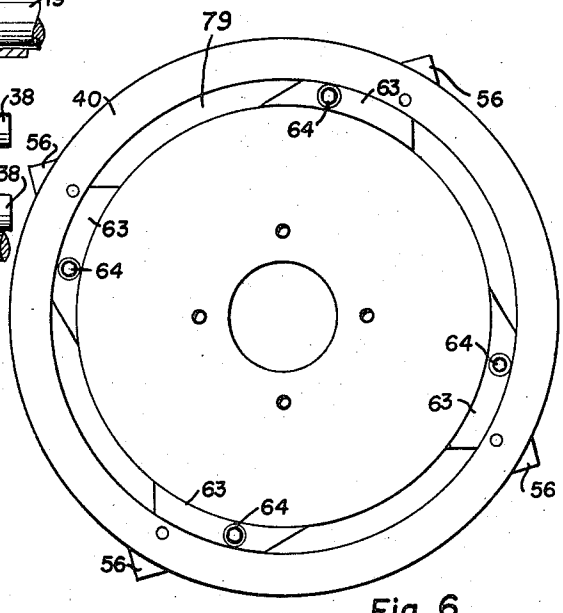


Fig. 6

INVENTOR.

JOHN E. HECKETHORN

BY

ATTORNEY

United States Patent Office

2,855,974

Patented Oct. 14, 1958

2,855,974

AUTOMATIC DECLUTCHING AND CUT-OFF CONTROL DEVICES FOR SPRING WINDING MACHINES

John E. Heckethorn, Denver, Colo., assignor to Heckethorn Manufacturing & Supply Company, Littleton, Colo., a corporation of Colorado

Application January 28, 1957, Serial No. 636,656

6 Claims. (Cl. 153—65)

This invention reltaes to a spring winding machine, and more particularly to an automatic control device for spring winding machines. Conventional spring winding machines are so arranged that an operator feeds a continuous wire into the machine; starts the machine to wind the wire in a continuous spiral length; stops the machine when the desired length has been wound; and then operates a cutoff device to cut the wire at the terminus of the wound spring.

The principal object of this invention is to provide an automatic control device which can be easily and economically applied to a spring winding machine of the type described above and which can be preset to automatically stop the machine when a spring of preset length has been wound; cut the wire; and restart the machine on a second similar spring without manual attention; and to so construct the control device that it will not interfere with manual operation and control of the machine when desired.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention, reference is had to the accompanying drawing which forms a part hereof. Like numerals refer to like parts in all views of the drawing and throughout the description.

In the drawing:

Fig. 1 is a front view of a conventional spring winding machine, illustrating the parts and elements to which the improved control device is applied;

Fig. 2 is a plan view of the machine of Fig. 1 with the improved control device in place thereon;

Fig. 3 is an enlarged rear view of the spring winding machine with the control device in place thereon and with a V-belt drive sheave removed therefrom to show the mechanism therebehind;

Fig. 4 is a similar rear view with a ratchet lever removed therefrom and with a cam disc of the control device broken away to illustrate the structure therebehind;

Fig. 5 is a sectional view looking downwardly on the line 5—5, Fig. 3; and

Fig. 6 is a detail, face view of a cam disc employed in the improved attachment device.

The usual elements of a conventional spring winding machine are herein designated by numeral as follows: front frame plate **10**, rear frame plate **11**, base plate **12**, wire table **13**, wire straightening rolls **14**, roll tension knob **15**, clutch lockout shaft **16**, manual clutch operating handle **32**, diameter control knob **17**, pitch control knob **18**, upper roll shaft **19**, lower roll shaft **20**, drive shaft **21**, cutoff shaft **22**, winding mandrel **23**, mandrel shear edge **31**, upper wire roller **24**, lower wire roller **25**, diameter control blade **26**, cutoff blade **27**, manual cutoff handle **28**, V-belt drive sheave **29**, and pitch control blade **30**.

In the conventional machine, the diameter of the spring

to be wound is set by means of the diameter control knob **17**, the pitch of the spring to be wound is preset by means of the pitch control knob **18**. The wire is fed through the straightening rolls **14** on the wire table **13** and between the upper and lower wire rollers **24** and **25**. Power is supplied to the sheave **29** and drive shaft **21** in any desired manner so as to cause the rollers **24** and **25** to force the wire against the diameter control blade **26** and around the stationary mandrel **23** to form a continuous wire spring, the pitch of which is controlled by presetting the pitch control blade **30** through the medium of the pitch control knob **18**. When the desired length of spring has been produced, the machine is stopped by manual actuation of the clutch handle **32** and the cutoff handle **28** is then manually operated to swing the cutoff blade **27** against the wire to shear the latter against the shearing edge **31** on the mandrel **23** to cut the wire so as to release a spring of the desired length.

This improved control device is designed to allow the machine to wind a spring of a predetermined number of turns; stop the machine at the termination of the spring; actuate the cutoff shaft **22** to cause the cutoff blade **27** to shear the wire and release the wound spring; and then to return the clutch shaft **16** to the operating position to restart the machine to produce a second similar spring.

In applying this invention, a conventional releasable, directional clutch **33** is applied to the rear extremity of the drive shaft **21** and the housing of the clutch **33** is extended rearwardly to form a hub **34** upon which an eccentric **35** is formed. The V-belt sheave **29** is concentrically mounted relative to the shaft **21** upon the rear face of the eccentric **35** by means of suitable attachment screws **36** so that the power is transmitted through the clutch to the drive shaft **21**.

A bearing pedestal **37** is mounted on the rear frame plate **11** by means of suitable attachment screws **38**, or in any other desired manner, so as to support a stub shaft **39** thereon. A circular cam disc **40** is rotatably mounted on suitable bearings **41** on the stub shaft **39**. A directional clutch drum **42** is secured on each face of the disc **40** about the bearings **41**.

The directional clutch drums **42** are of any of the conventional varieties provided with clutch rollers **43** which engage the pedestal **37** to prevent reverse rotation of the cam disc **40** and with clutch rollers **44**, which are engaged by a ratchet hub **45** to impart forward rotation to the cam disc **40**. The ratchet hub **45** is mounted on suitable anti-friction bearings **46** on the stub shaft **39** and a ratchet lever **47** is mounted on the ratchet hub **45** by means of suitable mounting screws **48**.

The ratchet lever **47** carries a cam follower roller **49** positioned to be resiliently urged into the eccentric path of the rotating eccentric **35** by means of a follower spring **82** tensioned between the lever **47** and a spring stud **83** on the back plate **11**. Thus, it can be seen that the sheave **29** will rotate the eccentric **35** and the latter will, due to its eccentricity, ride against the follower roller **49** during each revolution to cause the latter to oscillate. This oscillation is imparted through the ratchet lever **47**, the hub **45**, the clutch rollers **44**, to the circular cam disc **40**, to cause the latter to move forwardly, that is, clockwise in Fig. 3, with an intermittent movement.

The degree of rotation at each oscillation can be regulated and preset by means of a stroke adjusting knob **50** arranged to rotate a jackscrew **51** which is vertically and rotatably mounted on the rear frame plate **11**. The jackscrew **51** is threaded into a vertically adjustable slide block **52** which can be clamped in any desired vertical position by means of a clamp screw **53**. A stop arm **54** projects from the slide block **52** alongside the extremity of the ratchet lever **47** and the latter is provided with a

stop boss 55 which contacts and rests upon the stop arm 54 to limit the downward movement of the operating arm.

Thus, it can be seen that the "at rest" position of the roller 49 can be adjusted so as to take advantage of all or any part of the eccentricity of the eccentric 35 so that the length of the stroke made by the ratchet lever 47 can be accurately preset to control the degree of movement imparted to the cam disc 40 at each revolution of the eccentric 35.

The cam disc 40 is provided with one or more cutoff cams 56. The cams 56 are secured to the rear face of the cam disc by means of suitable attachment screws 57 so as to project radially from the periphery of the disc. The number of cutoff cams depends upon the lengths of the springs to be wound. More cams are employed for relatively short springs than for the longer springs. As illustrated, four of the cutoff cams are employed.

A cutoff actuating lever 58 is mounted on the rear extremity of the cutoff shaft 22 and acts to maintain a cam-follower roller 59 in the circular path of rotation of the cutoff cams 56. The cam-follower roller 59 is constantly and resiliently urged toward the axis of the cam disc by means of a tension spring 60 extending from a fixed spring stud 61 on the base plate 12 to a spring arm 62 formed on or attached to the cutoff actuating lever 58.

A plurality of arcuate clutch-operating dogs 63 are mounted in a circular dog-retaining groove 79 in the front face of the cam disc by means of suitable attachment screws 64, there being one clutch-operating dog 63 positioned in the space intermediate each of the cutoff cams 56. A second bearing pedestal 65 is mounted on the rear frame plate 11 and pivotally supports a cam-follower arm 66. The arm 66 is formed with a spring ear 76 and carries a cam-follower roller 67 in the circular path of rotation of the clutch-operating dogs 63.

A clutch-engaging lever 68 is also independently and rotatably mounted on the pedestal 65 and terminates in a clutch-engaging hook 69 positioned to be swung into engagement with a stop notch 70 on the clutch 33 to disengage or release the clutch. Conventional, releasable, directional clutches, such as the clutch 33, are provided with such stop notches with which a stationary member may be engaged to completely release the clutch. The clutch-engaging lever 68 is extended oppositely from the bearing pedestal 65 to form a spring arm portion 73 thereon. A tension spring 84 is tensioned between the spring ear 76 and the spring arm portion 73 to constantly and resiliently urge the latter portion against the head of a stop screw 75 in the cam-follower arm 66.

The cam-follower arm 66 and the roller 67 are constantly and resiliently urged inwardly toward the axis of the cam disc 40, and into the path of the dogs 63, by means of a tension spring 71, tensioned between the spring ear 76 and a spring stud 72 on the rear frame plate 11. The inward movement of the cam-follower arm is communicated to the clutch-engaging lever 68 to lift the hook 69 from engagement with the stop notch 70 by the stop screw 75 and the spring arm portion 73.

A manual clutch-control lever 74 is fixedly mounted on the cam follower arm 66 by means of the stop screw 75 or in any other desired manner and extends sidewardly and downwardly to a position adjacent the clutch lockout shaft 16. A clutch lockout lever 77 is mounted on and extends radially from the clutch lockout shaft 16 and is positioned to engage a roller or lug 78 on the extremity of the clutch control lever 74 when the shaft 16 is manually rotated counter-clockwise in Fig. 3 or clockwise in Fig. 1.

Rotation can be manually imparted to the shaft 16 at any time by means of the clutch lockout handle 32 which projects upwardly to a conveniently reached location above the machine. The shaft 16 is retained in the "lockout" position by means of a tension spring 80 connected to a spring lever 81 at the front of the machine and arranged to swing back and forth over the dead center point of the spring lever 81. Thus, it can be seen that the hook can be manually urged to swing the hook 69 into position to engage the stop notch 70 and lock the clutch 33 in the disengaged position by means of the clutch handle 32.

It is believed that the construction of the invention can be best understood by following through a sequence of operations. Let us assume that the clutch lockout handle is in the "engaged" position so that the clutch lockout lever has been swung upwardly by the spring 71 to disengage the clutch hook so that power is being transmitted through the clutch 33 to the spring winding mechanism to form the spring. The winding continues and the cam disc rotates intermittently until one of the dogs 63 contacts the cam follower roller 67 and forces the latter away from the axis of the cam disc 40 to tension the spring 71 and bring the hook 69 into resilient contact with the clutch 33 so that the stop notch 70 will abut thereagainst and disengage the clutch 33 to stop the winding mechanism. The eccentric 35 and the cam disc 40 continue to rotate to bring a cutoff cam 56 into contact with the follower roller 59 to rotate the cutoff shaft 22 to cause the cutoff blade 27 to sever the wire at the termination of the completed spring. The cam disc 40 continues to rotate so that the dog 63 that is engaging the roller 67 will move out of engagement therewith to release the clutch hook 69 and allow the clutch 33 to reengage to supply power to the drive shaft 21 to actuate the winding mechanism for winding a second spring. At the conclusion of the second spring the next successive dog 63 will engage the roller 67 and the above described "stop-cutoff-start" sequence will be repeated.

The lengths of the springs being wound can be adjusted during operation by rotating the stroke adjusting knob 50 to cause the stop arm 54 to vary the degree of contact between the eccentric 35 so as to adjust the R. P. M. of the cam disc. Should longer or shorter springs be desired than can be provided by the above adjustment, the number of dogs 63 and the number of cutoff cams 56 on the cam disc may be varied.

The winding can be manually stopped at any time by actuation of the lockout handle 79 and the wire may be manually cut when desired by actuation of the manual cutoff handle 28.

While a specific form of the improvement has been described and illustrated herein, it is to be understood that the same may be varied within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

1. A control device for a wire spring winding machine of the type having a drive shaft for actuating the spring winding mechanism and a cutoff shaft for actuating a cutoff blade for severing the wire at the termination of the winding, comprising: a rotary power-driven element; a clutch arranged to transmit power from said power-driven element to said drive shaft; an eccentric rotated by said power-driven element; a rotary cam disc; a ratchet lever mounted concentrically with said cam disc and positioned to be actuated by the eccentricity of said eccentric; means for transmitting motion from said ratchet lever to said cam disc to intermittently rotate the latter; a cutoff cam projecting from said cam disc; a cutoff actuating lever mounted on said cutoff shaft in the path of said cutoff cam to be actuated by the latter when said cam disc reaches a predetermined position; means for disengaging said clutch prior to actuation of said cutoff shaft; a plurality of said cutoff cams on said cam disc; a clutch-operating-dog mounted on said cam disc adjacent to each of said cutoff cams; means operable by said clutch-operating-dogs for releasing said clutch to stop the winding machine prior to actuation of said cutoff shaft; and an adjustable stop device positioned in the path of movement

of said ratchet lever for limiting its degree of movement toward said eccentric.

2. A control device for a wire spring winding machine of the type having a drive shaft for actuating the spring winding mechanism and a cutoff shaft for actuating a cut-off blade for severing the wire at the termination of the winding, comprising: a rotary power-driven element; a clutch arranged to transmit power from said power-driven element to said drive shaft; an eccentric rotated by said power-driven element; a rotary cam disc; a ratchet lever mounted concentrically with said cam disc and positioned to be actuated by the eccentricity of said eccentric; means for transmitting motion from said ratchet lever to said cam disc to intermittently rotate the latter; a cutoff cam projecting from said cam disc; a cutoff actuating lever mounted on said cutoff shaft in the path of said cutoff cam to be actuated by the latter when said cam disc reaches a predetermined position; means for disengaging said clutch prior to actuation of said cutoff shaft; a plurality of said cutoff cams on said cam disc; a clutch-operating-dog mounted on said cam disc adjacent to each of said cutoff cams; a cam-follower arm mounted on said machine; a cam-follower roller mounted on said arm in the path of rotation of said dogs to be contacted by the latter; and clutch-actuating means operable in consequence of movement of said cam-follower arm for releasing said clutch.

3. A control device as described in claim 2 in which the clutch actuating means comprises: a clutch-engaging lever mounted independently and concentrically of said cam-follower arm; a clutch-engaging hook formed on said clutch-engaging lever and positioned to engage and release said clutch; and means for transmitting movement from said cam-follower arm to said clutch-engaging lever.

4. A control device as described in claim 3 in which the means for transmitting movement comprises: a fixed abutment on said cam-follower arm positioned to engage said clutch-engaging lever to urge the latter away from said clutch; and resilient means positioned between said cam-follower arm and said clutch-engaging lever to resiliently urge said clutch-engaging lever toward engagement with said clutch.

5. A control device as described in claim 4 having manually operated means connected with said cam-follower arm for actuating the latter independently of said dogs.

6. A control device as described in claim 5 in which the manually-operated means comprises: a clutch-lockout shaft rotatably supported in said machine; a clutch-lockout lever mounted on and projecting from said shaft; and a clutch control lever secured to said cam-follower arm and extending into the path of said clutch-lockout lever to transmit movement from said clutch-lockout shaft to said lever to cause said hook to engage and release said clutch.

References Cited in the file of this patent

UNITED STATES PATENTS

1,452,128	Sleeper	Apr. 17, 1923
1,465,719	Peters	Aug. 21, 1923
2,096,605	Blount	Oct. 19, 1937
2,111,574	Solenberger	Mar. 22, 1938
2,145,942	McAdams	Feb. 7, 1939

FOREIGN PATENTS

137,130	Austria	Apr. 10, 1934