

March 19, 1968

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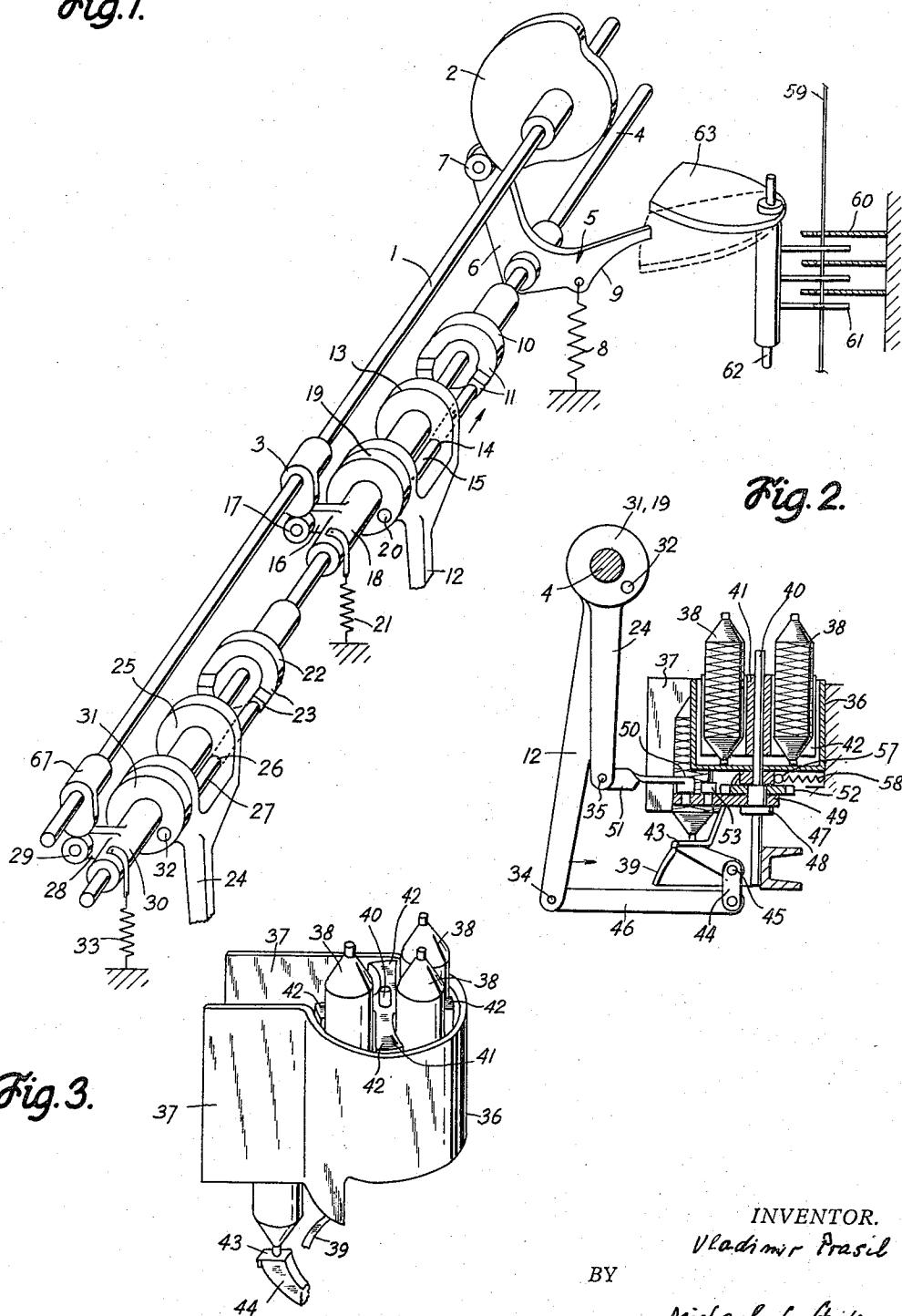
3,373,946

COP EXCHANGING APPARATUS

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2 Sheets-Sheet 1

Fig. 1.



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Fig. 4.

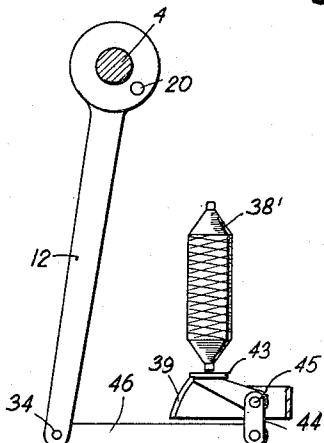


Fig. 7.

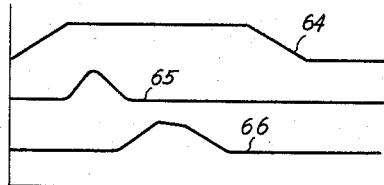


Fig. 5.

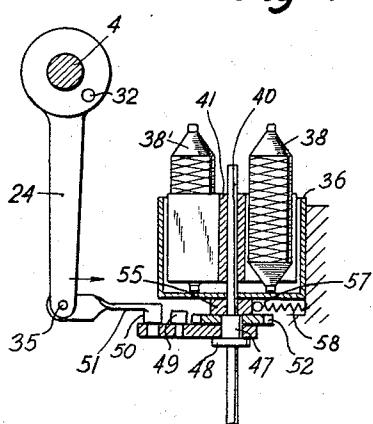


Fig. 8.

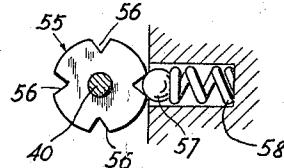


Fig. 9.

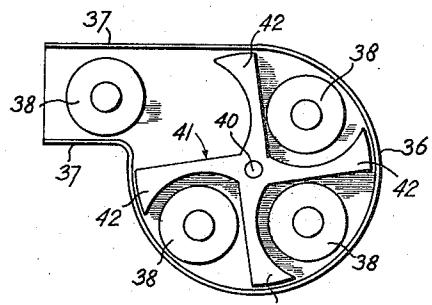
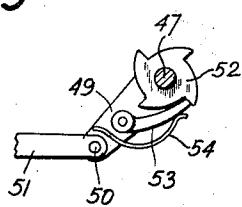


Fig. 6.



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COP EXCHANGING APPARATUS

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10 Claims. (Cl. 242—35.6)

The present invention relates to a cop exchanging apparatus for a winding machine, and more particularly to an apparatus for replacing a cop, whose yarn has been exhausted, with a new full cop when the stop motion of an automatic cross winding machine indicates the exhaustion of the yarn.

Apparatus serving this purpose is known, but the constructions of the prior art are complicated, require a great deal of space, and are subject to disturbances particularly due to the fact that a cop exchange is only required if the yarn of the cop is exhausted, and not upon a yarn breakage which requires a knotting operation, but not the exchange of the cop.

It is one object of the invention to overcome the disadvantages of known cop exchanging apparatus for winding machines, and to provide a cop exchanging apparatus which is of simple construction, operates reliably, and takes up little space.

Another object of the invention is to provide a cop exchanging apparatus which responds only to the exhaustion of the yarn wound from a supply cop onto a bobbin, but does not respond to a yarn breakage.

Another object of the invention is to provide a cop exchanging apparatus which will normally perform its operation when the stop motion of the winding machine is actuated, but which is locked if sensing means determine that a yarn breakage, and not exhaustion of the yarn of a supply cop has occurred.

With these objects in view, the present invention relates to an improved cop exchanging apparatus for a winding machine which winds a yarn from a supply cop onto a bobbin. One embodiment of the invention comprises actuating means, preferably rotary cam means, controlled by the winding machine upon a yarn breakage or exhaustion of a supply cop to perform an actuating motion; cop exchanging means, which include cop removing means, and cop supply means for supplying a full cop; coupling means having a normal coupling position for coupling the actuating means with the cop exchanging means; control means for the coupling means; connecting means for connecting the actuating means with the control means; and sensing means for sensing a yarn wound off a supply cop and located to respond to the exhaustion of a yarn, but not to a yarn breakage.

Since the connecting means connect the actuating means with the control means of the coupling means, the latter is placed during an actuating motion in the inoperative position, and actuation of the cop exchanging means upon a yarn breakage is prevented.

However, when the sensing means respond to the exhaustion of a yarn, the connecting means is rendered inoperative so that the coupling means remains in the normal coupling position, and the actuating means actuates the cop exchanging means to effect the substitution of a new full cop for the exhausted cop.

In the preferred embodiment of the invention, the actuating means is a cam shaft having first, second and third cams. The first and second cams operate through first and second coupling means, the cop removing means and the cop supply means in succession. The third cam operates through cam follower means, the control means of the first and second coupling means, but in the event of the exhaustion of the yarn of a supply cop, the sens-

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ing means actuate locking means to lock the cam follower means of the third cam in an inoperative position so that the third cam cannot disengage the first and second coupling means which remain in the normal position so that the cop removing means and the cop supply means are operated.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

15 FIG. 1 is a fragmentary perspective view illustrating the control apparatus according to one embodiment of the invention;

20 FIG. 2 is a fragmentary sectional view illustrating the control of cop exchanging means by the apparatus of FIG. 1;

FIG. 3 is a fragmentary perspective view illustrating the cop exchanging means;

25 FIG. 4 is a fragmentary sectional view illustrating the control of the cop removing means by the apparatus of FIG. 1;

FIG. 5 is a fragmentary sectional view illustrating the control of cop supply means by the apparatus of FIG. 1;

FIG. 6 is a horizontal sectional view illustrating a detail of the cop supply means shown in FIG. 5;

30 FIG. 7 is a diagram illustrating developed cam tracks of actuating cams provided in the embodiment of FIG. 1;

FIG. 8 is a fragmentary horizontal sectional view illustrating a detail of the cop exchanging means shown in FIG. 2; and

35 FIG. 9 is a schematic plan view illustrating the position of new cops in the cop supply means.

An automatic winding machine, not shown, has a plurality of winding units, each of which winds yarn let off by a supply cop onto a bobbin to form a cross wound package. A yarn 59, see FIG. 1, is wound off a bobbin 38' in the position of FIG. 4 and onto a bobbin, not shown. The yarn 59 moves upward between a stationary comb 60 and a comb 61 which is mounted for angular movement about a pivot pin 62. Comb 61 is biased to engage yarn 59, and if the yarn is exhausted, this condition is sensed by sensing comb 61 which turns to a control position in which a locking plate 63 is turned from its normal position shown in solid lines, to the locking position shown in broken lines.

40 50 Actuating means are provided which are actuated by a stop motion to perform an actuating motion whenever a yarn breakage or exhaustion of the yarn of a supply cop 38' occurs.

In the illustrated embodiment, the actuating means include a shaft 1 which is connected by a one revolution clutch to the winding machine so as to perform a single revolution whenever the stop motion of the winding machine is actuated. Shaft 1 carries three cams 67, 3 and 2 whose cam tracks are designed in accordance with graphs 66, 65, and 64, respectively, shown in FIG. 7.

55 65 A control shaft 4 extends parallel to shaft 1, and carries fixed cam follower means 5 having an arm 6 with a cam follower roller 7 cooperating with cam 2, and another arm 9 connected to a spring 8 which urges cam follower means 5 into engagement with cam 2. In the position of locking means 63 shown in broken lines, locking means 63 is located in the path of movement of arm 9, and blocks cam follower means 5 so that the same cannot follow the lower cam track portion when shaft 1 starts to rotate. Consequently, cam follower means 5 and control shaft 4, will be angularly displaced by cam 2 only if a yarn 59 is sensed by the sensing means 61.

Control shaft 4 carries two control cams 10 and 22, control cam 10 having an annular cam face 11, and control cam 22 having an annular cam face 23, each of which includes a higher axially projecting cam portion and a lower cam portion.

An operating lever 24 has a hub portion with a pair of flanges 25 mounted freely rotatably on control shaft 4. Flanges 25 have aligned bores 26 through which a pin 27 passes. A spring, not shown, urges pin 27 into engagement with cam face 23 of cam 22. In the normal position of the apparatus shown in FIG. 1, pin 27 abuts the higher cam portion of cam face 23 and projects into a bore 32 in a flange 31 of a hub portion 30 of a cam follower lever 28 whose cam follower roller 29 cooperates with cam 67. Hub 30 with follower 28, 29 is freely rotatable on control shaft 4 and is angularly oscillated when actuating shaft 1 turns cam 62. In the normal position of the apparatus, pin 27, passing through bores in flanges 25 and 31, couples operating lever 24 with the actuating cam 67 so that lever 24 performs an angular movement when the actuating shaft 1 turns one revolution. However, if control shaft 4 is turned by the connecting cam follower means 5 together with control cams 10 and 22, pin 27 moves to the lower cam track portion of cam face 23, and the coupling means 31, 32, 27, 25 becomes inoperative since pin 27 is withdrawn by a spring, not shown, from the bore 32 of flange 31. A spring 33 is connected to hub 30 and turns the same to a position in which cam follower roller 29 follows the cam track of cam 67.

A second operating lever 12 is controlled and operated in the same manner as operating lever 24. Operating lever 12 has a hub with a pair of flanges mounted for free turning movement on control shaft 4. A pin 15 is located in bores 14 of flanges 13 and also in bore 20 in a flange 19 of the hub 18 which carries a follower arm 16 provided with a cam follower roller cooperating with cam 3 against which the cam follower 16, 17 is urged by spring 21. A spring, not shown, urges pin 15 against the cam face 11 of control cam 10, and in the normal position of the apparatus shown in FIG. 1, the end of pin 15 abuts the higher cam track portion of cam face 11 so that the other end thereof is located in the bore 20 of flange 19, and couples operating lever 12 with cam follower 16, 17 and cam 3. When control shaft 4 is angularly displaced by cam follower means 5 under the action of cam 2, pin 15 engages the lower cam track portion of cam face 11 after moving in axial direction toward the right as viewed in FIG. 1 so that the pin is retracted from bore 20, and the coupling between the cam follower 16, 17, 19 and the operating lever 12, 13 is disengaged and inoperative.

Referring now to FIG. 2, operating lever 12 is connected by a pivot pin 34 with a link 46 articulated to an angular lever 44 which is turnable about a pin 45. The upper end of angular lever 44 carries a supporting pin 43 for a cop from which a yarn is unwound.

A cop magazine 36, best seen in FIG. 3, has a part-cylindrical portion in which cops 38 are located in upright position, separated by the arms 42 of a transporting member 41 which is secured to a shaft 40. Walls 37 form a tangentially extending outlet for the magazines 36 so that upon turning of transporting member 41, a cop 38 is placed between the walls 37 and drops along a guide to the position 38' resting on pin 43, as shown in FIGS. 2 and 4. When operating lever 12 performs an angular movement in the direction of the arrow in FIG. 2, angular lever 44 lowers support pin 43, and cop 38' drops along chute or guide face 39 into a receptacle. Consequently, members 12, 46, 44, 43 constitute cop removing means for disposing of an exhausted cop.

Shaft 40 of the transporting wheel 41 extends downward through the bottom of the magazine 36. As best seen in FIGS. 5, 6 and 8, shaft 40 carries an arresting wheel 55 having notches 65 successively engaged by a ball 57 biased by a spring 58 in a recess of the supporting means of the apparatus. Below arresting wheel 55, a ratchet

wheel 52 is secured to shaft 40, and cooperates with a pawl 53 pivotally mounted on a lever 49 which is turnable about the end portion of shaft 40. A spring 54 urges pawl 53 against ratchet wheel 52. Lever 49 is connected by a pin 50 with a link 51 which is articulated to the end of operating lever 24. When operating lever 24 is angularly displaced under the control of cam 67, lever 49 turns with pawl 53 which displaces ratchet wheel 52 one quarter turn with shaft 52 so that transporting wheel 41 is turned 90° and places the next following cop 38 in the chute so that the cop slides downward to the position 38' resting on support pin 43. From the above description, it is apparent that members 24, 51, 49, 53, 52, 40, 41 constitute cop supply means for supplying a new full cop. It is evident that cam 3 must first effect an operation of the cop removing means, whereupon cam 67 effects an operation of the cop supply means so that an exhausted cop is exchanged for a new full cop. In FIG. 7, graph 65 represents the position of the dwell of cam 3, and graph 66 the position of the dwell of cam 67, and it will be seen that first cam 3 and then cam 67 become effective during turning of actuating shaft 1. As shown by graph 64, the dwell of cam 2 begins its action before the dwell of cam 3, and ends its action after the dwell of cam 67 has operated.

Actuating shaft 1 is connected by a one revolution clutch to the drive means of the machine. In the event that the winding operation is interrupted, which may be due to the exhaustion of a cop 38', or to a yarn breakage, the one revolution coupling is automatically rendered operative, and actuating shaft 1 performs a single actuating revolution.

Operation

Assuming that the interruption of the winding operation was due to a yarn breakage, the yarn ends will be inserted into a tying device and the yarn will be tied in a manner which is not an object of the invention. The portion of the yarn 59 located between the sensing means 60, 61 will remain in the position illustrated in FIG. 1, and consequently cam follower means 5 is free to perform an oscillating motion, which is effected by cam 2 and spring 8 shortly after the single revolution of actuating cam 1 has started. Cam follower means 5 turns control shaft 4 with cams 10 and 22 so that the axially lower cam track portions of cam faces 11 and 23 are engaged by the coupling pins 15 and 27 which move out of the associated coupling openings 20 and 32, thereby disengaging the coupling between cam follower 16, 17, 18 and 19 and operating lever 12, 13 of the cop removing means, and also disengaging the coupling between cam followers 28, 30, 31 and operating lever 24, 25 of the cop supply means.

Actuating shaft 1 will rotate further together with cams 3 and 67 which will act on the respective cam followers 55 to turn the same on shaft 4, but such turning movement will not be transmitted to the operating levers 12 and 24 so that neither the cop removing means shown in FIG. 4, nor the cop supply means shown in FIG. 5 will be actuated. Consequently the supply cop in the position 38' is not exchanged, since there is still yarn left thereon which will be wound off after the yarn breakage has been eliminated by tying the yarn end of the supply cop and the yarn end of the take-up bobbin to each other.

However, if the yarn of the supply cop in the position 38' has been exhausted, and it is necessary to replace the exhausted cop, no yarn 59 will be located in the sensing means 60, 61. It will be understood that sensing means 60, 61 is located closely spaced from the yarn supply cop so as not to respond to yarn breakages which occur at a different place.

The absence of a yarn 59 in the sensing means 60, 61 permits a spring, not shown, to turn the locking means 63 to the position shown in broken lines blocking angular movement of cam follower means 5. When actuating

shaft 1 starts its single revolution, cam follower means 5 is prevented from following the cam track of cam 2 since it is blocked, and control shaft 4 is not turned. Control cams 10 and 22 remain in the position of FIG. 1 in which the coupling pins 15 and 27 respectively abut the axially higher cam track portions of cam faces 11 and 23, so that coupling pins 27 remain in the coupling bores 20 and 32 whereby the cam followers 16, 17, 19 and 28, 30, 31 remain coupled to the operating lever 12 of the cop removing means, and to the operating lever 24 of the cop supply means. While shaft 1 continues its revolution, cams 3 and 67 displace the respective cam followers and operating levers 12 and 24.

First operating lever 12 is displaced and pivots angular lever 24 with cop support pin 43 in counterclockwise direction as viewed in FIG. 4, so that support pin 45 moves downward below the wall of chute 39, and cop 38' slides down chute 39 into a receptacle, whereupon cam 3 permits operating lever 12 to return to its normal position so that angular lever 44 turns clockwise and support pin 43 is again placed in a position of readiness. After completion of this operation, or slightly before it, cam 67 actuates cam followers 28, 30 against the action of spring 33, and since coupling pin 27 is in the coupling position located in bore 32, operating lever 24 is angularly displaced in the direction of the arrow in FIG. 2, and shifts link 51, see also FIGS. 5 and 6, whereby pawl 53 turns ratchet wheel 52, shaft 40, and transporting wheel 41 90° in counterclockwise direction as viewed in FIG. 9 so that a new full cop 38 is transported to the outlet between walls 37 and to the chute 39 and slides down to the let-off position 38' in which it rests on the support pin 43. The yarn end of the new cop is then tied in an automatic operation to the end of the yarn already wound on the bobbin in a manner which is not an object of the present invention. The yarn taken off the new cop passes through the sensing means 60, 61 so that locking means 63 is returned to its normal inoperative position, permitting oscillation of cam follower means 5 and control means 4, 10, 22 by actuating cam 2.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of cop exchanging apparatus for winding machines differing from the types described above.

While the invention has been illustrated and described as embodied in a cop exchanging apparatus automatically controlled to be operative only in the case of exhaustion of a cop, and non-responsive to a yarn breakage, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. Cop exchanging apparatus for a winding machine, comprising, in combination, actuating means controlled by the winding machine upon a yarn breakage or exhaustion of a supply cop to perform an actuating motion; cop exchanging means; coupling means having a normal coupling position for coupling said actuating means with said cop exchanging means, and an inoperative position wherein said actuating means and said cop exchanging means are decoupled; control means for said coupling means; connecting means for connecting said actuating means with said control means for placing

during said actuating motion said coupling means in said inoperative position for preventing actuation of said cop exchanging means upon a yarn breakage; and sensing means for sensing a yarn wound off a supply cop and located to respond to the exhaustion of a yarn, but not to a yarn breakage, said sensing means controlling said connecting means to render the same inoperative when responding to the exhaustion of the yarn of a supply cop so that said coupling means remains in said normal coupling position and said actuating means actuate said cop exchanging means to effect the substitution of a new full cop for the exhausted cop.

5 2. An apparatus according to claim 1 wherein said actuating means include an actuating cam; wherein said connecting means include a cam follower means cooperating with said cam and being connected with said control means; and including locking means operated by said sensing means when responding to the exhaustion of a yarn to block movement of said cam follower means so that said coupling means remains in said normal coupling position and said actuating means actuate said cop exchanging means.

10 3. An apparatus according to claim 2 wherein said control means include a control shaft carrying said cam follower means, and control cam means on said control shaft; and wherein said coupling means include movable control means cooperating with said control cam means so that the latter move said coupling means between the normal coupling position and said inoperative position.

15 4. An apparatus according to claim 1 wherein said actuating means include cam means, and follower means cooperating with said cam means and connected by said coupling means with said cop exchanging means.

20 5. An apparatus according to claim 1 wherein said control means include control cam means; and wherein said coupling means include movable follower means cooperating with said control cam means so that the latter move said coupling means between said coupling and inoperative positions.

25 6. Cop exchanging apparatus for an automatic winding machine, comprising, in combination, actuating cam means controlled by said winding machine to perform a revolution upon a yarn breakage or exhaustion of a supply cop, and including first, second, and third cams; cop removing means; cop supply means for supplying a new full cop; first coupling means having a normal coupling position for coupling said cop removing means with said actuating cam means and including a first follower cooperating with said first cam; second coupling means having a normal coupling position for coupling said cop supply means with said actuating cam means and including a second follower cooperating with said second cam; control means for moving said first and second coupling means between said normal coupling positions and inoperative positions wherein said actuating cam means are decoupled from said cop removing means and said cop supply means; cam follower means cooperating with said third cam and connected with said control means so that said control means place during a revolution of said actuating cam means said first and second coupling means

30 in said inoperative position for preventing actuation of said cop removing means and of said cop supply means upon a yarn breakage; sensing means for sensing a yarn wound off a supply cop and located to respond to the exhaustion of a yarn, but not to a yarn breakage; and locking means operated by said sensing means responding to the exhaustion of the yarn of a supply cop to lock said cam follower means in an inoperative position so that said third cam is disconnected from said first and second coupling means whereby the same remain in said normal coupling positions and said actuating cam means

35 actuate said cop removing means and said cop supply means to effect the substitution of a new full cop for the exhausted cop.

40 7. Cop exchanging apparatus for an automatic winding machine, comprising, in combination, actuating cam means controlled by said winding machine to perform a revolution upon a yarn breakage or exhaustion of a supply cop, and including first, second, and third cams; cop removing means; cop supply means for supplying a new full cop; first coupling means having a normal coupling position for coupling said cop removing means with said actuating cam means and including a first follower cooperating with said first cam; second coupling means having a normal coupling position for coupling said cop supply means with said actuating cam means and including a second follower cooperating with said second cam; control means for moving said first and second coupling means between said normal coupling positions and inoperative positions wherein said actuating cam means are decoupled from said cop removing means and said cop supply means; cam follower means cooperating with said third cam and connected with said control means so that said control means place during a revolution of said actuating cam means said first and second coupling means

45 in said inoperative position for preventing actuation of said cop removing means and of said cop supply means upon a yarn breakage; sensing means for sensing a yarn wound off a supply cop and located to respond to the exhaustion of a yarn, but not to a yarn breakage; and locking means operated by said sensing means responding to the exhaustion of the yarn of a supply cop to lock said cam follower means in an inoperative position so that said third cam is disconnected from said first and second coupling means whereby the same remain in said normal coupling positions and said actuating cam means

50 actuate said cop removing means and said cop supply means to effect the substitution of a new full cop for the exhausted cop.

7. An apparatus according to claim 6 wherein said control means include first and second control cams, each of said first and second coupling means including a movable coupling member having a cam follower portion respectively cooperating with said first and second control cams; said cam follower means being connected with said control cams for turning movement so that upon operation of said cam follower means by said third cam, said first and second coupling means are simultaneously shifted between said coupling and inoperative positions.

8. An apparatus according to claim 7 wherein said control means include a control shaft carrying said first and second control cams; wherein said cop removing means includes a first operating lever, and said cop supply means includes a second operating lever, said operating levers being mounted for turning movement on said control shaft; and wherein said first and second followers respectively have coupling portions mounted for turning movement on said control shaft; and wherein said first and second coupling members connect said coupling portions of said first and second followers, respectively, with said first and second operating levers in said coupling positions of said first and second coupling means.

9. An apparatus according to claim 8 wherein said first and second cams operate said first and second followers of said first and second coupling means successively so that first said cop removing means and then said cop

supply means is actuated; and wherein said third cam actuates said cam follower means and said control means while said first and second cams displace said first and second followers.

10. An apparatus according to claim 6 wherein said locking means includes a turntable locking member movable between an inoperative position and a position located in the path of movement of said cam follower means so that said cam follower means is prevented from following said third cam whereby said control means are not actuated to shift said first and second coupling means.

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