July 10, 1962 S. FÜRST 3,043,529

APPARATUS FOR PREPARING COILS OF YARN FOR FURTHER FABRICATION

Filed July 23, 1958 2 Sheets-Sheet 1

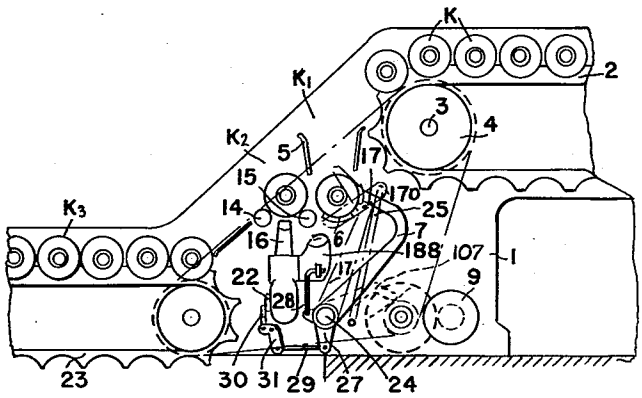


FIG. 1

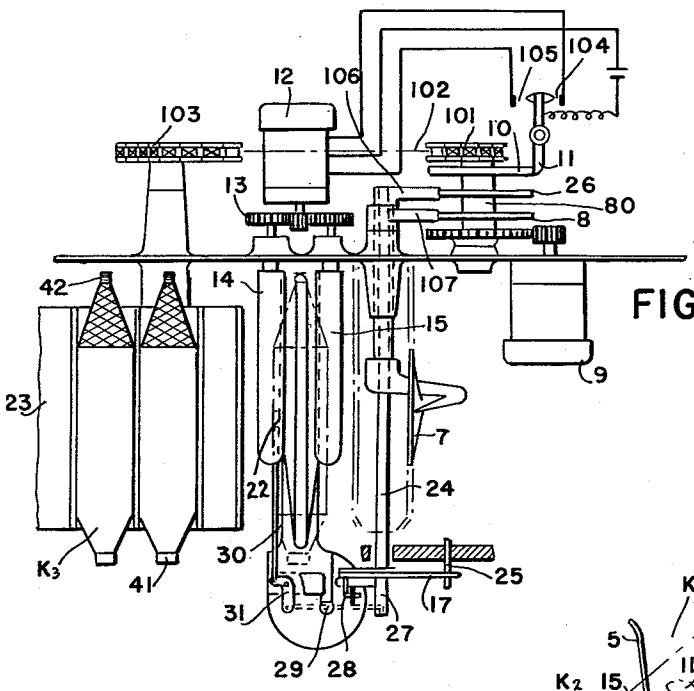


FIG. 2

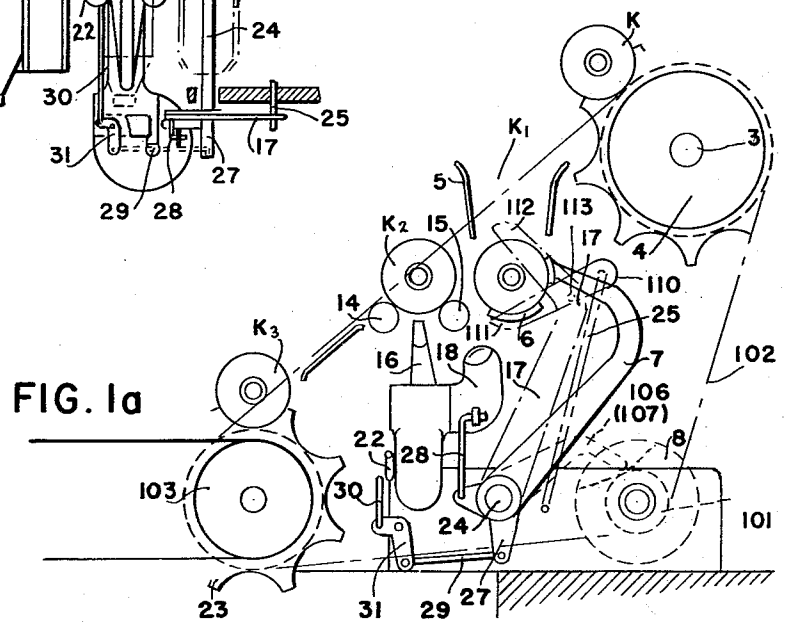


FIG. 1a

July 10, 1962 S. FÜRST 3,043,529

APPARATUS FOR PREPARING COILS OF YARN FOR FURTHER FABRICATION

Filed July 23, 1958 2 Sheets-Sheet 2

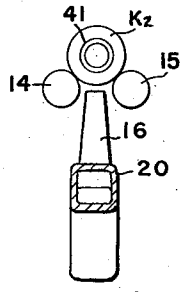


FIG. 3

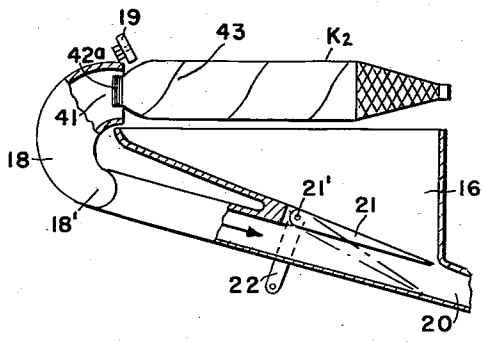


FIG. 4

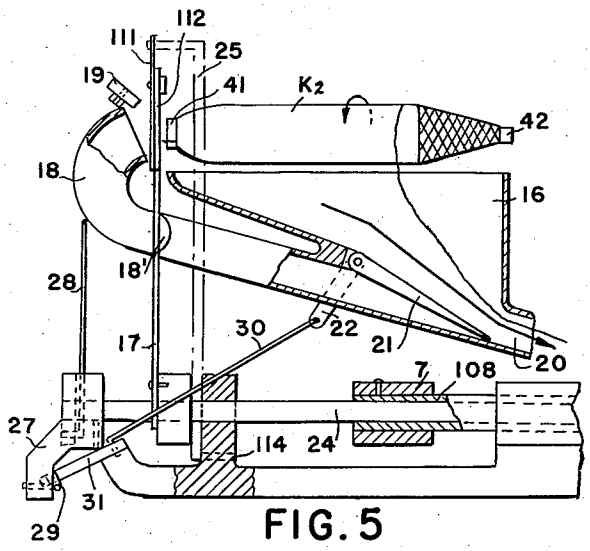


FIG. 5

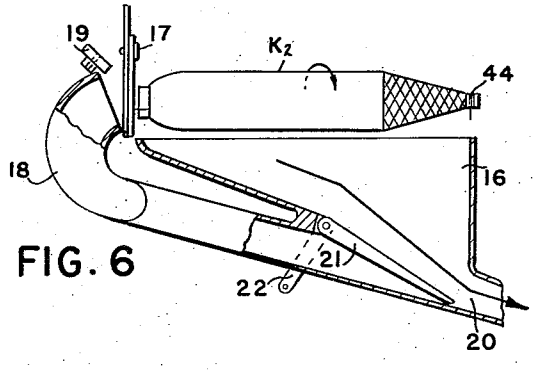


FIG. 6

United States Patent Office 3,043,529 Patented July 10, 1962

3,043,529

APPARATUS FOR PREPARING COILS OF YARN FOR FURTHER FABRICATION

Stefan Fürst, Monchen-Gladbach, Germany, assignor to Walter Reiners, Monchen-Gladbach, Germany

Filed July 23, 1958, Ser. No. 750,373
Claims priority, application Germany Aug. 1, 1957
8 Claims. (Cl. 242—35.6)

My invention relates to the preparation of yarn coils for subsequent use in weaving, spinning or other textile manufacturing. The packages may consist of shuttle bobbins or warp coils for use in weaving, pirns, cops or other yarn packages for spinning, re-winding or other textile manufacturing operations.

In the preparation of such coils, it is desirable to facilitate the further fabricatory use by having the starting end of the yarn located at a given spot of the spool or coil core in form of a small reserve winding which can readily be seized and unwound by automatic devices. Methods and apparatus in which such reserve windings are used for seizing, conveying and sensing operations are described, for instance, in the copending applications of W. Reiners and S. Fürst, Serial No. 640,166, filed February 14, 1957, now Patent No. 2,936,130; and of S. Fürst, Serial No. 640,137, filed February 14, 1957.

The preparatory work can be done in the manner and by the means disclosed in my copending application Serial No. 684,597, filed September 17, 1957. According to the invention of the copending application, the freely disposed end of the yarn is first unwound to a slight extent and then is again wound onto the core of the coil at the desired predetermined location, particularly the tip of the tubular core or quill of a spinning cop.

It is an object of my present invention to improve the just-mentioned apparatus toward further simplicity and reliability.

To this end, and in accordance with a feature of my invention, the unwinding of the yarn from the coil to be prepared is effected in the axial direction of the core, but the subsequent re-winding of the unwound yarn and back onto a given location of the core is done by rotating the core-and-coil body and running the yarn onto the core in a radial direction.

According to a more specific feature of my invention, the proper unwinding of the yarn end from the coil is effected by means of an air current.

Referring particularly to spinning cops as they come from the spinning machine, the reserve winding of yarn, as a rule, is located on the foot portion of the tubular core which forms the core end remote from the conical tip portion of the body of yarn. Accordingly, the air current used for dissolving the reserve winding on such cops is preferably active at the cop foot in a direction axially away from the core. In such cases, an appreciable yet not always equal length of yarn is contained in the original reserve winding as it is produced at the last winding step on the spinning machine. Therefore, according to another feature of my invention, it is favorable, after dissolving the original reserve winding by the air current, to first cut the yarn end down to a given short length, and then rotating the coil a given number of turns in the unwinding sense to thus remove an always definite length of yarn, before commencing the rewinding of the yarn to form a new reserve winding on the core tip.

According to another feature of the invention, the just-mentioned removal of yarn prior to re-winding is effected by means of a suction nozzle which has a nozzle slot extending along the coil, substantially parallel to the coil axis, and one end of the slot as well as the suction inlet of the nozzle are located near the tip of the coil, where a new

reserve winding is to be placed onto the core. Such a nozzle acts not only to remove the length of yarn to be wound onto the tip, but it also inherently operates to shift the unwound portion of yarn toward the core tip so that no other yarn guide is needed for subsequently running the yarn back onto the tip by simply rotating the coil in the winding-up sense.

Preferably, the seeking and dissolving of the original reserve winding on one foot of the core and the subsequent severing of the yarn end are performed as a single step of operation, and the unwinding of a given quantity of yarn and the running-up of a new reserve winding on the tip of the core in a direction perpendicular to the core axis are effected as a second step of operation. By thus proceeding in two sequential steps of operation, the work as well as the design of the necessary devices can be simplified. Due to the severing of the yarn at the end of the first operating step, a uniform length of yarn to be unwound and subsequently rewound is simply and reliably secured. For performing the two operating steps there are preferably used two separate air currents flowing through two respective channels. However, a single air impeller or source of suction may be used for producing both air currents. It suffices to first connect one channel with the impeller and, after completing the first operating step, to connect the other channel in lieu of the first one with the impeller.

The above-mentioned and other objects and features of my invention will be apparent from the embodiment described in the following with reference to the drawings in which—

FIG. 1 is a front view of coil-preparing apparatus constructed according to the invention;

FIG. 1*a* is an enlarged view of a portion of FIG. 1;

FIG. 2 is a top view of the same apparatus; and

FIGS. 3 to 6 illustrate details of the same apparatus in front view (FIG. 3) and side views (FIGS. 4 to 6).

The frame structure **1** of the machine illustrated in FIGS. 1 and 2 carries an endless conveyor chain **2** which runs about a sprocket roller **4** mounted on a shaft **3** and supplies the yarn coils K from the right, these coils consisting, in the illustrated example, of spinning cops as they come from the spinning machine. At the reversing point of conveyor travel the cops K drop individually into a guiding funnel **5** which passes them onto a holder sheet **6**. The cop located in position K_1 on sheet **6** lies opposite a pusher **7** which has an operating lever **107** that is controlled by a cam disc **8** driven by a motor **9**. Pusher **7** pivots on a shaft **24**. Mounted on the shaft **80** of cam disc **8** is another cam disc **10** (FIG. 2) which actuates an electric reversing switch **11**. Switch **11** operates to energize an electric motor **12** to run in one or the other direction. The motor **12** drives a pair of rollers **14**, **15** through spur gears **13** (FIG. 2). When the pusher **7**, actuated by cam disc **8**, moves toward the left (FIG. 1) it shifts the cop from position K_1 onto the pair of rollers **14**, **15**, into the position designated K_2. Located between rollers **14**, **15** is an elongated slot nozzle **16** (FIGS. 1, 3, 4). The length of the nozzle slot **16** is approximately equal to the length of the cop. Mounted at the left end (FIG. 5 and 6) of the slot nozzle **16** is a scissors-type cutter having a scissor arm **17** that is mounted on and can be turned by shaft **24**. This also moves the second arm **170** (FIG. 1) of the cutter into closing position, this second arm being pivotally connected to a linking rod **25** which in turn is pivotally connected to the stationary frame structure **1** of the machine. The shaft **24**, controls the pusher **7** as well as the cutter **17—170**, being driven from a cam disc **26** (FIG. 2) which is concentrically joined wtih cams **8** and **10**.

Each cop has a tubular core or quill which has a

foot portion **41** of a larger diameter at one end and a tip portion **42** at the other end. Located at the side of the foot **41**, opposite the pair of rollers **14** and **15**, is a displaceable tubular nozzle member **18** (FIGS. 4 to 6) whose opening can be moved into the immediate vicinity toward and over the foot **41** of the cop K_2 located on rollers **14**, **15**. The front part of nozzle **18** is broken away in FIG. 1, for clarity. Nozzle end **18** extends laterally of conduit **20**. Member **16** preferably forms an integral or fixed structure, while member **18** can pivot on **21'**, or at its hub **18'**, or on any other siutable pivot means. The tilting of member **18** about its hub **18'** (FIGS. 4, 5) is accomplished by means of crank arm **27** (FIG. 1) in the manner described below. A feeler roller **19** (FIG. 4) journalled on the tubular member **18** maintains a given minimum spacing between the nozzle opening of member **18** and the cop K_2.

The tubular member **18** and the slot nozzle **16** communicate with a suction conduit **20**. A flap valve **21**, pivoted at **21'** (FIG. 4) and actuable by means of an arm **22**, selectively connects either the tubular member **18** (FIG. 4) or the slot nozzle **16** (FIG. 5) with a suction-air producer (not shown). The movement of flap **21** takes place simultaneously with the tilting movement of tubular member **18** about hub **18'** and is controlled by an angular crank arm **27** (FIG. 1) mounted on the shaft **24**. The angular displacement of crank arm **27** is transmitted by a linking rod **28** to the tubular member **18** (FIG. 1). The angular displacement of arm **27** is also transmitted to valve flap **21** by a linking rod **29**, an angular lever **31** and another linking rod **30**.

An endless chain conveyor **23** (FIGS. 1, 2) receives the cops K_3 that were previously processed on the roller pair **14**, **15**, and conveys the cops to another location for further fabrication, or to a magazine.

The apparatus operates as follows. The cops K, supplied by conveyor **2**, pass individually through funnel **5** onto the holder sheet **6** whence they are displaced by pusher **7** into position K_2 on rollers **14**, **15**. The cam mechanism moves the tubular nozzle member **18** about its hub **18'** (FIGS. 4, 5) from below into the vicinity of the cop foot **41** and simultaneously connects the nozzle member with a source of suction air. Under the effect of the suction current, the yarn end originally contained in form of a reserve winding **42***a* (FIG. 4) on the foot of the cop is pulled off axially, and a portion of the immediately adjacent steeply pitched turns **43** of yarn on the surface of the yarn package is also unwound and pulled off. Tube **18** is first withdrawn from the bobbin so that the cutter **17** can move across the bobbin end **41** to sever the strand. Now the cutter **17** is actuated, the yarn end being cut off and being removed by the suction current. The switch **11** is now actuated to operate the drive motor **12** with the effect that the cop in position K_2 on rollers **14**, **15** is turned in the unwinding direction. Simultaneously, valve flap **21** pivoting about **21'** (FIG. 4) connects the slot nozzle **16** with the source of suction and disconnects the tubular nozzle member **18** from suction. Now the yarn end located at the slot of nozzle **16** is pulled into the nozzle (FIG. 5). The roller pair **14**, **15** performs only a given number of rotations corresponding to a predetermined length of yarn to be wound off. As a result, just as much yarn is unwound as is required for the formation of a reserve winding at the tip of the cop. The switch **11** is again actuated and reverses the motor **12** to now turn the cop in the winding-up sense. During the rewinding operation, the yarn end remains at the right-hand end of the suction nozzle **16** (FIG. 5). Consequently, the unwound length of yarn is now wound up only at the tip of the cop to form a new reserve winding as shown at **44** in FIG. 6. The processing is terminated with the completion of this reserve winding **44**.

In the meantime another cop has passed from conveyor **2** into position K_1. The next following actuation of the pusher **7** displaces the new cop toward the roller pair and thus also entrains the fully processed cop from position K_2 onto position K_3 (FIG. 2) on the receiving conveyor **23**. The cycle of operation then continues in the above-described manner.

The operation of the individual parts is as follows.

When starting the operation of the device, the motor **9** is energized. Operating through a spur gear transmission motor **9** drives the cam discs **8**, **26** and **10**, which are mounted on a common cam shaft. The same drive, acting through a chain transmission **102** and sprockets **101**, **103**, drives the feeder device **2** and the dispensing device **23**.

The rotating set of cams **8**, **10**, **26** actuates the controlling components. The cam **10** actuates the control lever **11** which at first turns clockwise and controls motor **12** to run in one direction by actuation of the contact pair **104**. After elapse of a certain time, the lever **11** actuates the contact pair **105** to make the motor run in the other direction. The cam **26** cooperates with a lever **106**. The cam **8** cooperates with another lever **107** which, in FIG. 1*a*, coincides with the lever **106**. The lever **107** is mounted on a hollow shaft **108**. The lever **106** is mounted on a full shaft **24**. Fastened to the end of the hollow shaft **28** is the tappet **7**. Fastened to the end of shaft **24** is the angular lever **27**. Also fastened to the shaft **24** is one arm of the scissors-type cutter **17**.

The scissors **27** are formed by the two blades **111** and **112**. The blade **112** is firmly connected with the cutter arm **17**. The other blade **111** is linked to the bolt **113** and is also pivotally joined with the rod **25** whose other end is rotatably mounted by means of a lug **114** on the machine frame structure. When the scissors, by rotation of the cam disc, are turned to the left by lifting of the lever **106** with the arm **17**, the connecting rod **25** is entrained. However, the length of this rod is so dimensioned, relative to the length of the scissors arm **17**, that it pulls the blade **111** on the right-hand side downwardly with the result that the scissors will close on the left side during the turning motion of the arm **17**. Since during operation the yarn extends between supply coil K_2 and suction tube **18**, the yarn is cut off by the closing of the scissors.

The angular lever **27** rotates together with the motion of the scissors arm **17**. This rotation is transmitted by the rod **28** to the suction tube **18** which moves away from the coil and thus vacates the space between coil and suction tube for the inward turning motion of the scissors **111**, **112**. The turning motion is also transmitted by the rod **29** to the lever **31**. The lever **31** has a slanting position as is particularly apparent from FIG. 5. For that reason, the lever **31** is visible in the lateral view according to FIG. 1 as well as in the top view according to FIG. 2 in form of an angular structure. When the lever **31** is entrained by the rod **29**, the rod transmits its motion to the control arm which is particularly linked with the arm **22** of the flap **21**. Since this rod, too, has a slanting position, it likewise appears in both FIGS. 1 and 2 at respectively different lengths.

During rotation of the cam discs, the lever **107**, cooperating with the cam **8**, is lifted when the machine operation is about to be terminated. Consequently, the hollow shaft **108** entrains the arm **7** and thereby shoves the coil located in the trough **6** toward the left. This coil displaces the coil K_2 on the rollers **14** and **15** to the left so that coil K_2 rolls onto the dispensing device and is thus conveyed away.

In cooperation with the rotation of the cams, the forward or return run of the motor **12** is effected by the contacts **104** and **105**. That is, as soon as a new coil is placed by the pusher **7** upon the drive rollers **14**, **15**, the motor runs in such a direction that the coil is driven in a direction opposed to that of its yarn turns. At the same time, however, the suction nozzle **18** is moved in the direction of the coil axis so that it places itself over

the coil (cop) foot as shown in FIG. 4. The yarn end, wound upon the cop foot, becomes dissolved. The dissolution of this reserve winding on the foot, just described, requires only very little time. It can be terminated already while the suction nozzle **18** is still approaching. Thereafter, the scissors are turned inward, and the yarn is cut off. The cop is further rotated in the same direction, and the angular lever **27** and the angular lever **31** moved together with the turning-in movement of the scissors. This motion is transmitted by the rod **30** to the flap **21** so that the suction air can no longer act at suction tube **18**, but will now act at suction tube **16** upon the cop. During reverse motion, the yarn end is sucked away and now, after dissolution of the turns, passes to the tip with a large angle of pitch. The cam shape of the set of cams determines the period of time during which the cop is driven in the unwinding direction. After elapse of this period, the cop is turned forward, i.e. in the winding-up direction. The yarn places itself against the most rearward edge of the suction tube **16**. Located opposite this edge is the tip of the cop core which is vacant for receiving the reserve winding. During the subsequent winding-up operation, the yarn pulled into the suction tube is again wound up to form a reserve winding on the core tip.

The above-described drive of the cop in the reverse or unwinding direction need not necessarily coincide with the sucking-off of the winding at the core foot. This drive may also commence at a later moment, namely only after the yarn is cut off. However, if the reverse winding takes place during the sucking-off operation, the latter operation may be more favorable because the winding is unwound or dissolved more rapidly. After forming the winding on the tip, the processing of the particular cop is terminated. Now the above-described exchange by pushing the cop away and entering a new cop takes place. As described, the latter operation is effected by means of the pusher **7**.

It will be obvious to those skilled in the art, upon studying this disclosure, that with respect to structural details my invention permits of various modifications and hence may be embodied in apparatus other than that particularly illustrated and described herein, without departing from the essential features of my invention and within the scope of the claims annexed hereto.

I claim:

1. An apparatus for unwinding a length of wound yarn end from one location on a yarn package and rewinding a determined length of the unwound yarn end on another location of the package, comprising means for withdrawing a length of wound yarn axially of the yarn package, means for parting from the withdrawn yarn a terminal portion thereof to leave a predetermined length of withdrawn yarn end remaining, means to turn the yarn package about its axis in unwinding direction, the apparatus providing means for withdrawing said remaining withdrawn yarn end in a non-axial direction, and means to turn the yarn package in winding direction to rewind said remaining length onto another location of the package.

2. An apparatus for unwinding a length of wound yarn end from one location on a yarn package and rewinding a determined length of the unwound yarn end on another location of the package, comprising suction nozzle means for withdrawing a length of wound yarn axially of the yarn package, means for thereafter parting from the withdrawn yarn a terminal portion thereof to leave a predetermined length of withdrawn yarn end remaining, means to thereafter turn the yarn package about its axis in unwinding direction, second suction nozzle means for withdrawing said remaining withdrawn yarn end in a non-axial direction, and means to thereafter turn the yarn package in winding direction, the second suction nozzle means running said remaining length onto another location of the package, the said running being in a direction transverse to the yarn package winding axis.

3. An apparatus for unwinding a length of wound yarn end from a reserve winding at one location on a yarn package and rewinding a determined length of the unwound yarn end on another location of the package, comprising suction nozzle means for withdrawing the reserve winding axially of the yarn package, means for thereafter parting the withdrawn yarn to leave a predetermined length of withdrawn yarn end remaining, means to thereafter turn the yarn package about its axis in unwinding direction, second suction nozzle means for withdrawing the remaining yarn end in a direction transverse to the yarn package winding axis, and means to thereafter turn the yarn package in winding direction.

4. An apparatus for unwinding a length of wound yarn end from one location on a yarn package and rewinding a determined length of the unwound yarn end on another location of the package, comprising suction nozzle means for withdrawing a length of wound yarn axially of the yarn package, means for parting from the withdrawn yarn a terminal portion thereof to leave a predetermined length of withdrawn yarn end remaining, means to turn the yarn package about its axis in unwinding direction, second suction nozzle means for withdrawing said remaining withdrawn yarn end in a non-axial direction, and means to thereafter turn the yarn package in winding direction, the second suction nozzle means running said remaining length onto another location of the package, the said running being in a direction transverse to the yarn package axis, the first and second recited nozzle means forming an integrated movable structure having a common suction duct, the first nozzle means having an intake opening positionable opposite an end of the yarn package on which a reserve winding is formed, the second nozzle means having an intake opening extending longitudinally of the yarn package, and valve means to connect one of the nozzle means to the suction duct and to disconnect the other nozzle means from said duct.

5. An apparatus for unwinding a length of wound yarn end from one location on a yarn package and rewinding a determined length of the unwound yarn end on another location of the package, comprising suction nozzle means for withdrawing a length of wound yarn axially of the yarn package, means for parting from the withdrawn yarn a terminal portion thereof to leave a predetermined length of withdrawn yarn end remaining, means to thereafter turn the yarn package about its axis in unwinding direction, second suction nozzle means for withdrawing said remaining withdrawn yarn end in a non-axial direction, and means to thereafter turn the yarn package in winding direction, the second suction nozzle means running said remaining length onto another location of the package, the said running being in a direction transverse to the yarn package axis, the first and second recited nozzle means forming an integrated movable structure having a common suction duct, the first nozzle means having an intake opening positionable opposite a foot end of the yarn package on which a reserve winding is formed, the second nozzle means having an intake opening extending longitudinally of the yarn package, and valve means to connect one of the nozzle means to the suction duct and to disconnect the other nozzle means from said duct, and means for moving said structure to dispose the first nozzle means adjacent said foot end and to adjust said valve means to apply suction to said first nozzle means and remove suction from the second nozzle means.

6. An automatic apparatus for unwinding a length of wound yarn end from a reserve winding at one location on a yarn package and rewinding a determined length of the unwound yarn end on another location of the same package, comprising conveyor means to convey a sequence of the yarn packages, guiding means to receive the packages in sequence after they leave the conveyor means, two rollers to receive individual packages in sequence from the guiding means, pusher means to push an individual package from the guiding means onto the rollers, switch and motor means to turn the rollers for unwinding and for

winding the yarn, first suction nozzle means for withdrawing a length of wound yarn axially of the yarn package, the first nozzle means having an intake opening positionable opposite a foot end of the yarn package on which the reserve winding is formed, means adjacent said end to automatically cut the withdrawn yarn to leave a predetermined length of withdrawn yarn end remaining, said switch means being thereafter automatically operated to actuate the motor to turn the yarn package about its axis in unwinding direction, second suction nozzle means for withdrawing the remaining unwound end in a non-axial direction, the second nozzle means having an intake opening extending lengthwise of the yarn package, the switch means being thereafter automatically operated to actuate the motor to turn the yarn package in winding direction, the second suction nozzle means running said remaining unwound end onto another location of the package, the said running being in a direction transverse to the yarn package axis, the first and second recited nozzle means forming an integrated movable structure having a common suction duct, and valve means to connect one of the nozzle means to the suction duct and to disconnect the other nozzle means from said duct, and means for moving said structure to dispose the first nozzle means adjacent said foot end and to simultaneously adjust said valve means to apply suction to said first nozzle means and remove suction from the second nozzle means, said means for moving said structure being also operative to remove the first nozzle means from said first end to permit access of the cutter to cut the withdrawn yarn.

7. An apparatus for unwinding a length of wound yarn end from one location on a yarn package and rewinding a determined length of the unwound yarn end on another location of the same package, comprising conveyor means to convey a sequence of the yarn packages, guiding means to receive the packages in sequence after they leave the conveyor means, two rollers to receive individual packages in sequence from the guiding means, pusher means to push an individual package from the guiding means onto the rollers, switch and motor means to turn the rollers for unwinding and for winding the yarn, first suction nozzle means for withdrawing a length of wound yarn axially of the yarn package, means for parting from the withdrawn yarn a terminal portion thereof to leave a predetermined length of withdrawn yarn end remaining, said switch and motor means being operative to turn the yarn package about its axis in unwinding direction, second suction nozzle means for withdrawing said remaining withdrawing yarn end in a non-axial direction, the second suction nozzle means having an air intake extending longitudinally of the yarn package, and means to set said switch means to turn the yarn package in winding direction, the second suction nozzle means running said remaining length onto another location of the package, the said running being in a direction transverse to the yarn package axis, the pusher means also serving to push the next yarn package against the preceding one to remove the latter from the rollers, and receiver means to receive the yarn package pushed off the rollers.

8. An apparatus for unwinding a length of wound yarn end from one location on a yarn package and rewinding the unwound yarn end on another location of the package, comprising means for withdrawing a length of wound yarn axially of the yarn package, means to turn the yarn package about its axis in unwinding direction, the apparatus providing means for withdrawing said withdrawn length of yarn in a non-axial direction, and means to turn the yarn package in winding direction to rewind said length onto another location of the package.

References Cited in the file of this patent

UNITED STATES PATENTS

2,035,721	Reiners	Mar. 31, 1936
2,208,930	Kahlisch	July 23, 1940
2,670,150	Perry	Feb. 23, 1954
2,675,971	Abbott	Apr. 20, 1954
2,685,413	Reiners	Aug. 3, 1954
2,747,806	Borchardt	May 29, 1956
2,755,857	Furst	July 24, 1956

FOREIGN PATENTS

53,411	Switzerland	Oct. 15, 1910