United States Patent [19]

Lutovsky et al.

[11] **3,776,479**

[45] **Dec. 4, 1973**

[54] **METHOD OF AND DEVICE FOR DETECTING THE YARN END FROM A CROSSWOUND BOBBIN IN AUTOMATIC YARN WINDING MACHINES**

[75] Inventors: **Josef Lutovsky**, Liberec; **Vladimir Prasil**, Brno, both of Czechoslovakia

[73] Assignee: **Elitex, Zavody Textilniho strojirenstvi generalni reditelstvi**, Liberec, Czechoslovakia

[22] Filed: **Feb. 24, 1971**

[21] Appl. No.: **118,362**

[30] **Foreign Application Priority Data**

Feb. 26, 1970 Czechoslovakia 1311/70

[52] **U.S. Cl.** ..... **242/35.6 R**, 242/36

[51] **Int. Cl.** **B65h 54/22**

[58] **Field of Search** ..... 242/35.5 R, 35.6 R, 242/36

[56] **References Cited**

UNITED STATES PATENTS

3,220,758	11/1965	Raasch et al.	242/35.6 R X
3,311,312	3/1967	Hauri	242/35.6 R
3,373,947	3/1968	Prasil	242/35.6 R
3,458,912	8/1969	Werffeli	242/35.6 R X
3,599,886	8/1971	Koller	242/35.6 R X

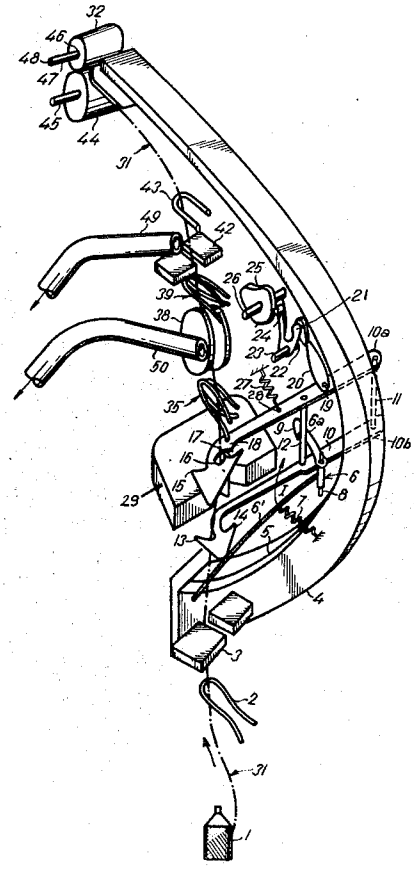
Primary Examiner—Stanley N. Gilreath

Attorney—Arthur O. Klein

[57] **ABSTRACT**

Method of and apparatus for preventing defects due to a failure in detecting the yarn end from a crosswound bobbin in automatic yarn winding machines. By means of a stop motion detecting the presence of the end of yarn from the crosswound bobbin in the position after exit of said yarn end from a detecting tube, the end of yarn from a supply cop is prevented from being introduced into the yarn knotter in the case of absence of the end of yarn from the crosswound bobbin. The introduction of the two ends of yarn into the yarn knotter is made possible in the case of presence of the end of yarn from the crosswound bobbin in the same cycle of the automatic procedure for removing the interruption of the winding process.

6 Claims, 8 Drawing Figures



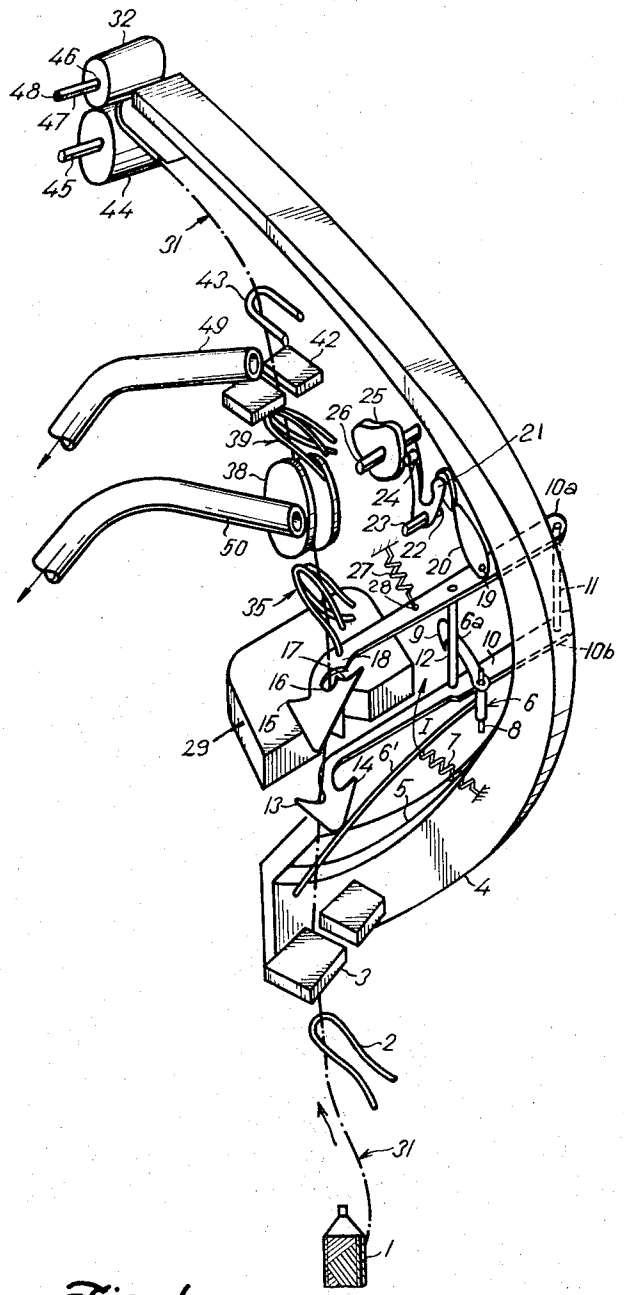


Fig. 1.

INVENTORS:
Josef LUTOVSKY
Vladimir PRASIL
BY: Arthur O. Klein
ATTORNEY

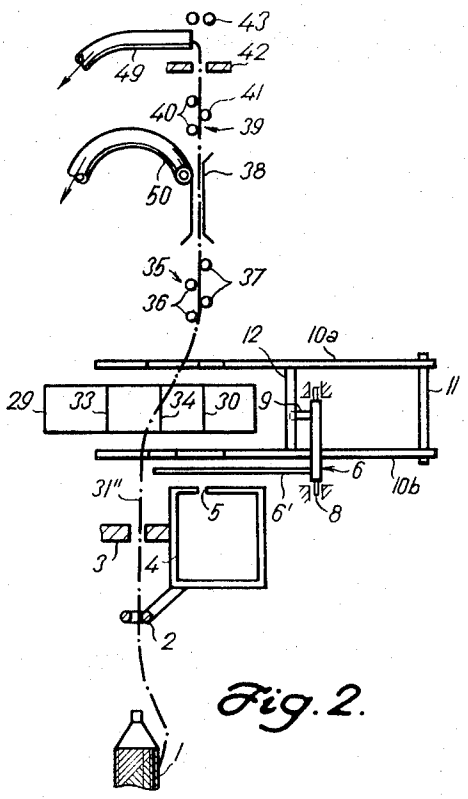


Fig. 2.

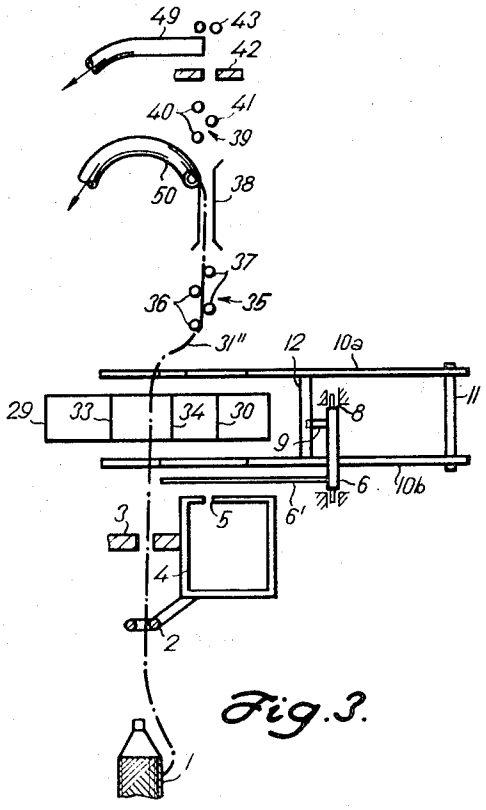


Fig. 3.

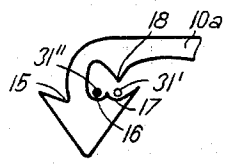


Fig. 2a.

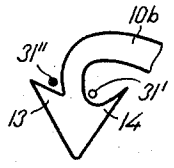


Fig. 2b.

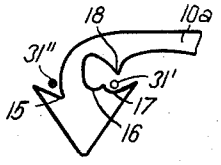


Fig. 3a.

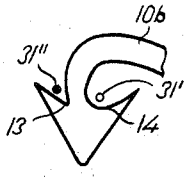


Fig. 3b.

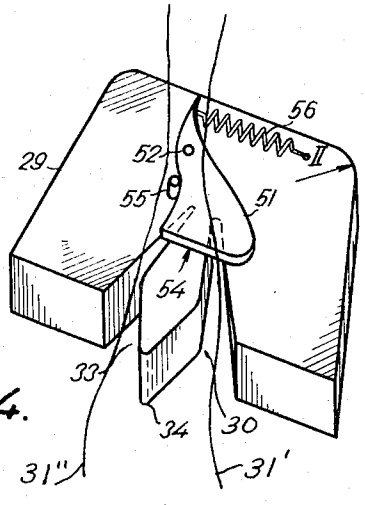


Fig. 4.

INVENTORS:
Josef LUTOVSKY
Vladimir PRASIL
BY: Arthur O. Klein
ATTORNEY

METHOD OF AND DEVICE FOR DETECTING THE YARN END FROM A CROSSWOUND BOBBIN IN AUTOMATIC YARN WINDING MACHINES

The present invention relates to a method of eliminating a failure of the automatic process for removing an interruption of the yarn winding process in automatic winding machines due to a failure in feeding the yarn end from the crosswound bobbin into the yarn knotter, and to a device for performing said method.

Automatic crosswinding machines with stationary winding units and provided with a knotter on each of said winding units have certain disadvantages as does any highly-automated device. The said disadvantages consist in that in the case of omitting only one step of the automatic procedure for removing the winding process due to breakage of the yarn being wound, or upon exhausting its supply on the supply cop, the efficiency of said machines is reduced by prolonging the time necessary for removing the causes of the interruption of the winding process, particularly by putting higher requirements on the attendance of the winding units by operators, or by performing the process of manually removing the cause of the interruption of the winding process itself.

Thus, it sometimes occurs in the machines of the above-mentioned type that even in the case in which, upon interruption of the winding process, whether due to breakage of the wound yarn or due to exhaustion of the yarn supply on the supply cop, the yarn end is not detected on the crosswound bobbin and is thus not even fed into the knotter. In spite of this, the whole procedure of the automatic device for removing the interruption of the winding process is carried out. However, because one yarn end was not present, the two yarn ends were not knotted together during the automatic procedure, the yarn end from the supply cop, which was present in the knotter, being cut off. Due to that, the yarn end of the supply cop is not available upon automatic repetition of the automatic procedure for removing the interruption of the winding process by knotting together the two yarn ends, the supply cop being automatically ejected during the following step onto a belt conveyor and brought thereby to the end of the machine, where it must be found by the operator and again filled into a magazine of one of the winding units of the machine.

The above prior winding machines are disclosed in:

Austrian Pat. No. 272,163

Swiss Pat. No. 454,693 (British Pat. No. 1,129,355)

British Pat. Nos. 1,228,633, 1,245,838, and 1,232,221

U.S. Pat. Nos. 3,373,946, and 3,373,947.

The present invention has among its objects the overcoming of the said disadvantage or to mitigate it by applying a further stop motion into the automatic device for removing the interruption of the winding process, said further stop motion preventing the yarn end from the supply cop from entering the knotter in the case in which the presence of the yarn end from the crosswound bobbin has not been detected in the position necessary for the introduction of such yarn into the yarn knotter.

The subject matter of the method according to the present invention consists particularly in that, by means of a stop motion detecting the presence of the yarn end from the crosswound bobbin in the position after said yarn end has left the detecting tube, the introduction of the yarn end from the supply cop into the yarn knotter is prevented in the case of absence of said yarn end from the crosswound bobbin; the introduction of the two yarn ends is, on the other hand, enabled upon the presence of the yarn end from the crosswound bobbin in the same cycle of the automatic procedure for removing the interruption of the winding process.

The device for performing the method according to the present invention is constituted by a stop motion consisting, on one hand, of a detecting part for detecting the presence of the yarn end from the crosswound bobbin in its position after leaving the detecting tube, and, on the other hand, of an active part preventing, either indirectly or directly, the introduction of the yarn end from the supply cop into the yarn knotter in the case of absence of the yarn end from the crosswound bobbin in the given position.

Further features of the method and device according to the present invention are disclosed in the following specification and shown in the form of an exemplary embodiment, in the accompanying drawings, of which:

FIG. **1** is an axonometric view of a winding unit provided with a first embodiment of a device in accordance with the present invention;

FIG. **2** is a diagram of the course of the winding process, in front view, the view showing yarn breakage during winding;

FIG. **2***a* is a diagrammatic view in plan of the positioning of the two yarn ends in the upper part of the inserting lever of the automatic mechanism for removing the interruption of the yarn winding process on the winding unit in a case such as that shown in FIG. **2**;

FIG. **2***b* is a plan view diagram of the positioning of the two yarn ends in the lower part of the inserting lever of the automatic mechanism for removing the interruption of the yarn winding process on the winding unit in a case such as that shown in FIG. **2**;

FIG. **3** is a diagram of the course of yarn winding, in front view, the view showing the changing of an empty cop for a new one, i.e. upon the first knotting of the two yarn ends after exchange of the supply cop;

FIG. **3***a* is a plan view diagram of the positioning of the two yarn ends in the upper part of the inserting lever of the automatic mechanism for removing the interruption of the yarn winding process on the yarn winding unit in a case such as shown in FIG. **3**;

FIG. **3***b* is a plan view diagram of the positioning of the two yarn ends in the lower part of the introducing lever of the automatic mechanism for removing the interruption of the winding process on the yarn winding unit in a case such as that shown in FIG. **3**; and

FIG. **4** is an axonometric diagram of a yarn knotter provided with a second embodiment of the device according to the present invention.

The specification below is limited to a single yarn winding unit, for better understanding, although it is to be understood that the automatic yarn winding machine is provided with a plurality of winding units of the same embodiment on one or on both sides.

Turning now to FIG. **1**, there is there shown a known yarn winding unit having a cop **1**, from which yarn generally designated **31** is guided upwardly over guide **2**, clearer **3**, introducing lever **10**, stop motion **35**, brake **38**, a further stop motion **39**, clearer **42**, and guide **43** to the yarn distributor **44**, by means of which said yarn is distributed on the crosswound bobbin **32**. The de-

tecting sucking tube 4, the mouth of which is located approximately on the line of contact between distributor 44 and crosswound bobbin 32, is mounted in front of the winding unit and connected with its lower end to a sucking pipeline (not shown) common to all winding units of the automatic winding machine. The detecting tube 4 is provided on the wall pointing to the winding unit with a slot 5, which can be covered about its whole length with a swingable flap (not shown). The introducing lever 10 is swingable about pivot 11 and consists of the upper arm 10*a*, and the lower arm 10*b*, mounted parallel one above each other. Those two arms 10*a*, 10*b* are interconnected by a column 12, which is provided with a recess (not shown), approximately in its central part.

The upper arm 10*a* of the introducing lever 10 is connected by means of a tie rod 20, one end of which is fastened to the upper arm 10*a* by means of pivot 19, while the other end is connected by means of pivot 21 to the bent lever 22 which is pivotable about pivot 23. At the end of the other arm of bent lever 22, a roller 24 is situated, roller 24 being in contact with the surface of cam 25 mounted rotatably on shaft 26, said cam controlling, by means of the said parts, the swinging motion of the introducing lever 10. Roller 24 is pulled into contact with the surface of cam 25 by means of a spring 27, one end of which is suspended in the opening 28 of the upper arm 10*a* of introducing lever 10, and the other end is affixed to a machine frame (not shown). The upper arm 10*a* of the introducing lever 10 is provided at its end with detents 15, 16, 17, 18. The lower arm 10*b* of the introducing lever 10 is provided with detents 13, 14. The knotter 29, which is stationarily mounted on the machine frame (not shown) is located between the upper arm 10*a* and the lower arm 10*b*.

The yarn knotter 29 (See FIG. 4) is provided in its central part with two recesses, of which recess 30 is destined for or designed to receive end 31′ of yarn 31 from the crosswound bobbin 32 and recess 33 is designed to receive the end 31″ of yarn 31 from the supply cop 1. The two recesses are separated by a separating projection 34 located between them.

The positions of yarn ends 31′ and 31″ are shown in FIG. 4. The force of the yarn end 31′ upon being introduced into the knotter, acts upon lever 51 at such point at which said force is sufficient for overcoming the resistance of spring 56, by means of which lever 51 is held in the position shown in FIG. 4. Thus lever 51 moves in the direction of the arrow II, whereupon yarn end 31″ enters recess 33 and yarn end 31′ enters recess 30.

If, however, yarn end 31′ is not present, it is impossible for yarn end 31″ to move lever 51, as said yarn end 31″ acts upon lever 51 at such point at which its force is insufficient to overcome the resistance of spring 56.

Stop motion 35, mounted above the yarn knotter 29, consists of stationary part 36 and movable part 37 (see FIGS. 2 and 3), the stop motion 35 being connected with a device (not shown) for changing the supply cop; such device is activated by said stop motion 35 in the case of detecting the absence of yarn. Above stop motion 35 there is located a brake 38; beside brake 38 there is located a sucking tube 50 connected to a sucking pipeline (not shown) common for all winding units of the machine. In the said sucking tube 50 there are caught by the action of vacuum or underpressure the yarn ends of cops (not shown) located in the supply position in a magazine (not shown).

Above brake 38 there is mounted a further stop motion 39. Stop motion 39 consists of a stationary part 40 and a movable part 41 (see FIGS. 2 and 3), and is connected to a device (not shown) for stopping the winding unit in the case of the absence of yarn in said stop motion 39, as well as for initiating the automatic process for removing the interruption of the winding process. Above said stop motion 39 there is mounted a yarn clearer 42. A further sucking tube 49, which extends near clearer 42, is connected to the sucking pipeline common to all winding units of the machine.

Above the clearer 42 there is mounted a further guide 43, yarn 31 being guided by means 43 to distributor 44 and therefrom to the crosswound bobbin 32. The distributor 44 is mounted on driven shaft 45, and the crosswound bobbin 32 is rotatably mounted in pivots 46 in frame 47 pivotable about pivot 48.

The device according to the present invention in the first illustrative embodiment, shown in FIGS. 1, 2, and 3, includes a bent lever 6, pivotably mounted upon a pivot 8 between the lower part of detecting tube 4 in front of slot 5. An arm 6′ of lever 6 is disposed below the lower arm 10*b* of introducing lever 10. The detecting arm 6′ of bent lever 6 which comes into contact with yarn 31, is held in its position by means of spring 7 mounted with its other end affixed to the wall of the detecting tube 4. The active arm 6*a* of bent lever 6 is provided at its end with a detent 9 which engages the appurtenant recess in column 12 connecting the two arms 10*a*, 10*b* of the introducing lever 10, or a recess (not shown) on any other suitable point of the introducing lever 10.

In accordance with the present invention, in the embodiment of the knotter 29 shown in FIG. 4, there is provided a covering plate 51, mounted above, or below the yarn knotter 29 at the point of recesses 30, 33 and the separating projection 34. The covering plate 51 is mounted upon a pivot 52 affixed to the body of knotter 29, and is swingable about it. Below pivot 52 beside the end of recess 33 there is located a stop limit 55 against which the plate 51 bears; on the extremity of plate 51 above pivot 52 one end of a coil tension spring 56 is fastened, the other end of said spring being fastened to yarn knotter 29.

In an unillustrated embodiment of knotter 29, there are employed two covering plates 51, of which one is located above and the other below yarn knotter 29. The other parts are the same for both plates.

The interruption of the yarn winding process can occur in two cases:

1. in the case of yarn breakage; and
2. in the case of exhausting the yarn supply on cop 1.

The above-described device performs the method according to the present invention in the following manner.

In the first case, yarn breakage, as shown in FIG. 2 the end 31″ of yarn 31 from cop 1 is located in guide 2, clearer 3, introducing lever 10, in which said yarn end is located in detent 13 of lower arm 10*b* (see FIG. 2*b*) and in detent 16 of upper arm 10*a* (see FIG. 2*a*) of introducing lever 10. Furthermore, said yarn passes through stop motion 35, brake 38, stop motion 39, clearer 42, and is finally sucked into tube 49.

In the case in which the end 31′ of yarn 31 from the crosswound bobbin 32 has been detected by means of detecting sucking tube 4, the end 31′ is located in slot 5 of said tube in front of the bent lever 6 of the stop mo-

tion according to the present invention and also in the detent **14** of the lower arm **10***b* (see FIG. **2***b*) and in the detent **17** of the upper arm **10***a* of introducing lever **10** (see FIG. **2***a*). Upon further motion of the yarn end **31'** in the direction towards the winding unit, such end **31'** swings out the detecting arm **6'** of bent lever **6,** which comes into contact with yarn **31** in the direction of arrow I (FIG. **1**). Thereupon, the bent lever **6** swings out in the direction of arrow I about pivot **8,** whereupon detent **9** on the active arm **6***a* of bent lever **6** is disengaged from a recess (not shown) on column **12,** or, in an alternative embodiment (not shown) from another suitable point of introducing lever **10.** As a result, the introducing lever **10** performs a swinging motion in the direction towards the yarn knotter **29,** into which the two ends **31''**, **31'** of yarn **31** are introduced and in which they are knotted together in a known manner (not shown). By introducing the two ends **31''**, **31'** of yarn **31** into the knotter **29,** end **31'** of yarn **31** is also introduced from the crosswound bobbin **32** into stop motion **35,** brake **38,** stop motion **39,** clearer **42,** and guide **43.** After knotting the two ends **31'**, **31''** of yarn **31,** the parts of the two ends **31'**, **31''** of yarn **31** between the yarn knotter **29** and the tube **49** are sucked off and the winding process is carried on in the usual manner.

In the case in which the end **31'** of yarn **31** has not been detected, for whatever reason, by detecting tube **4,** the arm of bent lever **6** cannot be acted upon by the stop motion according to the present invention, that is, said arm **6'** of bent lever **6** does not swing out in the direction of arrow I, since the said end **31'** of yarn **31** cannot be found at the given point to swing the lever. Then, however, the detecting arm **6'** of bent lever **6,** which contacts yarn **31,** as well as active arm **6***a* with detent **9,** remain on their places, i.e. the detent is always engaged with the said recess (not shown) on the column **12** (or in another suitable point of the introducing lever **10**), and does not permit the introducing lever **10** to swing out in the direction towards the knotter **29.** As a result, end **31''** of yarn **31** from the cop **1** is not introduced into the yarn knotter **29**; if it were, a part of said yarn between the yarn knotter **29** and tube **49** would be cut off and sucked off by tube **49.** The consequence of this procedure would be that stop motion **35** would emit an impulse for removing the interruption of the winding process.

With the device of the present invention, however, the end **31''** of yarn **31** from the supply cop **1** is held outside the yarn knotter **29** in the introducing lever **10,** and it is possible to repeat the detection of end **31'** of yarn **31** from the crosswound bobbin **32.** The end **31''** of yarn **31** from the supply cop **1** thus remains thus even longer in stop motion **35,** which does not emit said impulse. There is thus caused no change of cop **1** which would otherwise occur, because the first knotting attempt for knotting together the two ends **31'**, **31''** of yarn **31** was not successful, even when the supply of yarn **31** on cop **1** is not yet exhausted.

In the other case, the exhaustion of the yarn supply on cop **1,** (FIG. **3**), end **31''** of yarn **31** from cop **1** is situated in the guide **2,** the clearer **3,** and the introducing lever **10,** in which said end **31''** is located in detent **13** of lower arm **10***b* (FIG. **3***b*), and in detent **15** of upper arm **10***a* (FIG. **3***a*). Furthermore, the said yarn end **31''** passes through stop motion **35,** and is fastened beside brake **38** in the sucking tube **50.**

In the case in which the end **31'** of yarn **31** from the crosswound bobbin **32** has been detected by means of detecting tube **4,** said end **31'** is located in slot **5** of said tube **4,** in front of the detecting arm of bent lever **6** of the stop motion according to the present invention, and furthermore in the introducing lever **10,**i.e. in detent **14** of the lower arm **10***b* (FIG. **3***b*) and in detent **17** of upper arm **10***a* (FIG. **3***a*). Upon further movement of end **31'** of yarn **31** from crosswound bobbin **32** in the direction towards the winding unit, said detecting arm **6'** of bent lever **6,** which comes into contact with yarn **31,** is swung out in the direction of arrow I (FIG. **1**). Thereupon, the bent lever **6** is swung out in the direction of arrow **1** about pivot **8,** whereupon detent **9** on the active arm **6***a* of bent lever **6** is disengaged from the recess (not shown) on column **12,** (or at another suitable point on introducing lever **10** as above explained). The cycle of the automatic operation for removing the interruption of the winding process is thus repeated during: (a) the course of the operation in this second mentioned case, i.e. in the case of knotting together the ends **31'**, **31''** of yarn **31** upon exchange of cop **1,** (b) in the first case, i.e. upon breakage of yarn **31,** and (c) even in the case in which the end **31'** of yarn **31** from the crosswound bobbin **32** has not been detected in the course of the first knotting attempt.

In the stop motion according to the present invention shown in FIG. **4,** the introducing lever swings out in the direction towards the yarn knotter when the two ends **31'**, **31''** of yarn **31** are located therein, as well as in the case in which only end **31''** of yarn **31** from the supply cop is located therein. In that case, a stop motion is mounted on said yarn knotter in the embodiment shown in FIG. **4.** In the case in which the introducing lever **10** introduces the two ends **31'**, **31''** of yarn **31,** that from the crosswound bobbin **32** bears against edge **54** of the covering plate **51,** or the corresponding edges of both covering plates if two are used. This causes, by action of end **31'** of yarn **31** from the crosswound bobbin **32,** a swinging motion of said plate or plates **51** in the direction of arrow II. Thus recess **33** is uncovered, and thereupon is engaged by end **31''** of yarn **31** from the supply cop **1,** and recess **30** is engaged by end **31'** of yarn **31** from crosswound bobbin **32.** Thereupon, yarn knotter **29** performs the knotting operation of the two ends in a known manner, and the yarn leaves the yarn knotter **29** after restarting the winding process. Thereupon spring **56** returns the cover plate or plates **51,** into their original position, in which they bear against the stop limit or limits **55,** thus covering the recesses **30, 33,** as well as the separating projection **34,** from above or from above and below, respectively.

In the case in which the end **31'** of yarn **31** from the crosswound bobbin **32** has not been detected by detecting tube **4,** the introducing lever **10** introduces, in the direction towards the knotter **29,** only the end **31''** of yarn **31** from the supply cop **1.** In view of the absence of end **31'** of yarn **31** from the crosswound bobbin **32,** the covering plate or plates **51** on the yarn knotter **29** are not swung out in the direction of arrow II, thus not permitting access to either recess **33,** or recess **30.** The yarn knotter **29** performs the knotting attempt completely empty, i.e. the part of end **31''** of yarn **31** from supply cop **1** between the yarn knotter **29** and sucking tube **50** is not cut off. However, in view of the fact that end **31''** of yarn **31** from supply cop **1** is situated in the stop motion **35** above yarn knotter **29,** no impulse is

emitted by said stop motion **35** for changing cop **1**, and the end **31''** of yarn **31** from the supply cop **1** is prepared for being used in case that a repeated attempt for detecting end **31'** of yarn **31** from the crosswound bobbin **32** is successful.

The advantage of the method and the device according to the present invention consists in that the degree of automation of the winding apparatus is substantially enhanced in a simple manner and by the application of simple means in removing the interruption of the winding process. As a result, the efficiency of the machine is enhanced, and the necessity of manual interference by the operator is reduced to a minimum.

Although the invention is illustrated and described with reference to a plurality of preferred embodiments thereof, it is to be expressly understood that it is in no way limited to the disclosure of such a plurality of embodiments, but is capable of numerous modifications within the scope of the appended claims.

What is claimed is:

1. A yarn winding apparatus, comprising a source of yarn supply, means spaced from the yarn supply for feeding the yarn along a path and for taking up the yarn, a yarn detecting suction tube disposed along said path downstream of the yarn supply, said suction tube locating and picking up a yarn end on the means for taking up the yarn a yarn knotter disposed along said path downstream of the yarn detecting tube, and a yarn stop motion, said stop motion having a yarn detecting means which detects the presence of the end of yarn from the yarn take-up means in the position after its exit from the yarn detecting tube, said stop motion having a means which prevents the introduction of the end of the yarn from the yarn supply means into the knotter in the absence of the end of yarn from the yarn take-up means in said position after the exit of yarn from the yarn detecting tube, and means for introducing the yarn end to the knotter if it is not so prevented.

2. A yarn winding apparatus according to claim **1**, wherein the apparatus is an automatic yarn winding machine, the yarn supply is a cop, and the yarn take-up means is so constructed and arranged as to form a crosswound bobbin.

3. Apparatus according to claim **1**, wherein the means for introducing yarn into the knotter comprises a lever, the stop motion comprises a pivotally mounted lever having a yarn detecting arm which is in contact with the end of yarn from the yarn take-up means, and the stop motion has an active arm provided with a detent which selectively engages the yarn introducing lever.

4. Apparatus according to claim **1**, wherein the knotter has a body having two laterally spaced recesses extending generally normal to the said path of the yarn into which yarn ends may be introduced, said recesses being separated by a projection, and wherein the stop motion is a plate mounted on the body of the knotter for selectively covering the recesses in the body of the knotter.

5. Apparatus according to claim **4**, comprising means pivotally mounting the cover plate on the body of the knotter, and yieldable means constantly urging the cover plate to a recess and projection covering terminal position.

6. An automatic method of removing the interruption of the winding process upon the breakage of yarn during the winding process in yarn winding machines having a source of yarn supply, a yarn take-up means spaced from the yarn supply source for supplying the yarn along a path from the yarn supply source to the yarn take-up means, a yarn detecting tube disposed along said path downstream of the yarn supply, and a yarn knotter disposed along said path downstream of the yarn detecting tube, wherein the yarn take-up means and the source of yarn supply each have a broken end of yarn upon yarn breakage, comprising picking up the broken end of yarn from the yarn take-up means by the detecting tube, moving the end of yarn from the detecting tube, detecting the presence of the end of yarn after exit of the end of yarn from the tube, introducing the broken ends of yarn from the take-up means and the source of yarn supply into the yarn knotter when the presence of the end of yarn from the take-up means is detected, and preventing the broken end of yarn from the source of yarn supply from being introduced into the yarn knotter when the presence of the end of yarn from the take-up means is not detected.

* * * * *