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 [32] Priority **Dec. 8, 1966**
 [33] **Switzerland**
 [31] **17,671**

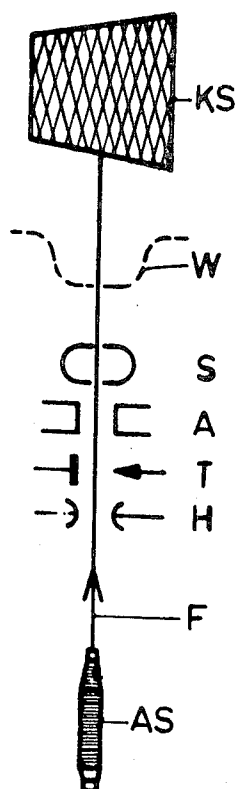
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[54] **PROCESS AND APPARATUS FOR ACTUATING
 THE CHANGE OF THE SUPPLY BOBBIN OF
 AUTOMATIC CROSS-WINDING MACHINES**
 3 Claims, 3 Drawing Figs.

[52] U.S. Cl. 242/36
 [51] Int. Cl. B65h
 63/02, B65h 63/06
 [50] Field of Search 242/35.5,
 35.6, 36, 35.6; 57/78, 81, 86, 87

ABSTRACT: A process for actuating the exchange of the supply bobbin of an automatic cross winding machine which is provided with an electronic yarn clearer, is characterized by the feature that the bobbin exchange is made dependent upon the appearance of a signal supplied by the electronic yarn clearer. The apparatus for carrying out this process is characterized by the fact that the electrical switching means of the yarn clearer contain impulse producing members which, if desired through suitable intermediate members, are connected with the actuating device initiating the bobbin exchange.



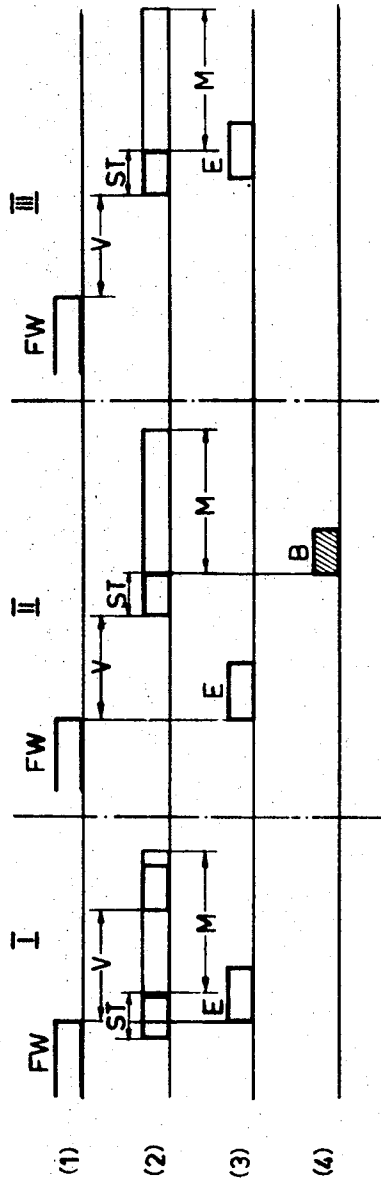


Fig. 2

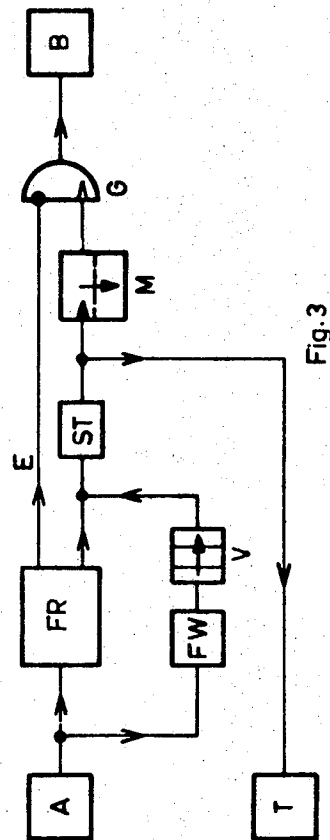


Fig. 3

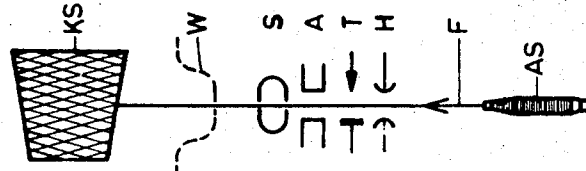


Fig. 1

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PROCESS AND APPARATUS FOR ACTUATING THE CHANGE OF THE SUPPLY BOBBIN OF AUTOMATIC CROSS-WINDING MACHINES

This invention relates to automatic cross-winding machines and is an improvement over and an addition to known automatic cross-winding machines, such as the automatic cross winder Autoconer made by W. Schlafhorst & Co. of Moenchengladbach, Germany, or the machine corresponding to Jenny, U.S. Pat. No. 3,304,015 issued Feb 14, 1967. The invention relates more particularly to an apparatus and process of actuating the exchange of the supply bobbin of an automatic cross-winding machine provided with an electronic yarn clearer.

An exchange of the supply bobbin can become necessary when the winding process is interrupted due to a yarn break or the empty running of the unwinding bobbin. In that case the usual operation of an automatic cross winder is as follows:

Initially the interruption of the moving of the yarn is determined by means of a suitable detecting device, the so-called yarn stop-motion device. This causes the operation of another device to eliminate the interruption, namely, to connect the end of the yarn already wound upon the cross-wound package with the end of the yarn which is to be further wound. For that purpose, it is necessary that the two yarn ends to be joined should be at specific locations wherein they can be grasped.

As far as the yarn end on the side of the cross-wound package is concerned, it can be raised from the slowly rearwardly rotating package by a suction nozzle and guided to a connecting device. However, the end of the yarn emerging from the supply bobbin is difficult to grasp at the spool itself. In most constructions this end of the yarn is therefore held in a defined location so that it can be brought out of that location by means of a gripping device to the connecting device.

The end of the yarn assumes a defined location at the starting end of a new bobbin. Therefore, the problem of grasping the yarn end of the supply bobbin can be solved by replacing the supply bobbin every time the running of the yarn is interrupted. This solution requires, however, the sorting of the ejected bobbins depending upon their filling condition and the reintroduction of bobbins the unwinding of which is to continue. This process will not be considered here.

Another process consists in that in case of yarn breakage the end of the yarn from a partially unwound bobbin is held by a suitable holding device so that it is also present in a defined location. Then a new supply bobbin is to be provided only if there is no yarn end at this location. This occurs when, for example, the supply bobbin is empty or when the yarn breakage occurs between the holding device and the supply bobbin.

To provide the exchange of the supply bobbin in accordance with this process, it is therefore necessary to determine upon interruption of the winding procedure whether the end of the yarn drawn off the supply bobbin can be grasped in the position defined by the holding device. To try to provide a connection without this determination and to start the winding head is not practically feasible due to the danger that the cross-wound package may be damaged and due to the difficulty of locating the yarn end on the cross-wound package when making a renewed attempt.

Usually a mechanical feeling member is used which is located between the holding device and the supply bobbin. This feeling member must be capable of determining the presence of a yarn which is at rest, and therefore must be very sensitive and precisely adjusted. A construction known in prior art consists of two forklike interengaging parts which engage the yarn and the end position of which depends upon the presence of the yarn. It was found in actual practice that such a feeling member can easily become inoperative, particularly due to dirtying, improper adjustment and wear.

Another prior art suggestion was to use a feeling device which does not engage the yarn, for example, in the form of a light beam. However, the determination of a resting yarn is also difficult with a device of this type which requires a considerably expensive apparatus.

An object of the present invention is to eliminate drawbacks of known constructions and to provide means operable with the least possible costs during breakage of a running yarn to provide an indication of the presence of a yarn end of a supply bobbin in the location defined by the clamping device.

Other objects of the present invention will become apparent in the course of the following specification.

The solution of the objectives of the present invention is particularly concerned with winding machines which are provided with an electronic yarn clearer and is essentially characterized by the feature that the exchange of bobbins is made dependent upon a signal supplied by the electronic yarn clearer.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawing, showing by way of example, a preferred embodiment of the inventive idea.

In the drawing:

FIG. 1 is a diagram illustrating the location of the parts relatively to the moving yarn which are important for the understanding of the present invention.

FIG. 2 is a diagram illustrating the time sequence of the signals controlling a bobbin exchange.

FIG. 3 is a block diagram showing the circuit of the actuating device of the present invention.

The separate devices constituting parts of the circuit are well known in the art and are shown merely diagrammatically.

FIG. 1 illustrates purely diagrammatically the path of movement of the spooling yarn F which is drawn off a supply bobbin AS and is wound upon a cross-wound package, e.g. a cone or cheese KS. Besides other parts, the yarn passes through an electronic yarn clearer which includes the cutting device designated as T and a sensing device A which operates without touching the yarn.

When the cutting device T cuts the yarn or when there is yarn breakage between the device T and the cross-wound package, the end of the yarn of the supply bobbin is held in a clamping device H so that it can be engaged by a gripping device.

FIG. 1 also shows a mechanical sensing device W that can be used as a part of the yarn stop-motion device of the machine in order to sense the presence of the yarn during the winding process. Such a mechanical sensing device can have the shape of a lever which is held in a predetermined position by the running yarn and which returns to a rest position when the yarn is broken or absent.

In place of the mechanical sensing device W, the sensing device A of the electronic yarn clearer can be used as a part of the yarn stop-motion device, as it delivers a signal component characterizing the presence of a moving yarn. This case will be dealt with in the example of the embodiment of the present invention.

The primary function of yarn stop-motion devices, when a yarn breakage occurs, are the stopping of the driving device of the winding unit and signaling the automatic knotting device, as disclosed in the U.S. Pat. to Jenny, No. 3,304,015 (issued Feb. 14, 1967).

Finally, FIG. 1 shows a suction nozzle S the purpose of which is to suck in the end of the yarn at the bobbin side in case of yarn breakage at the cross-wound package or between this package and the suction nozzle and thus to hold this yarn end. This operation will be described in greater detail hereinafter.

FIG. 2 is a time sequence diagram illustrating the signals occurring when a yarn breaks, with particular reference to the arrangement shown in FIG. 1.

Basically two different types of yarn breakage in normal operation can be considered, namely, intended yarn breakage produced by operating the cutting device and yarn breakages or yarn interruptions resulting from other causes. The first case is illustrated in section I of the diagram of FIG. 2 and takes place when a defect was found in the yarn. This leads to a release of the cutting device through an actuating device, which produces an impulse ST as shown in line (2) of the dia-

gram. Directly after the separation of the yarn the yarn stop-motion device is actuated, as indicated in line (1) of the diagram, in that there is the disappearance of a signal **FW** continuously produced by the undamaged yarn. According to a first example, not shown in the drawing this produces a signal which can start the exchange of the supply bobbin. In the considered case of intended breakage this action should not take place, however, since in this case the yarn is held in the holding device. Therefore, the separating impulse **ST** produces a condition which prevents the passage of the signal which would start the exchanging of the bobbin and which, for example, occurs immediately when the yarn stop motion is actuated.

The diagram of FIG. 2 shows another example pertaining to a particular embodiment of the present invention, in accordance with which the disappearance of the yarn stop motion signal **FW** releases the actuating device with a predetermined delay **V**. The rear flank of the first impulse **ST** released by the breakage of the yarn produces a locking condition **M** which prevents the second actuating impulse produced with the delay **V** after the disappearance of **FW** to start the exchange of the bobbin.

The second case, namely, the unpremeditated interruption of the yarn movement without cutting the yarn takes place, for example, when the supply bobbin becomes empty or when the yarn breaks. In that case there is no actuation of the cutting device before the appearance of the actuating signal **ST** released by the yarn stop motion and, therefore, there is no locking condition for this signal, as is indicated in section II of the diagram of FIG. 2, so that the signal causes an exchange of the supply bobbin.

In that case this exchange is usually necessary, since if the supply bobbin is exhausted or in the case of yarn breakage between the holding device and the unwinding spool, there is no yarn any more in the location of the holding device.

Due to the fact that during the unwinding of a single supply bobbin on the average 1.5 intentional yarn breakages and 1 unintentional breakage take place, it is apparent that the above described simple procedure already results in an effective operation.

However, among unintended yarn breakages there are also those which take place between the holding device and the cross-wound package. These can be also eliminated without exchanging the supply bobbin by a suitable actuation of the holding device. This is desirable, particularly when unintended yarn breakages take place quite often.

This can be accomplished in accordance with the present invention by using a signal for operating the exchange of the bobbin which is produced in the sensing device of the yarn cleaner during the passage of a yarn end. This specific signal characterized by its polarity and its amplitude can be used, for example, in accordance with the complete diagram of FIG. 2 and in the circuit according to FIG. 3, as a criterion for the necessity of a bobbin exchange.

Section II of FIG. 2 pertains specifically to the case of yarn breakage between the holding device and the supply bobbin and the case of exhausted bobbin. At the time of the interruption of the signal **FW** which characterizes an undamaged yarn (line (1)), the sensing device will detect the passage of the end of the yarn which is being wound upon the still running cross-wound package. This produces an impulse or condition **E** (line (3) of the diagram) which in the present example should be of such duration that it is shorter than the shortest duration **V** of the delay for the creation of the actuating impulse **ST** by the yarn stop motion. This actuating impulse or the rear flank thereof, occurs in this case at a moment in which the condition **E** has already terminated and therefore produces a release of the actuating device for the exchange of the supply bobbin (impulse **B** (line 4)).

On the other hand, section III shows conditions resulting from the appearance of a yarn end in case the yarn breaks between the sensing device and the cross-wound package. Then the yarn stop motion is actuated; however, the yarn end

extending from the supply bobbin remains lying in the sensing device due to the action of the suction nozzle **S** (FIG. 1). After the delay period **V**, there appears the impulse **ST** released by the yarn stop motion, which actuates the cutting device and produces a separation of the yarn at that location. Directly thereafter, the yarn piece which was lying in the sensing device is removed from the sensing device by the suction effect of the nozzle **S**, so that the impulse **E** is produced, as shown in section III, line (3). If the duration of the impulses **E** and **ST** is properly set, the rear flank of the actuating impulse **ST** occurs while **E** is present and this is used to prevent the starting of the exchange of the supply bobbin.

Similarly, in the case of an intentionally produced yarn breakage, the yarn impulse **E** follows the actuation of the cutting device, in this case by the first impulse **ST** (line (2), section I of FIG. 2), so that the rear flank of this impulse **ST** does not produce an exchange of the bobbin.

As already stated, the second impulse **ST** released by the yarn stop motion, is ineffective due to the locking action of the first actuation impulse of the cutting device.

Thus only in case II, namely, when the supply bobbin is empty or when yarn is broken between the holding device and the supply bobbin, an actuating signal **B** is produced to start the exchange of the bobbin.

FIG. 3 is a block diagram of a circuit of an actuating device of the present invention for producing an exchange of the supply bobbin. The illustrated example pertains to the electronic monitoring of yarn, whereby a single sensing device **A** carries out three different functions, namely, monitoring of the running yarn, yarn clearing and actuating the exchange of the supply bobbin. The device **A** produces an electrical signal which varies in time and which follows the differences in the thickness of the yarn along the yarn length. This signal is transmitted, on the one hand, to a yarn stop motion channel **FW** which determines the presence of a moving and therefore undamaged yarn by signal variations produced by the raw surface of the yarn. If these signal variations disappear, the actuating device **ST** is released through the delay device **V** to operate the cutting device **T**. The delay device **V** can operate purely electrically, however, it can be also provided with mechanical intermediate members.

According to a preferred embodiment of the present invention, the electronic yarn-monitoring device by means of an electromagnet, actuates the same mechanical members of the stopping device of the machine which can be used with a purely mechanical yarn stop-motion device. In that case one of these mechanical members operates a switch releasing the actuating device **ST**. This arrangement provides, on the one hand, a sufficient delay resulting from durations of actuation, inertness of mechanical members, switch movements, etc. On the other hand, it has the substantial advantage that the cutting device is not actuated when the winding operation is switched off by hand when the cross-wind package has reached a predetermined diameter or when a different supervising organ, and not the yarn stop motion device, has produced the switching off of the winding operation.

The operation of the cutting device further takes place through the evaluating circuit of the yarn cleaner **FR** which is also connected to the sensing device **A** and which produces an actuating signal when there is a defect in the yarn. The outlet of the actuating device **ST** is connected, on the one hand, to the cutting device **T** and, on the other hand, extends over intermediate members to an actuating device **B** which starts the exchange of the supply bobbin. By way of example, the first intermediate member may be a monostable multivibrator **M**. This multivibrator is actuated by the rear flank of the actuating impulse **ST** and operates so that during a time period **M** any possible further actuating impulse will not be effective. As shown in FIG. 2, line (2), the time constant **M** must be so selected that the condition **M** continues longer than the maximum delay time period **V** plus the duration of the impulse **ST**. The actuation of the multivibrator **M** transmits at the same time an impulse to the following intermediate member, name-

ly, the anticoincidence (exclusive OR-gate) device **G**. This impulse which is joined with the rear flank of the impulse **ST** is thus transmitted by the device **G** to the device **B**, provided that at the same time there does not appear an impulse **E** at the second inlet of the device **G**. As already stated, this impulse **E** is produced during the passage of a yarn end through the sensing device **A**, for example, in a channel of the evaluating device of the yarn clearer **FR**.

Thus the two intermediate members **M** and **G** produce the effect illustrated in the diagram of FIG. 2, namely, the actuating device **B** is released only if the rear flank of the first actuating impulse **ST** resulting from a yarn break, appears outside of the time interval **E** determined by the impulse of the yarn end.

By way of example, the actuating device **B** is an electromagnet which operates the mechanical members producing the exchange of the supply bobbin. This type of operation takes over completely the function of a yarn-feeling member located between the holding device and the unwinding bobbin, by the use of signals produced by the movement of the yarn but without contacting it. This results in a great simplification of the apparatus, particularly since the sensing device of an electronic yarn cleaner is used for producing these signals. A further important advantage lies in an increase in the safety of operations resulting from the elimination of mechanical feeling members for the unmoving yarn which are always subject to disturbances.

It is apparent that the example described above has been given solely by way of illustration and not by way of limitation and that it is capable of many variations and modifications within the scope of the present invention. All such variations and modifications are to be included within the scope of the present invention.

I claim:

1. A process for actuating the change of the supply bobbin of an automatic cross-winding machine having an electronic

yarn clearer with a sensing area, and a cutting device, said process comprising monitoring the yarn being wound, producing a pulse when there is a defect in the yarn, said pulse actuating the cutting device, producing a pulse when the winding of the yarn is interrupted, and combining said two pulses for providing the exchange of the bobbin.

2. An automatic cross-winding machine comprising an exchanging device for the supply bobbin and a yarn clearer, said yarn clearer having a yarn-cutting device, a sensing device for monitoring the yarn, a first signal-processing channel wherein a pulse is produced due to a defect in the yarn for actuating said cutting device, and a yarn stop-motion signal-processing channel delivering a pulse then the winding process is interrupted, said pulses from the said two signal-processing channels actuating an anticoincidence member operatively connected with said bobbin-exchanging device.

3. An automatic cross-winding machine comprising an exchanging device for the supply bobbin, a yarn stop-motion device delivering a signal when the winding process is interrupted, and a yarn clearer, wherein said yarn clearer has a sensing device for monitoring the yarn, a first signal-processing channel wherein a pulse is produced due to a defect in the yarn, a second signal-processing channel wherein a pulse is produced due to the passage of a yarn end through said sensing device, and a yarn-cutting device actuated by a pulse from said first signal-processing channel, said winding machine further comprising a delaying device for the signal from said yarn stop-motion device, means constituting a part of said first signal-processing channel for actuating said yarn-cutting device, said delaying device being connected to said means, and an anticoincidence member actuated by said pulses from the first and second signal-processing channels and operatively connected with said bobbin-exchanging device.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,539,122

Dated November 10, 1970

Inventor(s) HANS SPANI

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 35, change "unwinding spool" to --supply bot

Column 3, line 51, change "cleaner" to --clearer--.

Column 4, line 54, change "cross-wind" to --cross-winding--

Column 5, line 22, change "cleaner" to --clearer--.

Signed and sealed this 10th day of August 1971.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents