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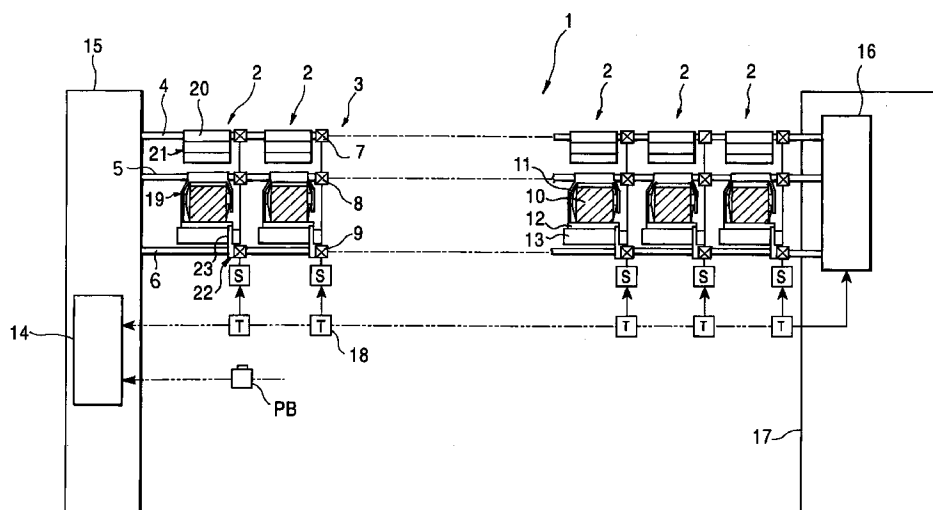
(54) **Doffing system for a texturing machine**

(57) To provide a doffing system for a texturing machine that controls yarn-breakage packages.

This invention has a detection means for detecting the size of a package 10 and identifies the packages 10 as either a large or a small package during doffing

based on the detected size. Based on this identification, packages of inappropriate sizes for the subsequent process can be removed.

FIG. 1



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Description

Field of the Invention

The present invention relates to a doffing system for a texturing machine that handles packages depending on the quantity (the length) of yarn, and in particular, to a doffing system for a texturing machine that can handle packages made because a yarn has been cut.

Background of the Invention

In a textile machine including a larger number of winding units, a travelling doffer that performs a sequential doffing operation using a carriage travelling along a chassis has been used as a doffing apparatus for removing packages and for supplying empty paper tubes. More recently, however, individual auto doffers have been used that can be installed more easily than travelling doffers, are more flexible, and can perform doffing for each winding unit. The individual auto doffer comprises a doffing mechanism provided for each winding unit, a drive shaft common to the winding units that supply a driving force to the doffing mechanism, a clutch for each winding unit that connects the doffing mechanism to the drive shafts, and a stocker in which packages are stored.

The operational procedure of each section of the doffing mechanism is correlated with the rotational angle of a cam that is rotated by the drive shafts so that the winding unit connected to the drive shafts via the clutch can continue the doffing operation. In addition, doffed packages are taken out to the stocker provided behind the chassis.

The amount of length of yarn wound round a package is controlled by a sizing device. Known methods used by the sizing device are a doffing timer for controlling the winding time and the accumulation of the number of rotations of paper tubes. For example, in the case of the doffing timer, since the yarn is wound at a constant speed, its length is controlled according to the amount of time for which the yarn has been wound. Thus, when a specified amount of yarn has been wound, the package is determined to be full and doffed.

In general, when yarn is cut in a texturing machine, the package is immediately doffed and an empty paper tube is supplied to initiate new winding. Consequently, doffed packages include full package and those that have been doffed because a yarn has been cut (packages with yarn breakage).

Since small package with a small amount of wound yarn are inappropriate as commodities, packages can be managed more easily by removing such packages before passing them to a subsequent inspection or boxing process. If, however, workers are responsible for sorting small packages, determination and sorting are cumbersome and judgement is likely to be subjective, resulting in conflicting evaluations.

It is thus an object of this invention to provide a doffing system for a texturing machine that can solve the above problems, and handle packages with yarn breakage.

Summary of the invention

To achieve this object, this invention has a detection means for detecting the size of a package, and sorts packages into large and small packages during doffing based on the detected size.

After sorting, one group of packages may be taken out while the other group of packages may be held and suspended from winding rollers.

A reference value with which packages are sorted into large and small packages may be set and changed.

Brief Description of the Drawings

Figure 1 is a front view of a texturing machine showing one embodiment of this invention.

Figure 2 is a timing diagram for a doffing mechanism based on the rotational angle of a cam.

Figure 3 is a flow chart showing the procedure of processing in a continuous operation mode.

Figure 4 shows the configuration of the overall texturing machine.

Detailed Description of the preferred Embodiments

One embodiment of this invention is described below in detail with reference to the drawings.

A draw and false twist texturing machine in Figure 4 including a doffing system according to this invention has a chassis 41 on which a large number of winding units are placed on multiple vertical stages and in a single horizontal array and a yarn supplying creel 42 provided behind the chassis 41 to constitute a yarn supplying system. A yarn cutter 43 that cuts yarn at an input port for fed yarn Y and a first feed roller 44 are disposed on the chassis 41.

A primary heater 45 that heats yarn, an exhaust gas duct 46, and a cooling plate 47 that cools the yarn are installed above the first feed roller 44 as a processing system, and a pre-twister guide 48, a nip twister 49 that twists the yarn, a tension adjuster 50 that adjusts the tension of the yarn, a second feed roller 51, a secondary heater 52, a third feed roller 53, a yarn feeler 54 that detects the presence of the yarn are disposed in front of the chassis 41.

Furthermore, an oiling roller 55, a winder 56 constituting a winding system, and an individual doffing device 57 are installed on the chassis 41.

As passages for workers, a maintenance passage 58 is provided in front of the chassis 41 and a full package collection passage 59 is provided behind the chassis 41. A stocker 60 faces the full package collection passage 59.

As shown in Figure 1, the doffing system using the individual doffing device 57 comprises a doffing mechanism 3 installed for each of a large number of winding units 2 constituting a texturing machine, drive shafts 4, 5, 6 common to each winding unit and disposed along the plurality of winding units 2 in order to supply a driving force to the doffing mechanism 3, electromagnetic clutches 7, 8, 9 that connect the doffing mechanism 3 for the winding unit 2 to the drive shafts 4, 5, 6, a detection means for detecting the size of a package 10, and a sorting means for identifying the package 10 as either a large or a small package. The sorting means can set as a reference, at a value ranging from of the size of a full package to the size of an empty paper tube, against which the package 10 is identified as either a large or a small package.

The winding unit 2 comprises a winding roller 12 that rotates a paper tube or the package 10 using frictional contact, a cradle 11 that holds the paper tube or package 10, and a traverse device 13 that traverses yarn to be wound.

In addition, the winding unit 2 includes a doffing timer (a sizing device) 18 for measuring the length of wound yarn in order to control the length of yarn wound around the package 10. That is, the timer measures in terms of time the length of the wound yarn that is fed at a constant speed in order to detect a full package, causing the electromagnetic clutch to be activated for doffing.

The doffing mechanism 3 opens, closes, and elevates, supplies an empty paper tube to, and threads yarn around a paper tube gripped by the cradle 11. These operations are performed based on the rotational angle of the cam. In addition, the winding unit 2 includes a push button PB that allows the cam, which has been stopped, to resume rotating.

The sorting means according to this invention sorts packages into large and small packages for doffing when a yarn has been cut. Large packages are taken out to the stocker as in full packages, while small packages are held and suspended from the winding roller 12.

The detection means for detecting the size of a package (the amount of wound yarn) may be a positional or distance sensor that detects the amount of increase in the height of the cradle 11 caused by an increase in the size of the package, or an outer-diameter sensor that measures the outer diameter of the package. In this case, the doffing timer 18 is used as the detection means. To use the doffing timer 18 that measures the amount (the length) of yarn, as the size detection means for sorting packages into large and small packages, a reference value B is provided.

The reference value B is normally set as follows.

$$A > B > 0$$

The following settings, however, are possible.

$$B = 0$$

or

$$B \cong A$$

The operation of the doffing system performed when the full package value A and reference value B ($A > B > 0$) are set is described with reference to a summary of the procedure of the processing in the continuous operation mode in Figure 3 and the overall layout of the texturing machine in Figure 4. The continuous operation mode is a normal doffing operation mode in which doffing is carried out each time the doffing timer 18 detects a full package, followed by the refilling of an empty paper tube and the subsequent winding of a new package 10.

1. Full package

When the count value X of the doffing timer 18 becomes the full package value A, a normal doffing operation is performed to take out the package 10 to the stocker 60. During a normal doffing for a full package, the cradle 11 is first elevated and then opened at that position to discharge the package, and an empty paper tube is then gripped by the cradle 11. The cradle 11 is then lowered to frictionally contact the paper tube with the winding roller 12, and the threading arm 23 is turned to elevate the yarn to the end of the paper tube.

Subsequently, the winding roller 12 is rotated and the traverse device 13 is traversed to resume winding.

2. End breakage package

During the continuous operation mode, if the yarn is cut before the doffing timer 18 has detected a full package, the yarn feeler 54 detects the yarn breakage and the yarn cutter 43 disposed at the input port for the supplied yarn Y cuts the yarn to prevent the end of the yarn from being entwined with the feed roller 44, while lighting an yarn-breakage indication lamp (not shown in the drawings).

When the yarn feeler 54 detects a yarn breakage, the count value X of the doffing timer 18 is compared to the reference value B to identify the yarn-breakage package 10 as either a large package that has exceeded the reference value B or a small package that has not reached said value B.

If the package is a large package, the cradle 11 is elevated and opened while the cam of the doffing mechanism 3 is stopped, so the package 10 is rolled into the stocker 60. Determining from the yarn-breakage indication lamp that the yarn has been cut, the operator removes waste yarn entwined in a yarn path including a processing system and passes the yarn through the path, allows an air sucker constituting the doffing apparatus to catch and hold the waste yarn, and then

presses the push button PB. When the push button PB is activated, the cradle 11, which has been stopped at the position at which it discharged the package 10, is reactivated, and the refilling of an empty paper tube in the cradle 11 and the threading of yarn around the paper tube are automatically executed to resume winding. The doffing timer 18 is reset in response to the resumption of winding.

When the yarn is cut before the count value X has reached the reference value B, a small package doffing operation is performed by elevating the cradle 11 and stopping the cam while the cradle 11 is closed. This small package is held within the cradle 11 while it is suspended from the winding roller 12. This state indicates that the operator should remove the package.

On viewing the yarn-breakage indication lamp, the operator approaches the apparatus to deal with the yarn breakage, reaches for the package from the maintenance passage 58 side, and presses the push button PB while the operator holds the package in his or her hands from below. When the push button PB is pressed, the cam is rotated slightly to open the cradle 11. The operator then removes the package while holding it in his or her hands. After a yarn passing operation and when the operator presses the push button PB again as described above, the doffing system threads the yarn into the paper tube.

In this manner, full packages for which the count value has reached the full package value A and, large and yarn breakage packages that have exceeded the reference value B during winding are taken out to the stocker. Yarn-breakage packages that have not reached the reference value B are stored as small packages. An indicator such as a small package indicating lamp operated by the sorting means may be provided on the full package collection passage 59 side, but the need for the operator to go to the full package collection passage 59 is eliminated by using the determination based on the operational state of the cradle 11.

If the reference value B is set at 0, the count value always exceeds the reference value B so all yarn-breakage packages are taken out to the stocker. In addition, if the reference value B $\geq$ the full package value A, the counter value never exceeds the reference value B so only full packages are taken out to the stocker with all yarn-breakage packages held.

Since the reference value B is variable in this manner, the operator can only arbitrarily vary the size of packages to be removed but also use a special setting such as the reference value B = 0 or A to handle all yarn-breakage packages uniformly.

Next, the relationship between the rotational angle of the cam and the operation of each component is described.

As shown in Figure 2, when the angle of the cam changes from $\theta 0 = 0^\circ$ to $\theta 1$, the cradle starts rising, while at angle $\theta 2$, it is already sufficiently elevated. At this point, the cradle is not open, and the cam is stopped

if the package is a small package. When the push button PB is pressed, the cam is rotated slightly to open the cradle before the angle of the cam becomes $\theta 3$, when the cam is stopped again. The cam is stopped at this point for the first time if the package is a large package with yarn breakage. When the push button PB is pressed, the supplying of a paper tube is begun and the cradle is closed before the angle becomes $\theta 4$. The lowering of the cradle is finished before the angle becomes $\theta 5$. The entire operation is finished at angle $\theta 6 = 360^\circ$. For a full package, the operation continues from $\theta 0$ to $\theta 6$ without interruption.

In this manner, in the individual auto doffer, the operation of each section of the doffing mechanism is correlated with the rotational angle of the cam. Thus, by setting an angle at which the cam is stopped for each group of large and small packages, the respective groups can be handled differently.

This invention has the following effects.

- (1) Since packages are sorted according to their size, packages of inappropriate sizes can be removed or packages can be ranked. This sorting is objective and uniform quality can be achieved.
- (2) Stored small packages can be removed easily. In particular, in a chassis that takes out doffed packages to a stocker behind a winding unit, yarn is threaded in front of the winding unit, thereby enabling the small package removal and threading operations to be executed continuously, resulting in improved working efficiency.
- (3) Since the reference with which packages are sorted into large and small packages can be set at a value ranging from the size of a full package to the size of an empty paper tube, the reference can only be arbitrarily changed but all end breakage packages can also be handled uniformly.

Claims

1. A doffing system for a texturing machine characterized in that the system has a detection means for detecting the size of a package, and sorts packages during doffing based on the detected size.
2. A doffing system for a texturing machine according to claim 1 characterized in that packages are handled differently depending on the results of sorting.
3. A doffing system for a texturing machine according to claim 1 or 2 characterized in that packages are sorted into two types, large and small packages.
4. A doffing system for a texturing machine according to claim 3 characterized in that after sorting, one group of packages are taken out while the other group of packages are held and suspended from winding rollers.

5. A doffing system for a texturing machine according to claim 3 characterized in that a reference value with which packages are sorted into large and small packages can be set and changed.

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6. A doffing system for a texturing machine according to any one of claims 1 to 5 characterized in that a yarn is continuously wound until a package becomes full and at this point of time, a doffing operation is initiated, in that the doffing operation is also performed when the yarn is cut before the package becomes full, and in that packages are sorted depending on their size when at least, the doffing operation is performed because a yarn has been cut.

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FIG. 1

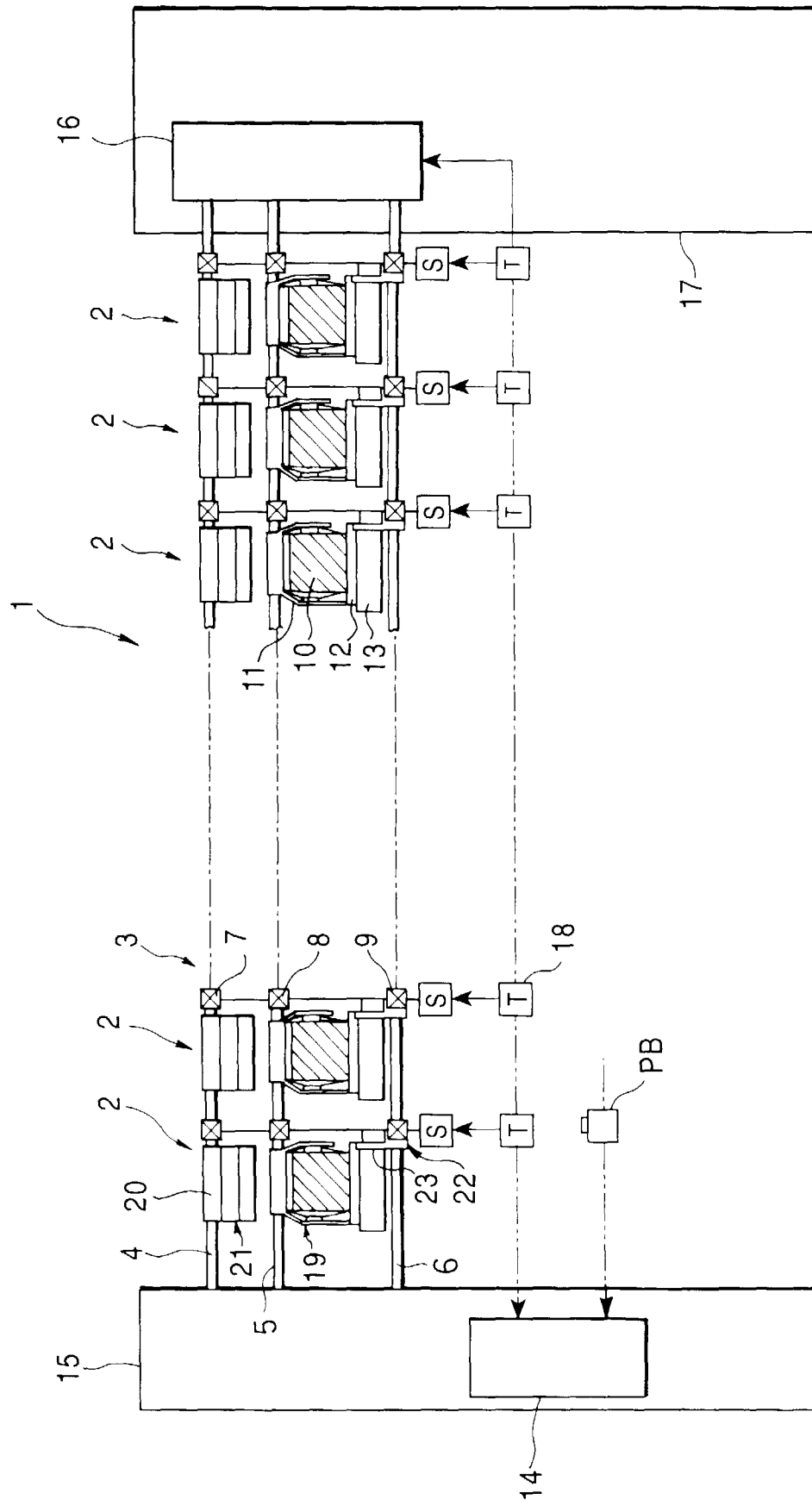


FIG. 2

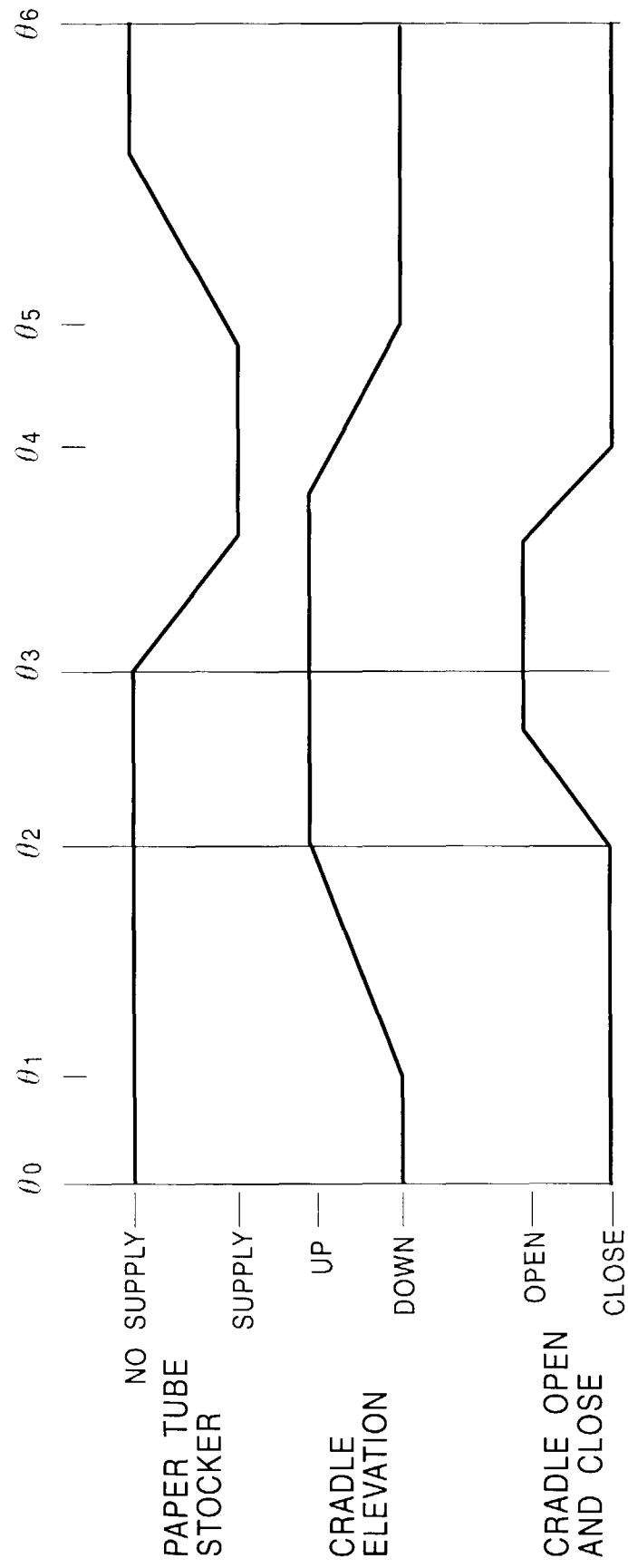


FIG. 3

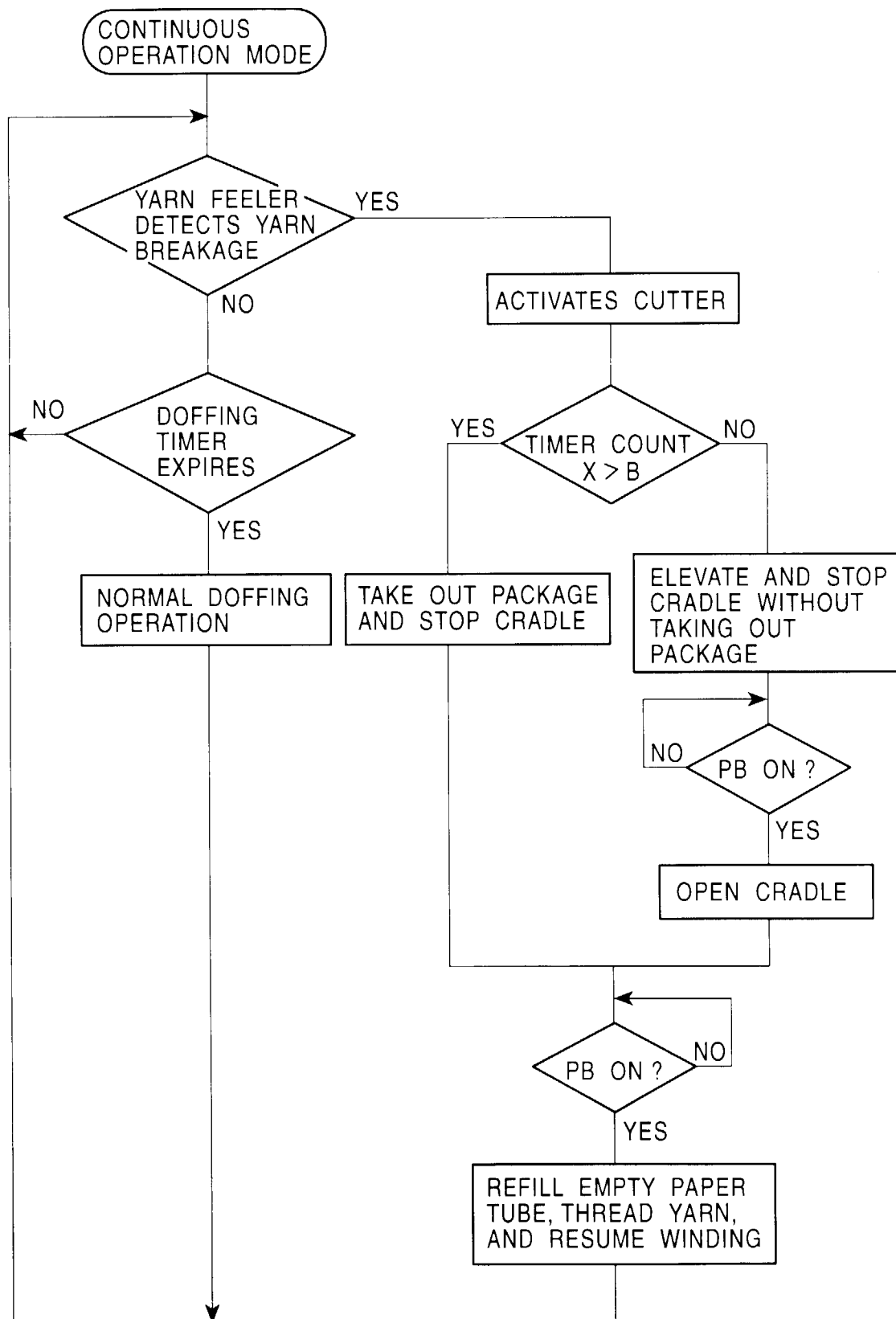


FIG. 4

