(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 544 339 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
24.03.2010 Bulletin 2010/12

(51) Int Cl.:
D03D 51/34 *(2006.01)* ***D03D 47/34*** *(2006.01)*

(21) Application number: **04078403.5**

(22) Date of filing: **15.12.2004**

(54) **Detection system for detecting and avolding knots and/or irregularities in weft yarns in a fabric**

Detektiersystem zum Detektieren und Vermeiden von Knoten und/oder Unregelmässigkeiten in Schussgarnen in ein Tuch

Système de détection pour détecter et éviter des noeuds et/ou irrégularités dans des fils de trame d'un tissu

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR

(30) Priority: **15.12.2003 BE 200300658**

(43) Date of publication of application:
22.06.2005 Bulletin 2005/25

(73) Proprietor: **IRO AB**
523 22 Ulricehamn (SE)

(72) Inventor: **Benoit, Dirk**
8790 Waregem (BE)

(74) Representative: **Grünecker, Kinkeldey,**
Stockmair & Schwanhäusser
Anwaltssozietät
Leopoldstrasse 4
80802 München (DE)

(56) References cited:
BE-A- 1 007 850
US-A- 4 559 976
US-A- 5 332 007

EP 1 544 339 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The invention relates to a weaving machine comprising a detection system for detecting and avoiding knots and/or irregularities in weft yarns when weaving a fabric on a weaving machine, where the knot and/or the irregularity may be manually removed by stopping the weaving machine or may be automatically removed by having a colour selector stop.

[0002] The problem when weaving fabrics where use is made of textile yarns, is that knots and/or irregularities of the textile yarns may cause them to become visible in the fabric. These fabrics then will be of a lesser quality, because of which they will be considered to be second choice fabrics. In order to produce a quality fabric, weft lengths which are free of knots have to be used.

[0003] The problem of knots and/or irregularities is already referred to in BE 1 007 850. In there, a weaving machine is described having a weft yarn supply, of the type where each weft yarn, between successive insertions, stays connected to the weft yarn and where the weft yarn, at the beginning of its insertion, is detached from the weft yarn by means of a weft scissors. The supply consists of at least two supply channels for the weft yarn, comprising a supply of yarn, means of control in order to provide a weft yarn from a specific supply channel and a control unit. The control unit is operating in conjunction with detection means which determine whether there is a knot or an irregularity between the supply of yarn of a supply channel and the weft edge. The control unit is operating in conjunction with control means which, after the detection means have discovered a knot or an irregularity of the weft yarn, will cut off the supply channel concerned and will continue to supply weft yarns by providing a weft yarn from one or several of the other supply channels. Furthermore, the control unit is operating in conjunction with switching means, which will determine when the knot or the irregularity of the weft yarn, situated in the disconnected supply channel, is in a position with respect to the weft scissors, such that in case the weft yarn mentioned before is detached from the weft edge by the weft scissors, the knot or irregularity will remain connected to the weft edge reconnect the disconnected supply channel, after the switching means have determined that the knot or the irregularity is situated in the position mentioned before.

[0004] The problem with such a system is that the weft yam is taken along with the lost selvedge. When a knot and/or an irregularity is for instance situated 10 m away from the fabric, and the weaving machine is weaving 16 wefts per cm, then 16 000 wefts have to be carried out to bridge these 10 m. When the weaving machine is operating at a speed of 600 wefts per minute, then it may take about 30 minutes before the disconnected supply channel will be reconnected again. The result will be a loss of yam and consequently a loss of efficiency.

[0005] The purpose of the invention is to provide a weaving machine, comprising a detection system for detecting and avoiding knots and/or irregularities of weft yarns when weaving a fabric on a weaving machine which may occur in the weft yarns themselves or which my occur when binding up a new bobbin or in case of a break of the weft yam of the bobbin, with a loss of weft yam as reduced as possible.

[0006] The purpose of the invention is solved by providing a weaving machine, comprising a detection system for detecting and avoiding knots and/or irregularities in weft yarns when weaving a fabric on the said weaving machine, wherein the knot and/or the irregularity may be manually removed by stopping the weaving machine or may be automatically removed by having a colour selector stop, wherein the detection system is provided with one or several knot detectors to detect the knots and/or the irregularities of the weft yarns, and is provided to determine the length of the weft yam between the knot and/or the irregularity and the fabric when detecting a knot and/or an irregularity of the weft yarn, and wherein the detection system is provided to activate the weaving machine to continue its weaving operation until the moment that the length of the weft yam between the knot and/or the irregularity and the fabric equals the width of the fabric, and at that moment, to send a signal to the weaving machine in order to stop the weaving machine or the colour selector in order to remove the knot and/or the irregularity manually, respectively automatically.

[0007] In such a manner, the weft yarn is still incorporated into the fabric as far as possible, before the knot and/or the irregularity is removed from the fabric, thus reducing the loss of yam and increasing the efficiency.

[0008] In a preferred embodiment of a weaving system according to the invention, a prewinder is installed, which is provided with a winding disk for pre-unwinding the weft yarns, and the detection system is designed to carry out a learning phase, in which the maximum number of windings (N) which are wound on the winding disk, are counted.

[0009] Preferably, the detection system of the weaving machine is thereby provided with a sensor to count the maximum number of windings (N) on the winding disk during the learning phase.

[0010] Preferably, the said sensor, is an existing sensor on the winding disk which normally serves to check whether the motor of the prewinder is running or not.

[0011] This has the advantage that no additional sensor has to be provided in the winding disk, but that the, already existing sensors in the winding disk, are used.

[0012] In a preferred embodiment of a detection system according to the invention, the weaving machine is provided with a colour selector and the detection system is designed to generate a bobbin break signal, that will release the weaving machine when the signal is activated and, that will stop the weaving machine and/or the colour selector when the signal is interrupted.

[0013] Preferably, the learning phase occurs between the starting signal and the activation of the bobbin break signal.

[0014] In a preferred detection system according to the invention, the detection system is designed to briefly interrupt the bobbin break signal in case a knot and/or an irregularity is detected, because of which the prewinder will come to a standstill.
With the detection of a knot and/or an irregularity, preferably the number of windings (Y) being taken off the winding disk (= take-off) is measured between the interruption of the bobbin break signal and the becoming into standstill of the prewinder.

[0015] In a preferred detection system according to the invention, the detection system is provided to measure the maximum number of windings (N) and the take-off (Y) by counting the number of UGN-pulses.

[0016] In an advantageous detection system according to the invention, the detection system is provided for the input of the weft length (G) of the fabric, and is provided to determine the number of windings (K) still remaining on the winding disk of the prewinder between the knot and/or the irregularity and the fabric, this number of windings (K) being converted into a number of UGN-pulses for whole weft lengths (V), that, may be still carried out after the knot and/or the irregularity has been detected before the knot and/or the irregularity is removed, on the basis of the circumference (O) of the winding disk of the prewinder and the weft length (G) entered into the detection system with the following formulas

- $$N - Y = K;$$
- $$G / O = T,$$

  T being the number of whole pulses in a weft length (G);
- $$K / T = P,$$

  P being the number of whole lengths;
- $$T * P = V.$$

[0017] In a preferred embodiment of a detection system according to the invention, the detection system is provided with a display which is provided to display the length of the weft yam (L_t) between the knot and/or the irregularity and the fabric, this length (L_t) being calculated by:

- calculating the length (L_w) of the number of windings (K) from the number of windings (K) obtained and the circumference (O) of the winding disk of the prewinder by means of the following formula:

$$L_w = \Pi * K * O;$$

- by adding the distance (L_v) between the fabric and the prewinder to this length (L_w) obtained, resulting in the total length between the knot and/or the irregularity and the fabric (L_t).

[0018] In a preferred embodiment of a detection system according to the invention, the detection system is provided with an electric circuit which is responsible for the processing of all input and output signals of the detection system.

[0019] In a preferred embodiment of a detection system according to the invention, the knot detector is provided at the entrance of the prewinder.

[0020] In a preferred detection system according to the invention, the weaving machine is designed to automatically remove the knot and/or the irregularity by means of an automatic selection transition.

[0021] Preferably, such a detection system may be applied with:

- the detection and removal of a knot when binding up a new bobbin;
- the detection and removal of a knot and/or an irregularity when there is a knot and/or an irregularity in the bobbin itself;
- the detection and removal of a knot in case of the breaking and binding up again of a bobbin.

[0022] The weaving machine is especially useful with chenille and other coarse yarns.

[0023] In order to further clarify the properties of this invention and to mention its additional advantages and particulars, a more detailed description of a detection system for detecting and avoiding knots and/or irregularities in weft yarns on a weaving machine will now follow. It may be obvious that nothing in the following description may be interpreted as being a restriction of the protection for the device according to the invention demanded for in the claims.

[0024] In this description, by means of reference numbers, reference is made to the attached drawings in which:

- ***figure 1*** is a schematic block diagram of a detection system for detecting knots and/or irregularities of weft yarns in a fabric, that is installed with a weaving machine;
- ***figure 2*** is a flowchart of the software of a knot detector.

[0025] The detection system (1) according to the invention, as represented in figure 1, is designed for detecting and avoiding knots and/or irregularities of weft yarns (10) when weaving a fabric on a weaving machine

(20). The weaving machine (20) is provided with one or several bobbins (2) to supply the weft yarns (10). The bobbins (2) are provided in a bobbin frame. Furthermore one or several prewinders (3) are provided between the bobbins (2) and the weaving machine (20) to pre-unwind the weft yarns (10) originating from one or several bobbins (2). The weft yarn (10), originating from a bobbin (2) is passing through a yam holder (11) to the prewinder (3).

[0026] The detection system (1) is provided with one or several knot detectors (4) to detect knots and/or irregularities of the weft yarns (10). In figure 1, two bobbins (2), one prewinder (3) and one knot detector (4) are represented. The knot detector (4) being installed between the bobbins (2) and the prewinder (3). However, the knot detector (4) may likewise be installed between the prewinder and the weaving machine (20), or it may be integrated in the prewinder (3). The prewinder (3) is provided with a winding disk (5) for pre-unwinding the weft yarn (10).

[0027] The detection system (1) is provided to determine the length of the weft yam (10) between the knot and/or the irregularity and the fabric in case a knot and/or an irregularity of the weft yam (10) is detected and at the same time to activate the weaving machine (20) to continue its weaving operation until the moment that the length of the weft yarn (10) becomes shorter than the width of the fabric and, at that moment, to send a signal to the weaving machine (20) to stop the weaving machine in order to remove the knot and/or the irregularity manually or to carry out a colour selector stop in order to remove the knot and/or the irregularity automatically.

[0028] The detection system (1) is provided to carry out a learning phase, during which the maximum number of windings (N) that are wound on the winding disk (5) of the prewinder (3) are counted. As shown in figure 1, a push button is therefore provided, whereby the learning phase is started by pushing it. However, the learning phase may be carried out when switching on the detection system (1). In order to carry out the learning phase, the detection system (1) is provided with a sensor, which, preferably, is a sensor already installed on the winding disk (5) that normally is used to check whether the motor or the prewinder is running or not. The learning phase takes place between the moment the prewinder (3) is switched on and the moment the bobbin break signal is activated. The bobbin break signal is a signal, which, when activated, is responsible for the releasing of the weaving machine (20) and when interrupted is responsible for a general stop of the weaving machine or the colour selector (the colour selector is not represented in the figure).

[0029] When detecting a knot and/or an irregularity, the bobbin break signal is briefly interrupted. At that moment, the number of windings (Y) (see figure 2) being taken of from the winding disk (5), i.e. the take-off, is measured between the interruption of the signal and the coming to a standstill of the prewinder (3).

[0030] The maximum number of windings that are wound on the winding disk (5) of the prewinder (3) and the take-off are measured by counting the UGN-pulses (8).

[0031] As represented in figure 2, in step S101, when switching on the prewinder (3) (= PUD), the starting signal is activated (start = 1) and the learning phase is started (learn = 1). In case those two values are equalling 1, the learning phase is carried out by counting the number of UGN-pulses, until the bobbin break signal is activated (S102). Then, this number of pulses counted, originating from the winding disk (5) of the pre-winding device (3) are entered (S103) in storage location (N). As long as no knot is detected, the loop P 103 is completed.

[0032] In case a knot and/or an irregularity is detected by the knot detector (4) (S104), the bobbin break signal is briefly interrupted, while the take-off is counted. Shortly thereafter, depending on the setting of the machine, either the machine is completely stopped, in case the knot and/or the irregularity will be removed manually or the colour selector is stopped in case the knot and/or the irregularity will be removed automatically (S105).

[0033] Then, in step S106 and S109, it is determined how many wefts there still can be carried out before the knot and/or the irregularity may be removed manually or automatically. To do so, the following steps will be taken:

- N - Y = K (S106), K being the number of windings remaining on the winding disk (5) of the prewinder (3) between the knot and the fabric;
- G / O = T (S107), T being the number of pulses in a weft length (G). The weft length (G) is entered into the detection system (1);
- K / T = P (S 108), being the number of whole lengths;
- T * P = V (S 109), V being the number of pulses for whole weft lengths.

[0034] The weaving machine (20) will continue to weave until the moment that Y = V, i.e. until the moment that the length of the weft yam (10) between the knot and/or the irregularity and the fabric equals the width of the fabric (S 110). At that moment the TF-out signal is activated (TF-out = 1) and the weaving machine (20) or the colour selector is stopped (S 111). However, as long as Y is not equal to V, the loop P109 is completed.

[0035] In step (S112), X is calculated by means of the formula (P + 1) x T. When this X equal is to the take-off (Y) (113), then the weaving machine (20) or the colour selector will be started again (S114). However, as long as X is not equal to Y, the loop P112 is completed.

[0036] Then, the knot and/of the irregularity can be removed manually or automatically as already indicated before. To remove the knot and/or the irregularity automatically, preferably use will be made of an automatic selection-transition (= PSO-system) as described in BE 1 007 850.

[0037] As represented in figure 1, there is a display (6), for instance, an LCD-display that is provided to display the length of the weft yarn (L_t) between the knot

and/or the irregularity and the fabric, this length (L_t) being calculated by:

- calculating the length (L_w) of the number of windings (K) from the number of windings (K) obtained and the circumference (O) of the winding disk of the prewinder by means of the following formula:

$$L_w = \Pi * K * O;$$

- adding the distance (L_v) between the fabric and the prewinder to this length (L_w) obtained, resulting in the total length between the knot and/or the irregularity and the fabric (L_t).

[0038] In order to process all input and output signals of the detection system (1), an electric circuit (7) has been provided. The following signals are sent to and from this electric circuit (7):

- A: the output signal to the LCD-display (6);
- B: the output signal of the indicator LEDs (16, 17, 18);
- C: the input signal of the input touch (13);
- D: the input signal of the knot detector (4);
- E: the input signal of he UGN-pulses;
- F: the output signal to the weaving machine (20) or to the colour detector.

[0039] Besides the push button (14) to start the learning phase (as described above), there is a second push button (15) for the input of the parameters. These push buttons (14, 15) together are constituting the "input touch".

[0040] Furthermore, there are three indicator LEDs, i.e.:

- a first LED (16) indicating that the voltage has been applied to the detection system (1);
- a second LED (17) indicating an error in the detection system (1), for instance, that there has been an interruption of the bobbin break signal and the prewinder has not come to a standstill;
- a third LED (18) producing an alarm in case a knot is detected.

[0041] In order to stop the weaving machine (20) or the colour selector as indicated in S 110 in figure 1, a stop signal (G) is sent to the control box (9) of the weaving machine.

Claims

1. Weaving machine, comprising a detection system (1) for detecting and avoiding knots and/or irregularities in weft yarns (10) when weaving a fabric on the said weaving machine (20), wherein the knot and/or the irregularity may be manually removed by stopping the weaving machine or may be automatically removed by having a colour selector stop, wherein the detection system (1) is provided with one or several knot detectors (4) to detect the knots and/or the irregularities of the weft yarns (10), and is provided to determine the length of the weft yarn (L_t) between the knot and/or the irregularity and the fabric when detecting a knot and/or an irregularity of the weft yam (10), **characterized in that** the detection system is provided to activate the weaving machine (20) to continue its weaving operation until the moment that the length of the weft yarn (L_t) between the knot and/or the irregularity and the fabric equals the width of the fabric, and at that moment, to send a signal to the weaving machine (20) in order to stop the weaving machine or the colour selector in order to remove the knot and/or the irregularity manually, respectively automatically.

2. Weaving machine according to claim 1, **characterized in that** a prewinder (3) is installed, which is provided with a winding disk (5) for pre-unwinding the weft yarns (10), and the detection system (1) is designed to carry out a learning phase, in which the maximum number of windings (N) which are wound on the winding disk (5) are counted.

3. Weaving machine according to claim 2, **characterized in that** the detection system (1) is provided with a sensor to count the maximum number of windings (N) on the winding disk (5) during the learning phase.

4. Weaving machine according to claim 3, **characterized in that** the said sensor is an existing sensor on the winding disk (5) which normally serves to check whether the motor of the prewinder is running or not.

5. Weaving machine according to any one of the claims 1 up to and including 4, **characterized in that** the weaving machine (20) is provided with a colour selector and the detection system (1) is designed to generate a bobbin break signal that will release the weaving machine (20) when the signal is activated, and that will stop the weaving machine (20) and/or the colour selector when the signal is interrupted.

6. Weaving machine according to claim 5, **characterized in that** the learning phase occurs between the starting signal and the activation of the bobbin break signal.

7. Weaving machine according to claim 5 or 6, **characterized in that** the detection system (1) is provided to briefly interrupt the bobbin break signal in case a knot or an irregularity is detected, because of which the prewinder (3) will come to a standstill.

8. Weaving machine according to claim 7, **characterized in that** with the detection of a knot and/or an irregularity, the number of windings (Y) being taken off the winding disk (5) (= take-off) is measured between the interruption of the bobbin break signal and the becoming into standstill of the prewinder (3).

9. Weaving machine according to any one of the claims 1 up to and including 8, **characterized in that** the detection system is provided to measure the maximum number of windings (N) and the take-off (Y) by counting the number of UGN-pulses.

10. Weaving machine according to claim 9, **characterized in that** the detection system (1) is provided for the input of the weft length (G) of the fabric, and is provided to determine the number of windings (K) still remaining on the winding disk (5) of the prewinder between the knot and/or the irregularity and the fabric, this number of windings (K) being converted into a number of UGN-pulses (8) for whole weft lengths (V) that may be still carried out after the knot and/or the irregularity having been detected, before the knot and/or the irregularity is removed, on the basis of the circumference (O) of the winding disk (5) of the prewinder (3) and the weft length (G) entered into the detection system (1) by means of the following formulas:

-

$$N - Y = K;$$

-

$$G / O = T,$$

T being the number of whole pulses in a weft length (G);
-

$$K / T = P,$$

P being the number of whole lengths;
-

$$T * P = V.$$

11. Weaving machine according to claim 9, **characterized in that** the detection system (1) is provided with a display (6), which is provided to display the length of the weft yam (L_t) between the knot and/or the irregularity and the fabric; this length (L_t) being calculated by:

- calculating the length (L_w) of the number of windings (K) from the number of windings (K) obtained and the circumference (O) of the winding disk (5) of the prewinder by means of the following formula:
-

$$L_w = \Pi * K * O;$$

- adding the distance (L_v) between the fabric and the prewinder (3) to the length (L_w) obtained, resulting in the total length between the knot and/or the irregularity and the fabric (L_t).

12. Weaving machine according to any one of the preceding claims, **characterized in that** the detection system (1) is provided with an electric circuit (7) which is responsible for the processing of all input and output signals of the detection system.

13. Weaving machine according to any one of the claims 1 up to and including 12, **characterized in that** the one or several knot detectors (4) are provided at the entrance of the prewinder (3).

14. Weaving machine according to any one of the claims 1 up to and including 13, **characterized in that** the weaving machine (20) is designed to automatically remove the knot and/or the irregularity by means of an automatic selection transition.

15. Weaving machine according to any one of the claims 1 up to and including 14, **characterized in that** the detection system (1) is applied for the detection and removal of a knot when binding up a new bobbin (2).

16. Weaving machine according to any one of the claims 1 up to and including 14, **characterized in that** the detection system (1) is applied for the detection and removal of a knot and/or an irregularity when there is a knot and/or an irregularity in the bobbin (2) itself.

17. Weaving machine according to any one of the claims 1 up to and including 14, **characterized in that** the detection system (1) is applied for the detection and removal of a knot in case of the breaking and binding up again of a bobbin (2).

Patentansprüche

1. Webmaschine, mit einem Detektionssystem (1) zum

Detektieren und Vermeiden von Knoten und/oder Unregelmäßigkeiten in Schussfäden (10) beim Weben eines Gewebes auf der besagten Webmaschine (20), worin der Knoten und/oder die Unregelmäßigkeit entweder manuell durch Anhalten der Webmaschine entfernt werden kann oder automatisch entfernt werden kann bei Vorliegen eines Farbselektorstopps, und worin das Detektionssystem (1) mit einem oder mehreren Knotendetektoren (4) zum Detektieren der Knoten und/oder der Unregelmäßigkeiten der Schussfäden (10) versehen und ausgebildet ist und zum Bestimmen der Länge (L_1) des Schussfadens zwischen dem Knoten und/oder der Unregelmäßigkeit und dem Gewebe beim Detektieren eines Knotens und/oder einer Unregelmäßigkeit des Schussfadens (10), **dadurch gekennzeichnet, dass** das Detektionssystem vorgesehen ist zum Aktivieren der Webmaschine (20) zur Fortführung deren-Weboperation bis zu dem Moment, in welchem die Länge (L_1) des Schussfadens zwischen dem Knoten und/oder der Unregelmäßigkeit und dem Gewebe der Breite des Gewebes gleich ist, und zum Aussenden eines Signals in diesem Moment an die Webmaschine (20), um entweder die Webmaschine oder den Farbselektor zu stoppen, und um den Knoten und/oder die Unregelmäßigkeit manuell respektive automatisch zu entfernen.

2. Webmaschine gemäß Anspruch 1, **dadurch gekennzeichnet, dass** ein Vorspulgerät (3) installiert ist, das zum Vor-Aufwickeln der Schussfäden (10) mit einer Wickelscheibe (5) ausgestattet ist, und dass das Detektionssystem (1) ausgebildet ist zum Durchführen einer Einlernphase, während welcher die maximale Anzahl an Windungen (N) gezählt wird, die auf der Wickelscheibe (5) aufgewickelt sind.

3. Webmaschine gemäß Anspruch 2, **dadurch gekennzeichnet, dass** das Detektionssystem (1) mit einem Sensor zum Zählen der maximalen Anzahl an Windungen (N) auf der Aufwickelscheibe (5) während der Einlernphase ausgestattet ist.

4. Webmaschine gemäß Anspruch 3, **dadurch gekennzeichnet, dass** der besagte Sensor ein an der Aufwickelscheibe (5) vorliegender Sensor ist, der normalerweise dazu dient, zu überprüfen, ob der Motor des Vorspulgeräts läuft oder nicht.

5. Webmaschine gemäß irgendeinem der Ansprüche 1 bis einschließlich 4, **dadurch gekennzeichnet, dass** die Webmaschine (20) mit einem Farbselektor ausgestattet ist, und dass das Detektionssystem (1) ausgebildet ist zum Generieren eines Spulen-Bruchsignals, welches die Webmaschine freigeben wird, falls das Signal aktiviert ist, und welches die Webmaschine (20) und/oder den Farbselektor abstoppen wird, falls das Signal unterbrochen wird.

6. Webmaschine gemäß Anspruch 5, **dadurch gekennzeichnet, dass** die Einlernphase zwischen dem Startsignal und der Aktivierung des Spulenbruchsignals stattfindet.

7. Webmaschine gemäß Anspruch 5 oder 6, **dadurch gekennzeichnet, dass** das Detektionssystem (1) vorgesehen ist, um das Spulenbruchsignal in einem Fall kurz zu unterbrechen, in welchem ein Knoten oder eine Unregelmäßigkeit detektiert ist, aufgrund welcher Unterbrechung das Vorspulgerät (3) zu einem Stillstand kommen wird.

8. Webmaschine gemäß Anspruch 7, **dadurch gekennzeichnet, dass** mit der Detektion eines Knotens und/oder einer Unregelmäßigkeit die Anzahl an von der Aufwickelscheibe (5) abgenommenen Windungen (Y) (= die Abnahme) zwischen der Unterbrechung des Spulenbruchsignals und des Eintretens des Stillstands des Vorspulgerätes (3) gemessen wird.

9. Webmaschine gemäß irgendeinem der Ansprüche 1 bis einschließlich 8, **dadurch gekennzeichnet, dass** das Detektionssystem (1) ausgebildet ist zum Messen der maximalen Anzahl an Windungen (N) und der Abnahme (Y) durch Zählen der Anzahl von UGN-Pulsen.

10. Webmaschine gemäß Anspruch 9, **dadurch gekennzeichnet, dass** das Detektionssystem (1) ausgebildet ist für die Eingabe der Schussfadenlänge (G) des Gewebes, und zum Bestimmen der Anzahl an Windungen (K), die zwischen dem Knoten und/oder der Unregelmäßigkeit und dem Gewebe nach wie vor auf der Aufwickelscheibe (5) des Vorspulgerätes verblieben sind, wobei diese Anzahl an Windungen (K) in eine Anzahl von UGN-Pulsen (8) für ganze Schussfadenlängen (V) konvertiert wird, welche nach dem Detektieren des Knotens und/oder der Unregelmäßigkeit nach wie vor abgenommen werden können, ehe der Knoten und/oder die Unregelmäßigkeit entfernt ist, und zwar auf der Basis des Umfangs (O) der Aufwickelscheibe (5) des Vorspulgeräts (3) und der Schussfadenlänge (G), wie in das Detektionssystem (1) mittels folgender Formeln eingegeben:

-

$$N - Y = K;$$

-

$$G / O = T,$$

wobei T die Anzahl von ganzen Pulsen in einer Schussfadenlänge (G) ist;
-

$$K / T = P,$$

wobei P die Anzahl ganzer Längen ist;
-

$$T * P = V.$$

11. Webmaschine gemäß Anspruch 9, **dadurch gekennzeichnet, dass** das Detektionssystem (1) mit einem Display (6) versehen ist, welches zum Anzeigen der Länge (L_1) des Schussfadens zwischen dem Knoten und/oder der Unregelmäßigkeit und dem Gewebe vorgesehen ist, wobei diese Länge (L_1) berechnet wird durch:

- Berechnen der Länge (L_w) der Anzahl an Windungen (K) aus der Anzahl der beschafften Windungen (K) und dem Umfang (O) der Aufwickelscheibe (5) des Vorspulgerätes mittels der folgenden Formel:
-

$$L_W = TT * K * O;$$

- Addieren des Abstands (L_v) zwischen dem Gewebe und dem Vorspulgerät (3) zu der erhaltenen Länge (L_w), resultierend in der Gesamtlänge (L_1) zwischen dem Knoten und/oder der Unregelmäßigkeit und dem Gewebe.

12. Webmaschine gemäß irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Detektionssystem (1) mit einem elektrischen Schaltkreis (7) versehen ist, der für das Verarbeiten aller Eingabe- und Ausgabe-Signale des Detektionssystems verantwortlich ist.

13. Webmaschine gemäß irgendeinem der Ansprüche 1 bis und einschließlich 12, **dadurch gekennzeichnet, dass** der eine oder die mehreren Knotendetektoren (4) an der Eingangsseite des Vorspulgerätes (3) angeordnet ist bzw. sind.

14. Webmaschine gemäß irgendeinem der Ansprüche 1 bis und einschließlich 13, **dadurch gekennzeichnet, dass** die Webmaschine (20) ausgebildet ist zum automatischem Entfernen des Knotens und/oder der Unregelmäßigkeit mittels einer automatischen Selektionstransition.

15. Webmaschine gemäß irgendeinem der Ansprüche 1 bis und einschließlich 14, **dadurch gekennzeichnet, dass** das Detektionssystem (1) appliziert wird zur Detektion und zum Entfernen eines Knotens, sobald eine neue Spule (2) angebunden wird.

16. Webmaschine gemäß irgendeinem der Ansprüche 1 bis und einschließlich 14, **dadurch gekennzeichnet, dass** das Detektionssystem (1) appliziert wird zur Detektion und zum Entfernen eines Knotens und/oder einer Unregelmäßigkeit, wenn es in der Spule (2) selbst einen Knoten und/oder eine Unregelmäßigkeit gibt.

17. Webmaschine gemäß irgendeinem der Ansprüche 1 bis und einschließlich 14, **dadurch gekennzeichnet, dass** das Detektionssystem (1) applizierbar ist zur Detektion und zum Entfernen eines Knotens im Fall eines Fadenbruchs und eines neuerlichen Anbindens einer Spule (2).

Revendications

1. Métier à tisser, comprenant un système de détection (1) pour détecter et éviter les noeuds et/ou irrégularités dans les fils de trame (10) lors du tissage d'un tissu sur ledit métier à tisser (20), dans lequel le noeud et/ou l'irrégularités peut être éliminé manuellement en arrêtant le métier à tisser ou peut être éliminé automatiquement par arrêt du sélecteur de couleur, dans lequel le système de détection (1) est doté d'un ou plusieurs détecteurs de noeud (4) pour détecter les noeuds et/ou les irrégularités des fils de trame (10) et est prévu pour déterminer la longueur du fil de trame (L_1) entre le noeud et/ou l'irrégularités et le tissu lors de la détection d'un noeud et/ou d'une irrégularité du fil de trame (10), **caractérisé en ce que** le système de détection est prévu pour activer le métier à tisser (20) pour poursuivre son tissage jusqu'au moment où la longueur du fil de trame (L_1) entre le noeud et/ou l'irrégularité et le tissu est égale à la largeur du tissu et, à ce moment, pour transmettre un signal au métier à tisser (20) afin d'arrêter le métier à tisser ou le sélecteur de couleur en vue d'éliminer le noeud et/ou l'irrégularité manuellement où automatiquement.

2. Métier à tisser selon la revendication 1, **caractérisé en ce qu'**une prébobineuse (3) est installée et dotée d'un tambour de bobinage (5) pour prébobiner les fils de trame (10) et le système de détection (1) est

destiné à procéder à une phase d'apprentissage dans laquelle le nombre maximum de tours (N) qui sont bobinés sur le tambour de bobinage (5) est compté.

3. Métier à tisser selon la revendication 2, **caractérisé en ce que** le système de détection (1) est doté d'un capteur pour compter le nombre maximum de tours (N) sur le tambour de bobinage (5) pendant la phase d'apprentissage.

4. Métier à tisser selon la revendication 3, **caractérisé en ce que** ledit capteur est un capteur existant sur le tambour de bobinage (5) qui sert normalement que le moteur de la prébobineuse tourne ou non.

5. Métier à tisser selon l'une de revendications 1 à 4 inclus, **caractérisé en ce que** le métier à tisser (20) est doté d'un sélecteur et le système de détection (1) est destiné à générer un signal de rupture de la bobine qui va libérer le métier à tisser (20) lorsque le signal est activé et va arrêter le métier à tisser (20) et/ou le sélecteur de couleur lorsque le signal est interrompu.

6. Métier à tisser selon la revendication 5, **caractérisé en ce que** la phase d'apprentissage survient entre le signal de départ et l'activation du signal de rupture de la bobine.

7. Métier à tisser selon l'une de revendications 5 ou 6, **caractérisé en ce que** le système de détection (1) est prévu pour interrompre brièvement le signal de rupture de la bobine au cas où un noeud ou une irrégularité est détecté, si bien que la prébobineuse (3) s'arrête.

8. Métier à tisser selon la revendication 7, **caractérisé en ce que**, avec la détection d'un noeud et/ou d'une irrégularité, le nombre de tours (Y) dévidés du tambour de bobinages (5) (dévidage) est mesuré entre l'interruption du signal de rupture de la bobine et l'arrêt de la prébobineuse (3).

9. Métier à tisser selon l'une des revendications 1 à 8 inclus, **caractérisé en ce que** le système de détection est prévu pour mesurer le nombre maximum de tours (N) et le dévidage (Y) en comptant le nombre d'impulsions UGN.

10. Métier à tisser selon la revendication 9, **caractérisé en ce que** le système de détection (1) est prévu pour l'insertion de la longueur de trame (G) du tissu et est destiné à déterminer le nombre de tours (K) qui reste sur le tambour de bobinage (5) de la prébobineuse entre le noeud et/ou l'irrégularité et le tissu, ce nombre de tours (K) étant converti en un nombre d'impulsions UGN (8) pour des longueurs complètes de trame (V) qui peuvent toujours être effectuées après le noeud et/ou l'irrégularité détectée avant que le noeud et/ou l'irrégularité ne soient éliminés, sur la base de la circonférence (O) du tambour de bobinage (5) de la prébobineuse (3) et la longueur du fil de trame (G) insérée dans le système de détection (1) au moyen des formules suivantes:

-

$$N - Y = K$$

-

$$G / O = T,$$

T étant le nombre d'impulsions complètes dans une longueur de trame (G);

-

$$K / T = P,$$

P étant le nombre de longueurs complètes;

-

$$T * P = V.$$

11. Métier à tisser selon la revendication 9, **caractérisé en ce que** le système de détection (1) est doté d'un écran (6) qui est prévu pour afficher la longueur du fil de trame ((L_1) entre le noeud et/ou l'irrégularité et le tissu, la longueur (L_1) étant calculée :

- en calculant la longueur (L_w) du nombre de tours (K) à partir du nombre de tours (K) obtenu et la circonférence (O) du tambour de bobinage (5) de la prébobineuse au moyen de la formule suivante :

-

$$L_w = \Pi * K * O;$$

- en additionnant la distance (L_v) entre le tissu et la prébobineuse (3) à la longueur (L_w) obtenue, ce qui conduit à une longueur totale entre le noeud et/ou l'irrégularité et le tissu (L_t).

12. Métier à tisser selon l'une des revendications précédentes, **caractérisé en ce que** le système de détection (1) est doté d'un circuit électrique (7) qui est

responsable du traitement de tous les signaux d'entrée et de sortie du système de détection.

13. Métier à tisser selon l'une de revendications 1 à 12 incluse, **caractérisé en ce qu'**un ou plusieurs des détecteurs de noeud (4) sont prévus à l'entrée de la prébobineuse (3).

14. Métier à tisser selon l'une des revendications 1 à 13 incluse, **caractérisé en ce que** le métier à tisser (20) est destiné à enlever automatiquement le noeud et/ou l'irrégularité au moyen d'une transition/sélection automatique.

15. Métier à tisser selon l'une des revendications 1 à 14 incluse, **caractérisé en ce que** le système de détection (1) est appliqué pour la détection et l'enlèvement d'un noeud lors du rattachement d'une nouvelle bobine (2).

16. Métier à tisser selon l'une des revendications 1 à 14 incluse, **caractérisé en ce que** le système de détection (1) est appliqué pour la détection et l'enlèvement d'un noeud et/ou d'une irrégularité lorsqu'il y a un noeud et/ou une irrégularité dans la bobine (2) elle-même.

17. Métier à tisser selon l'une des revendications 1 à 14 incluse, **caractérisé en ce que** le système de détection (1) est appliqué pour la détection et l'enlèvement d'un noeud en cas de rupture et de rattachement d'une bobine (2).

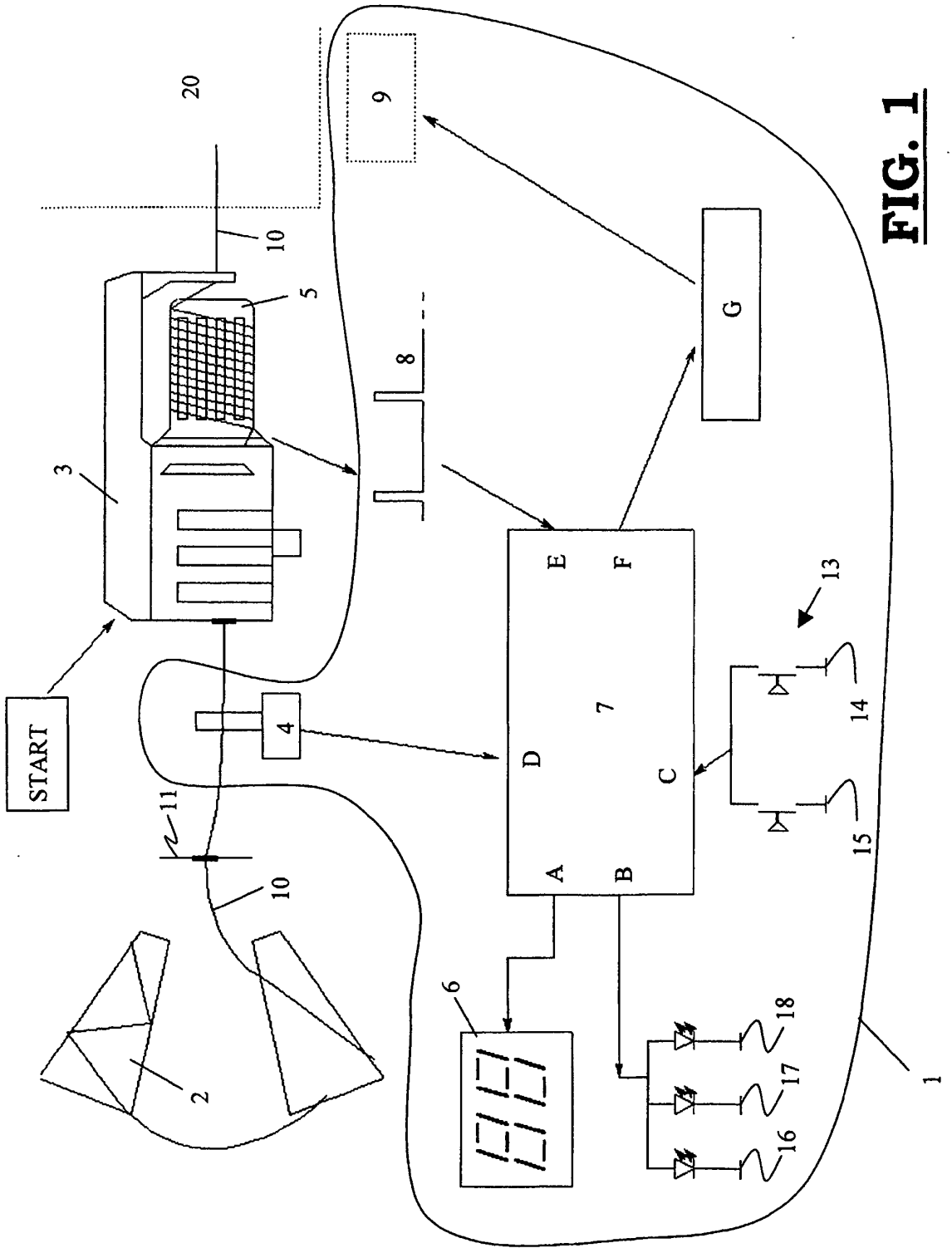

FIG. 1

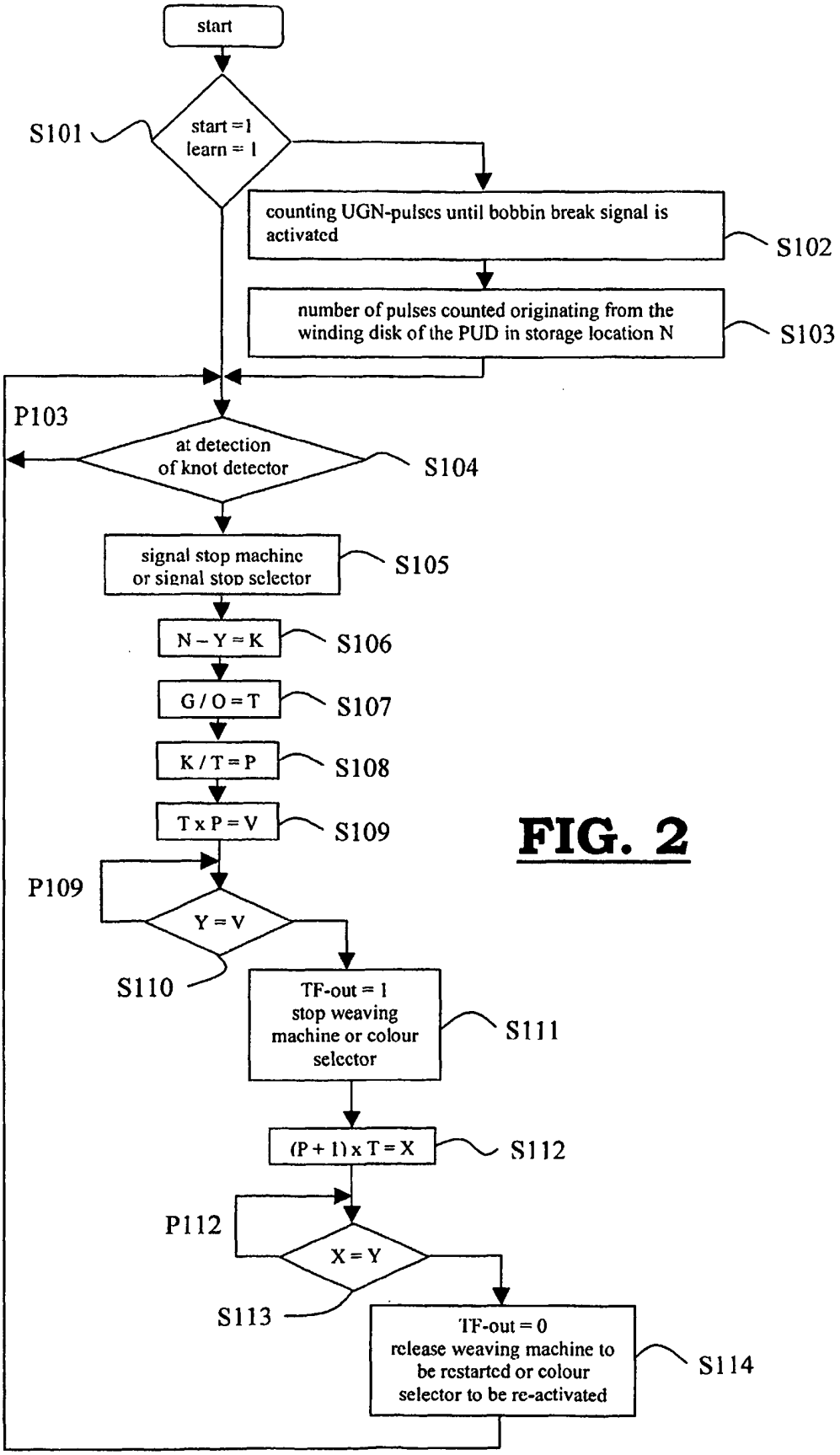
start
S101
start = 1
learn = 1
counting UGN-pulses until bobbin break signal is activated
S102
number of pulses counted originating from the winding disk of the PUD in storage location N
S103
P103
at detection of knot detector
S104
signal stop machine or signal stop selector
S105
N – Y = K
S106
G / O = T
S107
K / T = P
S108
T x P = V
S109
P109
Y = V
S110
TF-out = 1 stop weaving machine or colour selector
S111
(P + 1) x T = X
S112
P112
X = Y
S113
TF-out = 0 release weaving machine to be restarted or colour selector to be re-activated
S114

FIG. 2

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- BE 1007850 **[0003] [0036]**