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(54) **Block-using method and block device for positioning and locking a saddle-borne equipment piece.**

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EP 0 323 657 B1

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Description

The present invention relates to a method for stopping and positioning an equipment piece born on board of a mobile service carriage performing a continuous reciprocating patrolling motion along a side of an operating machine and furthermore to a device for practicing this method.

As disclosed in DE-A-35 36850, DE-A-21 17585 and EP-A 124 151, to date, in the automation of textile machines, the mobile service carriages have been exactly positioned by resorting to pin means, or to fork means, or to means having similar shapes. Said mobile carriages support and house maintenance and/or operating equipment pieces. In the case where pin means are used, a push actuator drives the extension of a mechanical pin which, by getting engaged into one of a series of bores provided on a plate rigidly fastened onto the framework of the machine, makes it possible the mobile carriage to be locked in its working positions. The so carried out positioning and locking unavoidably generates vibrations, of uncontrollable intensity, on the structure of the mobile carriage, with said vibrations being also transferred to the whole equipment piece on board of the same carriage. Said equipment piece submitted to more or less intense vibrations will be damaged, at least in its precision members, such as, e.g., detector and position sensors, as well as operating arms and lever systems. These latter will come to operate in their movements along incorrect coordinates, in that their supports may result to be more or less deformed owing to the repeating impacts generated by the sudden stops of the mobile carriage.

In the case where fork means are used, an actuator actuates the extension of the prongs of the said fork, engaging them to surround one of a series of protruding elements rigidly fastened to the framework of the machine.

Also in case of such a positioning and locking means, more or less intense vibrations are triggered as well, and the same above mentioned operating drawbacks will therefore occur. Furthermore, the fork must be associated to the presence of a tooth, or latch, capable of ensuring the carriage stopping lock during the whole time period of intervention of the equipment piece borne by said mobile carriage. The structure of the fork locking means is therefore not simple.

The purpose of the present invention is of overcoming the above mentioned drawbacks, by providing a stopping and positioning method, by means of which the mobile carriage can be stopped at precise working positions, without considerable vibrations being generated and transmitted on the supported equipment piece borne by said mo-

bile carriage. The method of the invention is characterized by the features indicated in the characterizing part of claim 1. In order to practice this method, a device in conformity with claim 2 is used.

This device has a simple structure, and makes it also possible a reliable precision to be achieved over time, in that it is neither damaged nor worn during the operations; and, thanks to its structural simpleness, it is also very reliable in operation, and not sensible to dirtying effects. This device is associated with means known from the prior art for the automatic monitoring and detection of the positions wherein the equipment piece supported by the saddle must perform its action, with said service carriage running along rail guides provided along the working front(s) of an operating machine, such as, e.g., a ring spinning frame. Inasmuch as said service carriages used for the automatic intervention for the splicing of broken threads on continuous spinning frames equipped with ring rail, and the equipment pieces associated with them, as well as the relevant operating members, including their system for programmed control, have structural features known from the prior art, they do not need to be herein explained in detail.

Forms of practical embodiment of the device according to the invention are defined in claims 3 to 5.

In the hereto attached drawing table, an example of practical embodiment of the invention is shown in a schematic view, and exclusively as regards those parts which need to be explained.

The figure of the drawing table shows a top plan view of a device according to the present invention, with the sensors which are required in order to enable the mobile carriage speed reducing system; it should be observed that these sensors are not represented in their details, in that they are inside the knowledge of those skilled in the art.

In the drawing, we have that:

1 are proximity sensors of inductive type aligned along the running direction of the service carriage 16, operating in order to detect the frontal presence of elements 3 and in order to scan the passage of the carriage 16 from spinning spindle to spinning spindle and to supply, in the programmed logic and in cooperation with other sensors (not shown), first the activation of the known carriage speed reducing command, and then the activation of an actuator 7 until the carriage 16 stops in a position exactly aligned with the spindle, on which an action has to be performed;

2 is a positioning block, which can be made from a metal material, or from a non-metal material, or from any other composite materials;

2a, 2b and 2c are the frontal positions which the

block 2 takes in the operating step of positioning beginning, until the end of its insertion in the space between two adjacent elements 3 in order to lock the mobile carriage 16;

3 are protruding elements which are substantially given the shape of revolution solids, and are installed in correspondence of the lower part of the spindles. Said protruding elements have their axis coincident with the axis of the spindles, and therefore their pitch corresponds to the pitch between the spindles;

4 is the side bevel of the positioning block 2, which is in the form of an inclined rectilinear section, in order to ensure the self-centering positioning of the mobile carriage;

6 is the side surface section of the block 2, which is substantially rectilinear and parallel to the direction of the thrust applied by a stem 5;

5 is the stem of the block 2 thrust actuator;

7 is the positioning block thrust actuator;

8 is the stem of an actuator 10, which makes a slide 12 supporting the device according to the present invention, to move forwards or backwards;

14 is the backwards-moved position of the slide 12, in order to make it possible the device according to the present invention not to be operating;

9 is the arrow which indicates the direction of advancement of the mobile carriage during its patrolling looking for the spinning spindles on which an action has to be carried out;

16 is the partial trace of the framework of the mobile service carriage onto which the slide 12 supporting the device according to the present invention is mounted.

The following disclosure of the operation, made by referring to the attached figure, concerns solely the device according to the present invention, which carries out the stopping and positioning of the mobile carriage bearing an equipment piece for the automatic maintenance of one or several machine front(s). It is understood that, for it to operate, detecting means and complementary devices are necessary, which are known per se and not herein discussed.

It is known to associate to a textile machine, such as e.g. a ring spinning frame, a service carriage in order to automatically re-join the broken threads during the spinning spindles operation. Said carriage is caused to run along the spinning front(s), along running ways comprising one or several rail(s) of any shapes, cooperating with suitable rolling means such as wheels, or rollers, or equivalent means. During the operation of the spinning frame, the service carriage for the re-joining of the threads is continuously frontally reciprocated along the spindle bed, performing a reciprocating

patrolling motion.

During said patrolling monitoring, the traveling carriage detects, by using detecting means known from the prior art, whether the thread is present or not on each spinning spindle. When it detects the absence of one of the threads under way of formation, the detecting means in cooperation with the proximity sensors 1 of inductive type, as well as through the operating program, enables the actuation of an electrovalve which makes the pneumatic actuator 7 start to operate via the stem 5 and push the block 2 to its position 2a, coming into frontal interference with the protruding element 3 which comes before the space into which the same block 2 has to be pushed (see the attached figure).

The anticipated advancement of the block 2 relatively to the space it should enter, inside which it will be locked at the end of the positioning step, is necessary because the same block 2, by means of its frontal surface, carries out a useful braking action, in order to reduce the speed of the whole carriage during the step of passage from the steady-state patrolling speed to the reduced speed of positioning beginning. It should be observed that the inertia of a mobile carriage carrying on board one or several equipment piece(s) is difficult to evaluate with correctness. With this latter specific statement in mind, the device according to the present invention carries out an adjustable braking effect, by varying, with known means, the intensity of the frontal thrust applied by the block 2 to the protruding element 3 by means of the actuator 7.

When, at the end of the front sliding, the contact begins between the inclined section 4 of block 2 and the circumferential surface of the element 3, the block 2 frontally moves to reach its position 2b. At this time point, it is advantageous that a micro-switch (not shown), entrusted with the task of detecting this frontal movement, disables and stops the carriage drive motor. The front thrust generated by the actuator 7, the inclined section 4 of the block 2 and the circumferential surface of the element 3 make it possible, owing to the shape of their contact surfaces, the positioning block 2 to be automatically and gradually wedged into the space it must enter in order to ensure the precise alignment of the traveling equipment piece with the spinning spindle, around which the working units advance and operate. The preservation of the precise alignment obtained, throughout the necessary time period for the above mentioned operating actions, is ensured by the surface sections 6 of the positioning block 2. Any fortuitous translating forces are in fact nullified by the planar contact between the surfaces 6 and the protruding elements 3.

It is clear that the present invention proposes a method and a device suitable for positioning and stopping a mobile carriage traveling along the op-

erating front of operating machines, without causing considerable impacts and vibrations which, should be present, would damage the equipment pieces, or equipment piece parts, carried on board by said carriage.

Claims

1. Method for stopping and positioning an equipment piece borne on board of a mobile service carriage (16), performing a continuous reciprocating patrolling motion along a side of an operating machine, in a predetermined working position on said side of the operating machine, by means of a positioning member (2) carried on said service carriage (16) and adapted to cooperate with protruding elements (3) associated to each working position along the operating machine side, comprising the steps of detecting the working position in which the service carriage is to be stopped and positioned, of stopping the carriage drive motor and of moving said positioning member (2) transversally to the direction (9) of the patrolling motion of the carriage (16) to make it cooperate with at least one of said protruding elements (3), and to perform a self-centering positioning of the carriage (16), characterised in that after said detection step the patrolling speed of the service carriage (16) is reduced to slacken its motion and said positioning member (2) is moved towards a protruding element (3) by applying a forward thrust to it, in order to perform a friction braking coadjuvating the slackening of the carriage motion and that the positioning member (2), under the continued forward thrust applied to it, is then gradually wedged into the space between two consecutive protruding elements (3), while stopping the carriage drive motor, in order to perform positioning and locking of the service carriage (16).
2. Device for putting in practice the method according to claim 1, comprising protruding elements (3) associated to each working position of the mobile service carriage (16) along an operating machine side, a positioning member (2) carried by said service carriage (16), means (5,7) to apply a forward thrust to said positioning member (2) and to move it transversally to the direction (9) of the patrolling motion of the carriage (16), a detecting means to detect the working position in which the service carriage is to be stopped, a carriage drive motor and means for controlling said motor, characterised in that said detecting means comprises proximity sensors (1) moun-

ted on said service carriage (16) to detect said protruding elements (3), in that said carriage drive motor is provided with braking means to slacken the motion of the carriage (16), in that means are provided to start, in cooperation with said detecting means and said proximity sensors (1), the operation of said means for applying the forward thrust to said positioning member (2), in that said positioning member consists of a block (2) having two frontal bevels subdividing each side surface of the block (2) in a section (4) inclined with respect to the direction of the thrust applied to said block and a section (6), adjacent the first one, substantially rectilinear and parallel to said direction, in that said protruding elements (3) are given the shape of revolution solids and in that a micro-switch is provided to stop the carriage drive motor when said positioning block (2), under the thrust applied to it, begins its entering movement in the space between two consecutive protruding elements.

3. Device according to claim 2, characterised in that the means to apply a forward thrust to the positioning block (2) comprises an actuator (7) and a stem (5), means are provided to vary the intensity of the forward thrust applied by said actuator (7).
4. Device according to claim 2, characterised in that the frontal bevels of the positioning block (2) are of circular or substantially circular shape.
5. Device according to claim 2, characterised in that said positioning block (2), said means (5,7) to apply a forward thrust to it, said proximity sensors (1) and said microswitch are supported by a slide (12) mounted on said service carriage (16) and that means (8,10) are provided to move said slide (12) from an inoperative position (14) in an operative position and vice versa.

Patentansprüche

1. Verfahren zum Anhalten und Positionieren eines Ausrüstungsteils, das an einem beweglichen Wagen oder Schlitten (16) gehalten wird, der eine kontinuierliche Hin- und Herbewegung zur Überwachung längs einer Seite einer Arbeitsmaschine ausführt, in einer vorbestimmten Arbeitsstellung auf dieser Seite der Arbeitsmaschine mittels eines Positionierungsteils (2), das an dem Wagen (16) angebracht ist und mit vorstehenden Elementen (3) zusammenwirkt, die jeder Arbeitsposition längs der Arbeitsma-

schinenseite zugeordnet sind, mit den Schritten des Feststellens der Arbeitsposition, in der der Wagen angehalten und positioniert werden soll, des Anhaltens des Wagenantriebsmotors und des Bewegens des Positionierungsteils (2) quer zu der Richtung (9) der Überwachungs-
bewegung des Wagens (16), damit er mit wenigstens einem der vorstehenden Elemente (3) zusammenwirken kann und zum Ausführen einer selbstzentrierenden Positionierung des Wagens (16),

dadurch gekennzeichnet,

daß nach dem Schritt des Feststellens die Überwachungsgeschwindigkeit des Wagens (16) reduziert wird, um seine Bewegung zu verzögern, und das Positionierungsteil (2) in Richtung auf ein vorstehendes Element (3) durch Anlegen eines Vorwärtsschubes bewegt wird, um eine Reibungsbremung zur Unterstützung der Verzögerung der Wagenbewegung durchzuführen, und daß das Positionierungsteil (2) unter dem fortgesetzten Vorwärtsschub, der an ihm anliegt, allmählich in den Raum zwischen zwei aufeinanderfolgenden vorstehenden Elementen (3) eingedrückt wird, während der Wagenantriebsmotor angehalten wird, um die Positionierung und Verriegelung des Wagens (16) durchzuführen.

2. Vorrichtung zum Durchführen des Verfahrens nach

Anspruch 1,

mit vorstehenden Elementen (3), die jeder Arbeitsposition des beweglichen Wagens (16) längs einer Seite der Arbeitsmaschine zugeordnet sind, einem Positionierungsteil (2) an dem Wagen (16), einer Einrichtung (5,7) zum Anlegen eines Vorwärtsschubes an dem Positionierungsteil (2) und für dessen Bewegung quer zu der Richtung (9) der Überwachungs-
bewegung des Wagens (16), einer Feststelleinrichtung zum Feststellen der Arbeitsstellung, in der der Wagen angehalten werden soll, einem Wagenantriebsmotor und einer Einrichtung zum Steuern des Motors,

dadurch gekennzeichnet,

daß die Feststelleinrichtung Näherungssensoren (1) umfaßt, die an dem Wagen (16) zum Feststellen der vorstehenden Elemente (3) angebracht sind, daß der Wagenantriebsmotor mit einer Bremsenrichtung zum Verzögern der Bewegung des Wagens (16) versehen ist, daß eine Einrichtung vorgesehen ist zum Starten des Betriebs der Einrichtung zum Anlegen eines Vorwärtsschubes an dem Positionierungsteil (2) im Zusammenwirken mit der Feststelleinrichtung und den Näherungssensoren (1), daß das Positionierungsteil aus einem Block

(2) besteht, der zwei frontale Abschrägungen aufweist, welche jede Seitenfläche des Blocks (2) in einen Abschnitt (4) unterteilt, der bezüglich der Richtung des an dem Block anliegenden Schubes geneigt ist, und einen Abschnitt (6) angrenzend an den ersteren im wesentlichen geradlinig und parallel zu dieser Richtung, daß die vorstehenden Elemente (3) die Form von Drehkörpern haben, und daß ein Mikroschalter vorgesehen ist, um den Wagenantriebsmotor anzuhalten, wenn der Positionierungsblock (2) unter dem an ihm anliegenden Schub seine Eintrittsbewegung in den Raum zwischen zwei aufeinanderfolgenden vorstehenden Elementen beginnt.

3. Vorrichtung nach Anspruch 2,

dadurch gekennzeichnet,

daß die Einrichtung zum Aufbringen eines Vorwärtsschubes an dem Positionierungsblock (2) einen Zylinder (7) und eine Kolbenstange (5) umfaßt, und daß eine Einrichtung vorgesehen ist zum Ändern der Intensität des Vorwärtsschubes, der durch den Zylinder (7) aufgebracht wird.

4. Vorrichtung nach Anspruch 2,

dadurch gekennzeichnet,

daß die frontalen Abschrägungen des Positionierungsblocks (2) kreisförmig oder im wesentlichen kreisförmig sind.

5. Vorrichtung nach Anspruch 2,

dadurch gekennzeichnet,

daß der Positionierungsblock (2), die Einrichtung (5,7) zum Anlegen eines Vorwärtsschubes an diesem, die Näherungssensoren (1) und der Mikroschalter an einem Schiebestück (12) angebracht sind, das an dem Wagen (16) angebracht ist, und daß eine Einrichtung (8,10) vorgesehen ist, um das Schiebestück (12) aus einer Außerbetriebsstellung (14) in eine Betriebsstellung und umgekehrt zu bewegen.

Revendications

1. Procédé pour arrêter et positionner une pièce d'équipement portée sur un plateau d'un chariot de service (16) mobile, opérant un mouvement de surveillance continu en va-et-vient le long d'un côté d'une machine en fonctionnement, dans une position de travail prédéterminée sur ledit côté de la machine en fonctionnement, au moyen d'un élément de positionnement (2) porté sur ledit chariot de service (16) et propre à coopérer avec des éléments qui font saillie (3) associés à chaque position de travail le long du côté de la machine en fonc-

tionnement, comportant les étapes de détection de la position de travail dans laquelle le chariot de service doit être arrêté et positionné, arrêt du moteur d'entraînement du chariot et déplacement dudit élément de positionnement (2) transversalement à la direction (9) du mouvement de surveillance du chariot pour le faire coopérer avec au moins l'un desdits éléments qui font saillie (3), et réaliser un positionnement du chariot (16) par autocentrage, caractérisé en ce que, après ladite étape de détection, la vitesse de surveillance du chariot de service (16) est réduite pour ralentir son mouvement, et ledit élément de positionnement (2) est déplacé vers un élément qui fait saillie (3) en lui appliquant une poussée vers l'avant de façon à réaliser un freinage par frottement aidant au ralentissement du déplacement du chariot, et que l'élément de positionnement (2), sous l'effet de la poussée continue vers l'avant qui lui est appliquée, est alors progressivement coincé dans l'espace entre deux éléments qui font saillie (3) consécutifs, alors que le moteur d'entraînement du chariot est arrêté, de façon à réaliser le positionnement et le verrouillage du chariot de service (16).

2. Un dispositif pour mettre en pratique le procédé suivant la revendication 1, comportant des éléments qui font saillie (3) associés à chaque position de travail du chariot de service (16) mobile le long du côté d'une machine en fonctionnement, un élément de positionnement (2) porté par ledit chariot de service (16), des moyens (5,7) pour appliquer une poussée vers l'avant audit élément de positionnement (2) et le déplacer transversalement à la direction du mouvement de surveillance du chariot (16), un moyen de détection pour détecter la position de travail dans laquelle on doit arrêter le chariot de service, un moteur d'entraînement de chariot et un moyen pour commander ledit moteur, caractérisé en ce que ledit moyen de détection consiste en des capteurs de proximité (1) installés sur ledit chariot de service (16) pour détecter lesdits éléments qui font saillie (3), en ce que ledit moteur d'entraînement de chariot est pourvu d'un moyen de freinage pour ralentir le mouvement du chariot (16), en ce que un moyen est prévu pour démarrer, en coopération avec ledit moyen de détection et lesdits capteur de proximité (1), le fonctionnement desdits moyens pour appliquer la poussée vers l'avant audit élément de positionnement (2), en ce que ledit élément de positionnement consiste en un bloc (2) qui comporte deux parties avant biseautées divisant chaque surface latérale du bloc (2) en une section (4)

inclinée par rapport à la direction de la poussée appliquée audit bloc, et une section (6), adjacente à la première, sensiblement rectiligne et parallèle à ladite direction, en ce que lesdits éléments qui font saillie (3) ont la forme de solides de révolution et en ce que un micro-interrupteur est placé pour arrêter le moteur d'entraînement du chariot quand ledit bloc de positionnement (2), sous l'effet de la poussée qui lui est appliquée, commence son mouvement pour entrer dans l'espace entre deux éléments qui font saillie consécutifs.

3. Dispositif suivant la revendication 2, caractérisé en ce que le moyen pour appliquer une poussée vers l'avant au bloc de positionnement (2) consiste en un vérin (7) et une tige (5), un moyen est prévu pour varier l'intensité de la poussée vers l'avant appliquée par ledit vérin (7).
4. Dispositif suivant la revendication 2, caractérisé en ce que les parties avant biseautées du bloc de positionnement (2) sont de forme circulaire ou sensiblement circulaire.
5. Dispositif suivant la revendication 2, caractérisé en ce que ledit bloc de positionnement (2), lesdits moyens (5,7) pour lui appliquer une poussée vers l'avant, lesdits capteurs de proximité (1) et ledit micro-interrupteur sont portés par un support coulissant (12) monté sur ledit chariot de service (16) et en ce que des moyens (8,10) sont installés pour déplacer ledit support coulissant (12) depuis une position de non-fonctionnement (14) jusqu'à une position de fonctionnement, et vice versa.

