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(54) **Parting device and removal method of a faulty weft in a weaving loom**

Teilungsvorrichtung und Verfahren zur Entfernung eines fehlerhaften Schussfadens in einer Webmaschine

Dispositif de séparation et procédé de suppression d'une trame défectueuse dans un métier à tisser

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(56) References cited:
EP-A- 0 100 939
EP-A- 0 336 388
EP-A- 0 465 416
WO-A-96/38616
BE-A4- 1 000 904
FR-A- 2 527 655
FR-A- 2 583 435
US-A- 4 635 686

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Description

Field of the invention

[0001] The present invention concerns a device and a method for the parting and removal of a faulty weft.

BACKGROUND

[0002] As known, in weaving looms there is the need to automatically identify and remove a faulty weft from the fabric being woven.

[0003] A weft may be inserted in a faulty manner into the shed due to various reasons, both textile and mechanical; however, it must be removed whenever its presence could lead to a fault visible also in the finished fabric.

[0004] The removal of a faulty weft certainly requires to halt the loom and implies the action of a series of auxiliary devices or specific controls depending on the specific removal technique.

[0005] In EP853693 and EP309013 some exemplary ways according to the prior art are shown.

[0006] The removal techniques used so far provide the execution of complex movements and the use of auxiliary equipment which is integrated in the specific loom. As a matter of fact, the defective weft must be removed towards a side of the loom, however, without interfering significantly with the warp yarns and with the preceding weft, which can otherwise result in the development of other faults in the fabric.

[0007] For such purpose, a relatively long procedure is normally performed which provides, after halting the loom, to move the sley back, reopen the warp shed to free the faulty weft from the warp yarns, grip the weft yarn from the output side after causing it to bend by 180°. Thereby it is possible to remove the weft detaching it from the preceding weft in a punctual and transversal way. An excessive longitudinal load on the preceding weft is thereby avoided, which weft would otherwise end up being displaced from its correct position causing a new fault in the fabric.

[0008] However, this mode is not entirely satisfactory, both because it requires to set up complex controls, and because it requires a rather long execution time. As a matter of fact, in order to be able to remove the weft causing it to bend by 180°, it must be provided to introduce a further auxiliary weft connected to the faulty one, which operation obviously takes time. Moreover, the parting of the faulty weft from the preceding weft does not occur in a perfectly transversal way, but of course a sleight component of tangential traction is imparted - especially with certain types of yarns - which risks to slightly disarrange the fabric.

[0009] FR2527655 discloses a removal apparatus for faulty weft yearns in a weaving loom, comprising a sliding hook. The hook is used to hold the faulty yearn and separate it from the leading edge portion of a fabric being woven, transversally to the weft yarns. FR 2583435 discloses a similar apparatus, where an array of tips are aligned along the weft yearns under the fabric being woven. Said array of tips is moved up and down and forward-backward through a cam-follower mechanism.

SUMMARY OF THE INVENTION

[0010] The object of the present invention is hence that of providing a removal device of a faulty weft and a method therefor which overcomes the drawbacks highlighted above. In particular, it is intended to provide a device which is simple, effective, does not interfere with the other weaving members, is applicable also to existing looms and, above all, allows to reduce the complexity and duration of intervention operations.

[0011] Such object is achieved by means of a device for the parting of the faulty weft as defined in its more general terms in the accompanying independent claims 1 and 7.

[0012] According to the invention, the device for the parting of the faulty weft comprises at least a tip head arranged according to an axis substantially transversal to the fabric being woven on the loom and being movable according to its longitudinal axis and, by means of the movement of the sley, movable also crosswise to its longitudinal axis in a direction substantially parallel to the warp yarns.

[0013] According to a further aspect, the device for the parting of a faulty weft comprises a plurality of tip heads arranged substantially crosswise to the fabric being woven on the loom and aligned to the weft yarns.

[0014] According to the invention, the tip heads are mounted integral with the front side of a loom sley.

[0015] According to another preferred aspect, the tip heads are longitudinally movable by means of a pneumatic actuator which imparts a force F, directed towards the fabric, smaller than the one necessary to damage the fabric. The tip heads have a vertex shape suited not to pierce the fabric and the relative actuators are preferably mounted in a height-adjustable way on the sley.

[0016] According to a further aspect of the invention, a removal method of a faulty weft yarn from a fabric being woven on a weaving loom is provided, comprising the steps of

- detecting the occurrence of a faulty weft yarn;
- causing a loom sley to move back;
- opening the warp shed to free the faulty weft from the warp yarns; and
- removing the faulty weft yarn;

wherein, before the faulty weft yarn removal step, it is provided to

- arrange at least a tip head in the proximity of the fabric-forming area, arranged with its longitudinal axis is substantially perpendicular to the fabric, causing the tip head to feel at least the last two/four wefts

with a force, directed along the longitudinal axis of the tip head, smaller than the one necessary to pierce the fabric,

causing the tip head to wedge in between the last-but-one weft and the last faulty weft freed from the warp yarns, and

moving the tip head engaged with the faulty weft back until detaching said weft from the preceding weft.

[0017] Further features and advantages of the device and of the method according to the invention will in any case be more evident from the following detailed description of a preferred embodiment of the same, given by way of example and illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a diagrammatic elevation side view of the device according to the invention adjacent to the leading edge portion of a fabric;

fig. 2 is a diagrammatic, perspective, top view of the same portion of fig. 1;

figs. 3-7 are diagrammatic, elevation side views of the device of the invention in a series of subsequent working steps; and

fig. 8 is a perspective photograph of an example of a tip head of the invention mounted on a sley (B) of a weaving loom.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

[0019] Fig. 1 shows a portion of fabric 3 being woven, supported by a fabric supporting shelf 1. The fabric consists of an array of warp threads 4 which interlace with a series of weft yarns 5.

[0020] The last inserted weft is referred to as 5a; during the normal weaving operations, after having been introduced said weft is beaten - by a reed of sley B (fig. 8) - kept adhering to fabric 3 due to the effect of the subsequent crossing of the warp yarns (as visible in fig. 1).

[0021] According to the invention, the loom is provided with at least one or a plurality of weft parting tip heads 2, preferably arranged underlying the fabric with their longitudinal axis substantially crosswise (perpendicular) to the fabric being woven, mounted so as to be able to perform a movement both parallel and perpendicularly to the longitudinal axis thereof. Although the parting tip heads 2 can be mounted on a suitable control bar, according to a preferred embodiment, each tip head 2 is mounted integral with sley B and so as to be able to perform a movement along the longitudinal axis thereof; in particular, tip head 2 can be lifted, approaching abovelying fabric 3, or lowered, moving away from the fabric.

[0022] The vertex of the tip head is more or less rounded off depending on the fabric with which it is to interact but nevertheless such as to reduce the possibility of an undesired piercing of the woven fabric: as a matter of fact, it is intended to be inserted in between two sufficiently loose adjoining wefts (the last two introduced wefts) and hence to wedge in between the same until parting the last one from the preceding one. With thin yarns, which produce a remarkable tightening between the wefts upon beating of the sley, the tip head vertex must be sharper, while with thicker yarns, producing a fabric with more distanced wefts, the tip head may be advantageously more rounded at its vertex, which also aids a more regular operation, as will be detailed in the following.

[0023] Preferably, parting tip head 2 is integral with a piston of a pneumatic actuator (not visible), which is in turn actuated by an electrovalve. The pneumatic actuator is fastened on the front side (i.e. the fabric-facing one) of the weaving loom sley and can be fed with compressed air coming from the pneumatic circuitry onboard the loom.

[0024] As can be understood from the description set forth above, the device according to the invention is positively simple, providing only one or more tip heads (a number thereof depending on loom width, but for example 6 or 8 tip heads for loom width of 190 and 230 cm, respectively) controlled according to a longitudinal movement and displaceable crosswise integrally with the sley.

[0025] Each tip head is controlled so as to fit in between the last-but-one, correctly-introduced weft 5 and the last faulty weft 5a, so as to wedge in between the same and then to detach and move away the faulty weft from the last-but-one weft of fabric 3. Thanks to the movement of the tip head or of all the tip heads arranged along the sley in a direction substantially parallel to the warp yarns (hence perpendicular to the weft yarns), the faulty weft is detached remaining substantially parallel to the preceding one, thereby causing only crosswise loads with no longitudinal component to be applied on the wefts.

[0026] In the following a parting sequence is shown, with reference to a single tip head, being it understood that the same intervention occurs in correspondence of all the tip heads installed on the loom sley.

[0027] Let us assume that weft 5a is a faulty weft, which must be parted from fabric 3 and then removed.

[0028] After having beaten the last faulty weft 5a, the sley is set, with a stationary loom, in a preset position. In this position, the line of action of tip head 2 is directed at the last three or four wefts belonging to fabric 3.

[0029] The pneumatic actuator (i.e. the piston integral with the tip head) is then actuated to bring the tip head close to fabric 3 (fig. 3), adjusting the pressure so that pneumatic thrust F be the desired one, i.e. the one determined according to the features of the fabric, of the yarn, and of the weft density. As a matter of fact, as already mentioned, for fabrics having loose wefts, a low-intensity force F is used; for fabrics having tight and compact wefts, force F is increased. In other words, force F is set so that tip head 2 may rest on, and "feel", above-

lying fabric 3, during the movement of the sley, without running through it.

[0030] Once the head tip touches fabric 3, it is made to move back together with the sley, with which it is integral. The head tip thereby feels the lower face of fabric 3 (fig. 4) while the reed of the sley moves back; at the same time, the opening of warp shed 4 takes place, which operation occurs in phase with the movement of the sley by means of controls known per se.

[0031] Thanks to the opening of warp shed 4, the last weft 5a becomes free to move towards the reed. The tip head can hence easily wedge in between the last-but-one weft 5 and faulty weft 5a, until detaching the latter, as shown in fig. 5. In actual fact, the synchronisation between the opening of the warp shed and the reed movement is such as to allow tip heads 2 to engage with faulty weft 5a when it is devoid of the restraint formed by the crossing of warp yearns 4. The force F of tip head 2 is hence able to overcome the adhesion between the wefts and hence detach and displace faulty weft 5a.

[0032] Subsequently (fig. 6) tip head 2 moves away the portion of weft 5a from fabric 3, being integral with the reed which continues the movement backwards.

[0033] At the end of the backward movement of the sley mounting the reed, faulty weft 5a is completely detached from fabric 3 and tip head 2 can move back down along its line of action, due to the effect of the electrovalve intervention, which cancels pneumatic force F (possibly with an elastic or pneumatic return actuator).

[0034] Weft portion 5a, parted from fabric 3, is ready to be removed by means of known-type automatic removal devices.

[0035] At this point the significant advantages which may be achieved through the invention device are also evident.

[0036] The tip heads with the relative actuators are extremely simple and reliable devices and can be applied to the sley of any loom, even already operatively installed (hence available as retrofit).

[0037] It is possible to exploit the sley movement, without having to provide further actuators for the transversal movement of the tip heads. Moreover, the weft detachment step is performed by actively exploiting the backward run of the sley, which would otherwise represent an unused idle time. There derives also a general reduction of repair time, because the weft is already detached at the end of the shed opening step and it is hence possible to carry out weft removal at once, without having to wait for a new introduction of the auxiliary weft.

[0038] The number of actuators may vary depending on the loom width, but already with one it is theoretically possible to obtain an effective detachment of the faulty weft, with extremely reduced costs.

[0039] However, it is understood that the invention is not limited to the particular configurations illustrated above, which represent only non-limiting examples of the scope of the invention, but that a number of variants are possible, all within the reach of a person skilled in the art, without departing from the scope of the invention as defined in the accompanying claims.

[0040] For example, although reference has always been made to pneumatic actuators, it is not ruled out that it may be possible to adopt other-type actuators, for example electric ones (for example having linear motors) with a relative drive.

Claims

1. Parting device for a faulty weft in a weaving loom, comprising at least a wedging-in means (2) arranged substantially crosswise to a leading edge portion of a fabric being woven on the loom, said wedging-in means (2) being shaped to wedge in between two adjacent weft yarns acting along a respective intervention axis and also movable crosswise to said intervention axis, wherein said wedging-in means comprises at least a tip head (2) arranged according to a substantially crosswise axis to said portion of fabric being woven on the loom and shaped so as to be movable along its longitudinal axis and also crosswise to its longitudinal axis in a direction substantially parallel to the warp yarns, **characterised in that** said tip heads (2) are mounted on the front side of a sley (B) of the loom.

2. Parting device for a faulty weft in a weaving loom as claimed in claim 1, comprising a plurality of tip heads (2) arranged substantially aligned to the weft yarns.

3. Device as claimed in any one of claims 1 to 2, wherein said tip heads (2) are longitudinally movable by means of a pneumatic actuator.

4. Device as claimed in claim 3, wherein said tip heads (2) are integral with a piston of said pneumatic actuator.

5. Device as claimed in any one of claims 1 to 4, wherein said tip heads (2) are arranged in the proximity of said fabric portion being woven so that in their longitudinal and crosswise movement they can feel at least the last two/four fabric wefts.

6. Device as claimed in any one of claims 1 to 5, wherein said tip heads (2) are movable along their longitudinal axis through an actuator which imparts a fabric-directed force (F) smaller than the one necessary to run through the fabric.

7. Removal method of a faulty weft yarn from a fabric being woven on a weaving loom, comprising the steps of
detecting the occurrence of a faulty weft yarn (5a);
moving back a loom sley (B);
opening the warp shed (4) to free the faulty weft (5a)

from the warp yarns;
removing the faulty weft yarn (5a);
further comprising, before the step of removing the faulty weft yarn (5a), the steps of
arranging at least a wedging-in means (2) in the proximity of the fabric-forming area, arranged with an own intervention axis substantially crosswise to a leading edge portion of the fabric,
causing said wedging-in means to wedge in between the last-but-one weft (5) and the last faulty weft (5a) freed from the warp yarns,
causing to move away/back said wedging-in means engaged with said faulty weft (5a) from the fabric until detaching said faulty weft (5a) from the preceding weft (5), wherein said wedging-in means are in the shape of one or more tip heads (2), **characterised in that** said tip heads (2) are caused to move away/back from the fabric integrally with the sley (B).

8. Method as claimed in claim 7, wherein said tip heads (2) are arranged underneath the fabric (3) and are made to rise in contact with the fabric by means of pneumatic actuators.

9. Method as claimed in claim 8, wherein said tip heads (2) are as in any one of claims 1 to 5.

10. Method as claimed in any one of claims 7 to 9, wherein said wedging-in means are caused to engage with at least the last wefts (5, 5a) with a force (F), directed along the relative intervention axis, smaller than the one necessary to pierce the fabric.

Patentansprüche

1. Trennvorrichtung für einen fehlerhaften Schussfaden in einer Webmaschine, mit wenigstens einem Einklemmmittel (2), das im Wesentlichen quer zu einem führenden Randabschnitt eines auf der Webmaschine gewebten Gewebes angeordnet ist, wobei das Einklemmmittel (2) zum Einklemmen zwischen zwei benachbarten Schussfäden, die entlang einer jeweiligen Interventionsachse wirken, ausgeformt ist, und weiter quer zu der Interventionsachse beweglich ist, wobei das Einklemmmittel wenigstens einen Kopf (2) aufweist, der entsprechend einer im Wesentlichen quer zu dem Abschnitt des auf der Webmaschine gewebten Gewebes angeordnet ist und so geformt ist, dass er entlang seiner Längsachse beweglich ist und weiter quer zu seiner Längsachse in einer Richtung im Wesentlichen parallel zu den Kettfäden beweglich ist, **dadurch gekennzeichnet, dass** die Köpfe (2) auf der Vorderseite einer Lade (B) der Webmaschine montiert sind.

2. Trennvorrichtung für einen fehlerhaften Schussfaden in einer Webmaschine nach Anspruch 1, mit einer Mehrzahl von Köpfen (2), die im Wesentlichen mit den Schussfäden ausgerichtet sind.

3. Vorrichtung nach einem der Ansprüche 1 - 2, wobei die Köpfe (2) in Längsrichtung mittels eines pneumatischen Aktuators beweglich sind.

4. Vorrichtung nach Anspruch 2, wobei die Köpfe (2) einstückig mit einem Kolben eines pneumatischen Aktuators einstückig sind.

5. Vorrichtung nach einem der Ansprüche 1 - 4, wobei die Köpfe (2) in der Nähe des gewebten Gewebeabschnitts derart angeordnet sind, dass sie in ihrer Längs- und Querbewegung wenigstens die letzten 2/4-Schussfäden fühlen können.

6. Vorrichtung nach einem der Ansprüche 1 - 5, wobei die Köpfe (2) entlang ihrer Längsachse durch einen Aktuator beweglich sind, der eine auf das Gewebe gerichtete Kraft (F), die kleiner ist als diejenige, die erforderlich ist, um durch das Gewebe zu laufen, aufbringt.

7. Verfahren zum Entfernen eines fehlerhaften Schussfadens aus einem auf einer Webmaschine gewebten Gewebes, mit den folgenden Schritten:

Erkennen des Auftretens eines fehlerhaften Schussfadens (5a);
Zurückbewegen der Weblade (B);
Öffnen des Kettfachs (4) zum Befreien des fehlerhaften Schussfadens (5a) von den Schussfäden;
Entfernen des fehlerhaften Schussfadens (5a);
weiter mit, vor dem Schritt des Entfernens des fehlerhaften Schussfadens (5a), den folgenden Schritten:

Anordnen wenigstens eines Einklemmmittels (2) in der Nähe des das Gewebe bildenden Bereichs, der mit einer eigenen Interventionsachse im Wesentlichen quer zu dem führenden Randabschnitt des Gewebes angeordnet ist;
Bewirken des Einklemmens zwischen dem vorletzten Schussfaden (5) und dem letzten Schussfaden (5a), der von den Schussfäden befreit ist, durch das Einklemmmittel;
Verursachen einer Vor- und Zurückbewegung des Einklemmmittels, das mit dem fehlerhaften Schussfaden (5a) in Eingriff ist, von dem Gewebe bis zum Entfernen des fehlerhaften Schussfadens (5a) von dem vorangehenden Schussfaden (5), wobei die Einklemmmittel in Form eines oder mehrerer Köpfe (2) sind, **dadurch gekennzeichnet, dass** die Köpfe (2) zu einer Hin- und

Herbewegung mit dem Gewebe gemeinsam mit der Lade (B).

8. Verfahren nach Anspruch 7, wobei die Köpfe (2) unterhalb des Gewebes (3) angeordnet sind und dazu ausgebildet sind, in Berührung mit dem Gewebe mittels eines pneumatischen Aktuators angehoben zu werden.

9. Verfahren nach Anspruch 8, wobei die Köpfe (2) nach einem der Anspruche 1 - 5 ausgebildet sind.

10. Verfahren nach einem der Ansprüche 7 - 9, wobei die Einklemmmittel veranlasst werden, mit wenigstens dem letzten Schussfäden (5, 5a) mit einer entlang der relativen Interventionsachse gerichteten Kraft (F) in Eingriff zu kommen, die kleiner ist, als diejenige, die zum Durchstoßen des Gewebes erforderlich ist.

Revendications

1. Dispositif de séparation pour une trame défectueuse dans un métier à tisser, comprenant au moins un moyen d'insertion (2) disposé essentiellement transversalement à une partie de tête d'un tissu en cours de tissage sur le métier à tisser, ledit moyen d'insertion (2) ayant une forme permettant de l'insérer entre deux fils de trame adjacents le long d'un axe d'intervention respectif et étant également mobile transversalement audit axe d'intervention, dans lequel le moyen d'insertion comprend au moins une tige (2) disposée selon un axe essentiellement transversal à ladite partie de tissu en cours de tissage sur le métier à tisser et conformée de façon à être mobile le long de son axe longitudinal et également transversalement à son axe longitudinal dans une direction essentiellement parallèle aux fils de chaîne, **caractérisé en ce que** lesdites tiges (2) sont montées sur la partie avant d'un rot (B) du métier à tisser.

2. Dispositif de séparation pour une trame défectueuse dans un métier à tisser suivant la revendication 1, comprenant une pluralité de tiges (2) disposées essentiellement alignées sur les fils de trame.

3. Dispositif suivant l'une quelconque des revendications 1 à 2, dans lequel lesdites tiges (2) sont mobiles longitudinalement à l'aide d'un actionneur pneumatique.

4. Dispositif suivant la revendication 3, dans lequel lesdites tiges (2) font partie intégrante d'un piston dudit actionneur pneumatique.

5. Dispositif suivant l'une quelconque des revendications 1 à 4, dans lequel lesdites tiges (2) sont disposées à proximité de ladite partie de tissu en cours de tissage, de sorte que, dans leur mouvement longitudinal et transversal, elles peuvent sentir au moins les deux/quatre dernières trames de tissu.

6. Dispositif suivant l'une quelconque des revendications 1 à 5, dans lequel lesdites tiges (2) sont mobiles le long de leur axe longitudinal via un actionneur qui applique une force orientée vers le tissu (F) inférieure à celle nécessaire pour passer à travers le tissu.

7. Procédé d'élimination d'un fil de trame défectueux d'un tissu en cours de tissage sur un métier à tisser, comprenant les étapes de
détecter la présence d'un fil de trame défectueux (5a); déplacer en arrière un rot du métier (B);
ouvrir la foule de chaîne (4) afin de libérer la trame défectueuse (5a) des fils de chaîne;
enlever le fil de trame défectueux (5a);
comprenant en outre, avant l'étape d'enlèvement du fil de trame défectueux (5a), les étapes de
disposer au moins un moyen d'insertion (2) à proximité de la zone de formation du tissu, disposé avec un axe d'intervention propre essentiellement transversal à une partie de bord de tête du tissu,
provoquer l'insertion dudit moyen d'insertion entre l'avant-dernière trame (5) et la dernière trame défectueuse (5a) libérée des fils de chaîne,
provoquer le mouvement d'écartement/en arrière dudit moyen d'insertion engagé dans ladite trame défectueuse (5a) depuis le tissu jusqu'au détachement de ladite trame défectueuse (5a) de la trame précédente (5), où ledit moyen d'insertion a la forme d'une ou plusieurs tiges (2), **caractérisé en ce que** lesdites tiges (2) sont amenées à se déplacer à l'écart/en arrière du tissu intégré au rot (B).

8. Procédé suivant la revendication 7, dans lequel lesdites tiges (2) sont disposées en dessous du tissu (3) et sont conçues pour se soulever au contact avec le tissu à l'aide d'actionneurs pneumatiques.

9. Procédé suivant la revendication 8, dans lequel lesdites tiges (2) sont comme dans l'une quelconque des revendications 1 à 5.

10. Procédé suivant l'une quelconque des revendications 7 à 9, dans lequel ledit moyen d'insertion est amené à s'engager dans au moins les dernières trames (5, 5a) avec une force (F), dirigée le long de l'axe d'intervention relatif, qui est plus petite que celle nécessaire pour percer le tissu.

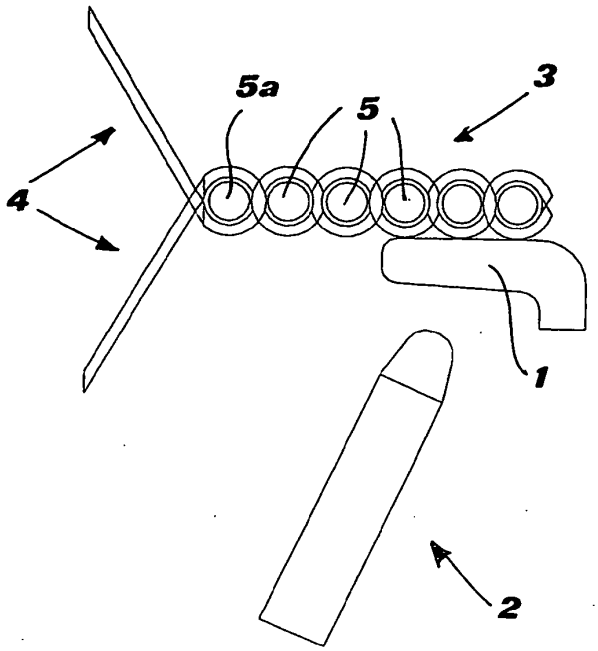


FIG. 1

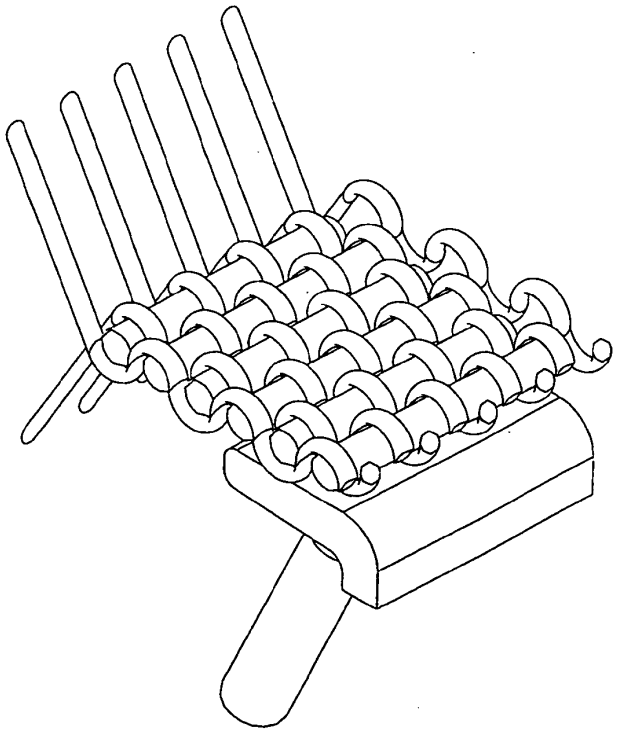


FIG. 2

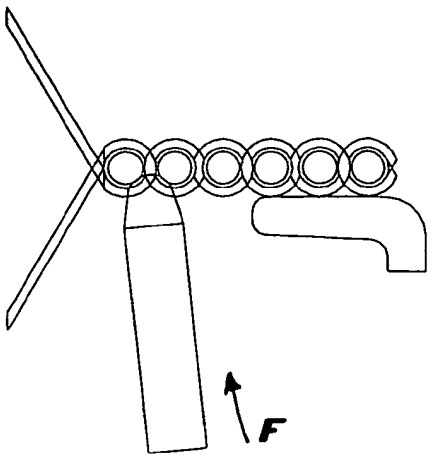


FIG. 3

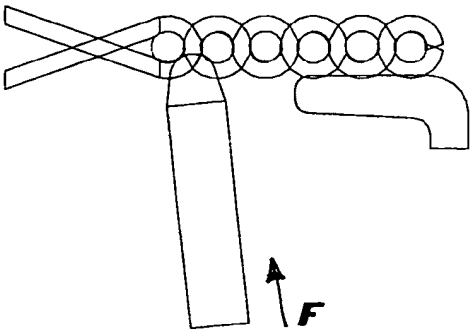


FIG. 4

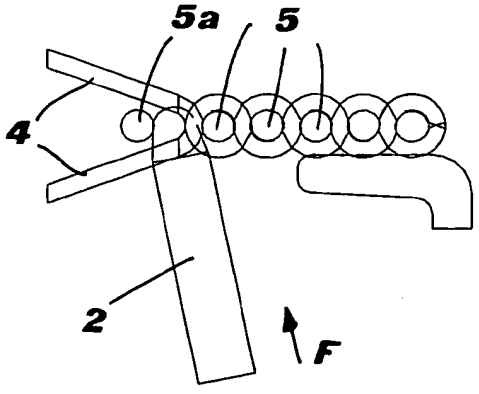


FIG. 5

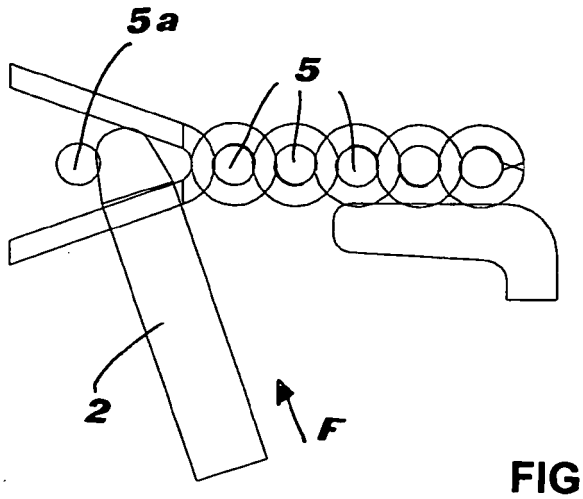


FIG. 6

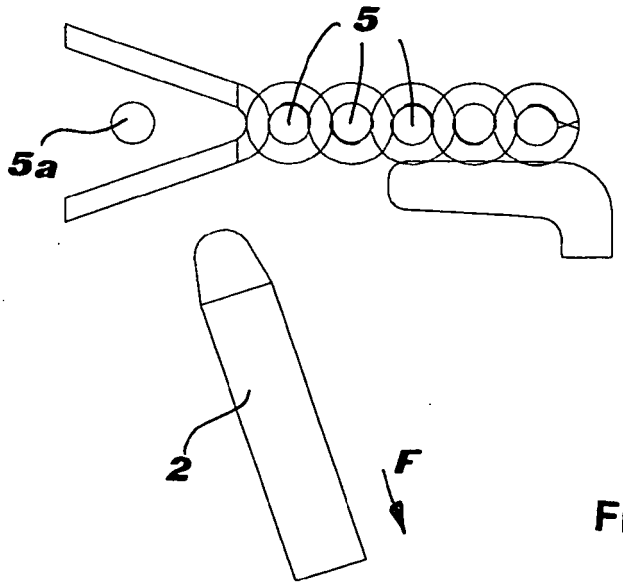


FIG. 7

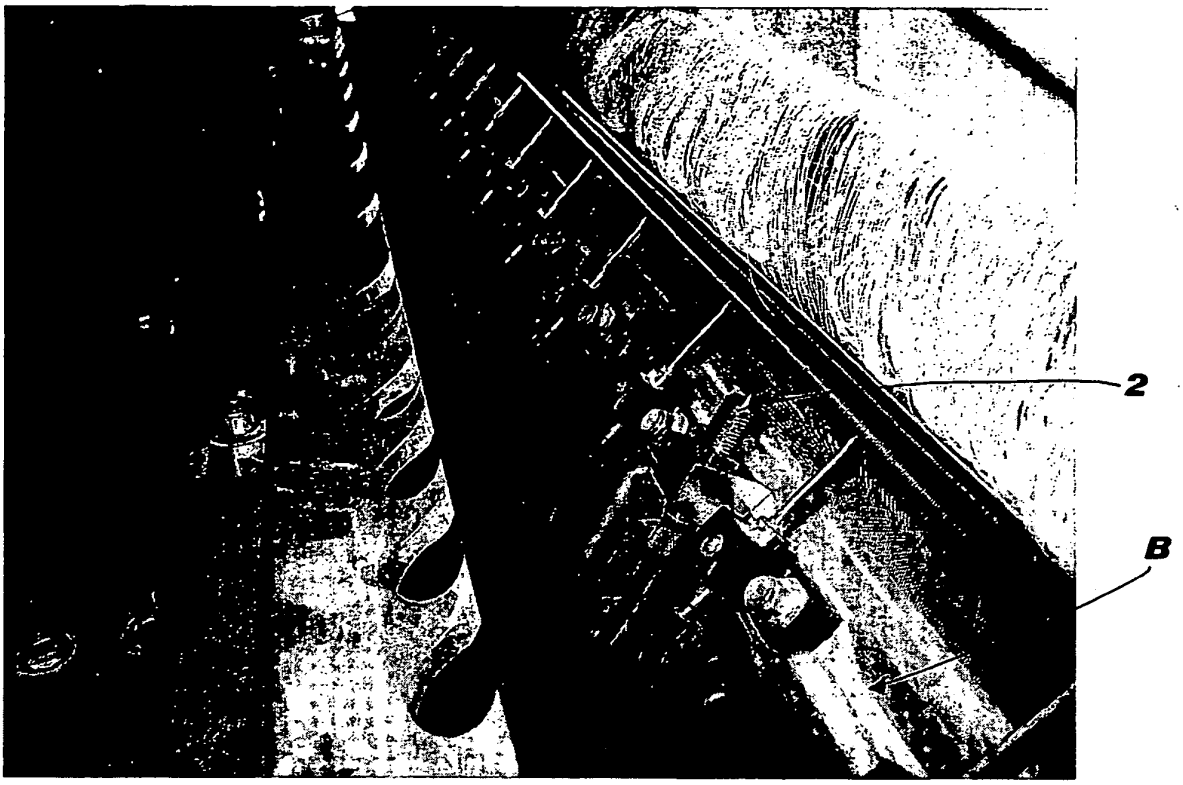


FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 853693 A **[0005]**
- EP 309013 A **[0005]**
- FR 2527655 **[0009]**
- FR 2583435 **[0009]**