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(54) **Control and adjustment device to form terry loops in terry looms and method thereof**

Verfahren und Vorrichtung zum Steuern und Regeln der Plüschhenkelbildung in Frottierwebmaschinen

Procéde et dispositif de commande et de réglage pour former les boucles dans un métier pour tissu éponge

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EP-A- 0 518 809
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Description

[0001] The present invention concerns a device and a method to control and adjust the members which allow to form the loops in terry looms. In particular, it concerns a device of the aforementioned type, which allows to easily carry out wide adjustments of the motion laws for the rotary oscillating movements of the take-up roller and for the coordinate alternate translatory movements of the warp yarn guiding roller, which cause the forming of terry loops.

[0002] As known, in modern weaving looms there is the need to obtain the maximun flexibility and possibility of adjustment with the minimum manual work on the part of the operators. Particularly in weaving looms which provide for the possibility to weave terry cloths, it is necessary to be able to quickly and easily change both the distance between each terry loop in the cloth (typically, one loop every three or four beatings up of the loom: so-called "3/1 loop" and, respectively, "4/1 loop") and the height of the loop (shown by h in fig. 1) in respect of the basic terry cloth.

[0003] According to the most recent known technique, these adjustments - which will be indicated hereinafter "of motion law" and respectively "of amplitude" - are carried out by a control and adjustment device which is apt to produce a relative movement between the warp yarns and the weft yarns, such as to insert, at regular intervals, a weft yarn in an offset position (namely - as shown in fig. 1 - at a preset distance S from the fabric Te) which, in the successive beating up, will allow to form the loops of the terry cloth.

[0004] Said relative movement can be obtained with two different methods, which are briefly illustrated hereunder with reference to a "3/1 loop" terry cloth.

[0005] According to a first solution, one modifies the beating up point of the reed P, so that the first two wefts t_1 and t_2 are left at the preset distance S: in the beat-up of the third weft t_3 the reed P forms the wanted loop by performing the full stroke.

[0006] According to another solution, the fabric Te formed on the "weaving side" is shifted at a preset distance S, and kept there during insertion of the first two wefts t_1 and t_2: before the beat-up of the third weft t_3, the fabric Te is moved back to the initial position, thereby forming the loop with the regular beat-up of the weft t_3.

[0007] In other words, the first solution acts appropriately on the motion of the sley, while the second solution acts on the motion of the cloth holder, namely on the controlled and coordinate movement of the take-up roller and of the warp yarn guiding roller.

[0008] Both movements are obtained by means of an electromechanical device, which receives the motion from the main shaft of the loom and transmits it to the members concerned through leverages, whose reciprocal engagement is preset by means of low-power actuators.

[0009] A device of this type is widely illustrated EP-A-534.403, in the name of Somet Società Meccanica Tessile S.p.A., the contents of which may be used as reference for a better understanding of the present description.

[0010] Said device comprises first mechanical members, in the form of cam means, to determine the law of the successive cyclic movements of the cloth holder, and second mechanical members, in the form of levers of different length, apt to determine the amplitude of the movement and thus the height of the terry loop.

[0011] Such a device, though apt to satisfactorily overcome many of the drawbacks of prior art, allows an automatic adjustment of the amplitude (that is, by using electromagnetically controlled mechanisms) only between three distinct values, one of them being a naught value. It is possible to preset intermediate values of amplitude, or differing from the three predermined values, only by performing manual operations on the kinematic mechanism, in order to change the position of a lever end inside an eyelet.

[0012] Device for the continuous adjustment of similar kinematic mechanisms forming part of this field of technique are known from EP-298.454, EP-350.446, and EP-768.407.

[0013] Nevertheless, all these systems are complicated and thus scarcely reliable; they involve the use of a plurality of members performing relative movements one in respect of the other, which give rise to undesired frictions and overheating; they require a constant active control on an adjustment motor; they involve the use of ratchet gears or other disconnectable mechanisms, to stop the action of the device when the loom must work in normal conditions without having to form a terry loop.

[0014] EP 518.809 discloses a terry loop forming device according to the preamble of claim 1, where an articulated quadrilateral mechanism is provided and an actuating device is apt to change the length of a lever of said mechanism so as to adjust the amplitude of the motion.

DE4432452 discloses a terry-loop-forming device where a single drive is used to determine the motion law and the amplitude of the loop-forming movement.

[0015] The scope of the present invention is thus to solve also these further inconveniences of prior art, by supplying an adjustment device to control the cyclic movement of a cloth holder in a terry loom, which allows:

[0016] to continuously vary, in an extremely simple manner, the amplitude of the movement up to reaching naught values of the amplitude for a normal working condition of the loom; and

[0017] to actively operate with a shifting member only during adjustment, said member remaining in a fixed position during normal working in steady conditions;

[0018] all this being achieved with a minimum amount of elements of the kinematic mechanism and by eliminating as far as possible the use of high-friction sliding couplings, so as to provide a device apt to work in a continuous and reliable manner, while requiring very lit-

tle maintenance.

[0019] said objects are reached by means of a device and method as described in the accompanying claims.

[0020] In short, the device to form terry loops according to the present invention is of the type comprising a drive shaft for transmission of a main rotary movement, and an outlet lever caused to rotate with an oscillating movement, between these two elements there being provided first mechanical members to determine the motion law and second mechanical members to adjust the amplitude of said oscillating movement in which actuating means are apt to change the geometrical position of a hinge of a kinematic chain of said second members, so that a specific transmission ratio and thus a given loop height may correspond to each of the geometrical positions taken up by said hinge.

[0021] Further characteristics and advantages of the device according to the present invention will anyhow be more evident from the following detailed description of a preferred embodiment thereof, given by way of example and illustrated on the accompanying drawings, in which:

[0022] Fig. 1 is a diagrammatic perspective view of the weaving zone, illustrating the main parameters to form the loop in a terry cloth;

[0023] Fig. 2 is a diagrammatic side elevation view of the main structure of the loom, into which is inserted the device according to the invention;

[0024] . Figs. 3A and 3B are diagrammatic side elevation views of the device according to the invention, in a first working position for two different rotation angles of the drive shaft of the device; and

[0025] Figs. 4A and 4B are diagrammatic side elevation views of the device according to the invention, in a second working position for two different rotation angles of the drive shaft of the device.

[0026] With reference to fig. 2, a main motor M1 of the weaving loom is mechanically connected in synchronism both with the sley 3 and with a drive shaft 1 of the device for terry loop formation.

[0027] On said drive or inlet shaft 1 there are keyed two conjugate cams 4a and 4b (figs. 3A-4B) having a profile apt to determine the motion law for terry loop formation. To change said motion law - for instance, modify the number of weft yarns being inserted before completion of the loop - said cams 4a and 4b can be easily replaced.

[0028] The cams 4a and 4b transmit the motion to a rocking lever 5, which bears onto said cams by means of rollers 5a and 5b respectively, and which is pivoted in 5c. Having bound the lever 5 in the two rotation senses, there is no need to adopt any precautions (such as return springs) in order to keep the contact between the rollers 5a, 5b, and the cam surfaces 4a, 4b.

[0029] According to the invention, the end of the rocking lever 5 has an eyelet 5d, of suitable length, into which is apt to freely slide a pin 6 fixed to a hinge forming part of an inlet side of an articulated quadrilateral kinematic mechanism.

[0030] Said kinematic mechanism consists of an inlet rod 7, a connection rod 8 and an outlet lever 2. The connection rod 8 is pivoted, on one side, by means of the intermediate hinge-pin 6 to the inlet rod 7 and, on the other side, by means of another intermediate hinge 9 to the outlet lever 2.

[0031] The outlet lever 2, oscillating about a first base hinge positioned in the fixed point J_1, is the outlet lever of the terry loop formation device, since its end 2a is connected to rods 20 and 21 moving, respectively, the front cloth holder 22 and the warp yarn guiding roller 23.

[0032] Whereas, the inlet rod 7 is hinged at its other end onto a second base hinge 10 fixed to a shifting member. In the embodiment shown, said member is in the form of an adjusting lever 11, hinged in a fixed axis J_2 and comprising a sector gear 12 extending over a circumferential path of a certain diameter and length.

[0033] The sector gear 12 engages with a pinion 13 in the form of a worm screw, controlled by means of an auxiliary driving motor M2. The coupling between the worm screw 13 and the sector gear 12 forms an irreversible transmission: this represents an advantage, it being sufficient for the motor M2 to transmit a control only during adjustment, while it is no longer necessary for said motor to transmit any torque in steady running conditions, since the position of the shifting member 11 remains unvaried due to irreversibility of the coupling. It is thus evident that the auxiliary motor M2 can also have a low power and limited performances.

[0034] As can be understood, also by referring to the drawings, the auxiliary motor M2 allows to change the angular position of the shifting member or adjusting lever 11 and thus the position of the second base hinge 10 which forms part of the articulated quadrilateral of apexes 10-6-9-J_1. Consequently, also the transmission ratio between the inlet rod 7 and the outlet lever 2 is substantially modified: this allows to vary the amplitude of the oscillating movement transmitted, through the articulated quadrilateral mechanism, from the rocking lever 5 to the outlet lever 2.

[0035] As can be seen from figs. 3A and 3B (which illustrate two different angular positions, α_1 and α_2 respectively, of the drive shaft 1) the oscillation of the rocking lever 5, controlled by the cams 4a and 4b, is transmitted to the inlet rod 7 through the coupling formed by the hinge-pin 6 and the eyelet 5d, and in turn to the outlet lever 2 with a transmission ratio determined by the geometry of the articulated quadrilateral mechanism, namely by the position of the second base hinge 10.

[0036] - The motor M2 is preferably provided with an encoder allowing a microprocessor to detect the exact position of the adjusting lever 11, so as to preset the proper weaving program and that of terry loop formation.

[0037] According to a preferred embodiment of the invention, the inlet rod 7 and the connection rod 8 have the same length. In this case, it is possible to find a position of the adjusting lever 11 (figs. 4A and 4B) in which

the second movable base hinge 10 perfectly overlaps the intermediate hinge 9: in this condition, the motion of the rocking lever 5 is transmitted to the two rods 7 and 8, which oscillate together without any motion being transmitted to the outlet lever 2 which keeps motionless. Evidently, in these conditions, no oscillating motion is transmitted by the device according to the invention to the cloth holder of the loom, thereby obtaining working conditions in which no terry loop is formed.

[0038] With the device according to the present invention it is thus possibile to continuously vary the amplitude of the oscillating movement allowing to form the terry loops, from a naught value corresponding to the normal working conditions of the loom, up to a maximum value determined by the dimensions of the elements of the aforedescribed kinematic chain.

[0039] All the objects set forth earlier in the description have thus been achieved. In fact, the device according to the present invention is extremely simple and consists of a comparatively small number of elements; it is easy to operate and requires a positive action of the auxiliary motor M2 only during adjustment, the shifting member 11 remaining motionless in a steady working condition; it allows, in a fully automatic way, to continuously vary the amplitude of the oscillating movement, starting from a naught value, without having to make use of ratchet gears or other mechanisms having to be disconnected.

[0040] It is anyhow understood that the invention is not limited to the particular embodiment described heretofore, which merely represents a non-limiting example of its scope, but many variants can be introduced therein, all within the reach of a person skilled in the art, without thereby departing from the scope of the present invention.

[0041] For example - if it were deemed preferable for the specific working conditions - the shifting member, instead of being in the form of an adjusting lever 11, could be in the form of a toothed sliding cursor apt to shift the hinge 10 along a rectilinear path, instead of a circumferential path.

[0042] Likewise, it is not strictly necessary for the eyelet 5d to be engaged by the intermediate hinge-pin 6, between the inlet rod 7 and the connecting rod 8, it being sufficient for the motion of the rocking lever 5 to be transmitted to the inlet rod 7.

Claims

1. Device to control and adjust, in terry looms, the movements of the take-up roller and of the warp yarn guiding roller which cause the forming of terry loops - of the type comprising a drive shaft (1), connected to a main drive of the loom, and an outlet lever (2) apt to impart a cyclic movement to said take-up roller and/or guiding roller, between said shaft (1) and said lever (2) being provided first mechanical members (4a, 4b, 5) to determine the motion law and a kinematic chain comprising at least a quadrilateral mechanism (7, 8, 2), **characterised in that** it also comprises actuating means (11, 13 M2) apt to change the geometrical position of a movable base hinge (10) of said quadrilateral mechanism to adjust the transmission ratio between said shaft (1) and said lever (2).

2. Device as in claim 1), wherein said quadrilateral mechanism comprises an inlet rod (7) controlled by said first mechanical members (4a, 4b, 5), a connection rod (8), and an outlet rod forming said outlet lever (2) or being integral therewith, said movable base hinge (10) coinciding with the base hinge of one of said inlet or outlet rods.

3. Device as in claim 2), wherein said movable hinge is the base hinge (10) of said inlet rod (7).

4. Device as in claims 1), 2) or 3), wherein said actuating means comprise an electric motor (M2) apt to control a shifting member to shift said movable hinge (10).

5. Device as in claim 4), wherein said shifting member is in the form of an oscillating adjusting lever (11) comprising a sector gear (12) engaged with a corresponding pinion (13) of said electric motor (M2).

6. Device as in any one of claims 3) to 5), wherein said inlet rod (7) and said connection rod (8) are of equal length, so that a position of the movable hinge (10) can be determined in correspondence of which the outlet lever (2) keeps motionless during motion of the first mechanical members.

7. Device as in any one of the previous claims, wherein said first mechanical members include of a rocking lever (5), controlled by cam means (4a, 4b) and comprising an eyelet (5d) into which is apt to freely slide a pin (6) fixed to the inlet rod (7) of said articulated quadrilateral mechanism.

8. Method to control and adjust, in a terry loom, the movements of the take-up roller and of the warp yarn guiding roller which cause the forming of terry loops - comprising to provide a terry loop forming device including first mechanical members (4a, 4b, 5) to determine the motion law and a quadrilateral mechanism (7, 8, 2), **characterised in that** the amplitude of said movements which cause the forming of terry loops is varied shifting the position of a movable base hinge (10) of said quadrilateral mechanism (7, 8, 2).

9. Method as in claim 8), wherein the naught value of said oscillation amplitude, namely the loom working

condition in which no terry loop is formed, is obtained by causing the position of said movable base hinge (10) to coincide with the position of the not adjacent intermediate hinge (9) of said quadrilateral mechanism (7, 8, 2).

Patentansprüche

1. Vorrichtung zum Steuern und Einstellen der Bewegungen der Aufnahmewalze und der den Kettfaden führenden Walze, die bei Frottierwebmaschinen das Bilden der Frottierschlaufen verursachen - von der Art mit einer Antriebswelle (1), die mit einem Hauptantrieb der Webmaschine verbunden ist, und mit einem Ausgangshebel (2) der dazu in der Lage ist, eine zyklische Bewegung auf die Aufnahmewalze und/oder die Führungswalze aufzubringen zwischen der Welle (1) und dem Hebel (2), der mit ersten mechanischen Elementen (4a, 4b, 5) zum Bestimmen des Bewegungsgesetzes und einer kinematischen Kette mit wenigstens einem vierseitigen Mechanismus (7, 8, 2) versehen ist, **dadurch gekennzeichnet, dass** sie weiter Betätigungsmittel (11, 13 M2) aufweist. die zur Änderung der geometrischen Position eines beweglichen Basisgelenks (10) des vierseitigen Mechanismus zum Einstellen des Übertragungsverhältnisses zwischen der Welle (1) und dem Hebel (2) eingerichtet sind.

2. Vorrichtung nach Anspruch 1, wobei der vierseitige Mechanismus eine Eingangsstange (7), die durch die ersten mechanischen Elemente (4a, 4b, 5) gesteuert wird, eine Verbindungsstange (8) und eine Ausgangsstange, die den Ausgangshebel (2) bildet oder mit diesem einstückig ist, aufweist, wobei das bewegliche Basisgelenk (10) mit dem Basisgelenk entweder der Eingangsstange oder der Ausgangsstange übereinstimmt.

3. Vorrichtung nach Anspruch 2, wobei das bewegliche Gelenk das Basisgelenk (10) der Eingangsstange (7) ist.

4. Vorrichtung nach Anspruch 1, 2 oder 3 wobei das Betätigungsmittel einen Elektromotor (M2) aufweist, der zum Steuern eines Schiebelements zum Verschieben des beweglichen Gelenks (10) eingerichtet ist.

5. Vorrichtung nach Anspruch 4, wobei das Schiebelement in der Form eines schwingenden Einstellhebels (11) ist, mit einem Sektorzahnrad, das mit einem entsprechenden Ritzel (13) des Elektromotors (M2) in Eingriff ist.

6. Vorrichtung nach einem der Ansprüche 3 - 5, wobei die Eingangsstange (7) und die Verbindungsstange (8) gleich lang sind, so dass eine Position des beweglichen Gelenks (10) bestimmt werden kann, bei der der Ausgangshebel (2) während der Bewegung der ersten mechanischen Elemente bewegungslos verharrt.

7. Vorrichtung nach einem der vorangehenden Ansprüche, wobei die ersten mechanischen Elemente einen Schwinghebel (5) aufweisen, der durch Nokkenmittel (4a, 4b) gesteuert wird und ein Langloch (5d) aufweist, in der ein Stift (6), der an der Eingangsstange 7 des gelenkigen vierseitigen Mechanismus fixiert ist, frei gleiten kann.

8. Verfahren zum Steuern und Einstellen der Bewegungen der Aufnahmewalze und der Kettfadenführungswalze bei Frottierwebmaschinen, die das Bilden der Frottierschlaufen verursacht - mit einer Frottierschlaufenbildungsvorrichtung einschließlich ersten mechanischen Elementen (4a, 4b, 5) zum Bestimmen des Bewegungsgesetzes und einem vierseitigen Mechanismus (7, 8, 2), **dadurch gekennzeichnet, dass** die Amplituden der Bewegungen, die das Bilden der Frottierschlaufen verursacht, durch Verschieben der Position des beweglichen Basiselements (10) des vierseitigen Mechanismus (7, 8, 2) variiert wird.

9. Verfahren nach Anspruch 8, wobei der Null-Wert der Schwingungsamplitude, also der Arbeitsbedingung, in dem keine Frottierschlaufe gebildet wird, durch Bewirken, dass die Position des beweglichen Basisgelenks (10) mit der Position des nicht benachbarten Zwischengelenks (9) des vierseitigen Mechanismus (7, 8, 2) übereinstimmt, erreicht wird.

Revendications

1. Dispositif pour commander et régler, dans les métiers à tisser les tissus éponge, les mouvements du rouleau d'appel de tissu et du rouleau de guidage de fils de chaîne qui provoquent la formation de boucles de tissu éponge - du type comprenant un arbre d'entraînement (1), relié à une commande principale du métier, et un levier de sortie (2) adapté à communiquer un mouvement cyclique audit rouleau d'appel de tissu et/ou audit rouleau de guidage, entre ledit arbre (1) et ledit levier (2) étant prévus des premiers organes mécaniques (4a, 4b, 5) pour déterminer la loi de mouvement et une chaîne cinématique comprenant au moins un mécanisme quadrilatéral (7, 8, 2), **caractérisé en ce qu'**il comprend également des moyens d'actionnement (11, 13, M2) adaptés à modifier la position géométrique d'une articulation de base mobile (10) dudit mécanisme quadrilatéral pour régler le rapport de transmission entre ledit arbre (1) et ledit levier (2).

2. Dispositif selon la revendication 1, dans lequel ledit mécanisme quadrilatéral comprend une tige d'entrée (7) commandée par lesdits premiers organes mécaniques (4a, 4b, 5), une bielle (8), et une tige de sortie formant ledit levier de sortie (2) ou étant d'un seul tenant avec celui-ci, ladite articulation de base mobile (10) coïncidant avec l'articulation de base de ladite tige d'entrée ou de ladite tige de sortie.

3. Dispositif selon la revendication 2, dans lequel ladite articulation mobile est l'articulation de base (10) de ladite tige d'entrée (7).

4. Dispositif selon la revendication 1, 2 ou 3, dans lequel lesdits moyens d'actionnement comprennent un moteur électrique (M2) adapté à commander un organe de déplacement pour déplacer ladite articulation mobile (10).

5. Dispositif selon la revendication 4, dans lequel ledit organe de déplacement se présente sous la forme d'un levier de réglage oscillant (11) comprenant un secteur denté (12) engagé avec un pignon correspondant (13) dudit moteur électrique (M2).

6. Dispositif selon l'une quelconque des revendications 3 à 5, dans lequel ladite tige d'entrée (7) et ladite bielle (8) sont d'égale longueur, de manière qu'une position de l'articulation mobile (10) puisse être déterminée en correspondance de laquelle le levier de sortie (2) reste immobile durant le mouvement des premiers organes mécaniques.

7. Dispositif selon l'une quelconque des revendications précédentes, dans lequel lesdits premiers organes mécaniques comprennent un levier basculant (5), commandé par des moyens formant cames (4a, 4b) et comprenant un oeillet (5d) dans lequel est adaptée à glisser librement une tige (6) fixée à la tige d'entrée (7) dudit mécanisme quadrilatéral articulé.

8. Procédé pour commander et régler, dans un métier à tisser les tissus éponge, les mouvements du rouleau d'appel de tissu et du rouleau de guidage de fils de chaîne qui provoquent la formation de boucles de tissu éponge - comprenant la fourniture d'un dispositif de formation de boucles de tissu éponge comprenant des premiers organes mécaniques (4a, 4b, 5) pour déterminer la loi de mouvement et un mécanisme quadrilatéral (7, 8, 2), **caractérisé en ce que** l'amplitude desdits mouvements qui provoquent la formation de boucles de tissu éponge est modifiée en déplaçant la position d'une articulation de base mobile (10) dudit mécanisme quadrilatéral (7, 8, 2).

9. Procédé selon la revendication 8, dans lequel la valeur zéro de ladite amplitude d'oscillation, à savoir la condition de fonctionnement du métier dans laquelle aucune boucle de tissu éponge n'est formée, est obtenue en amenant la position de ladite articulation de base mobile (10) à coïncider avec la position de l'articulation intermédiaire non adjacente (9) dudit mécanisme quadrilatéral (7, 8, 2).

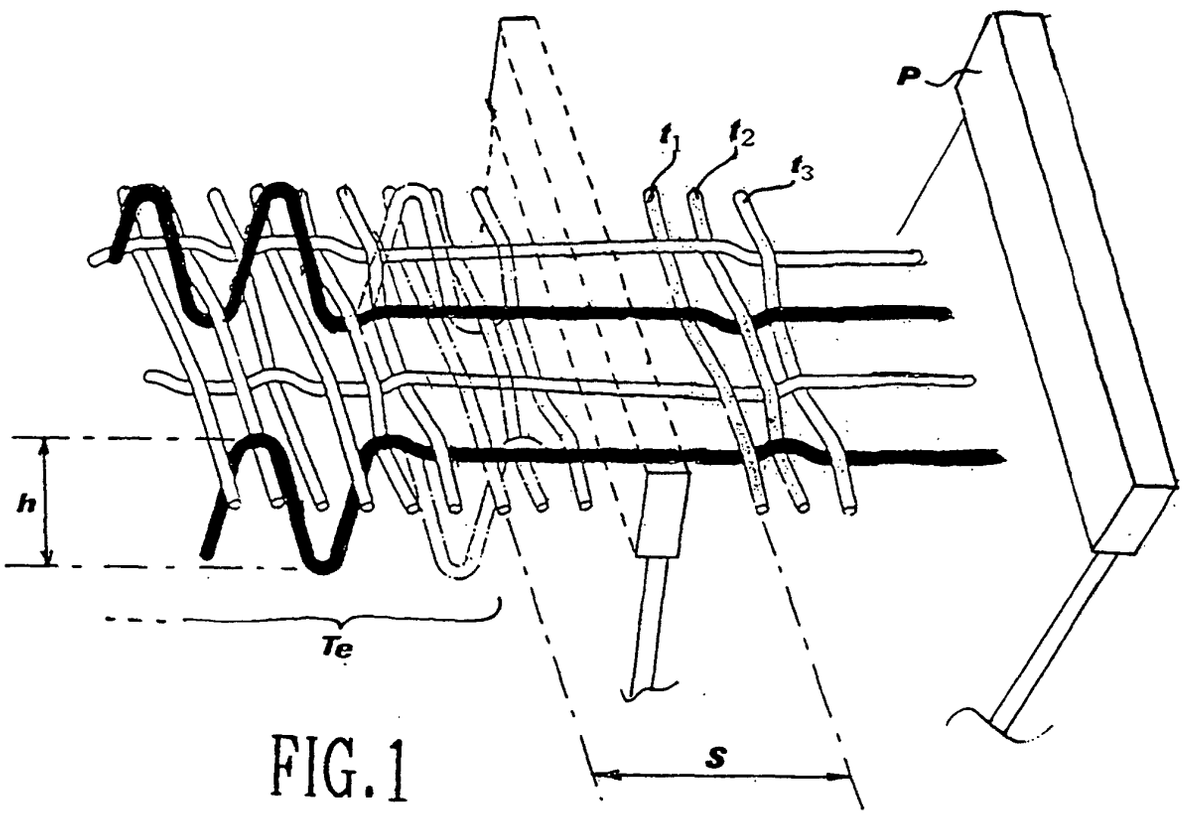


FIG.1

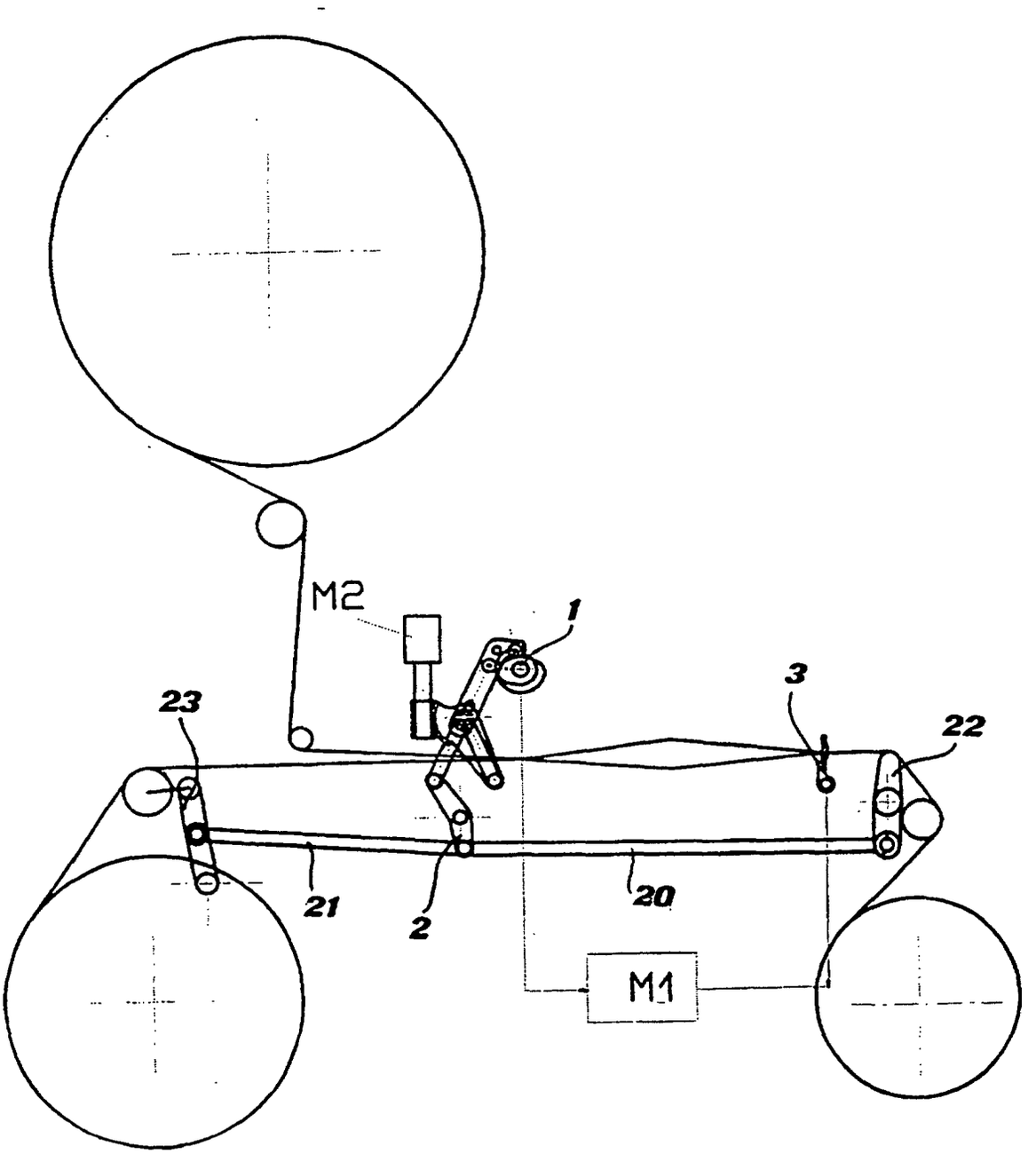


FIG.2

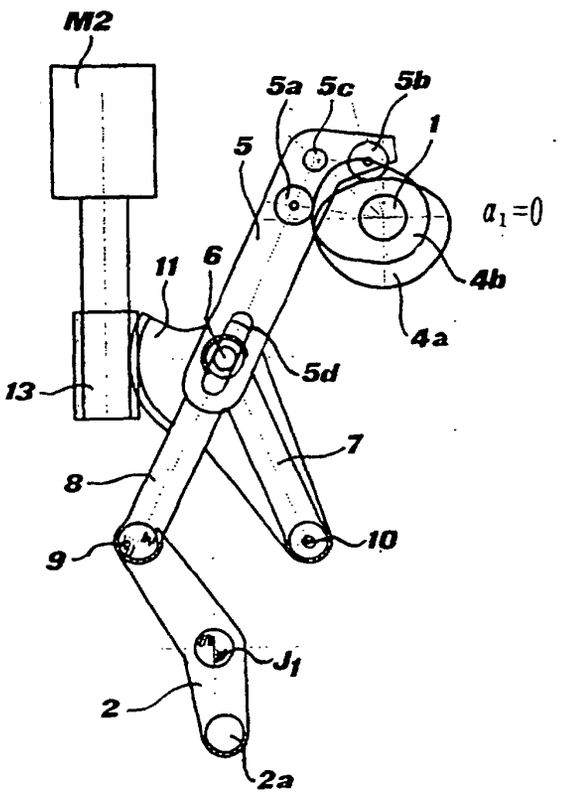
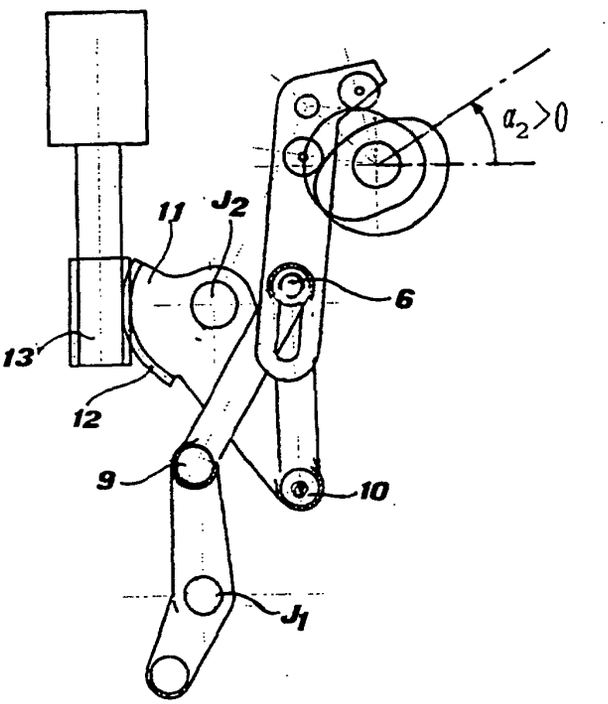

M2
5a
5c
5b
1
5
$a_1=0$
11
6
4b
4a
13
5d
7
8
10
9
J_1
2
2a

FIG.3A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11
J_2
6
13
12
9
10
J_1

FIG.3B

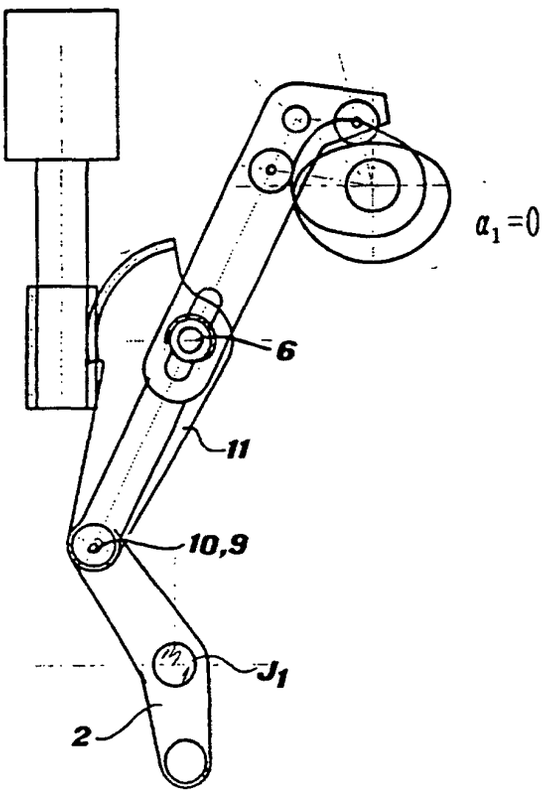

FIG.4A

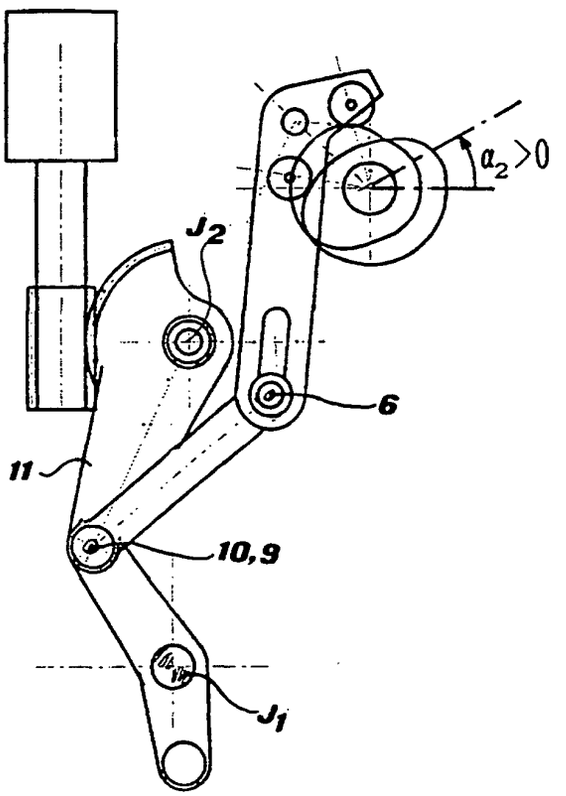

FIG.4B