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(54) **DEVICE FOR CARRYING OUT THE PROGRAMMING OF ROTARY DOBBIES IN WEAVING MACHINES**

VORRICHTUNG ZUM PROGRAMMIEREN VON ROTATIONSSCHAFTMASCHINEN FÜR WEBMASCHINEN

DISPOSITIF DESTINE A LA PROGRAMMATION DE RATIERES ROTATIVES DANS DES METIERS A TISSER

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**EP-A- 0 570 628** **EP-A- 0 607 632**  
**EP-A- 0 768 402**

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## Description

**[0001]** The present invention relates to a device for carrying out the programming of rotary dobbies for the operation of heald frames in weaving machines, of the type comprising improved electric-motor control means.

**[0002]** It is known that the positioning of the heald frames of a weaving machine or loom from which the configuration of the weft of the finished fabric is obtained, must be programmed in a predetermined sequence which defines the position which each frame must assume upon each rotation of the main shaft, this generating the controls for the oscillating devices which operate the frames themselves, so as to obtain for them one of the two - high or low - positions required.

**[0003]** Since the dobby main shaft is operated in accordance with an intermittent cycle, with the dead centre at each half-turn through 180°, the operating and control device must be able, for each stoppage of the main shaft, to make the rotating shaft alternately integral or not with an eccentric cam or similar device actuating the frame-moving leverage, resulting, in one case, in the change of position thereof and, in the other case, in the previous position being maintained. The dobbies operating the heald frames in weaving looms must therefore be controlled by means of special devices for carrying out the programming, which are designed to produce, by means of special actuators, the variation in the relative positions of the operating means which, in turn, vary the position of the frames.

**[0004]** It is already known in the art of a large number of devices for carrying out the programming of the dobbies, which, however, have numerous drawbacks, including the need to stop the shaft at each half-turn, so as to have the time necessary for clearing the previous programming operation and entering a new one for the next half-turn. It is obvious how the programming devices of this type cause an increase in the idle time of the machine, to the detriment of the machine productive time.

**[0005]** Another type of drawback which may be encountered in the devices of the known type most widely used - involving a single control, with times for pressing of the operating leverage synchronised with the centreline of the movement diagram, both for forward movement and for reverse movement - consists in the high probability of errors during selection of the movement in a clockwise or anticlockwise direction, it being indispensable, moreover, with said devices, to perform a few half-turns under zero load when it is required to locate the weft and reset the correct shed for reading purposes.

**[0006]** The technical problem of providing a device for carrying out the programming of dobbies, in particular rotary dobbies for controlling weaving machines, which allows: selection of the position of heald frames to be performed without stopping rotation of the main shaft at each half-turn; independent selection of the frames for rotation in the clockwise direction and for rotation in the anticlockwise direction; and reduced stressing of the

warp yarns, ensuring reduced stresses and forces in the dobby components, so as to allow extremely high working speeds and a low power consumption, had been solved with the device forming the subject of European patent no. 768,402 in the name of the same Applicant. This device, intended for rotary dobbies of the type in which the heald frame control rods are actuated by connecting rods, each mounted on an eccentric ring rotating with respect to the main shaft of the dobby, which has moreover a disc made to rotate by said shaft, and a selection lever pivotally hinged on said eccentric ring and designed to engage with said disc via one of its end teeth, through the action of a spring - comprised an operating lever rotating about a fixed fulcrum owing to the action of thrusting means and in opposition to spring-type recall means, so that the projecting end profiles of the same operating lever were alternately arranged along or outside the trajectory of the end opposite to the toothed end of the selection lever, so as to cause or prevent engagement thereof with the rotating disc, the rotation of the operating lever being performed during rotation of the main shaft. In the embodiment according to the aforementioned patent a mechanical solution was adopted, whereby one of the projecting end profiles of said operating lever was formed as a tooth pivotally hinged on the corresponding end of said lever, inside a recess having two diverging abutment walls, and kept in contact with one of them by a spring, so as to be able to oscillate until contact with the other one was established, so as to phase-displace the active engagement with said selection lever, in the condition of backward movement of the dobby, and, correspondingly, the spring acting on the selection lever and the one acting on the toothed profile of the operating lever were dimensioned so that the action of the former could not be exceeded by the action of the latter.

**[0007]** With the subsequent European patent no. 799,919, the same Applicant introduced an important improvement consisting in the replacement of the mechanic solution detailed in the aforementioned patent with the use of electric operating means which are electronically-controlled and capable of producing the movements of said operating lever or replacing the lever in its control function. The same patent suggested two practical embodiments of the new solution, based on the use of electric stepper motors, widely illustrated in the drawings thereof and clearly defined in the subordinate claims.

**[0008]** Other solutions based on the use of electric motors to control the operating lever in the programming device at issue were contained in the European patent application no. 1,251,194, again in the name of the same Applicant.

**[0009]** With the solution subject of the present invention, new and original ways and means are now adopted to manufacture the electric-motor control of the device for carrying out the programming of dobbies. Thus it is possible, on the one hand, to further limit the power and the thickness of electric control motors, and, on the other,

to guarantee both extremely precise and reliable controls, and a more reliable retain of the C-shaped control lever in its working positions.

**[0010]** Furthermore, the precision and the strict control characterising said means allow, for the first time, the C-shaped operating levers of the device to assume an intermediate position, in addition to the ordinary working positions employed so far. This allows to translate into practice the possibility of achieving a condition of continuous sequential upward and downward movement of each frame, which is typical of plain fabric weaving, in addition to the conventional conditions of high and low heald frames, resulting in a drastic simplification of the device and dobby operation for this type of weaving.

**[0011]** For this purpose, the invention relates to a device for carrying out the programming of rotary dobbies for the operation of heald frames in weaving machines, in particular weaving looms, of the type in which the heald-frame operating levers are actuated by connecting rods, each mounted on an eccentric ring rotating with respect to the main shaft of the dobby, which has moreover a disc for each frame, which disc is made to rotate by said shaft and a selection lever pivotally hinged on said eccentric ring and designed to engage with said disc via one of its end teeth, through the action of a spring, said device comprising for each frame a C-shaped lever which is made to oscillate about a fixed point, so that the toothed ends of the lever itself are arranged either along or outside the trajectory at the end opposite to the toothed end of the selection lever, in order to cause or prevent the engagement of the lever with the rotating disc, characterised in that positive controls are provided causing the C-shaped levers to oscillate, said positive controls being synchronised with the rotation of the loom main shaft and obtained independently for each heald frame, by means of a rotary electric motor. In this device, each of said rotary electric motors controls a C-shaped lever by means of a crank-and-rod device.

**[0012]** The invention will now be described in greater detail, purely by way of example, with reference to the accompanying drawings, which illustrate a currently preferred practical embodiment thereof in its elements concerning one of the heald frames. In these drawings:

fig. 1 shows a partial schematic cross-section of a rotary dobby to which the device according to the invention is applied with the C-shaped operating lever of one of the heald frames in its first working condition;

fig. 1A is an enlarged detail of the engagement area of the C-shaped lever illustrated in fig. 1;

fig. 2 is a cross-section similar to that shown in fig. 1, with the C-shaped operating lever in its second working position;

fig. 2A is an enlarged detail of the engagement area of the C-shaped lever illustrated in fig. 2; and

fig. 3 is a cross-section similar to the two previous ones with the C-shaped operating lever in a third

working position, intermediate between those shown in figg. 1 and 2 and unforeseeable up until today.

**[0013]** As illustrated in the drawings, the device according to the invention forms part of a dobby which comprises a rotating shaft 1 which has keyed onto it - for each heald frame - a connecting-rod element 2 shaped so as to have a projection 2A pivotally hinged at 3A with the operating rod 3 of the heald frame (not shown) and a substantially circular ring 2B which has two rollers 2C and 2D in opposite positions.

**[0014]** The centre of connecting rod 2 has inserted inside it a bearing 4, the inner ring of which has mounted on it an eccentric cam 5 which is able to rotate, as can be seen further, with respect to the shaft 1.

**[0015]** The eccentric cam 5 has mounted on it in an oscillating manner, by means of a rivet 6 or the like, a rocker lever 7, or selection lever, which has shaped ends 8 and 9 and, on its inner side, a tooth 11 opposite to the end 9.

**[0016]** A spring 12, arranged between the eccentric cam 5 and the end 9 of the lever 7, exerts a recall action on the lever 7 itself and thus tends to cause it to rotate so as to move the tooth 11 towards the axis of rotation of the shaft 1.

**[0017]** Finally, said shaft 1 has keyed onto it a disc 13 at the periphery of which there are formed two grooves 13A and 13B arranged diametrically opposite with respect to the centre of rotation of the disc 13 itself and which is located on the axis of the shaft 1.

**[0018]** The disc 13 has keyed onto it the inner ring of a bearing, the outer ring of which has keyed onto it the eccentric cam 5 for thus rotating about the shaft 1.

**[0019]** The disc 13 lies in the same position as the lever 7, such that the tooth 11 of the latter is able to engage with one of two notches 13A or 13B and be disengaged therefrom.

**[0020]** The device is completed by a C-shaped operating lever 14, the ends of which have tooth-shaped projecting profiles 14A, 14B. The operating lever 14 is able to oscillate, being mounted with its middle point about a fulcrum 14C. According to the invention, the C-shaped lever 14 does not comprise the return spring that the devices of the known art are usually equipped with. Said lever is operated, as can be seen further down, so as to assume in a positive manner and in close coordination with the rotation of the main shaft of the loom operated by the dobby, the two conventional working positions in which its toothed ends 14A and 14B are able to engage with or not engage with the end (8) of the selection lever (7) opposite to the toothed end (11), along the trajectory 8A followed by said end 8. Furthermore, according to the invention, The C-shaped operating lever 14 is able to assume also an intermediate position, in which the mechanism controlled thereby is in an idle position and produces a continuous sequential movement (up and down) of the corresponding heald frame, typical of plain fabric weaving. This weaving can therefore be performed, with

remarkable advantages, without the mechanism controlled by the lever 14 continuously having to engage.

[0021] Again according to the invention, the positions of the lever 14 are positively controlled by a rotary electric motor 16, the shaft 16A of which is capable of controlled rotations in both directions and operates through a crank 17 and a rod 18 on the C-shaped operating lever 14, the connecting rod 18 being pivotally hinged at 19 near the end 14A of said lever 14.

[0022] In the device according to the invention, oscillations of the C-shaped operating lever 14 about the fixed fulcrum 14C are controlled by the precise rotary movements of the shaft 16A of the electric motor 16 through the crank 17 and the connecting rod 18, so that the toothed ends 14A and 14B of the same lever are timely and very precisely arranged, either along (figg. 1 and 2) or outside (fig. 3) the trajectory 8A of the end 8 (opposite to the toothed end 11) of the selection lever 7, so as to produce or prevent the engagement of the selection lever with the rotating disc 13, for the purpose of a smooth functioning of the dobby in the various working conditions. According to the invention, the motor 16 and the members 17 and 18 which connect it to the C-shaped operating lever 14, operate independently for each heald frame and allow said lever to assume, in addition to the two conventional engagement positions, also an intermediate idle position, for the weaving of plain fabric, as already said.

[0023] With the solution of the present invention illustrated above, the effort exerted by motor 16 in order to move the rod-crank assembly 17, 18 and to cause the C-shaped operating lever 14 to oscillate is further reduced. Such effort is in any case noticeably smaller compared to the solutions of the prior art, owing to the interposition of the crank 17 and of the connecting rod 18 - which is extremely advantageous from a mechanical point of view - and to the lack of return-spring means of the lever 14, which characterise the invention.

[0024] Consequently, the power demand from motor 16 is mechanically limited, which allows electric motors 16 which are small-sized and, specifically, extremely thin to be employed in the device according to the invention.

[0025] Furthermore, the design and manufacture of the device are extremely simplified, which device - even to a superficial examination - is completely different from those of the prior art.

[0026] Most of all, however, the solution according to the invention described above, providing the independent control and the control through the electric motor of each heald frame, allows to move the C-shaped operating lever so that it assumes its operating position without requiring the idle half-turns which are essential in the prior art, as mentioned at the beginning of the description, to locate the weft and re-establish the correct reading shed.

[0027] It is understood that other embodiments of the invention as claimed, different from those described and illustrated, are possible.

## Claims

1. Device for carrying out the programming of rotary dobbies for the operation of heald frames in weaving machines, particularly looms, of the type in which the control rods (3) of the heald frames are operated by connecting rods (2), each mounted on an eccentric ring (5) rotating with respect to the main shaft (1) of the dobby, which dobby also comprises, for each frame, a disc (13) caused to rotate by said shaft (1) and a selection lever (7) pivotally mounted on said eccentric ring (5) and capable of engaging said disc (13) with an end tooth (11), through the action of a spring (12), said device comprising, for each frame, a C-shaped lever (14) caused to oscillate about a fixed point (14C) so that the toothed ends (14A, 14B) of the same lever position themselves either along or outside the trajectory of the end (8) opposite to the toothed end (11) of the selection lever (7), in order to cause or prevent the engagement of the selection lever with the rotating disc (13), **characterised in that** positive controls are provided causing the C-shaped operating levers (14) to oscillate, said positive controls being synchronised with the rotation of the loom main shaft and obtained, independently for each heald frame, by means of a rotary electric motor (16).
2. Device as claimed in claim 1) in which said rotary electric motors (16) control a C-shaped lever (14) each.
3. Device as claimed in claims 1) and 2) in which the shaft of said rotary electric motors (16) is capable of rotating in both directions and operates through a crank-and-rod mechanism (17, 18) onto the C-shaped operating lever (14), near one of its ends (14A), onto which the connecting rod (18) of the mechanism itself is pivoted.
4. Device as claimed in claims 1) to 3) in which each C-shaped lever (14) is controlled by its own rotary electric motor (16) so as to take up both the conventional engagement positions, to which correspond the up and down positions of the respective heald frame, and an intermediate idle position to which corresponds the continuous sequential upward and downward movement of said frame.

## Patentansprüche

1. Vorrichtung zum Ausführen der Programmierung von drehbaren Schaftmaschinen für den Betrieb von Litzenrahmen in Webmaschinen, insbesondere Webstühlen, von der Art, bei der Steuerstangen (3) der Litzenrahmens von Verbindungsstangen (2), die an einem in Bezug auf die Hauptwelle (1) der Schaft-

maschine drehenden exzentrischen Ring (5) befestigt sind, betrieben werden, wobei die Schaftmaschine weiter für jeden Rahmen eine Scheibe (13), die von einer Welle (1) zur Drehung veranlasst wird, und einen Wahlhebel (7), der schwenkbar an dem exzentrischen Ring (5) befestigt ist und dazu in der Lage ist, die Scheibe (13) mit einem Endzahn (11) durch die Wirkung einer Feder (12) zu ergreifen, wobei die Vorrichtung für jeden Rahmen einen C-förmigen Hebel (14), der zu einer Schwingung um einen festen Punkt (14C) veranlasst ist, so dass dessen gezahnte Enden (14A, 14B) entweder entlang oder außerhalb der Bahn eines dem gezahnten Ende (11) der Wahlhebels (7) gegenüberliegend positioniert werden können, um einen Eingriff des Wahlhebels (7) mit der Drehscheibe (13) zu bewirken oder zu verhindern, **dadurch gekennzeichnet, dass** der C-förmige Hebel (14) durch eine Zwangssteuerung zu einer mit der Drehung der Hauptwelle des Webstuhls synchronen Schwingung unabhängig für jeden Litzrahmen mittels eines elektrischen Rotationsmotors (16) veranlasst ist.

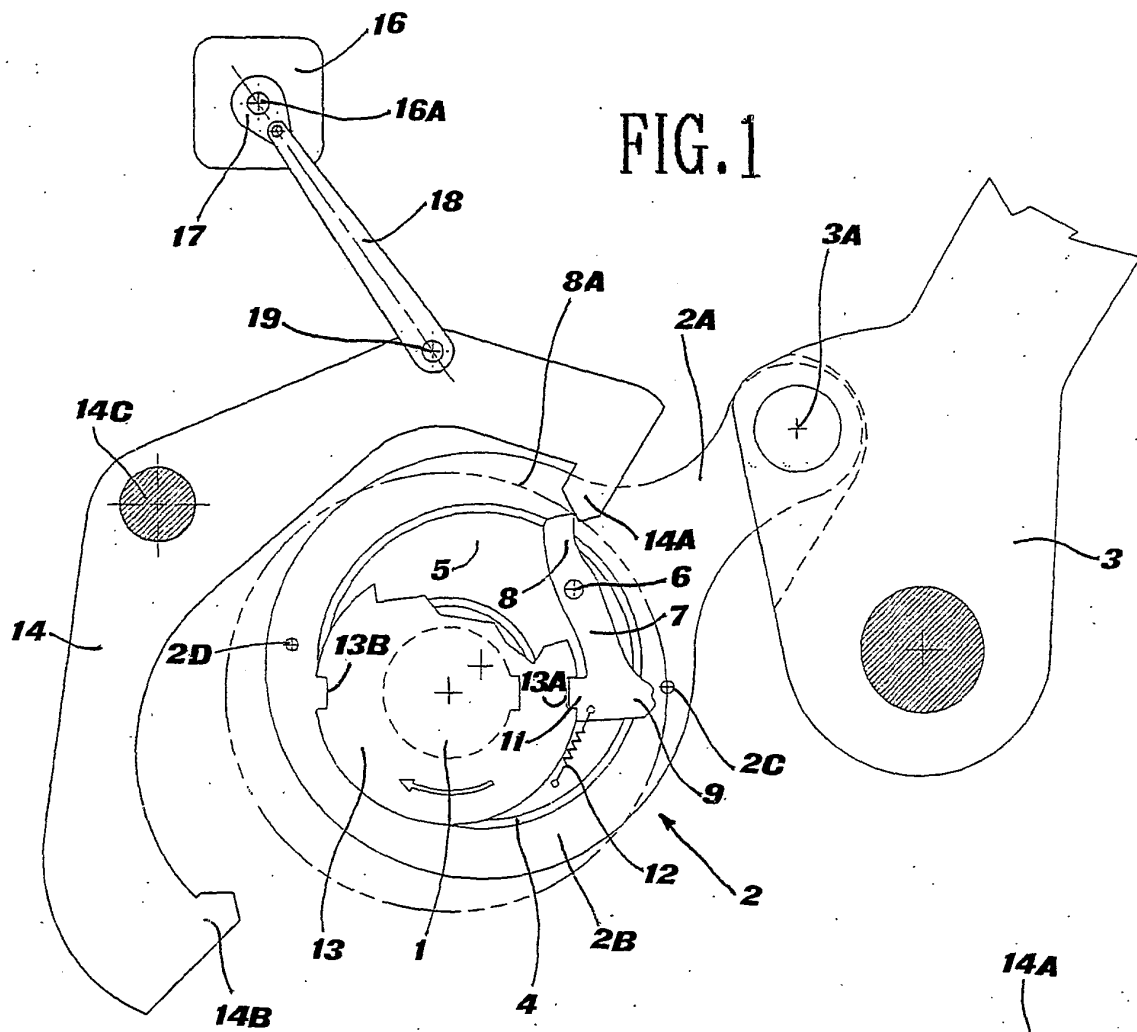
2. Vorrichtung nach Anspruch 1, wobei die elektrischen Rotationsmotoren (16) jeweils einen C-förmigen Hebel (14) steuern.
3. Vorrichtung nach Anspruch 1 und 2, wobei die Welle des elektrischen Rotationsmotors (16) dazu in der Lage ist, in beide Richtungen zu drehen und über einen Kurbel-und-Stangen-Mechanismus (17, 18) auf den c-förmigen Betätigungshebel (14) nahe eines seiner Enden (14A), an das die Verbindungsstange (18) des Mechanismus selbst angelehnt ist, wirkt.
4. Vorrichtung nach einem der Ansprüche 1 bis 3, wobei jeder der C-förmigen Hebel (14) durch einen eigenen elektrischen Rotationsmotor (16) gesteuert wird, um sowohl die üblichen Eingriffspositionen, denen die Auf- bzw. Ab-Positionen der jeweiligen Litzrahmen entspricht, als auch eine Zwischenleerposition, die der kontinuierlichen sequentiellen Aufwärts- und Abwärtsbewegung des Rahmens entspricht.

et un levier (7) de sélection monté de façon pivotante sur la bague excentrique (5) et pouvant entrer en prise avec ledit disque (13) par une dent d'extrémité (11), sous l'action d'un ressort (12), ledit dispositif comportant, pour chaque cadre, un levier (14) en forme de C amené à osciller autour d'un coin fixe (14C) afin que les extrémités dentées (14A, 14B) du même levier se positionnent d'elles-mêmes le long, ou à l'extérieur, de la trajectoire de l'extrémité (8) opposée à l'extrémité dentée (11) du levier de sélection (7), afin de provoquer ou d'empêcher l'entrée en prise du levier de sélection avec le disque (13) en rotation, **caractérisé en ce qu'il** est prévu des commandes positives qui font osciller les leviers (14) d'actionnement en forme de C, lesdites commandes positives étant synchronisées avec la rotation de l'arbre principal du métier et obtenues, indépendamment pour chaque cadre à lisses, au moyen d'un moteur électrique tournant (16).

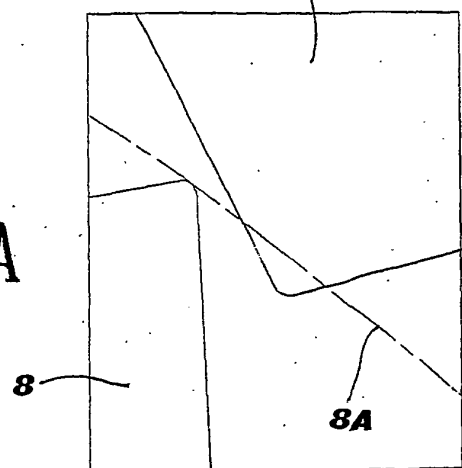
2. Dispositif selon la revendication 1, dans lequel lesdits moteurs électriques tournants (16) commandent chacun un levier (14) en forme de C.
3. Dispositif selon les revendications 1 et 2, dans lequel l'arbre desdits moteurs électriques tournants (16) peut tourner dans les deux sens et agit, par l'intermédiaire d'un mécanisme (17, 18) à manivelle et bielle, sur le levier (14) d'actionnement en forme de C, à proximité de l'une de ses extrémités (14A), sur lequel la bielle (18) du mécanisme lui-même pivote.
4. Dispositif selon les revendications 1 à 3, dans lequel chaque levier (14) en forme de C est commandé par son propre moteur électrique tournant (16) afin de prendre à la fois les positions d'engagement classiques, auxquelles correspondent les positions haute et basse du cadre à lisse respectif, et une position intermédiaire inactive à laquelle correspond le mouvement séquentiel continu de montée et de descente dudit cadre.

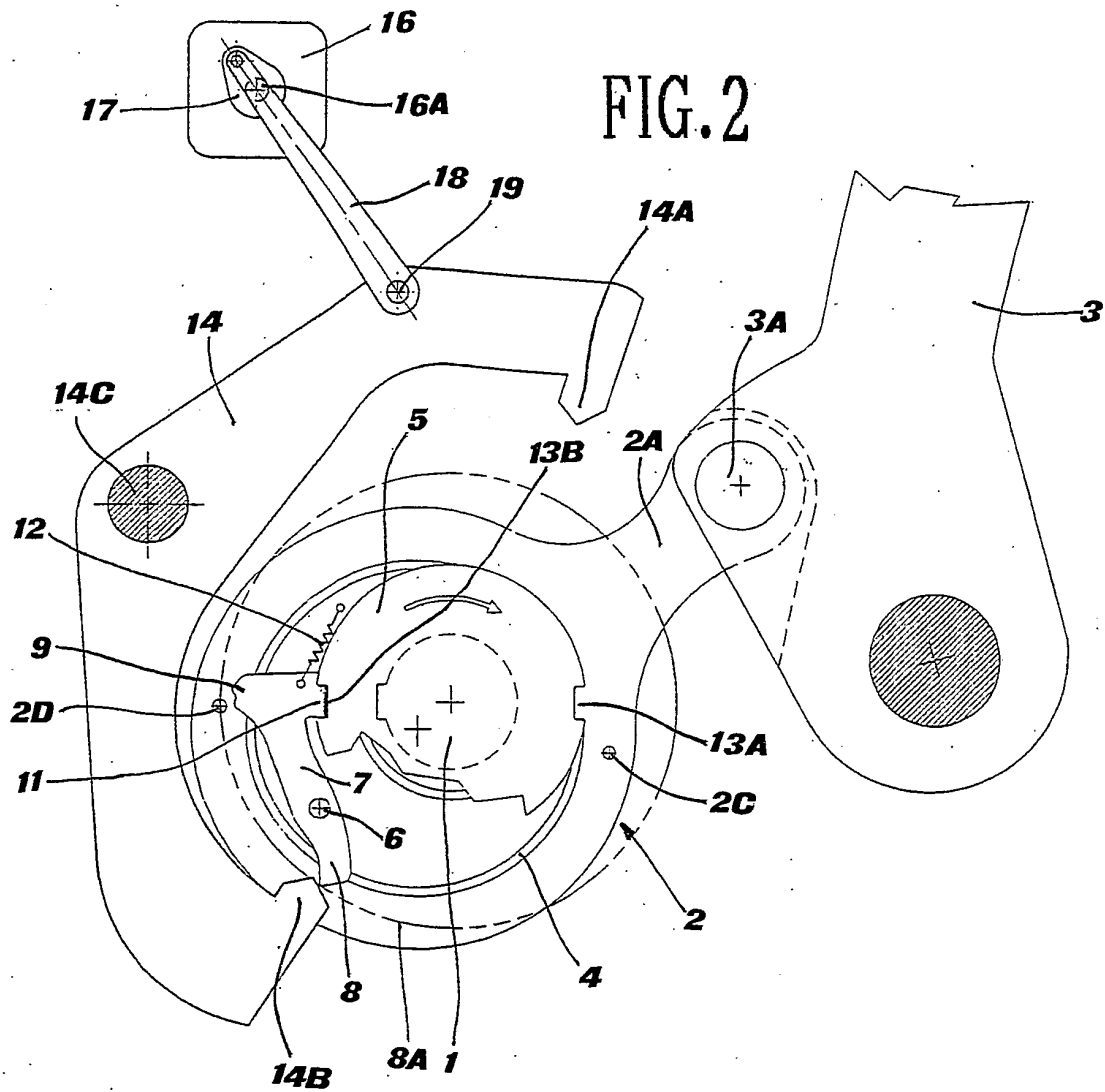
## Revendications

1. Dispositif pour effectuer la programmation de ratières rotatives pour le fonctionnement de cadres à lisses dans des machines à tisser, en particulier des métiers, du type dans lequel les tiges de commande (3) des cadres à lisses sont actionnées par des biellettes (2), montées chacune sur une bague excentrique (5) tournant par rapport à l'arbre principal (1) de la ratière, laquelle ratière comporte aussi, pour chaque cadre, un disque (13) que ledit arbre (1) fait tourner



**FIG.1A**





**FIG. 2A**

