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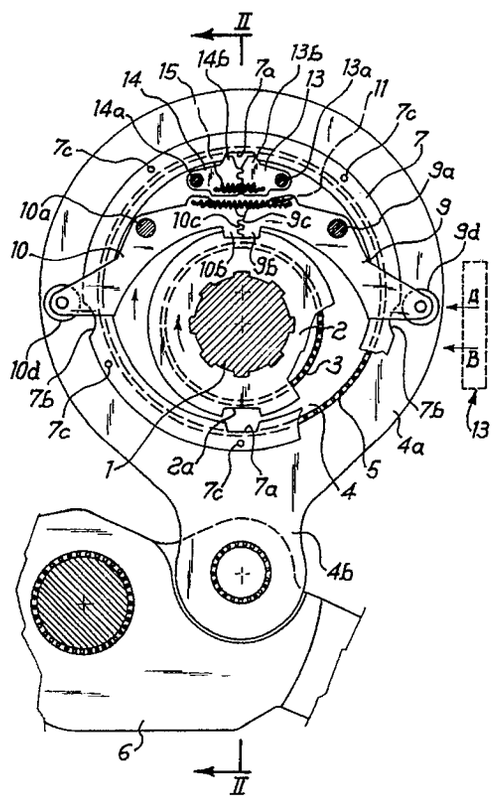
(54) Positive device for governing and controlling a rotary dobby in looms.

(57) Device for governing and controlling a rotary dobby for actuating heddle frames in looms, comprising a control shaft (1), a disc (2) fixed in rotation on said shaft and an eccentric composed of an eccentric ring (4) keyed to the shaft, with which it can rotate relative to an external traversing body (4a) linked to the actuating bar for the frames, in which are provided a first (9, 10) and a second (13, 14) pair of levers firmly pivoted on the rotating eccentric ring (4) and adapted for cooperating radially with one another, one free end of said first and second pairs of levers being respectively adapted for engaging with the rotating disc (2) and with the traversing body (4a), the other free end (9d, 10d) of the levers of the first pair being, moreover, adapted for receiving any control action of an external programmer device (13) which causes the levers to rotate radially in a centripetal or centrifugal direction, the action and the interaction of said pairs of levers and of said programmer creating a positive command both of the engaging and of the disengaging of said levers and, simultaneously, a positive safety means which assures the correct functioning of the governing and control device.

Fig.1



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POSITIVE DEVICE FOR GOVERNING AND CONTROLLING A ROTARY DOBBY IN LOOMS

The subject of the present invention is a positive device for governing and controlling a rotary dobby for actuating the positioning levers for the frames of the heddles of a loom.

It is known that the positioning of the frames of the heddles of a loom, determining the weft of the finished fabric, must be programmed in accordance with a predetermined sequence which predicts the raised or lowered position which each frame must adopt at every rotation of the main shaft, to which are firmly attached the oscillating devices which actuate said frames for the purpose of achieving the movement into one of the two desired positions, high or low.

Because the main shaft is actuated in accordance with an intermittent cycle with a stop at each half-revolution of 180°, the governing and control device must, in correspondence with each stop of the main shaft, be capable of making the rotary shaft locked to, or disengaged from, said eccentric which actuates the movement lever mechanisms for the frames, thereby determining for them, in one case, the raising or lowering and, in the other case, the maintenance of the preceding position.

Solutions are known in the art which provide the use of eccentrics, coaxially mounted on the rotary shaft, which eccentrics must be brought into a rotationally locked position with an element which converts the rotary motion into an alternating rectilinear motion so as to cause the displacement of the frame, or must be kept idling relative to the shaft but in a fixed position, thus causing the frame to be held in the fixed position.

In particular, there is known from the Patent Application FR-81 20502, a device which provides an eccentric, rotating with the main shaft, which can be firmly locked to, or kept neutral from, an oscillating element actuating the lever mechanisms governing the movement of the frames, by means of two fixed levers, positioned outside the rotary elements and governed by a programmer for actuating an internal engagement and disengagement mechanism; said device, however, possesses the serious disadvantage that said governing levers and said engagement and disengagement mechanism operate correctly only dependently upon a reaction on an indirect return element composed of a spring which, only if it is perfectly calibrated and in perfect operating conditions, assures the functioning of said control device.

The technical problem therefore arises of creating a device for governing and controlling a rotary dobby for actuating the positioning levers for the frames of the heddles of a loom, the device being equipped with controls and gear, blocking and positive safety means which assure the correct positioning and mutual engagement of the movable parts, both during the rotation with the shaft that determines the variation in the position of the frame and in the neutral or idling position with maintenance of the position adopted by the frame in the preceding revolution.

Said safety means must, furthermore, contribute to the blocking of the rotation, when each final position corresponding to the half-revolution through 180° is reached.

Said device, which must revolve at high speed, must furthermore be of very small size and mass, must make possible rapid programming, actuating the desired command during the very short stopping time of the main shaft; and it must be easy and economical to assemble and maintain, thus enabling the repair times to be reduced to a minimum.

Said results are achieved by the present invention, which provides a device for governing and controlling a rotary dobby for the actuation of heddle frames in looms, comprising a control shaft, a disc rotationally locked to said shaft and an eccentric, composed of an eccentric ring keyed onto the shaft, with which it can rotate relative to a traversing external body secured to the actuating bar for the frames , in which there are provided a first and a second pair of levers, firmly pivoted on the rotating eccentric ring and adapted for cooperating radially with one another, one free end of said first and second pairs of levers, respectively, being adapted for engaging with the rotating disc and with the traversing body, the other free end of the levers of the first pair being, furthermore, adapted for receiving any control action of a known, external programmer device, which causes the levers to pivot,disengaging the other end of the lever from the rotating disc, and in one configuration locking the rotary shaft to the eccentric and causing a variation in the position of the traversing body and, in the other configuration, making the rotation of the disc idle (neutral) relative to the eccentric ring while keeping unchanged, however, the position of the oscillating body, the action and the interaction of said pairs of levers and of the programmer creating a positive control both of the engagement and the disengagement of said levers and, simultaneously, a positive safety assuring correct functioning of the governing and control device.

In the device for governing and controlling a rotary dobby according to the present invention, it is provided, furthermore, that levers of said first pair shall have one of the two ends shaped with a tooth orientated substantially radially towards the

interior of the eccentric and with a cylindrical set of gear teeth orientated in a substantially tangential direction and adapted for making possible mutual engagement of the two levers with each other, in such a way that the rotation carried out by one of the two levers causes an identical rotation of the other lever in the opposite sense, and by the fact that the rotation of the two levers towards the centre of the control shaft by means of said set of gear teeth firmly locks together the two teeth to constitute one single tooth having twice the width of each of said two teeth.

It is provided, furthermore, that the programmer shall incorporate actuator means equipped with permanent magnets, which exert a thrust or return action on the free ends of the levers of the first pair, thereby causing the rotation of same in a centrifugal or centripetal direction and that auxiliary return means shall be applied between the levers of each of said pairs of levers for the purpose of promoting the rotation in a radial direction of same, respectively in a centripetal and a centrifugal sense; more especially, the free end of the levers of said first pair has a sliding element pivoted onto it in the axial direction.

Said disc possesses two notches, disposed diametrally opposite each other with respect to the rotational centre of the shaft and adapted for receiving said double tooth; furthermore, said notches and said tooth have flanks and walls respectively shaped according to curved or inclined profiles to favour engagement without play of the tooth in the notch. In the device for governing and controlling a rotary dobby, said traversing body has an internal ring, equipped with two notches disposed diametrally opposite each other on the internal surface and two notches, or the like, disposed on the external surface and diametrally opposite each other and on an axis perpendicular to the axis of the internal notches, which are adapted for engaging with the teeth of the levers of said second pair, said external notches being, in turn, adapted for engaging with the sliding element integral with the end of the levers of said first pair.

Further details may be understood from the following description, with reference to the attached drawings, in which there are shown:

in Figure 1:

a partial schematic section through the device of this invention in a position with the eccentric engaged;

in Figure 2:

a section through the device on the plane of II-II in Figure 1;

In Figure 3:

the device of Figure 1 at the end of a rotation through 180° ready to be programmed;

In Figures 4a/b/c:

the sequence of release, rotation with levers engaged with the eccentric, blocking and disengagement of the levers, respectively.

As shown in Figure 1, the device according to this invention is composed of a rotary shaft 1, on which is keyed a disc 2, rotating integrally with the shaft and equipped with two diametrally opposite notches 2a and 2b; on said disc there is concentrically mounted a sleeve 3, on which an eccentric ring 4 can revolve, bounded in its circumferential external surface by a further sleeve 5, which allows it to rotate relative to the oscillating external body 4a of the eccentric 4 connected to an extension 4b pivoted on the actuating bar 6 for the frame of the loom, not illustrated in the Figure.

A ring 7 is also fixed to the oscillating body 4a by rivets 7c, this ring possessing two notches 7a of substantially trapezoidal shape, diametrally opposite each other, on its internal surface, and two basically semicircular notches 7b on its external surface, diametrally opposite each other and on an axis perpendicular to the axis of the internal notches 7a.

The device of this invention comprises, furthermore, a first pair of levers 9 and 10, connected to the eccentric 4 at the pivots 9a and 10a respectively, and a second pair of levers 13 and 14, these being attached to the eccentric ring 4 at the respective end pivots 13a and 14a. Each lever of said first pair has one of its two ends free, facing inwards and respectively equipped with a radially orientated took 9b and 10b, and also a set of cylindrical gear teeth 9c and 10c respectively, orientated tangentially; said sets of teeth are adapted for engaging each other, in this way forming one single radial tooth 17, having twice the width of the two teeth 9b and 10b, and adapted for engaging with the notch 2a or 2b of the disc 2.

Said tooth 17 has, moreover, sides suitably shaped for obtaining optimum positioning and engagement with the notch 2a and 2b.

The other free end of each lever is, in contrast, equipped with a roller 9d and 10d, and is adapted for receiving a thrust command from a programmer element 13 and for rotating freely on the front annular surface of the oscillating body 4a in the case in which the levers 9 and 10 are engaged with the disc 2, or for engaging with the semicircular notch 7b in the ring 7 under the thrust action from the programmer 13, which itself produces said thrust by small pistons equipped with permanent magnet heads, themselves known, and indicated schematically in the Figure by two arrows A and B, which engage with said rollers 9d and 10d.

The levers 13 and 14 of said second pair have, in turn, a free end shaped as a set of cylindrical gear teeth 13c and 14c, orientated substantially tangentially and adapted for engaging with each

other; said end possesses, in addition, an upper tooth 13b and 14b, adapted for engaging radially into the notch 7a of the ring 7.

In this way, the rotational action imparted to one of the two levers of each pair compels a corresponding rotation in the opposite direction of the other lever.

In the preferred example of embodiment illustrated in the Figures, both the pairs of levers 9, 10, 13, 14 have an auxiliary spring or the like 11 and 15, respectively, disposed horizontally; the ends of each spring are attached to the levers of the same pair; said springs exert a restoring action which promotes rotation in the radial centripetal direction of the levers of the first pair and centrifugal radial rotation of the levers of the second pair. The functioning of the device will now be described, starting from the configuration of Fig. 1, in which the programmer 13 is not exerting any thrust action on the free end 9d of the lever opposite; in this condition, the restoring action of the spring 11 causes the levers 9 and 10 of the first pair of levers to rotate towards the centre, thus keeping the tooth 17 engaged into the notch 2a, and therefore when the shaft 1 starts to rotate it entrains with it the disc 2 and the eccentric ring 4, with which the levers 9 and 10 and also the levers 13 and 14 integrally move; the latter levers (Fig. 4a), as a result of the inclined shape of the flanks of the teeth 13b and 14b, disengage themselves from the notch 7a, and move downwards, and exert a direct pressure action on the levers 9 and 10, keeping them blocked in a position of engagement with the notch 2a.

With continuing rotation, the teeth 13b and 14b slide in contact with the internal surface of the ring 7, keeping the levers 9 and 10 blocked at all times until, when the rotation has completed 180°, by bringing the oscillating body (4a) of the eccentric 4 into the raised position, the teeth meet the diametrally opposite notch 7a, into which they engage by the effect of the simultaneous stopping of the shaft and the restoring action of the spring 15 (Fig. 4b), in this way releasing the levers 9 and 10, which can now be reprogrammed.

In Fig. 4c there is shown a programming example contrary to that just described. In this case, after the first rotation through 180°, the programmer 13 exerts a thrust action on the end 10d of the lever 10, as a consequence of which both the end 10d with a roller of the lever 10 and also the end 9d of the lever 9, caused to rotate by the sets of teeth 9c, 10c, engage into the corresponding notches 7b, thus locking onto the ring 7, in this way overcoming the restoring action of the spring 11 and forcing the two teeth 9b and 10b to disengage from the notch 2a, by rising until they bear against the levers 13 and 14, on which they exert a thrust force which promotes blocking of the oscillating body 4.

In these conditions, the rotation of the shaft 1 causes rotation of the disc 2 only, while the rotation remains neutral with respect to the eccentric ring 4, which keeps its own position, keeping the oscillating body 4a also in its preceding position and consequently also the frame of the loom.

By a succeeding programming, which is intended for causing new engagement of the levers 9 and 10 with the disc 2, said small piston with magnetic head A or B returns into the at-rest position, and the piston by magnetic attraction will move with it the end 9d or 10d of the opposite lever, causing radial, centripetal rotation of the two levers 9 and 10 in accordance with the restoring action of the auxiliary spring 11.

It is apparent from the foregoing description how the reciprocal action of the two pairs of levers, in addition to causing governing and control of the operation of the heddle frames, constitutes also a positive safety blocking, both in the case of rotation of the eccentric and in the case where this eccentric is in the idling position, thereby guaranteeing maximum accuracy and reliability of the device, which is capable of operating correctly, even in the case of simultaneous breakage of both restoring springs; in the first case on account of the rotation of the eccentric ring 4 it entrains with it the two pairs of levers, thereby assuring engagement of said tooth 17 with the disc 2, whereas in the second case the thrust action of the programmer 13, which causes disengagement of the tooth 17 from the notch 2a, with consequent bringing of the oscillating body 4a into the neutral condition, is directly promoted by the absence of the restoring action exerted by the spring 11.

Finally, in the case also where the levers are raised and it is necessary to programme the next engagement, the command is positive, being created by the retraction of the magnetic piston, which takes with it the free end of the lever.

Numerous variants can be introduced, without thereby departing from the scope of the invention in its general characteristics.

Claims

1. Device for governing and controlling a rotary dobby for actuating heddle frames of looms, the device comprising a control shaft (1), a disc (2) rotationally locked with said shaft and an eccentric, composed of an eccentric ring (4) keyed onto the shaft (1), with which it can rotate relative to a traversing external body (4a) attached to the actuating bar for the frames, characterized by the fact that the device comprises a first (9, 10) and a second (13, 14) pair of levers, firmly pivoted on the rotating

eccentric ring (4) and adapted for cooperating radially with one another, one free end of said first and said second pair of levers, respectively, being adapted for engaging with said rotating disc (2) and with the traversing body (4a), the other free end (9d, 10d) of the levers of the first pair being, moreover, adapted for receiving any control action from an external programmer device (13), of known type, which causes the levers to rotate, disengaging the other end (9b, 10b) of the levers (9, l0) from the rotating disc (2), thus, in one configuration, locking the rotary shaft (1) to the eccentric (4), causing a variation in the position of the traversing body and, in the other configuration, rotationally disengaging the disc (2) from the eccentric ring (4), but leaving unchanged the position of the oscillating body (4a), the action and the interaction of said pairs of levers and of the programmer device creating a positive control both of the engagement and of the disengagement of said levers (9, 10) and, simultaneously, a positive safety which assures correct functioning of the governing and control device.

2. Device for governing and controlling a rotary dobby according to Claim 1, characterized by the fact that the levers (9, 10) of said first pair have one of the two ends formed with a tooth (9b, 10b) orientated substantially radially towards the inside of the eccentric (4) and with a set of cylindrical gear teeth (9c, 10c), orientated substantially tangentially and adapted for making possible reciprocal engagement of the two levers with each other in such a way that the rotation effected by one of the two levers causes an identical rotation of the other lever in the opposite sense, and by the fact that the rotation of the two levers (9, 10) towards the centre of the control shaft (1) by means of said set of gear teeth brings the two teeth (9b, 10b) firmly together to form a single tooth (17) having a width twice that of each of said two teeth.

3. Device for governing and controlling a rotary dobby according to Claim 1, characterized by the fact that the programmer incorporates actuating means equipped with permanent magnets, which exert a thrust action or restoring action on the free ends of the levers of the first pair, causing rotation of said levers in a centrifugal or centripetal sense.

4. Device for governing and controlling a rotary dobby according to the preceding Claims, characterized by the fact that auxiliary restoring means are applied between the levers of each of said pairs of levers, for the purpose of promoting the rotation in the radial direction of the first and second pairs of levers, respectively, in a centripetal sense and in a centrifugal sense.

5. Device for governing and controlling a rotary dobby according to Claim 1, characterized by the fact that the other free end of the levers (9, 10) of said first pair has a sliding element pivoted onto it in the axial direction.

6. Device for governing and controlling a rotary dobby according to Claim 1, characterized by the fact that said disc (2) has two notches (2a, 2b), diametrally opposite each other with respect to the centre of rotation of the shaft (1) and adapted for receiving said double tooth (17).

7. Device for governing and controlling a rotary dobby according to Claim 1, characterized by the fact that said notches (2a, 2b) and said tooth (17) have flanks and walls respectively shaped to curved or inclined profiles for promoting engagement without play of the tooth in the notch.

8. Device for governing and controlling a rotary dobby according to Claim 1, characterized by the fact that said traversing body (4a) has an internal ring (7) equipped with two notches (7a) disposed diametrally opposite each other on the internal surface, and two notches (7b) or the like disposed on its external surface, diametrally opposite each other and on an axis perpendicular to the axis of the internal notches (7a), which are adapted for engaging with the teeth (13b, 14b) of the levers of said second pair, said external notches, in turn, being adapted for engaging with the sliding element (9d, 10d) fitted to the end of the levers (9, 10) of said first pair.

Fig.1

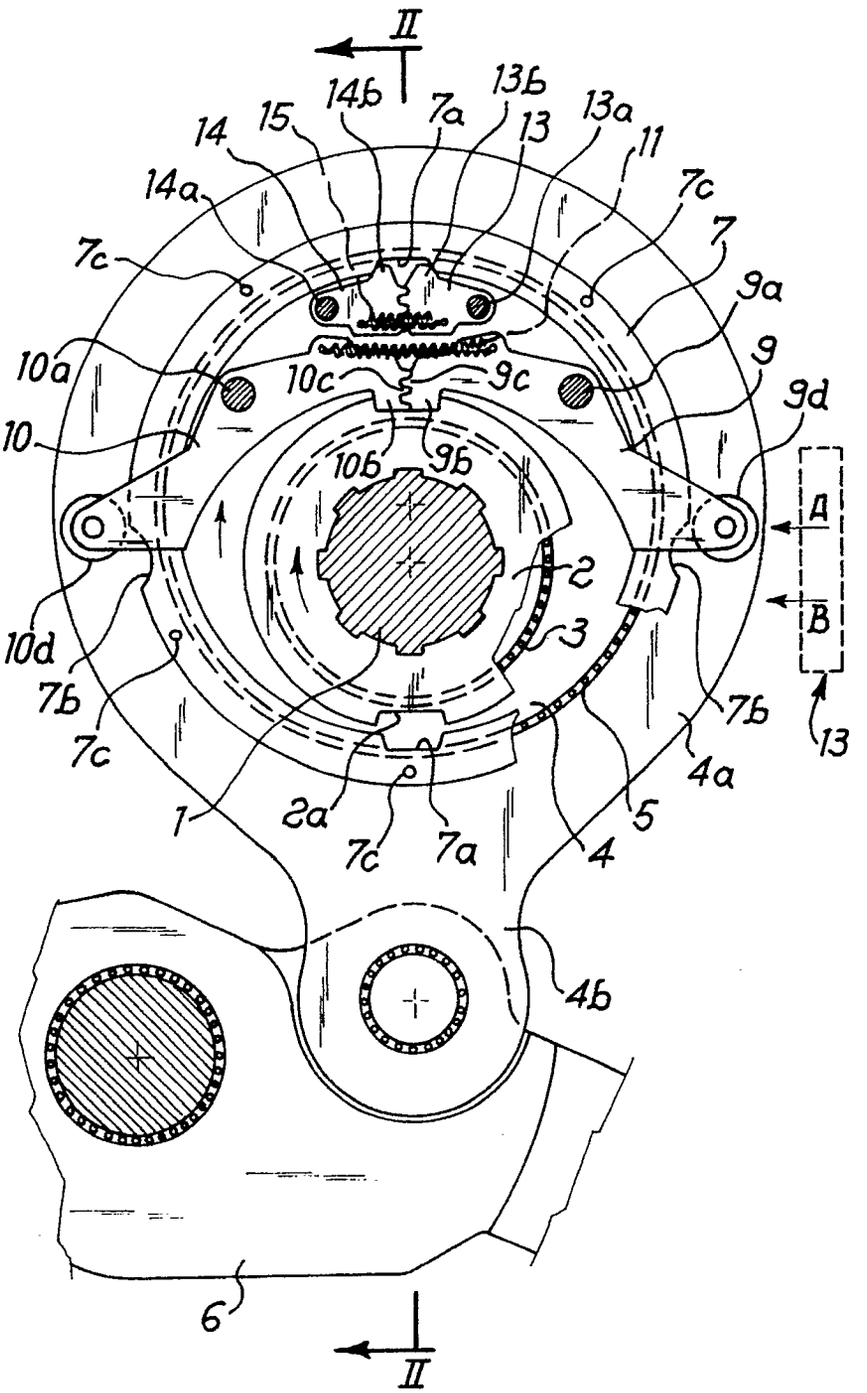

II
14b
13b
13a
14
15
7a
13
11
14a
7c
7
9a
10a
10c
9c
9
9d
10
10b
9b
A
B
2
3
10d
7b
7c
1
2a
7c
7a
4
5
4a
13
4b
6
II

Fig.2

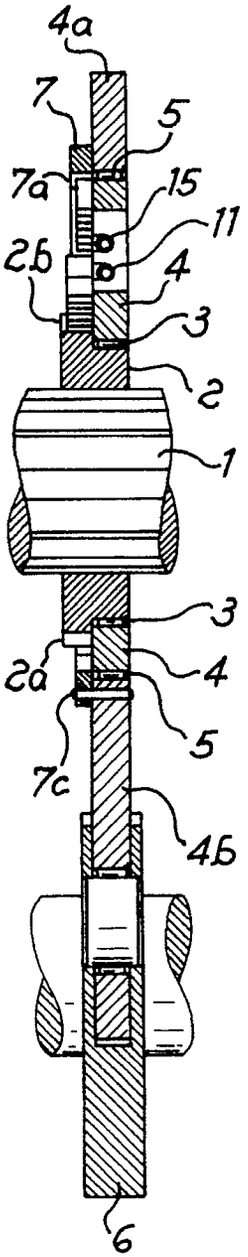

4a
7
5
7a
15
11
2b
4
3
2
1
3
2a
4
5
7c
4b
6

Fig. 3

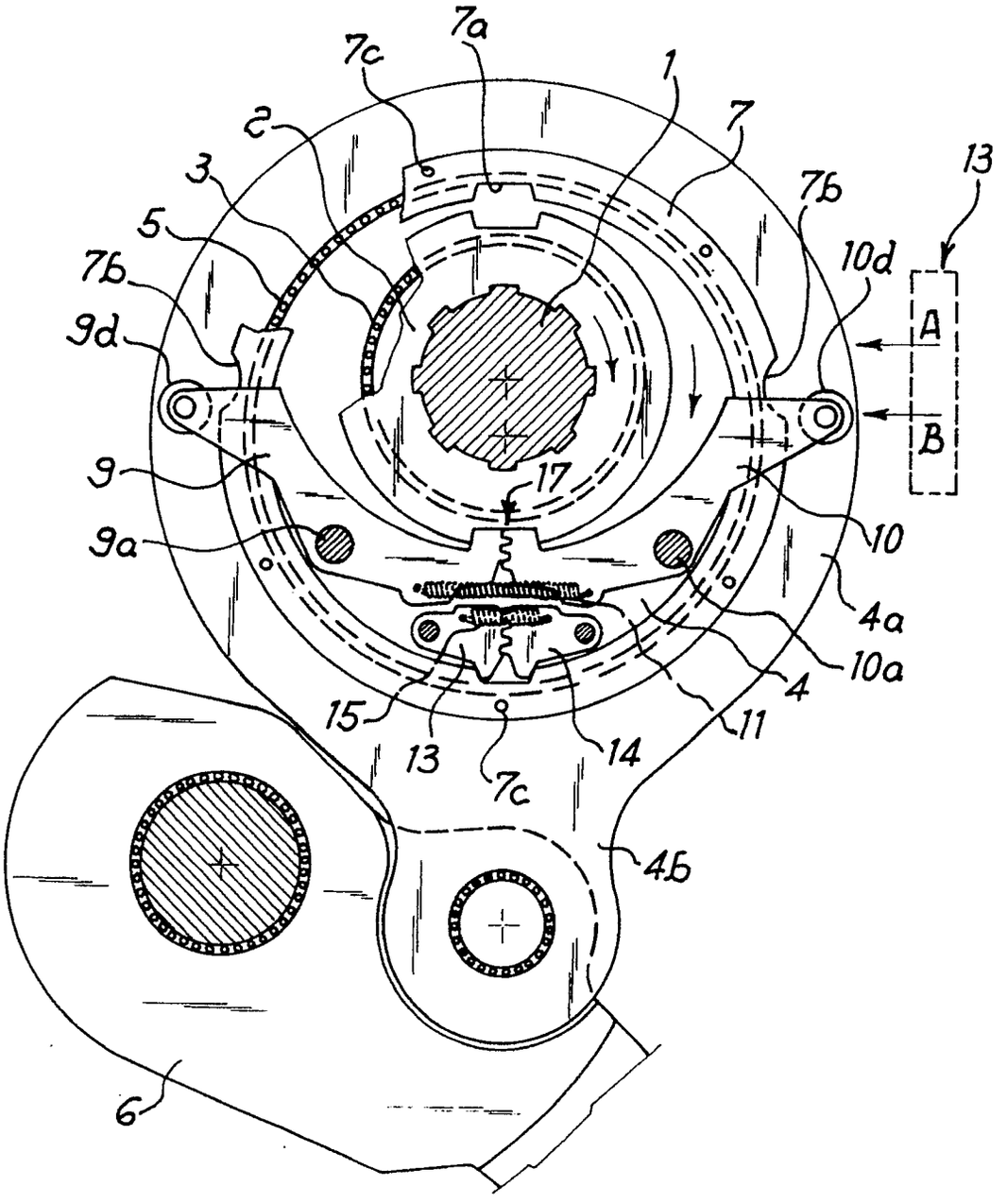


Fig.4a

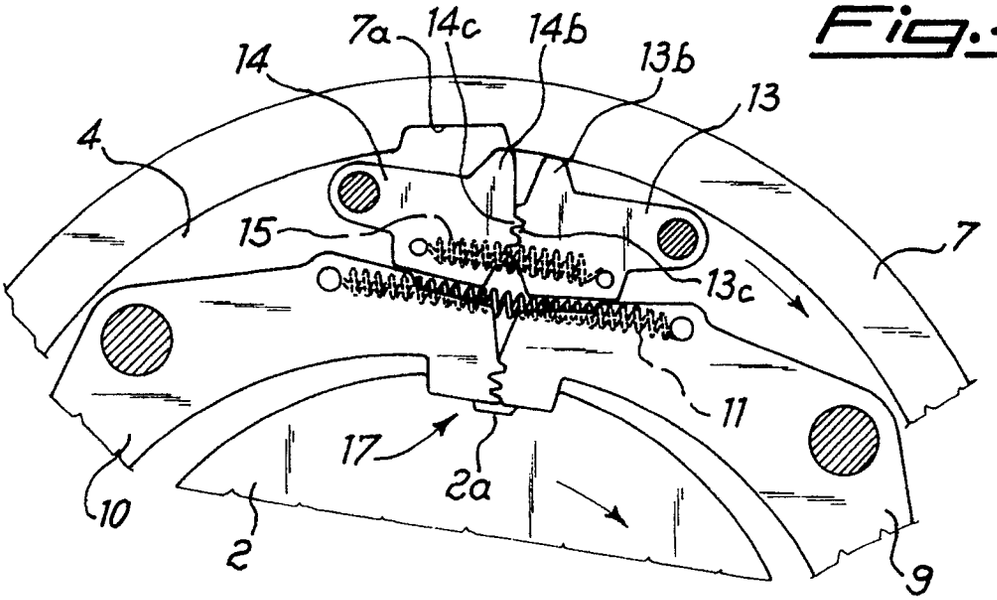


Fig.4b

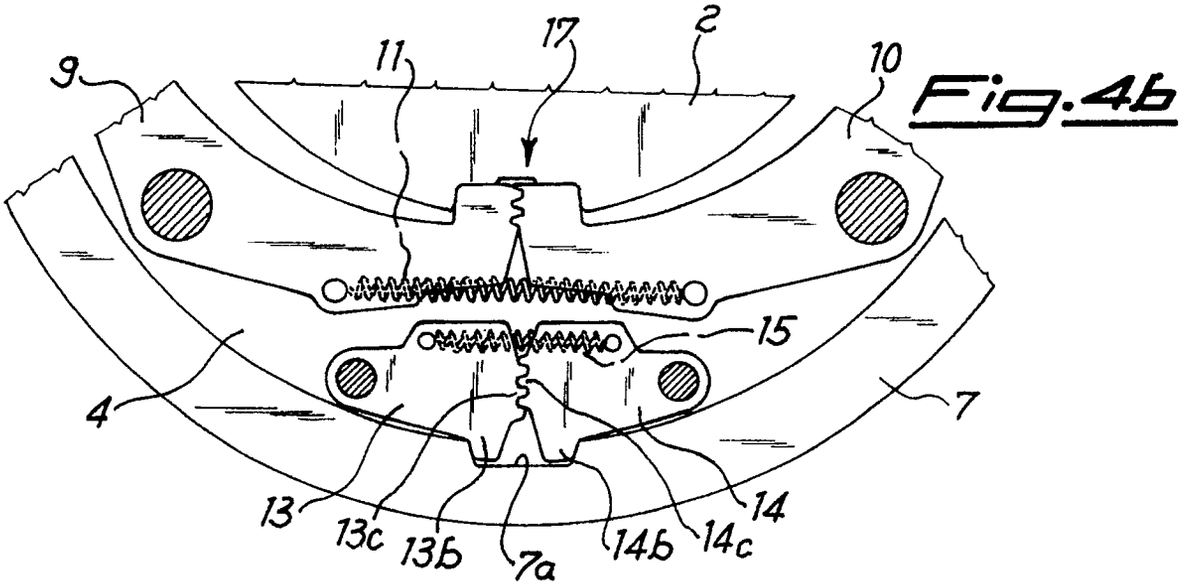
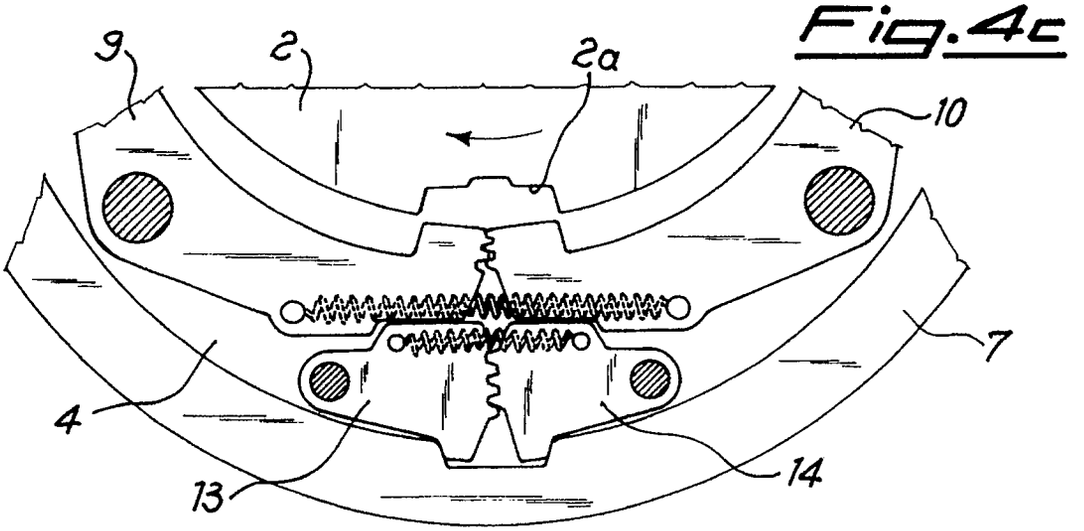


Fig.4c



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EUROPEAN SEARCH REPORT

Application Number

EP 91 20 0157

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 185 780 (STÄUBLI) * figures *	1,6	D 03 C 1/00
A	EP-A-0 050 160 (GEB SULZER) * figures *	1	
A	FR-A-2 596 074 (SCHLAFHORST) * figures *	1	
A	EP-A-0 212 273 (SCHLAFHORST) * figures *	1	
A	EP-A-0 068 139 (TEXTILMA AG) * figures *	1	
D,A	EP-A-0 078 752 (STAUBLI) * figures *	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D 03 C

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	22 May 91	REBIERE J-L.

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