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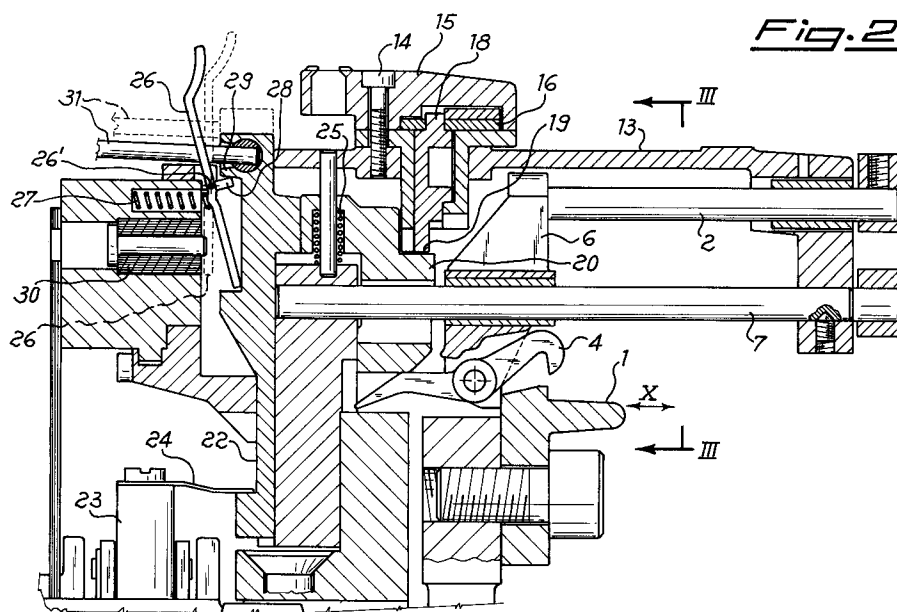
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I-20123 Milano (IT)(54) **Device for enabling and disabling the needle bars and the piercer bars in an embroidery machine.**

(57) A device is described for enabling and disabling the needle bars (2) and the piercer bars (3) according to a predetermined program in an embroidery machine, comprising means or hooks (4) suitable to connect said bars (2,3) to an oscillating drive bar (1). Such hooks (4) are operated by a single actuating member (16) which connects the oscillating drive bar

(1) either to the needle bars (2) or to the piercer bars (3), and selecting levers (26) are provided suitable to connect to the oscillating drive bar (1) either all of the bars (2,3) or some of them which, according to said program, have not been connected to the drive bar (1) by said actuating member (16).

**Fig. 2****EP 0 536 090 A2**

The present invention relates to a device for enabling and disabling the needle bars and the piercer bars according to a predetermined program in an embroidery machine and particularly it offers improvements with respect to both the Italian patent Nr. 1.153.643 filed on November 5, 1992 and the European Patent Application Nr. 0230.211 filed on June 6, 1986, the two both by the applicant of the present patent application.

The device forming the object of the present invention comprises a series of needle bars suitable to be enabled and disabled according to a certain program with the same arrangement of the structure described in the above cited Italian patent, but representing an improvement thereof as in the present invention piercer bars are also provided having means for enabling and disabling the bars themselves independently from the means for enabling and disabling the needle bars.

It should be noticed as well that the present invention represents an improvement also with respect to the above cited European Patent Application as, while in the latter two different operating means are provided for enabling and disabling the needle bars and the piercer bars, in the present invention a single operating means is advantageously provided for enabling and disabling the needles and the piercers.

The characteristics and the advantages of the present invention are clearly pointed out in the following description of a non-limiting embodiment thereof made with reference to the attached drawings in which:

Figure 1 represents a schematic perspective view of this device;

Figure 2 is a vertical sectional view of the device;

Figure 3 is a sectional view according to the line III-III in Fig. 2;

Figure 4 is a particular of this device ;

Figure 5 is an elevational schematic view of the means for both feeding and holding the thread, applied to this device; and

Figure 6 is a plan view of Fig. 5.

Referring to the Figs. 1 and 2, an oscillating drive bar 1, according to the prior art relative to the embroidery machines, shifts to and fro on a horizontal plan according to the double arrow X. Said bar 1 is connected to either the needle bars 2 or the piercer bars 3 through connecting means to be described hereinafter.

For convenience of representation, the drawings show only one needle bar and a corresponding piercer bar, both said bars being a part of a so called rapport, even if such machines comprise a plurality of needle bars and the same number of piercer bars.

Said connecting means consists of two hooks 4 and 5, respectively for a needle bar 2 and for a piercer bar 3. A slider 6 is fixed on the needle bar 2 and surrounds the stationary shaft 7 while a slider 8 is fixed on the corresponding piercer bar 3. On said sliders 6 and 8 the hooks 4 and 5 are pivoted respectively through pins 9 and 10 around which small springs 11 and 12 are wound tending to cause the downward rotation of said hooks 4 and 5, as wholly shown in fig. 3.

In the upper part of the embroidery machine a body 13 is fixed, while being provided with holes through which the needle bars 2 or the piercer bars 3 slide, when these are alternatively connected to the oscillating drive bar 1. Above said body 13, a cap 15 is fixed, by means of screws, below which an actuating member 16 can be moved, e.g. through a pneumatic piston not shown in the drawing, while being provided with slots 17 in which pawls 18 having projections 19 and 19' are inserted. It is specified that one pawl is provided for each rapport consisting of a needle bar 2 and a corresponding piercer bar 3, and that the actuating member 16 is one and only for the whole machine and it can be shifted in two positions corresponding to the tiltings of the pawls according to the axes a and b, as shown in Fig. 4. In correspondence with the two projections 19 and 19' of each pawl 18, two small blocks 20 and 21 are placed, in turn respectively above the hooks 4 and 5. In such an arrangement, when the pawls 18 tilt according to the axis a due to the shifting of the actuating member 16 in the direction of the arrow Y, the projections 19' of the various pawls 18 reach the small blocks 21 pushing them against the tail of the hooks 5 thus causing a raising thereof and disengaging them from the oscillating drive bar 1. On the contrary, when the actuating element 16 is shifted in the direction opposite to the arrow Y, the pawls 18 tilt according to the axis b so that the projections 19 of the various pawls 18 reach the small blocks 20 thus moving them downwards against the tail of the hooks 4 and raising them as shown in fig. 2 as well as disengaging them, such in a way, from the oscillating drive bar 1. As it can be seen, the single drive bar 16 causes, in one position, the enabling of all the needle bars and the disabling of all the piercer bars and, in the other position, it causes the enabling of all the piercer bars and the disabling of all the needle bars.

A slider 22 is provided, combined with each pair of small blocks 20 and 21, having its upper part inserted between the two small blocks 20, 21 and actuated in its lower part by a resetting bar 23 which is moved both upwards and downwards, e.g. by means of a pneumatic piston not represented in the drawing. Said resetting bar 23 is connected to the various sliders 22 by an elastic member 24.

Inside the connection of the slider 22 with the small blocks 20 and 21, two springs 25 are provided for each small block 20,21; such springs tend to push upwards the slider and the small blocks of each rapport.

In correspondence with each slider 22 a selecting lever 26 is provided which is pivoted at 26' and keeping lowered, in the position of Fig.2, both the corresponding sliders 22 and the small blocks 20,21 as well as keeping raised the hooks 4 and 5 which thus result disengaged from the oscillating drive bar 1. Such a position of the selecting levers 26 is obtained by lowering the resetting bar 23 thus causing the slider 22 to lower from the position represented in dashed line to the one represented in unbroken line of the upper end of the slider itself, so that said selecting levers 26 are pushed by the springs 27 in said position of disengagement. Thus it is clear that such a position of the levers 26 involves the disengaging of both all the needle bars and all the piercer bars.

The selecting levers 26 are provided with a projection 28 as well as the sliders 22 are provided with a projection 29 so that when the sliders 22 lower, by means of the resetting bar 23, from the position represented in unbroken line in Fig.2, the selecting levers 26 move to the position represented in dashed line in the same drawing and are held by magnets 30, if excited, each of them being placed in correspondence with a selecting lever 26. According to the above cited program, there are both excited magnets 30 and non-excited others so that the excited ones hold the corresponding selecting levers 26, while the non-excited ones allow the corresponding selecting levers 26 to return, as being pushed by the corresponding springs 27, in the position of disengagement.

It is clear that the hooks corresponding to the selecting levers 26 held close to the respective magnets, move to the position in which they engage with the oscillating drive bar 1 while the hooks corresponding to the selecting levers 26 which are in the position of disengagement represented in unbroken line in Fig.2, remain in the raised position in which they are disengaged from the oscillating drive bar 1.

Clearly what above explained is true for the hooks 4 or 5 which have not been previously disengaged from the pawls 18 and then a selected operation will be obtained of either the needle bars 2 or the piercer bars 3, depending on the adopted program.

The oscillating bar 1, depending on the presetting thereof to cause the operation of either the needle bars or the piercer bars, moves according to motion laws different from each other and proper for each of these movements which are selectable upstream of the above described device.

It should also be noticed that the hooks 4 and 5 have an internal outline, which reaches the oscillating drive bar 1, shaped according to a plane, whereby it slides along the protruding part of said bar 1 without any wear of the touching parts.

As it can be seen in the Figs. 2,5 and 6, in the upper part of each slider 22 a rod 31 is fixed which passes through a narrow opening 32, acting as a pivot, obtained in a hub 33. At its opposite end, the rod 31 is pivoted at 34 on a middle lever 35 which is the counterpart of a roller supporting lever 36 in turn pivoted at 37 inside said lever 35. A roller 36', on which the yarn feeding each needle bar is wound, is freely rotatable around a pin 38 of the lever 36 and is integral with a gear 39 which in turn engages with another gear 40 on whose axis a braking means is mounted, not shown in the drawing, common to all the needle bars.

The lowering of the slider 22 from the position represented in dashed line to the one in unbroken line of the upper end of the slider itself, involves the disengaging of the lever 26, as well as a lowering of the rod 31 with its end fixed to the slider and a raising of the rod 31 with its end inserted in the pivot 34. The middle lever 35, thereby rotating upwards, pulls with its edge 41 the roller supporting lever 36 so that the gear 39 moves thus disengaging from the gear 40. In such a way, the yarn winding roller 36' stops, thereby interrupting the yarn feeding to the disengaged needle bar 2, which corresponds to said lever 26 in the position of disengagement.

As above explained, during the automatic operation, i.e. while actuating the sliders 22 by means of the resetting bar 23, the clockwise rotation of the middle lever 35 is obtained by means of the rod 31 as well as the contemporaneous raising of the roller supporting lever 36 which rests on the edge 41 of the middle lever 35.

Moreover, during the automatic operation, an upward releasing of the sliders 22, which corresponds to an enabling of the needle bars, involves an anticlockwise rotation of the middle lever 35 on the pivot 37, this being caused by the lowering of the pivot 34 and the consequent coupling of the gears 39 and 40.

The above described mechanism, illustrated in Fig.5, allows a manual free rotation of the roller supporting lever 36 on the pivot 37 from a position I to a position II in order to facilitate the threading of the yarn in the machine. Through a further upward movement of the lever 36 besides the position II, the edge 42 of the lever 36 touches the corner 43 of the middle lever 35 thus causing a clockwise rotation of the middle lever 35 itself on the pivot 37 with a consequent upward shifting of the pivot 34 and disengagement of the corresponding needle bar by means of the slider 22 which,

being pushed by the end of the rod 31 opposite to the pivot 34, reaches the position of disengagement.

A subsequent manual enabling of the needle bar occurs by manually operating the selecting lever 26, thus causing it to reach the enabling position in which it touches the corresponding magnet.

As it could be noticed in the above description, the advantages of this invention are the following:

improved simplicity and savings both in the realization and operation thereof, mainly due to the fact that the needle bars and the piercer bars are actuated by a single means, and to the fact that the actuating means of the selecting levers, e.g. consisting of magnets, are stationary and each of them for one selecting lever.

Claims

1. A device for enabling and disabling needle bars (2) and piercer bars (3) according to a predetermined program in an embroidery machine, comprising connecting means (4,5) suitable to connect said bars to an oscillating drive bar (1), characterized in that said connecting means are operated by a single actuating member (16) which connects said oscillating drive bar (1) to either the needle bars (2) or the piercer bars (3), and selecting levers (26) being suitable to connect to said oscillating drive bar (1) either all the bars (2,3) or some of them which have not been excluded, according to said program, from the motion of the oscillating drive bar (1), by means of said actuating member.
2. A device according to claim 1, characterized in that said actuating member (16) moves pawls (18) which are rotated in correspondence with two positions of the actuating member (16) so that each pawl (18), for each rapport consisting of a needle bar (2) and a corresponding piercer bar (3), in one position disengages one of the two bars (2,3) from the oscillating drive bar (1) while in the other position disengages from the oscillating drive bar (1) the other of the two bars (2,3).
3. A device according to claim 2, characterized in that said connecting means consists of both pivoted hooks (4,5) each of them provided with springs (11,12) which tend to cause the rotation of the hooks in the position of engagement, and sliders (6,8), on which said hooks (4,5) are pivoted, fixed to said needle bars (2) and piercer bars (3), so that when the hooks are in the position of engagement the oscillat-

ing drive bar (1) is connected only to the hooks in said position, said hooks (4,5) having a flat internal outline which touches said bar (1) without any wear for the parts in contact.

4. A device according to claim 2, characterized in that each pawl (18) has two projections (19,19') so that in one position of the pawl one projection (19) presses a first small block (20) touching a connecting means (4) which is disengaged from the oscillating drive bar (1), while in the other position the other projection (19') presses a second small block (21) touching the other connecting means (5) which is thereby disengaged from the oscillating drive bar (1).
5. A device according to claim 4, characterized in that a slider (22) is provided which is both combined with each pair of small blocks (20,21) of one rapport and suitable to be moved to the position of disengagement for disengaging the two respective connecting means (4,5) from the oscillating drive bar (1).
6. A device according to claim 5, characterized in that a selecting lever (26) is provided for each slider (22) so that each selecting lever (26) keeps, in a first position, the respective slider (22) in the position of disengagement corresponding to the pressure on both small blocks (20,21) of one rapport, while in a second position it lets said slider (22) free of reaching the position of engagement corresponding to the engagement of the connecting means (4 or 5) which has not been excluded by the corresponding pawl (18).
7. A device according to claim 6, characterized in that a resetting bar (23) is provided which is actuated to cause both the respective slider (22) to reach the position of disengagement and the respective selecting lever (26) to reach the position for keeping the slider (22) in said position of disengagement, said selecting lever (26) being pushed in said position by a spring means (27).
8. A device according to claim 7, characterized in that the resetting bar (23) is connected to the sliders (22) through elastic means (24) so that with a little shifting of said sliders (22) the selecting levers (26) move in such a position to keep the sliders (22) in the position of disengagement, while by continuing the shifting of the sliders (22) a projection (29) of the sliders themselves moves the levers (26) thus placing them in a second position in which they are held by magnets (30) while the sliders (22),

being not kept, shift in the position of disengagement as being pushed by a spring means (27), and those magnets (30) which are excited hold the respective selecting levers in the position of engagement and the magnets which are not excited let the corresponding selecting levers (26) move in the position of disengagement, as being pushed by said spring means, according to the cited program.

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9. A device according to claim 5, characterized in that a rod (31) is fixed on each slider (22) and when the slider (22) reaches the position of disengagement, and consequently the corresponding needle bar (2) is disengaged, the feeding is interrupted of the yarn of each roller (36') on which the thread for feeding each needle is wound.

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10. A device according to claim 9, characterized in that said rod (31), on the opposite side with respect to the slider (22), passes through a narrow opening (32) formed in a hub (33) and is pivoted with its pivot (34) on a middle lever (35) having an edge (41), so that when the corresponding slider (22) reaches the position of disengagement, the pivot (34) raises together with the lever (35) thus pulling with its edge (41) a roller supporting lever (36) and causing said interruption of the yarn feeding.

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11. A device according to claim 10, characterized in that the roller supporting lever (36) is suitable to be manually rotated around a pivot (37) of said lever (35) without causing a rotation of said lever (35), in order to facilitate the yarn threading of the machine.

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12. A device according to claim 11, characterized in that said roller supporting lever (36) is suitable to be further manually rotated from said position so that said lever (36) touches a corner (43) of said middle lever (35) thus causing the upward movement of the pivot (34) with a consequent positioning of the corresponding slider (22) in the position of disengagement.

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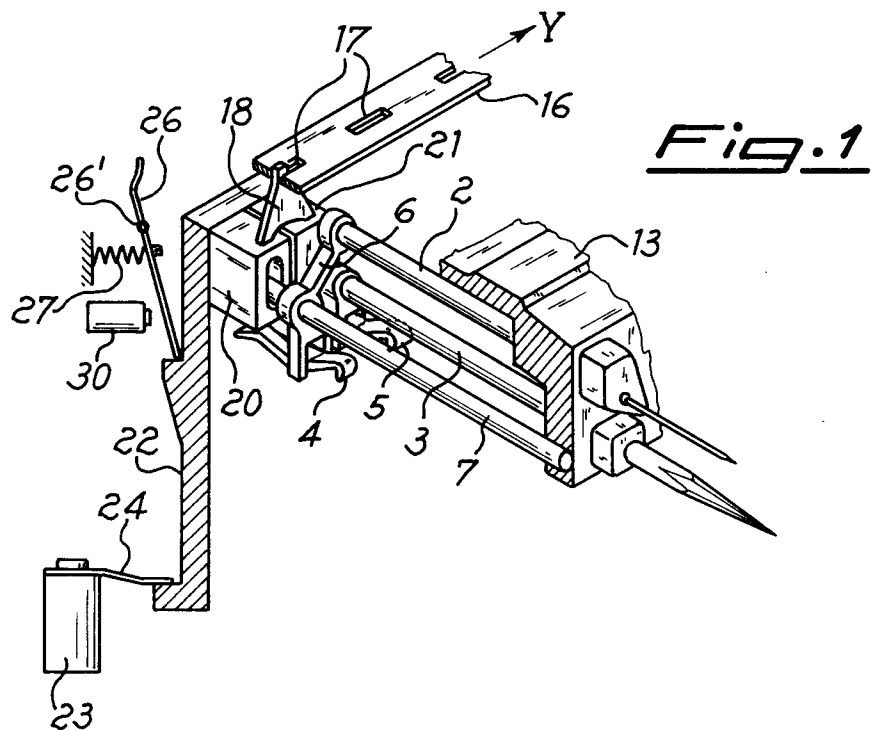


Fig. 3

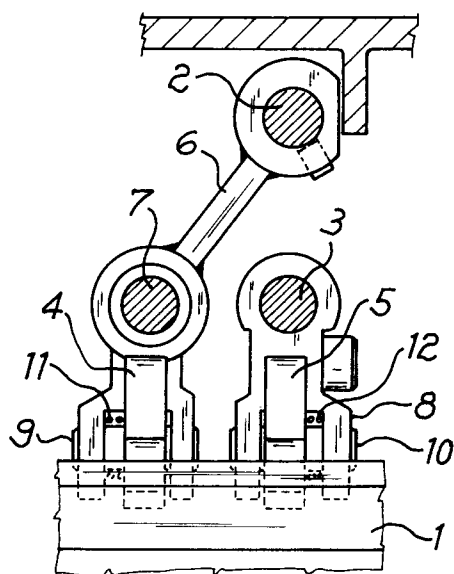


Fig. 4

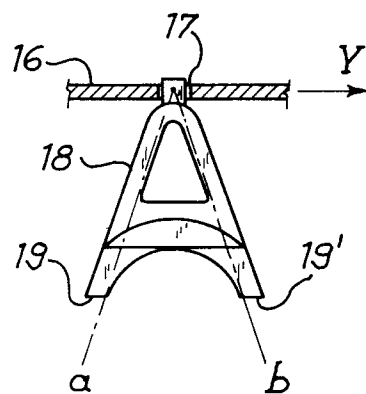
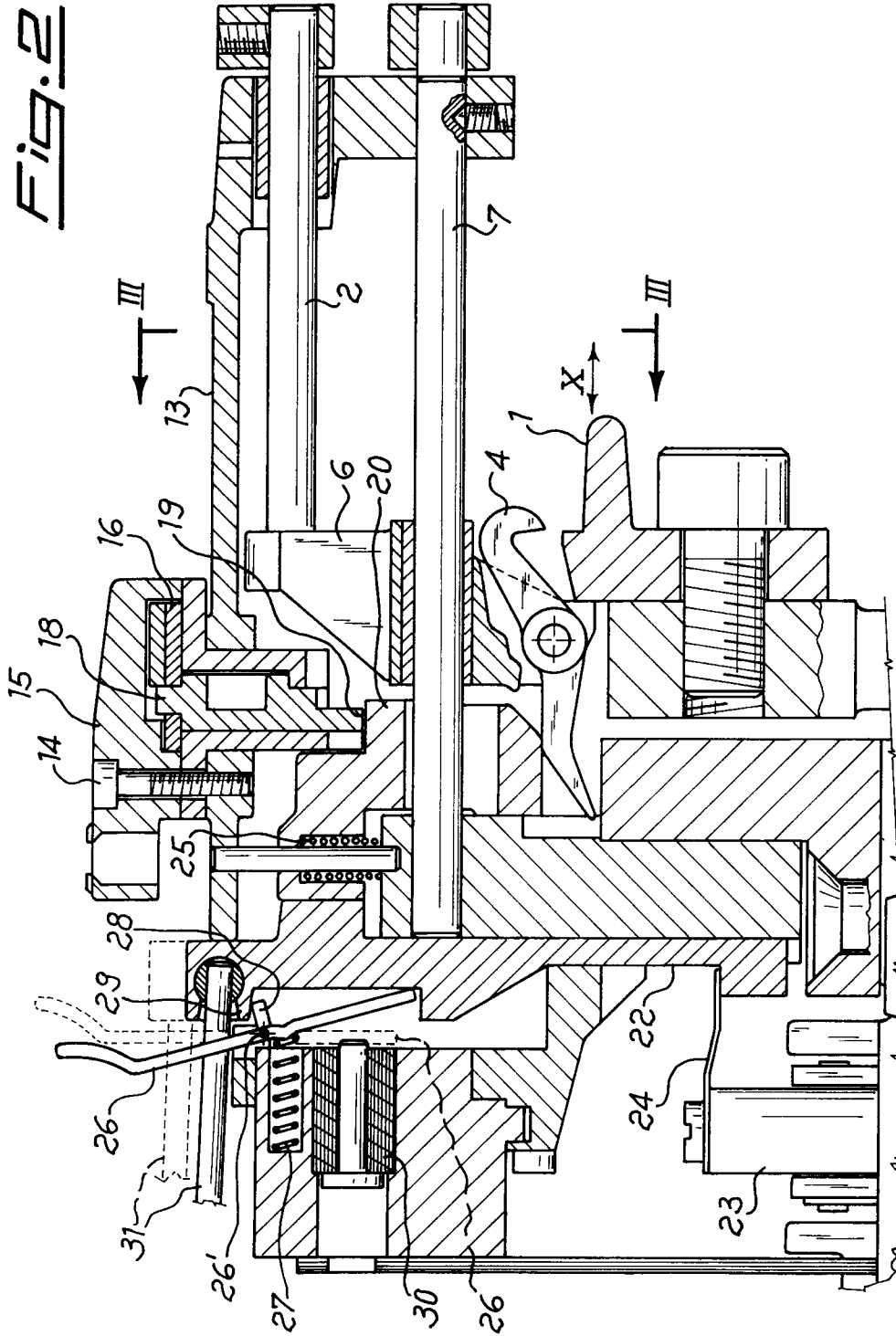


Fig. 2



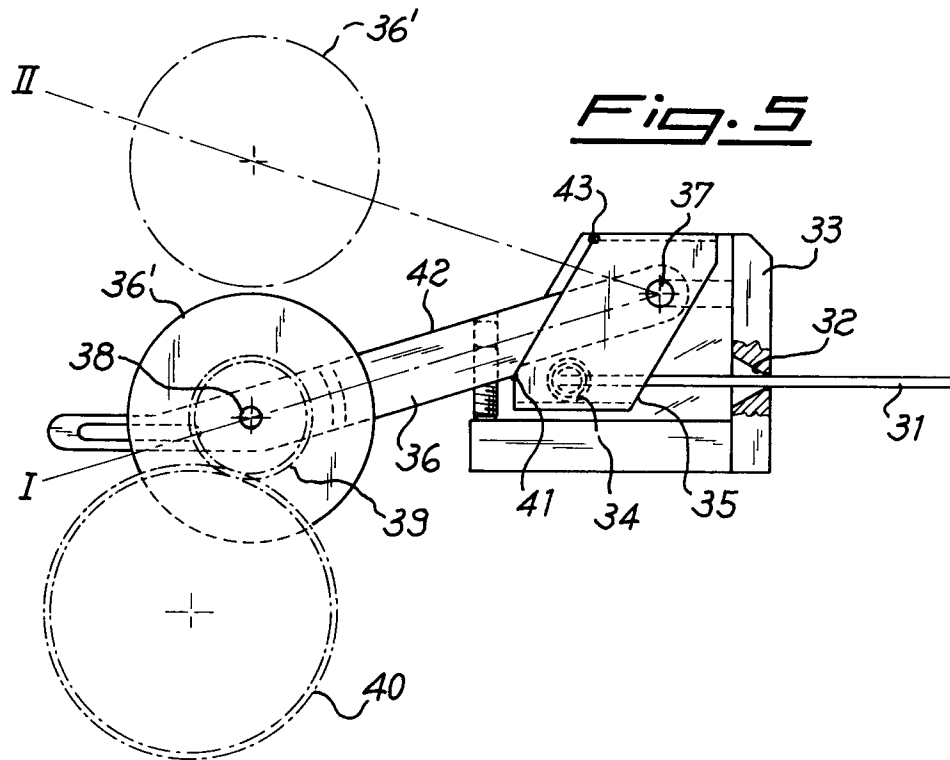


Fig. 6

