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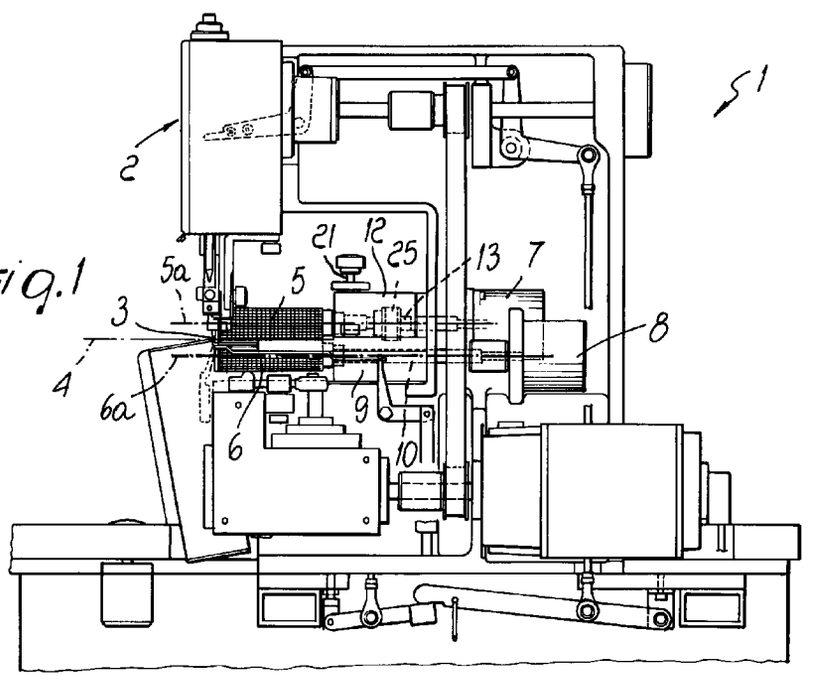
(54) Precision stitcher, particularly for applying knitted borders to items of clothing or the like

(57) A precision stitcher, particularly for applying knitted borders to items of clothing or the like, comprising a stitching head (2) provided with a needle (3) and two traction rollers (5,6) for the border to be applied, which are arranged downstream of the needle working area with respect to the advancement direction of the border to be applied. The traction rollers (5,6) are arranged so that their axes (5a,6a) lie transversely to the border advancement direction and are actuatable with an intermittent rotary motion about their respective axes (5a,6a) and with opposite rotation directions to move the border, which is interposed between the traction rollers (5,6). The stitcher also comprises at least one step motor (7,8) actuatable on command and connected to the traction rollers (5,6) to actuate them with an intermittent rotary motion about their respective axes (5a,6a).

Fig.1



EP 0 703 309 A1

Description

The present invention relates to a precision stitcher, particularly for applying knitted borders to items of clothing or the like.

Stitchers for applying knitted borders to items of clothing with very precise stitches, so as to achieve an effect that is qualitatively comparable with darning, are known.

These conventional machines comprise a stitching head that is provided with a needle and is arranged above an ideal working plane, along which the item to be bordered and the border to be applied are fed simultaneously. Below the ideal working plane, at the needle working area, a crochet is provided that cooperates with the needle to form the stitch.

Upstream of the needle working area, along the advancement direction followed by the item to be bordered and by the border to be applied during stitching, a shaped guide is provided wherein the border to be applied is inserted; by passing through said guide, said border is folded so as to straddle the upper and lower sides of the flap of the item of clothing to be bordered, which is fed towards the needle by a wheel or belt arranged laterally adjacent to the feeding path of the border at least directly upstream of the needle working area.

Downstream of the needle working area, again along the advancement direction of the item to be bordered and of the border to be applied during stitching, a border traction device is provided that is usually composed of two traction rollers arranged respectively below and above the ideal working plane, so that their axes are orientated transversely to the advancement direction to be given to the border to be applied. These two rollers generally have an appropriate knurled contact surface, so as to achieve optimum adhesion to the border that is inserted between the two rollers, and are actuated with an intermittent rotation, in step with the movement of the needle, about their respective axes and with opposite rotation directions, so as to cause the intended advancement of the border during stitching.

In conventional machines, the actuation of the traction rollers is taken, by virtue of kinematic links, from the same main motor that drives the stitching head and the crochet.

The actuation of the border traction rollers is fundamental in these machines, since the extent of the advancement of the border, with respect to the actuation rate of the needle, determines the length of the stitch. In order to achieve an effect that is comparable with darning, the length of the stitch must be substantially equal to the distance between two adjacent stitches of the border to be applied; that is to say, the length of the stitch must be precisely correlated to the fineness of the border to be applied.

In the kinematic transmission that links the border traction rollers to the main motor a device is provided whereby it is possible to vary the rotation angle of the traction rollers to adapt it, in each instance, to the fineness of the border to be applied.

In conventional stitchers, the devices for varying the extent of the rotation of the border traction rollers are constituted by manually-actuated mechanical variators that act by varying the extent of the rotation angle transmitted by the main motor to the traction rollers.

In using these machines, problems have been observed as regards the stitch length adjustment device.

Since this mechanical adjustment is to be performed manually, there is an undesirable elongation of the stitch as the machine operating speed rises, to the detriment of precision, producing stitches the length whereof is different from the distance between two contiguous loops of the border to be applied, and therefore with a result that is significantly different from the intended darning effect.

Furthermore, when it is necessary to vary the length of the stitch several times due to production requirements, it is very difficult to achieve precise repeatability of the stitch length if said length is changed and then returned to a previous value.

Another problem is the gradual decrease in precision caused by the inevitable wear of the components of the adjustment device.

A principal aim of the present invention is to solve the problems described above by providing a stitcher, particularly for applying knitted borders to items of clothing or the like, that is highly precise in stitch length adjustment.

Within the scope of this aim, an object of the invention is to provide a stitcher in which it is possible to automatically adjust the length of the stitch as a function of the fineness of the border to be applied.

Another object of the invention is to provide a stitcher with a stitch length adjustment device that is more compact than the adjustment devices of currently commercially available machines.

This aim, these objects, and others which will become apparent hereinafter are achieved by a precision stitcher, particularly for applying knitted borders to items of clothing or the like, comprising a stitching head provided with a needle and two traction rollers for the border to be applied, said rollers being arranged downstream of the needle working area with respect to the advancement direction of the border to be applied and so that their axes lie transversely to the border advancement direction, and being actuatable with an intermittent rotary motion about their respective axes and with opposite rotation directions to move said border, interposed between said traction rollers, along said advancement direction; characterized in that it comprises at least one step motor actuatable on command and connected to said rollers for their actuation with an intermittent rotary motion about their respective axes.

Further characteristics and advantages of the invention will become apparent from the following detailed description of a preferred but not exclusive embodiment of the stitcher according to the invention, illustrated only

by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a front elevation view of a portion of the stitcher according to the invention, proximate to the stitching head;
figure 2 is a top plan view of the portion of the stitcher related to the traction rollers for the border to be applied and to the elements for actuating said rollers;
figure 3 is an enlarged-scale sectional view of figure 2, taken along the plane III-III;
figure 4 is a sectional view, taken similarly to figure 3, in which the traction rollers of the border to be applied are mutually spaced with respect to the position of figure 3;
figure 5 is a sectional view of figure 2, taken along the plane V-V;
figure 6 is a lateral elevation view of the detail of the stitcher shown in figure 2;
figure 7 is an enlarged-scale sectional view of figure 2, taken along the plane VII-VII;
figure 8 is an enlarged-scale view of a detail of figure 2.

With reference to the above figures, the stitcher according to the invention, generally designated by the reference numeral 1, comprises, in a per se known manner, a stitching head 2 provided with a needle 3 and arranged above an ideal working plane 4, along which the item of clothing to be bordered and the border to be applied, not shown for the sake of simplicity, are fed simultaneously.

Below the ideal working plane 4, at the path followed by the needle 3, there is a crochet, not shown for the sake of simplicity, that is actuated in step with the needle so as to cooperate therewith in forming the stitches.

The stitcher is equipped, in a per se known manner, with a feeder for the item of clothing to be bordered; said feeder can be constituted simply by a wheel, on the perimeter whereof the edge of the item of clothing to be bordered is rested, or can be constituted by a belt or another conveyor element that produces the gradual advancement of the item to be bordered towards the needle 3.

Upstream of the needle working area, according to the advancement direction given to the item to be bordered, there is a guide, also of a conventional type and not shown for the sake of simplicity, with the help of which the border to be applied to the item to be bordered is folded beforehand, arranging said border so that it straddles the flap of the item to be bordered directly upstream of the working area of the needle 3.

Downstream of the working area of the needle 3, with respect to the advancement direction given to the item to be bordered and to the border to be applied, there is a pair of rollers for the traction of the border to be applied; said pair is composed of two rollers 5 and 6 that are arranged respectively above and below the working plane 4 and are orientated so that their axes 5a and 6a are mutually parallel and lie transversely to the advancement direction to be given to the border to be applied. The wall of the two rollers 5 and 6, which makes contact with the border to be applied, is adequately knurled and/or covered with a material providing excellent adhesion to the border to be applied, so as to effectively avoid accidental slippage of the border with respect to the rollers 5 and 6 during traction.

The two rollers 5 and 6 are rotatably actuated about their respective axes 5a and 6a with mutually opposite rotation directions, so as to cause an intermittent advancement of the border to be applied, which is inserted between the rollers, in step with the movement of the needle.

The rollers 5 and 6 are actuated about their respective axes 5a and 6a by at least one step motor, differently from conventional machines.

Conveniently, there are two step motors, designated by the reference numerals 7 and 8, which actuate the upper roller 5 and the lower roller 6 respectively.

More particularly, the lower roller 6 is rotatably supported, about its axis 6a by a fixed support 9 directly connected to the supporting structure of the machine, and the output shaft 8a of the step motor 8 is connected to the shaft 10 of the roller 6, which is mounted on the support 9 by virtue of the interposition of bearings 11.

The upper roller 5 is instead rotatably supported about its own axis 5a by a movable support 12 pivoted to the fixed support 9 about an axis that is parallel to the axis 5a and 6a of the rollers 5 and 6 so that, by virtue of the oscillation of the movable support 12 with respect to the fixed support 9, it is possible to space the roller 5 from the roller 6 during the insertion of the border to be applied between the rollers 5 and 6.

More particularly, the shaft 13 of the upper roller 5, which is arranged parallel to the shaft 10, is mounted on the movable support 12 by virtue of the interposition of bearings 14 and is connected to the step motor 7 by an intermediate shaft 15, which is parallel to, and spaced from, the shaft 13 and constitutes the pivot for connecting the movable support 12 to the fixed support 9. In practice, the intermediate shaft 15 is supported by the fixed support 9 so as to be rotatable about its own axis and supports the movable support 12 so as to be rotatable about the same axis; said movable support 12 in turn supports the shaft 13 of the roller 5.

The shaft 15 is connected to the output shaft 7a of the step motor 7, and its rotation is transmitted to the shaft 13 by virtue of a toothed belt 25 that connects a toothed pulley 16, keyed to the intermediate shaft 15, to a toothed pulley 17 keyed to the shaft 13.

The movable support 12 is provided with an arm 18, whereon a lever 19 acts; said lever can be actuated to cause the oscillation of the movable support 12 with respect to the fixed support 9 about the axis 15a of the shaft 15, so as to space the upper roller 5 from the lower roller 6. The oscillation of the movable support in the direction that spaces the upper roller 5 from the lower

roller 6 is contrasted by a spring 20 connected to the movable support 12 at one end and to the fixed support 9 at the other end.

The distance between the upper roller 5 and the lower roller 6, in the maximum mutual approach condition, can be adjusted by means of an adapted setting screw 21 mounted on the movable support 12 and resting on a locator 22 that is fixed to the fixed support 9.

The step motors 7 and 8 are actuated by a programmable electronic control device 23 that supervises the operation of the entire machine. In this manner it is possible to program the advancement spaces of the border to be applied according to the fineness range of the borders, so that the electronic control element 23 actuates the step motors 7 and 8 through rotation angles that exactly match the fineness of the border to be applied.

In this manner, stitch length adjustment is completely automated and safely excludes the possibility of errors or of poor precision, allowing to achieve a stitching that can be compared with darning in terms of quality.

In practice, it has been observed that the stitcher according to the invention fully achieves the intended aim, since it offers high precision in stitch length adjustment, avoiding any manual intervention to adjust the length of the stitch and allowing perfect repeatability of a stitch of preset length.

The stitcher thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept; all the details may furthermore be replaced with other technically equivalent elements.

In practice, the materials employed, as well as the dimensions, may be any according to the requirements and the state of the art.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. Precision stitcher, particularly for applying knitted borders to items of clothing or the like, comprising a stitching head (2) provided with a needle (3) and two traction rollers (5,6) for the border to be applied, said rollers (5,6) being arranged downstream of the needle working area with respect to the advancement direction of the border to be applied and so that their axes (5a, 6a) lie transversely to the border advancement direction, and being actuatable with an intermittent rotary motion about their respective axes (5a,6a) and with opposite rotation directions to move said border, interposed between said traction rollers (5,6), along said advancement direction; characterized in that it comprises at least one step motor (7,8) that can be actuated on command and is connected to said rollers (5,6) for actuation thereof with an intermittent rotary motion about their respective axes (5a,6a).

2. Stitcher according to claim 1, characterized in that it comprises two step motors (7,8), one for each one of said traction rollers (5,6).

3. Stitcher according to the preceding claims, characterized in that it comprises a programmable electronic control device (23) operatively connected to said at least one step motor (7,8) to actuate it through preset rotation angles according to the fineness of the borders to be applied.

4. Stitcher according to one or more of the preceding claims, characterized in that a first one (5) of said two traction rollers (5,6) can be moved on command towards or away from the second traction roller (6).

5. Stitcher according to one or more of the preceding claims, characterized in that said first traction roller (5) is rotatably mounted, about its own axis (5a), on a movable support (12) that is pivoted, about an axis that is parallel to the axes (5a,6a) of said traction rollers (5,6), to a fixed support (9) connected to the supporting structure of the machine, said movable support (12) being oscillatable on command with respect to said fixed support (9), in contrast with elastic return means (20), to move said first traction roller (5) away from said second traction roller (6).

6. Stitcher according to one or more of the preceding claims, characterized in that one (8) of said step motors is connected to said second traction roller (6) by means of its output shaft (8a).

7. Stitcher according to one or more of the preceding claims, characterized in that the other one (7) of said step motors is mounted on said fixed support (9) and is connected, by means of its output shaft (7a), to an intermediate shaft (15) kinematically connected to said first traction roller (5), said intermediate shaft (15) constituting the pivot for connecting said movable support (12) to said fixed support (9).

8. Stitcher according to one or more of the preceding claims, characterized in that said intermediate shaft (15) is connected to said first traction roller (5) by virtue of a toothed-belt transmission (25) that connects a toothed pulley (17), fixed coaxially to said first traction roller (5), to a toothed pulley (16) keyed to said intermediate shaft (15).

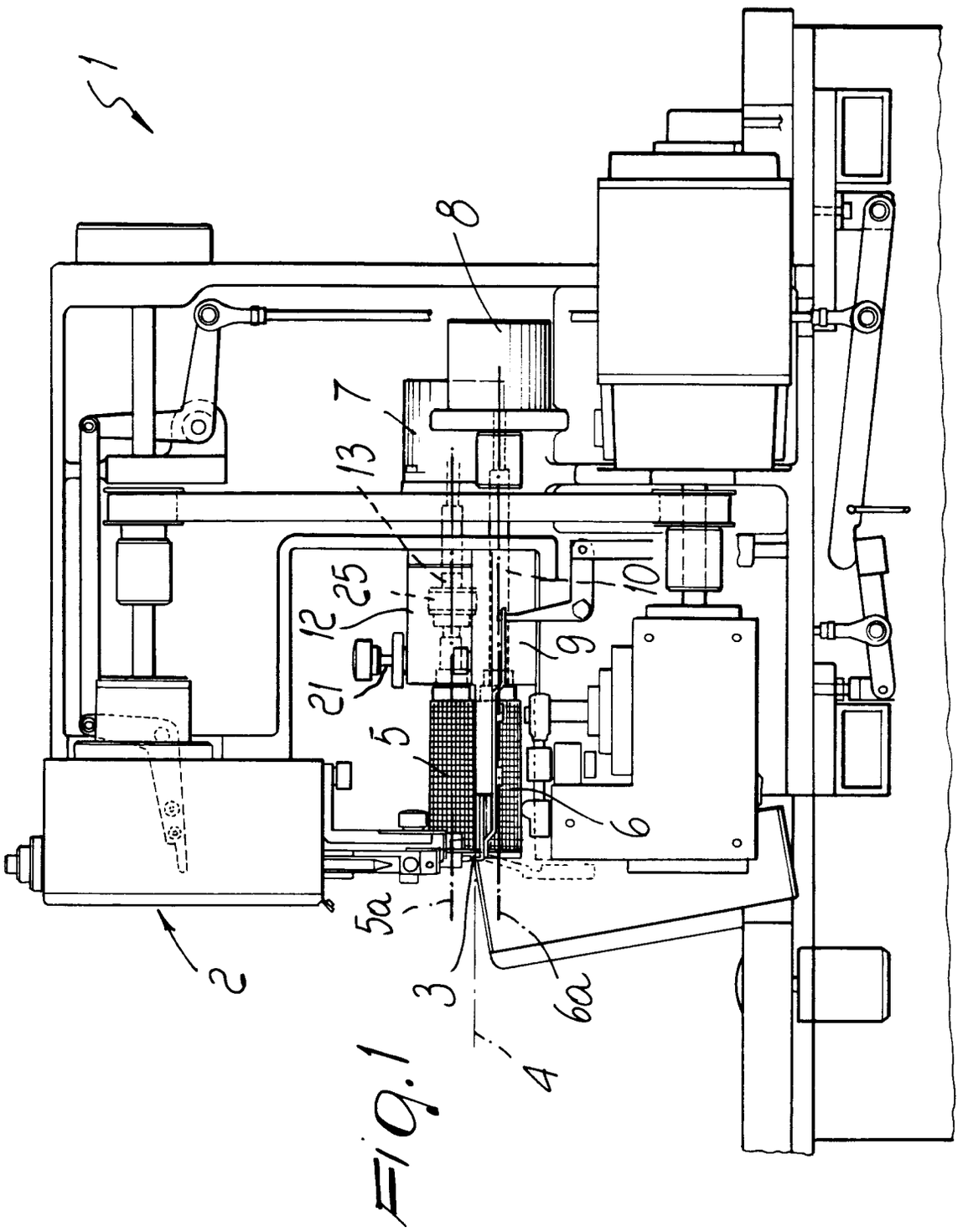
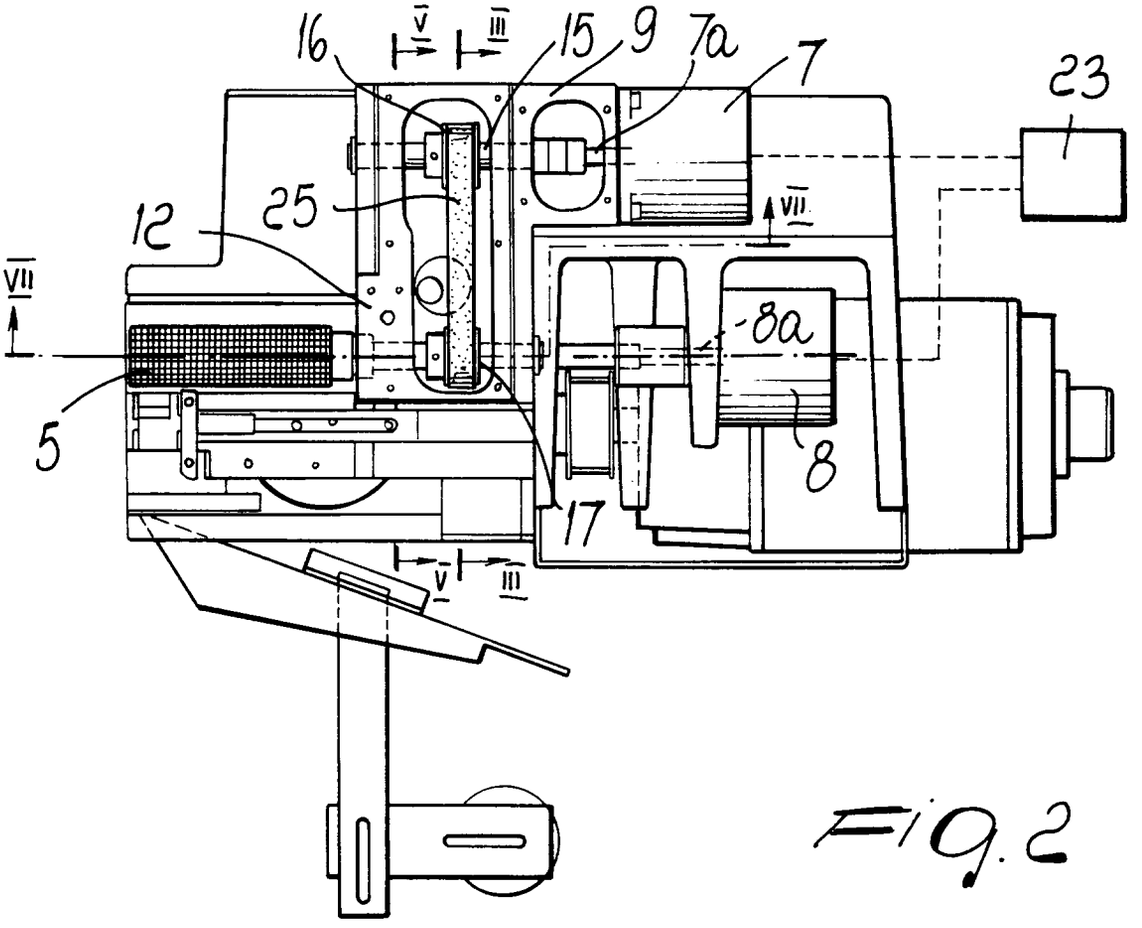


Fig. 1


16
V
III
15
9
7a
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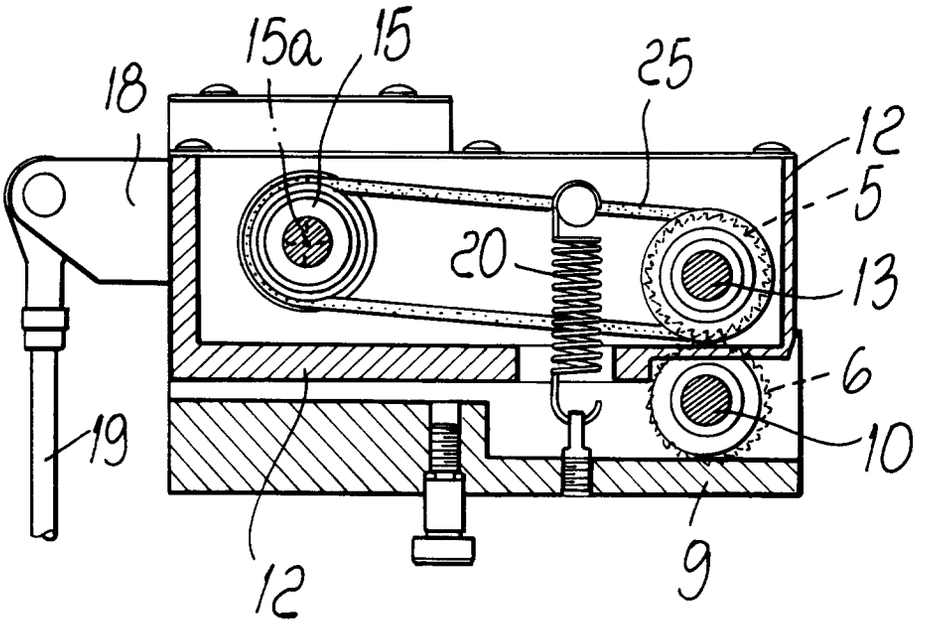
23
25
12
VII
VII
8a
5
8
17
V
III

FIG. 2


15a
15
18
25
12
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19
12
9

FIG. 3

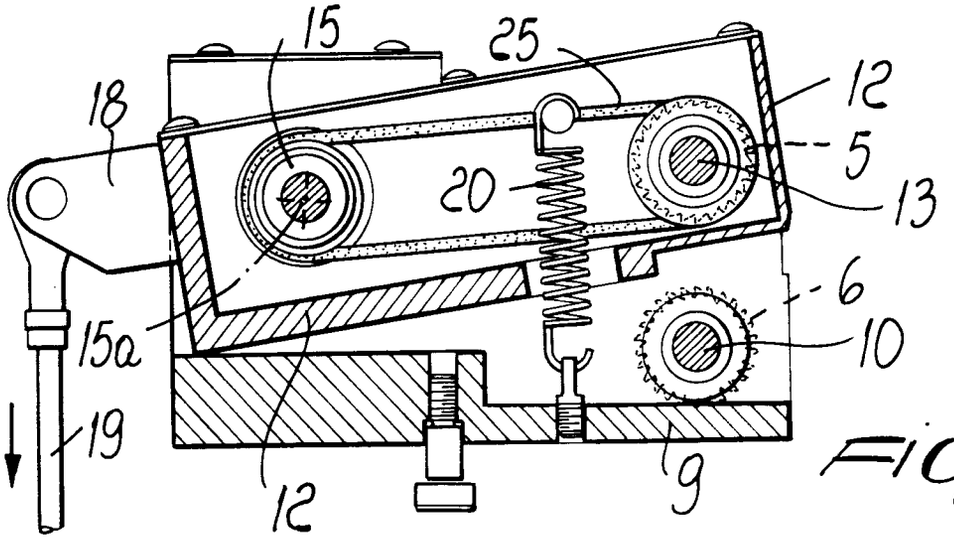


FIG. 4

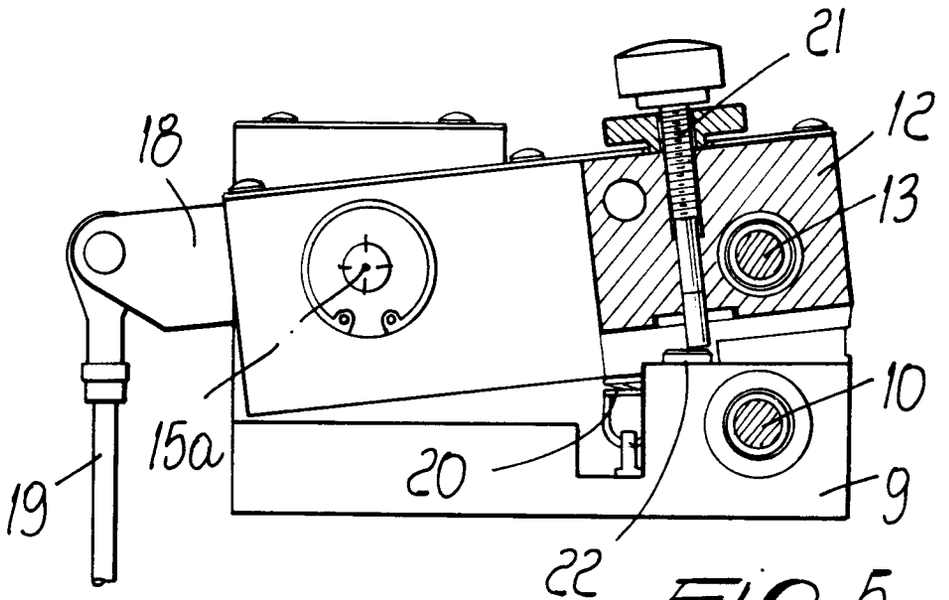


FIG. 5

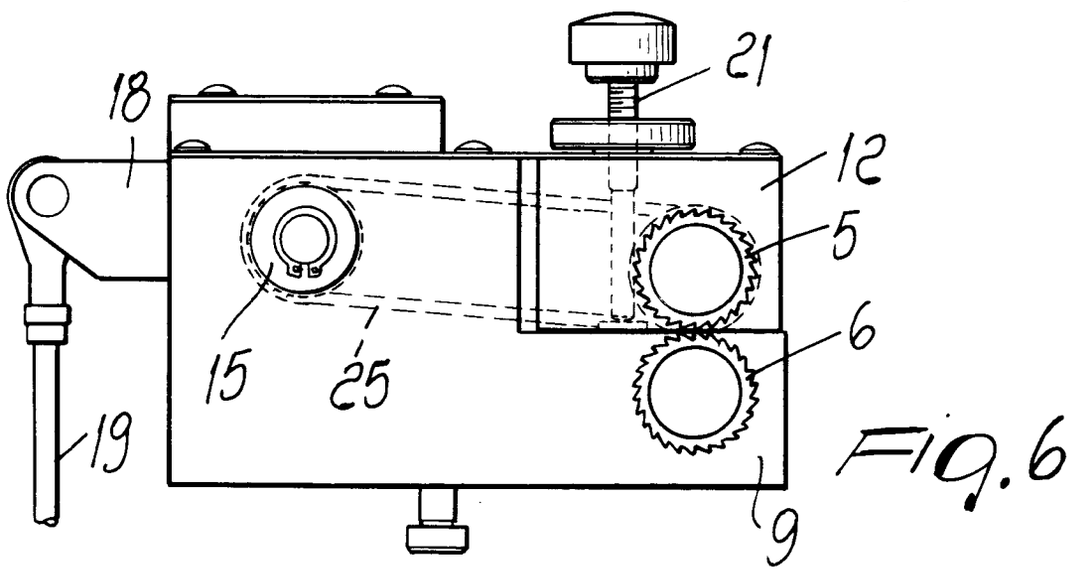
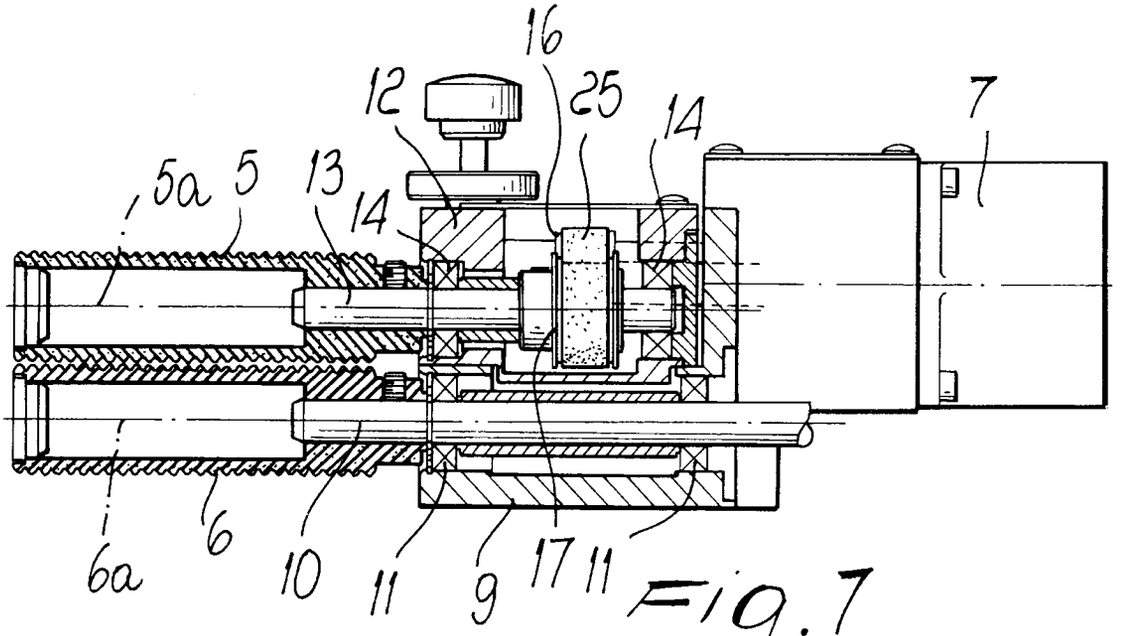


FIG. 6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5a
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6a
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11
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17
11

Fig. 7

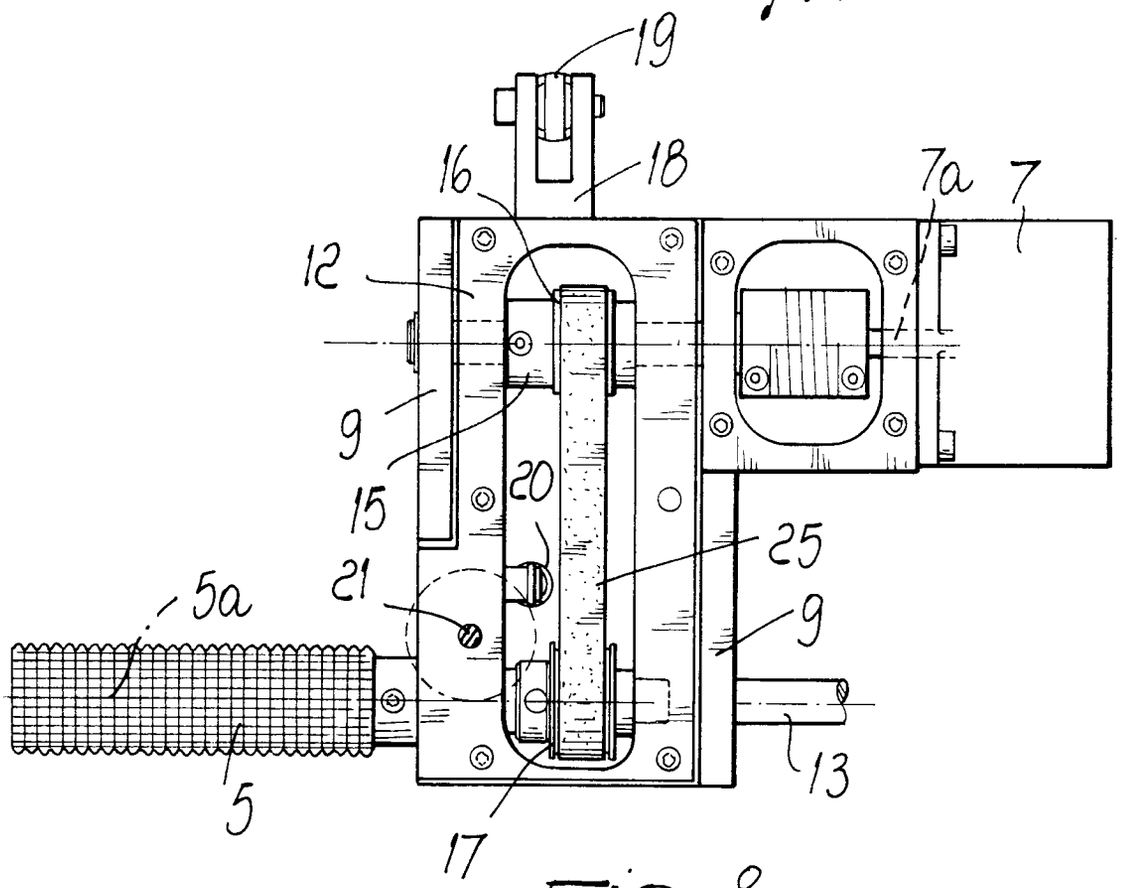
19
16
18
7a
7
12
9
15
20
25
21
5a
9
5
13
17

Fig. 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 11 5085

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.6)
Y	EP-A-0 115 264 (EXACTA S.P.A.) * figures *	1-8	D05B27/14
Y	DE-A-35 16 715 (PFAFF INDUSTRIEMASCHINEN GMBH) * page 9, line 8 - line 26 * * page 10, line 30 - page 11, line 18 * * page 16, line 20 - line 33; claim 1 *	1-3,6	
Y	US-A-4 147 120 (M. ADAMSKI, JR. ET AL.) * column 8, line 55 - column 9, line 19; claim 1; figures *	4,5,7,8	
A	DE-A-42 39 674 (SARA LEE CORP.; UNION SPECIAL CORP.) * column 8, line 15 - column 9, line 35; figures 1-12B *	1,4,5,7, 8	
A	US-A-4 182 248 (A.C. KLAGES)		
A	US-A-4 303 027 (T. UEMURA ET AL.)		TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	US-A-4 295 435 (T. UEMURA)		D05B
A	GB-A-2 021 164 (LEVI STRAUSS & COMPANY)		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 November 1995	D Hulster, E

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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