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Langenegger

[11] **3,823,678**

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[54] **AUTOMATIC COLOR-CHANGE MECHANISM FOR SHUTTLE EMBROIDERING MACHINE**

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[52] **U.S. Cl.** **112/84**
[51] **Int. Cl.** **D05c 5/00**
[58] **Field of Search** 112/83, 84, 94

[56] **References Cited**

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[57] **ABSTRACT**

An automatic color-change mechanism for a shuttle embroidering machine has a pair of pusher guides arranged on a needle carriage and converging to a point at the front of the latter and at an acute angle to each other. For the 4/4 repeat, a left hand pusher in one guide and a right hand pusher in the other are linked with a control bar movable transversely to the working direction of the needles. The linkage levers are disposed at an angle to each other such that, as the control bar moves left, the left hand pusher is moved into working position while the right hand pusher is withdrawn and vice versa.

3 Claims, 8 Drawing Figures

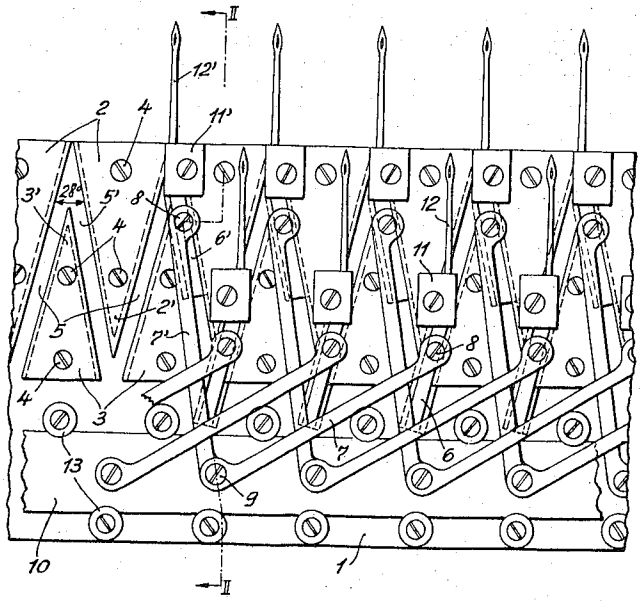
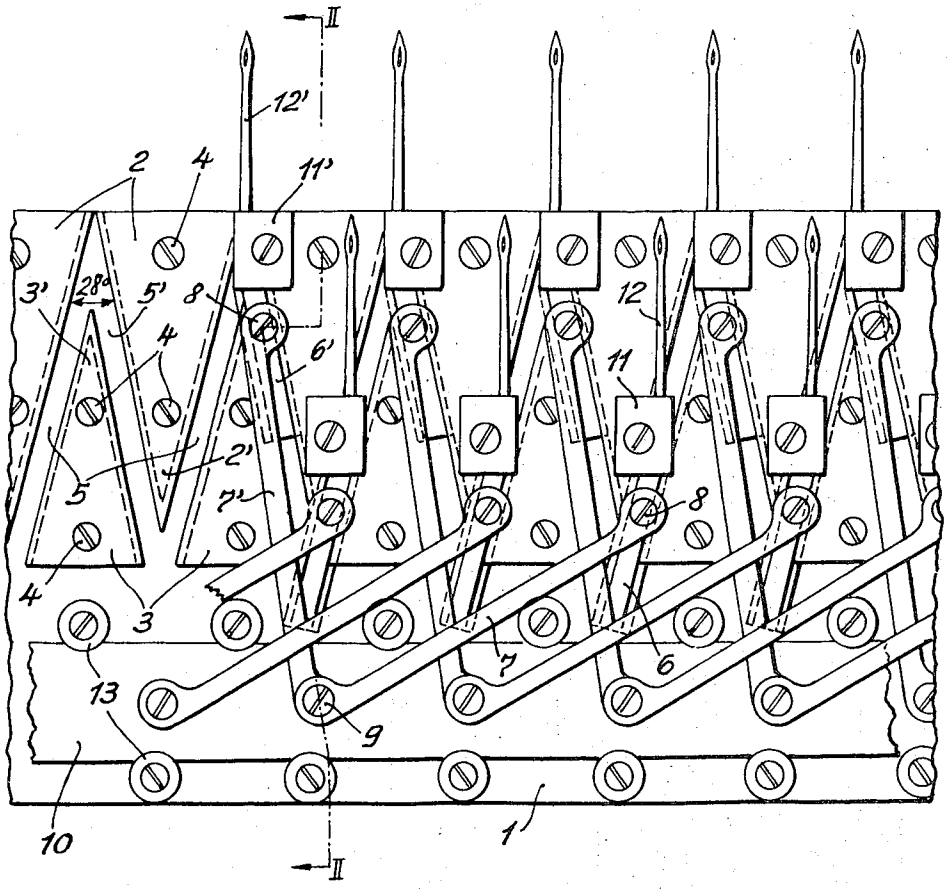


Fig.1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3'
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8
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6'
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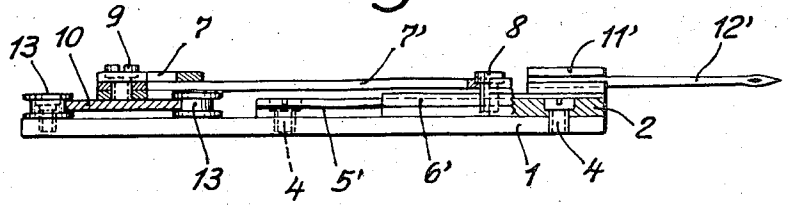
7'
8
4
3
7
6
13
9
10
1
II

Fig.2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1
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Fig.3

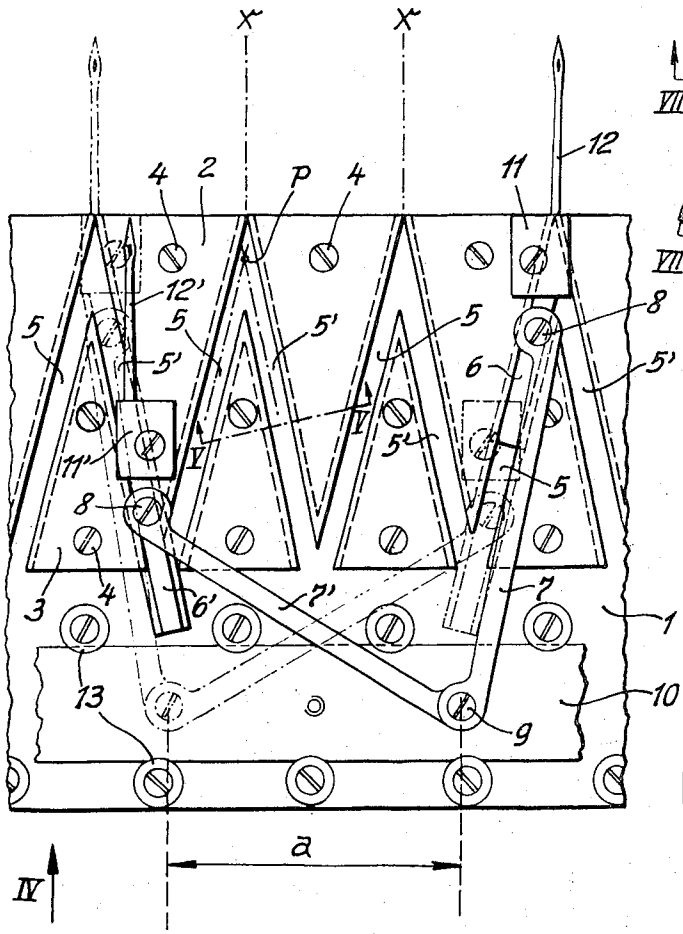


Fig.6

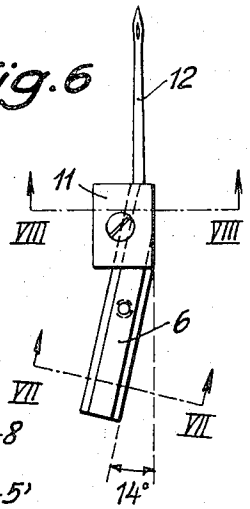


Fig.7

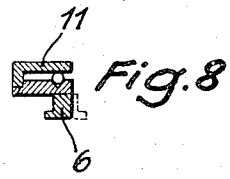


Fig.8

Fig.4

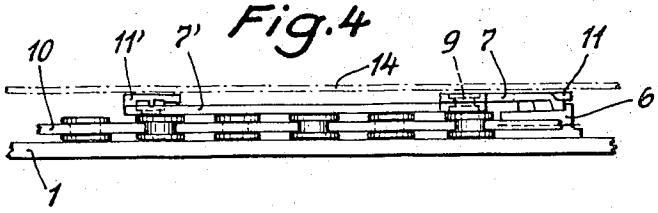
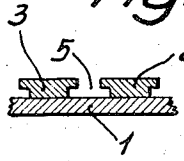


Fig.5



AUTOMATIC COLOR-CHANGE MECHANISM FOR SHUTTLE EMBROIDERING MACHINE

This invention relates to an attachment or mechanism for shuttle embroidering machines which makes possible fully automatic two-color change in all repeats, including 4/4 repeats.

To achieve this purpose the color-change device or mechanism according to the invention has pairs of pusher guides arranged on a needle carriage and converging to a point at the front at an acute angle to each other. For each 4/4 repeat a left-hand pusher running in one guide and a right-hand pusher running in the other guide are linked by pairs with a control bar movable transversely to the working direction of the needles, by connecting levers arranged at an angle to each other, in such manner that as the control bar moves left the left-hand pusher moves in its guide into the working position, and the right-hand pusher in the other guide assumes its resting position, whereas when the control moves right the pushers are brought into the opposite positions.

Compared with color changing systems known heretofore the device according to the invention has the advantage of being absolutely unsusceptible to trouble, even with the simplest design. Moreover, two-color embroidering is possible in all repeats by taking out the appropriate needles. Automatic color change as well as two-color embroidering are possible in the 4/4 repeat also.

The accompanying drawing shows by way of example a preferred embodiment of the invention. In the drawing:

FIG. 1 is a fragmentary top view of the color-changing mechanism, with the control bar moved to the left;

FIG. 2 is a sectional view taken along the line II—II of FIG. 1;

FIG. 3 is a view similar to FIG. 1 which illustrates the position of a pair of connecting levers with needle pushers as the control bar is moved to the right;

FIG. 4 is an elevational view in the direction of arrow IV in FIG. 3;

FIG. 5 is a fragmentary vertical section taken along the line V—V of FIG. 3;

FIG. 6 is a top view of a needle pusher with its needle;

FIG. 7 is a sectional view taken along the line VII—VII of FIG. 6; and

FIG. 8 shows a sectional view as taken along the line VIII—VIII of FIG. 6.

Referring to the drawing, the automatic color changing device shown in FIGS. 1 and 3 comprises wedge-shaped guide pieces 2 and 3 fixed with screws 4 on a needle carriage or needle rail 1 working transversely to the longitudinal axis thereof, so that their acute-angled points 2′ and 3′ project alternately from opposite sides, forming guideways 5 and 5′ of dovetail profile with their flanks (FIG. 5). Each two guide pieces 2 and the guide piece 3 projecting therebetween form pairs of guideways, in which each two sides 5,5′ converge forwardly at an angle of about 28°, intersecting at an apex P and ending together at the front edge of the needle rail 1. Running in the guideways 5 and 5′ are needle pushers 6 and 6′, every fourth guideway pair 5 and 5′ has a right-hand pusher 6 running in a guideway 5 linked by a pair of connecting levers 7 and 7′ with a left-hand pusher 6′ running in a guideway 5′. The front

ends of the connecting levers 7 and 7′ are pivoted to pushers 6 and 6′ arranged in 4/4 repeat by means of hinge pins 8, while the rear ends of the connecting levers 7 and 7′ are linked with a control bar 10 extending lengthwise of the needle rail 1, by means of a common hinge pin 9. At their front ends the needle pushers 6 and 6′ carry needle clamps 11 and 11′ holding needles 12 and 12′ each of which, as shown in FIG. 6, includes an angle of 14° with its pusher axis. In the longitudinal axis of the needle rail 1, i.e., transverse to the working direction of the needles, the control bar 10 can perform a limited movement of about 52 mm and runs in two sets of rollers 13 guiding its edges.

As the control bar 10 is shifted to the right, the right-hand needle pushers 6 with the needles 12 are brought into their working position (FIG. 3), and as the control bar is shifted to the left the same happens with the left-hand pushers 6′ and the needles 12′. The left-hand pushers 6′ are a mirror image of the right-hand pushers 6. The position x of the needles on needle rail 1 is the same in the working position of the left and right-hand pushers 6 and 6′. Due to the left and right-hand pushers 6 and 6′ being connected in pairs, only one pusher at a time — left or right-hand — can be in working position for each 4/4 repeat. Owing to the reciprocally positive control of the left and right-hand pushers in the 12/4 repeat by means of the connecting lever pairs 7,7′ moved together through control bar 10, all left-hand pushers 6′ are brought into working position as the control bar 10 is moved to the left, and all right-hand pushers 6 as the bar is moved to the right. Hence the color change can be effected by operating the control bar 10, without having to stop the machine.

Because in the working position the pushers 6 or 6′ are approximately parallel to their connecting levers 7 or 7′, and the connecting levers are almost at right angles to the control bar 10, even under hard stitching impacts the stress on the needles in the working position has only an insignificant effect in the direction of the control bar traverse 10, so that the pressures are taken up solely by the needle carriage.

The mutual stop for the needle pushers 6 and 6′ formed by the convergence of the pusher guides 5 and 5′ at the intersection P limits the traverse *a* of the control bar at the same time. Every movement of the control bar 10 actuates all needles simultaneously, drawing back the needles in the working position and at the same time advancing the needles in the resting position into the working position.

The needle carriage 1 equipped with the device described has a height of only 12 mm approximately, including the cover (FIG. 4).

With the control bar 10 in the left-hand position, the link 7′ of the connecting lever pairs 7 and 7′ in the working position is crossed by two links 7 of the neighboring connecting levers pairs 7 and 7′ in the resting position, whereas in the right-hand position of the control bar 10 the link 7 of a connecting lever pair 7, 7′ in the working position crosses each time the two links 7′ of the neighboring connecting lever pair 7, 7′ in the resting position.

What I claim is:

1. An automatic color-change mechanism for a shuttle embroidery machine, having pairs of pusher guides arranged on a needle carriage and converging to a point at the front at an acute angle to each other, wherein for each 4/4 repeat a left-hand pusher running

in one guide and a right-hand pusher running in the other guide are linked in pairs with a control bar movable transversely to the working direction of the needles by connecting levers disposed at an angle to each other such that as the control bar moves left the left-hand pusher moves in its guide into working position, and the right-hand pusher in the other guide assumes its resting position, while as the control bar moves right the pushers are brought into positions opposite thereto.

2. An automatic color-change mechanism as defined in claim **1,** wherein the connecting levers are linked in pairs with the control bar by a common pivot pin, being divergent to the front and having their ends each connected by a pivot pin with a pusher running in the respective guide.

3. An automatic color-change mechanism as defined in claim **1,** wherein, with the control bar in the left-hand position, the link of the connecting lever pairs in the working position is each time crossed by two links of neighboring connecting lever pairs in the resting position, whereas in the right-hand position of the control bar the link of a connecting lever pair in the working position crosses each time two links of neighboring lever pairs in the resting position.

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