June 4, 1963 E. MARSCHIK 3,092,054

APPARATUS FOR CARRYING OUT AUTOMATIC REPEAT CHANGE IN EMBROIDERY MACHINES

Filed Nov. 14, 1960 2 Sheets-Sheet 1

Fig.1

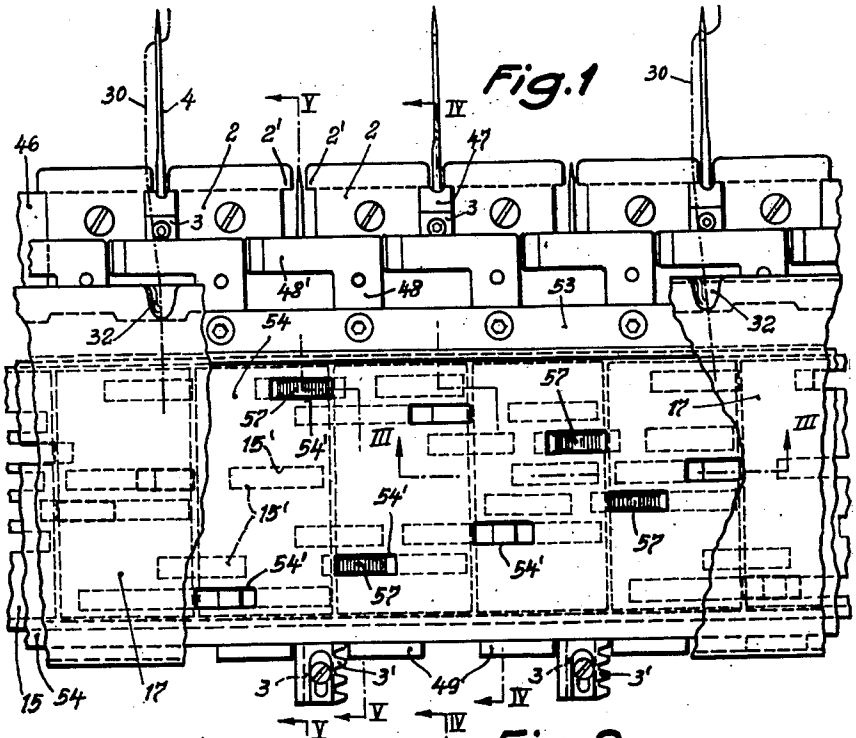
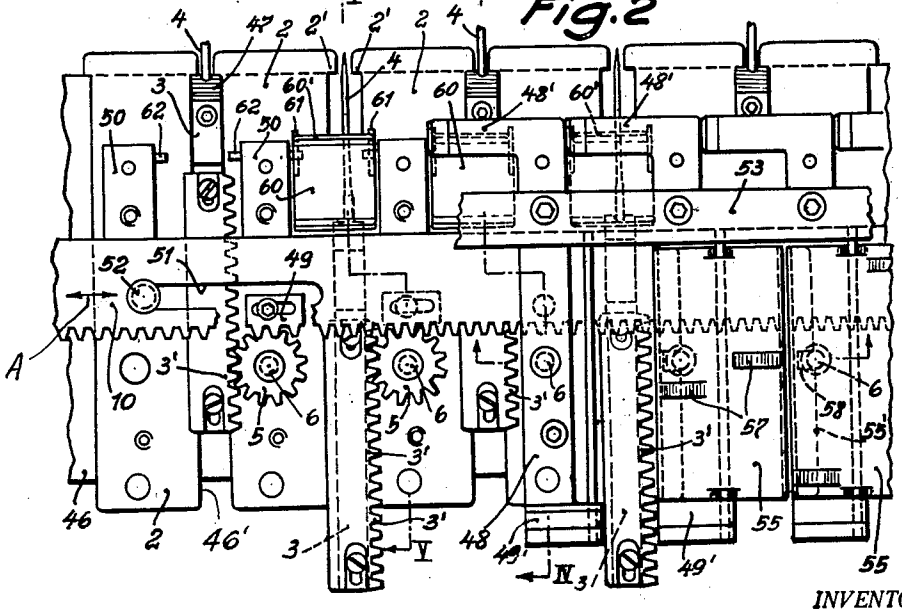


Fig.2



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Filed Nov. 14, 1960 2 Sheets-Sheet 2

Fig.3

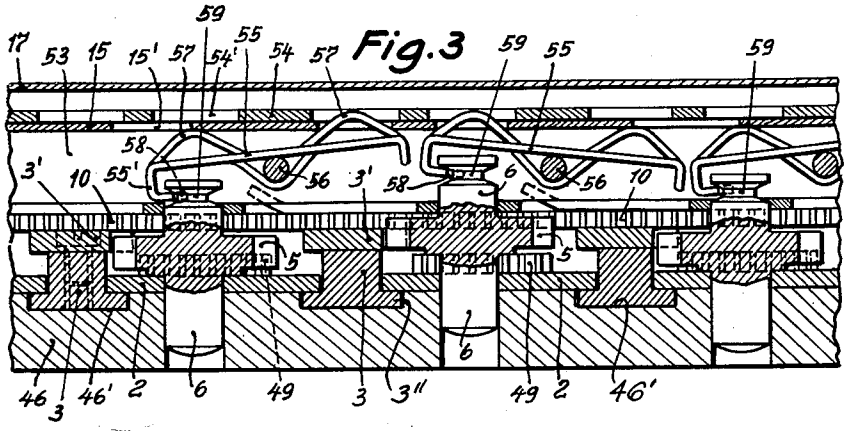


Fig.4

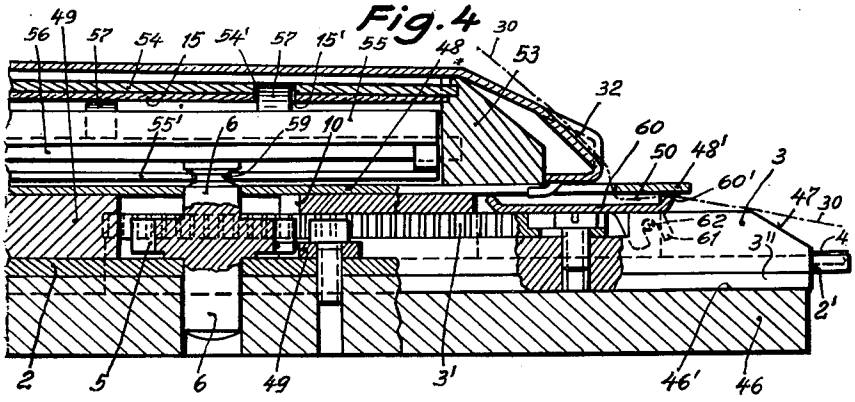
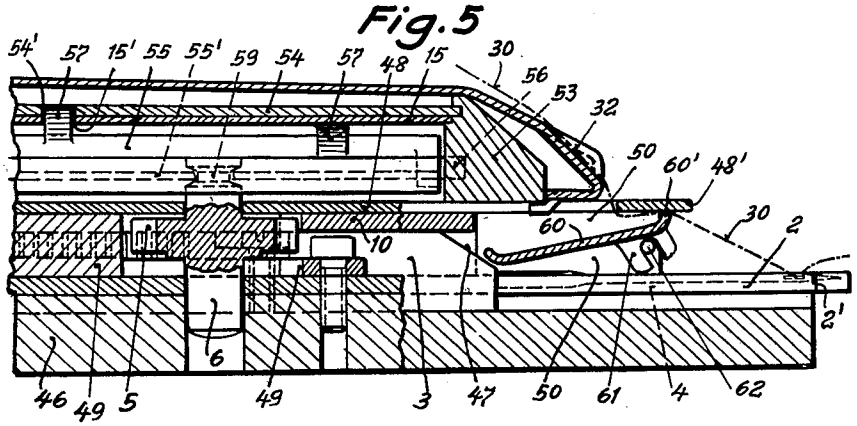


Fig.5



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3,092,054

APPARATUS FOR CARRYING OUT AUTOMATIC REPEAT CHANGE IN EMBROIDERY MACHINES

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Claims priority, application Switzerland Nov. 11, 1959
4 Claims. (Cl. 112—83)

There have been proposed a method and an apparatus for carrying out the automatic repeat change and the automatic yarn and color changes for the automatic use of an additional upper thread in Schiffli embroidery machines of any system (e.g. of the type shown in U.S. Patents 1,118,115 and 1,190,911). Such apparatus was characterized in that the needles are no longer directly and rigidly attached to the needle bar as heretofore, but are mounted on needle carriages movable to and fro, and that there is provided a repeat change device controlled by an exchangeable automatically operable repeat finding template, operating the needle carriage and actuated through the apparatus, in conjunction with automatically operated threading and thread cut-off devices as well as changing members and/or such holding in readiness additional thread. In my copending application Ser. No. 753,585, filed August 6, 1958, now Patent No. 3,025,808, I have disclosed and claimed an apparatus of the class described wherein the needles are movable on the needle bar.

The present invention relates to a further development of this apparatus for effecting the automatic repeat change and automatic yarn and color changes in Schiffli embroidery machines, the apparatus being particularly characterized by its simplified design. The simplification chiefly results from the elimination of the rethreading mechanism.

The yarn or color change is accomplished according to the invention by an arrangement whereby, at the commencement of work, the needles of each series are differently threaded in a definite sequential order with respect to yarn or color, and the yarn or color change is effected by the change of the active needles in unchanged distance of the repeat and by displacing the work-frame simultaneously.

In order to ensure troublefree work of the automatic yarn and color change device according to the invention, there is provided a thread return brake means operatively connected to each needle carriage, closing upon retraction of the needle carriage and opening upon advance of the same.

The underlying principle of this apparatus is to be seen in the embroidery needles which are retractable in any desired series whereby, considering the needles remaining in active position, there results an altered distance of repeat and an altered color position, thus enabling the designs to be executed in different repeats and colors. In the functioning of the color change, the needles series each time becoming active, are merely threaded in another color in order to carry out the embroidery work in a different color, in this case at the same distance of repeat, which is enabled by displacing the work-frame for the purpose of bringing the working place of the cloth to the embroidery needle. In this way it is possible to work: in the 8/4 repeat 2 yarn colors, in the 12/4 repeat 3 yarn colors, in the 16/4 repeat 4 yarn colors, and so on, whereby the needles need only be threaded once at the commencement of the work in the corresponding sequence of the colors. In the inoperative or again retracted needles, the yarn as threaded therein can be drawn after as a loop. But, if desired, the thread may also be cut off about 3 centimeters beyond the needle eye, and thus remains, due to the thread return control, threaded in the needle until its next insertion.

The accompanying drawing shows by way of example one preferred form of embodiment incorporating the invention.

FIG. 1 shows a fragmentary top view of the needle bar provided with the apparatus, with cover plate partially broken away;

FIG. 2 is a fragmentary top view of the same without cover plate, with machine parts partially dismantled;

FIG. 3 is a sectional view on a larger scale along the needle bar, taken on the line III—III in FIG. 1 or 2;

FIG. 4 is a sectional view on a larger scale, taken on the broken line IV—IV of FIG. 1 or 2, and

FIG. 5 shows a section on a larger scale, taken on the broken line V—V of FIG. 1 or 2.

Referring to said annexed drawing, a needle bar **46** has reciprocatable needle carriages **3** guided thereon in grooves **46'** extending transversely to the bar. The flange-like enlarged slide foot of each needle carriage **3** is further embraced by guide plates **2** which are mounted on the needle bar and whose longitudinal edges project beyond said groove **46'**. The front end of each needle carriage **3** carries an embroidery needle **4** and exhibits an upwardly turned inclined surface **47**. The advanced position of the needle carriages **3**, inserted from behind into the guides **46'**, is limited by lateral projections **2'** of the front ends of guide plates **2**. The needle carriages **3** have fixed thereto toothed racks **3'** meshing with pinions **5**. The latter are vertically displaceably supported with their axles **6** in bearing bores of the guide plates **2** and of the tie-plates **48** arranged thereover in spaced relation. In lowered position, the pinions **5** each engage locking means constituted by a toothed locking piece **49** and the rack **3'** of the needle carriage **3**. In raised position, however, the pinions **5** engage both the rack **3'** of the respective needle carriage and a driving rack **10** with which they form a drive means. The pinions are thus in permanent engagement with the rack **3'** of the needle carriages, are further locked in their lowered position and brought into driving engagement with rack **10** in their raised position. With their rear end, the tie-plates **48** are mounted on brackets **50** and these on the bearing plates **2**, whereas the front parts of the tie-plates are supported by brackets **50**. Against the latter the driving rack **10** also rests with its back. The rack **10** lies with its underside on the racks **3'** and with its upper side against the tie-plates **48**, thereby limiting vertical displacement of rack **10**. The control path of rack **10** is limited by a longitudinal slot **51** with which it slides over a stud **52** attached to a guide plate **2**.

Vertical adjustment of the pinions **5** is effected by longitudinal adjustment of a camming template **15** provided with openings **15'**. The template forms actuating means and is laterally guided on brackets **49'** and on a bearing profile **53** mounted on the tie-plates **48** and brackets **50**. At the top it is supported by a bearing plate **54** which is provided with recesses **54'** and fixed on the one hand to the brackets **49'** and on the other hand to the bearing profile **53**. Arranged beneath the template **15** there are rockers **55** which are capable of swinging on the brackets **49'** transversely to the longitudinal direction of the template and to the axles **56** supported on the bearing profile **53**. Said rockers **55** consist of oblong sheet steel and include feelers or cam portions **57** which are laterally staggered on sides opposite each other with respect to the axis **56** and with respect to their median line parallel to the needle bar **46**, which feelers are capable of passing through the openings **15'** in the template **15** into the recesses **54'** in the bearing plate **54**. The recesses **54'** are arranged on the bearing plate **54** in a formation that corresponds to the position of the cams **57** so that oscillation of a rocker **55** alternately causes one or the other of its cams **57** to enter the recess **54'** allocated thereto. One of the two edges of each rocker, parallel to the rocker

axis, has a downwardly and inwardly directed hook profile 55' with a recess 58, which engages a constriction 59 at the upper end of a respective axle 6 of pinion 5 so that rocking effects raising and lowering of the pinions 5. The recesses 15' in the template, cooperating with the cams 57 of the rockers 55, may for instance, as visible in FIG. 1, be distributed with respect to the cams in the pushing direction of the template in such a way that of two adjacent needles carrying two different yarns or colors in two positions of the template 15, in the first portion retraction of the first needle is effected, and in the second portion of template 15 the first needle is advanced and at the same time the second needle is retracted.

In the operation of the rockers 55 the use of return springs is dispensed with, which with the plurality of needles would cause undue operational resistances on a needle bar. Control of the rockers by two cams per rocker secures a positive, power-saving actuation of the same. By staggering the cams within a cam formation extending over four rockers, a greater freedom of movement for the repeat-finding template reaching over the entire needle bar is achieved, so that sufficient stations find place therein. For further combinations of the individual or serial retraction of the needles, the template may be changed for another.

By displacement of the rack 10 in the direction of the arrow A in FIG. 2, depending on the position of the template, the desired needles may be retracted from the active position. The needles that remained in active position in the new series are brought to the working place by shifting the cloth so that with these needles the embroidery work may be continued with another color. The thread in the inoperative needles is drawn after as a loop until re-inserted or, if desired, cut off about 3 centimeters beyond the needle eye. Any repeat distance change of the active needles may take place by the same procedure, the needles being preferably all threaded with the same color which makes it possible to execute a design in different and mixed sizes of repeats.

In order to prevent undesired unthreading of the needle upon cutting off the thread 30 at the needle intended for interrupting the work, provision is made for thread-return brake means over each needle carriage 3. Said brake means includes a clamping member or flap 60 of sheet steel which, with lateral forked bearings 61, is supported on axle pins 62 of the brackets 50. At least the front edge of said flap is bent up and serves as clamping edge 60' cooperating with a laterally projecting thread-guide arm 48' which forms an anvil member, of the tie-plate 48. The fulcrum of the flap lies far to the front. With advanced needle carriage, the flap is held horizontal by its resting thereon, so that the thread, as shown in FIG. 4, can easily slide through between the guide arm 48' and the clamping edge 60' of flap 60. Thereby the thread is also carried through the thread guide means 32 of the cover plate 17. On reaching the retracted position of the needle carriage 3, the flap loses its rest and falls, as shown in FIG. 5, by its own weight into its braking position, thus securing the thread against return. By the inclined surface 47 at the forward end of the needle carriage 3, with the advance thereof, the flap 60 is raised to its non-braking position.

The action of the described apparatus is as follows: During a short dwell of the needle bar 46 which is reciprocable as disclosed in the Eggart Patent 1,118,115, in its retracted position, the repeat-control template 15 is set in the desired station over the automatic repeat-change mechanism. Incidentally, by control of the corresponding rockers 55, the pinions 5 of the desired needle carriages will be released from their locking position and brought into engagement with the rack 10. Also by automatic operation of the rack 10 in the direction of the arrow A in FIG. 2, these needle carriages are retracted from their active position. The needles that remained in active position are secured in it by engagement of the pinion 5 in the toothed locking piece 49 and can execute their work in their repeat, or if otherwise threaded, in their color, as soon as by suitable sideways shift of the frame the place of the cloth being embroidered has been brought toward the embroidery needles that remained in active position. Thereby a change in repeat and color takes place according to a predetermined plan that corresponds to the design to be executed. Since the repeat-finding template remains in its previously sought station, at the next change, by means of the rack 10, this needle series will again be brought forward; by means of the repeat-finding template the new needle series be determined, and retracted from the active position. This procedure may be repeated and varied at will, inasmuch as the embroidery yarn always remains threaded in the needle, even if the needles do not work in their retracted position.

What I claim is:

1. In an embroidery apparatus wherein an elongated needle bar is provided with an array of needles extending in a direction generally transverse thereto for engagement with a fabric extending generally parallel to said needle bar and perpendicularly to said needles, the improvement which comprises:

a plurality of needle carriages, each carrying a respective one of said needles and provided with a rack, displaceably mounted on said bar for individual movement in said direction between an extended position wherein corresponding needles are engageable with said fabric and a retracted position wherein corresponding needles are withdrawn from engagement with said fabric;

drive means on said bar for displacing said needle carriages between said positions; and

actuating means operable for coupling selected ones of said carriages with said drive means for displacement relative to said bar into one of said positions and for temporarily locking the remainder of said carriages against displacement relative to said bar, said drive means including a drive rack longitudinally shiftable along said bar and a respective pinion assigned to each of said carriages and shiftable on said bar between a first position wherein the respective rack of each carriage is coupled with said drive rack and a second position wherein said respective rack is decoupled from said drive rack, said actuating means including cam means for selectively shifting said pinions.

2. In an embroidery apparatus wherein an elongated needle bar is provided with an array of needles extending in a direction generally transverse thereto for engagement with a fabric extending generally parallel to said needle bar and perpendicularly to said needles, said apparatus further comprising guide means for supplying a respective thread to the eye of each needle, the improvement which comprises:

a plurality of needle carriages, each carrying a respective one of said needles, displaceably mounted on said bar for individual movement in said direction between an extended position wherein corresponding needles are engageable with said fabric and a retracted position wherein corresponding needles are withdrawn from engagement with said fabric;

drive means on said bar for displacing said needle carriages between said positions;

actuating means operable for coupling selected ones of said carriages with said drive means for displacement relative to said bar into one of said positions; and thread-brake means assigned to each of said needles operable in the extended position of the respective carriage to permit drawing of a respective thread through the eye thereof and in the retracted position of the needle for blocking passage of thread therethrough.

3. In an embroidery apparatus wherein an elongated needle bar is provided with an array of needles extending in a direction generally transverse thereto for engagement with a fabric extending generally parallel to said needle bar and perpendicularly to said needles, said apparatus further comprising guide means for supplying a respective thread to the eye of each needle, the improvement which comprises:

a plurality of needle carriages, each carrying a respective one of said needles, displaceably mounted on said bar for individual movement in said direction between an extended position wherein corresponding needles are engageable with said fabric and a retracted position wherein corresponding needles are withdrawn from engagement with said fabric;

drive means on said bar for displacing said needle carriages between said positions;

actuating means operable for coupling selected ones of said carriages with said drive means for displacement relative to said bar into one of said positions; and

thread-brake means assigned to each of said needles operable in the extended position of the respective carriage to permit drawing of a respective thread through the eye thereof and in the retracted position of the needle for blocking passage of thread therethrough, said thread-brake means including a respective anvil member on said bar adjacent each of said carriages, a respective clamping member pivotally mounted on said bar in juxtaposition with an anvil member normally clamping against said anvil member the threads supplied to the respective needle, and means on said carriages for camming the respective clamping members out of engagement with the respective threads upon displacement of the carriages into their extended positions.

4. In an embroidery apparatus wherein an elongated needle bar is provided with an array of needles extending in a direction generally transverse thereto for engagement with a fabric extending generally parallel to said needle bar and perpendicularly to said needles, said apparatus further comprising guide means for supplying a respective thread to the eye of each needle, the improvement which comprises:

a plurality of needle carriages, each carrying a respective one of said needles, and provided with a rack, displaceably mounted on said bar for individual movement in said direction between an extended position wherein corresponding needles are engageable with said fabric and a retracted position wherein corresponding needles are withdrawn from engagement with said fabric;

drive means on said bar for displacing said needle carriages between said positions;

actuating means operable for coupling selected ones of said carriages with said drive means for displacement relative to said bar into one of said positions and for temporarily locking the remainder of said carriages against displacement relative to said bar, said drive means including a drive rack longitudinally shiftable along said bar, a respective pinion assigned to each of said carriages and shiftable on said bar between a first position wherein the respective rack of each carriage is coupled with said drive rack and a second position wherein said respective rack is decoupled from said drive rack, and a lock member engageable with each pinion in said extended position of said carriages for preventing displacement of the respective needles upon engagement thereof with said fabric, said actuating means including cam means for selectively shifting said pinions; and

thread-brake means assigned to each of said needles operable in the extended position thereof to permit drawing of a respective thread through the eye thereof and in the retracted position of the needle for blocking passage of thread therethrough.

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