

Aug. 2, 1966

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3,263,632

MULTI-NEEDLE EMBROIDERY MACHINES

Filed Nov. 23, 1962

6 Sheets-Sheet 1

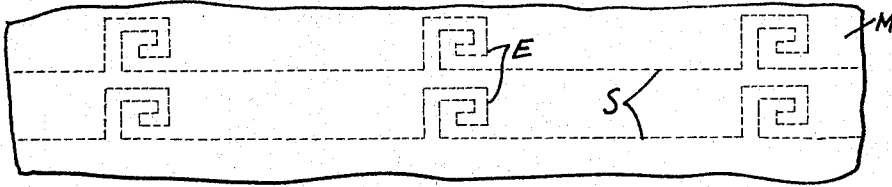


FIG. 1

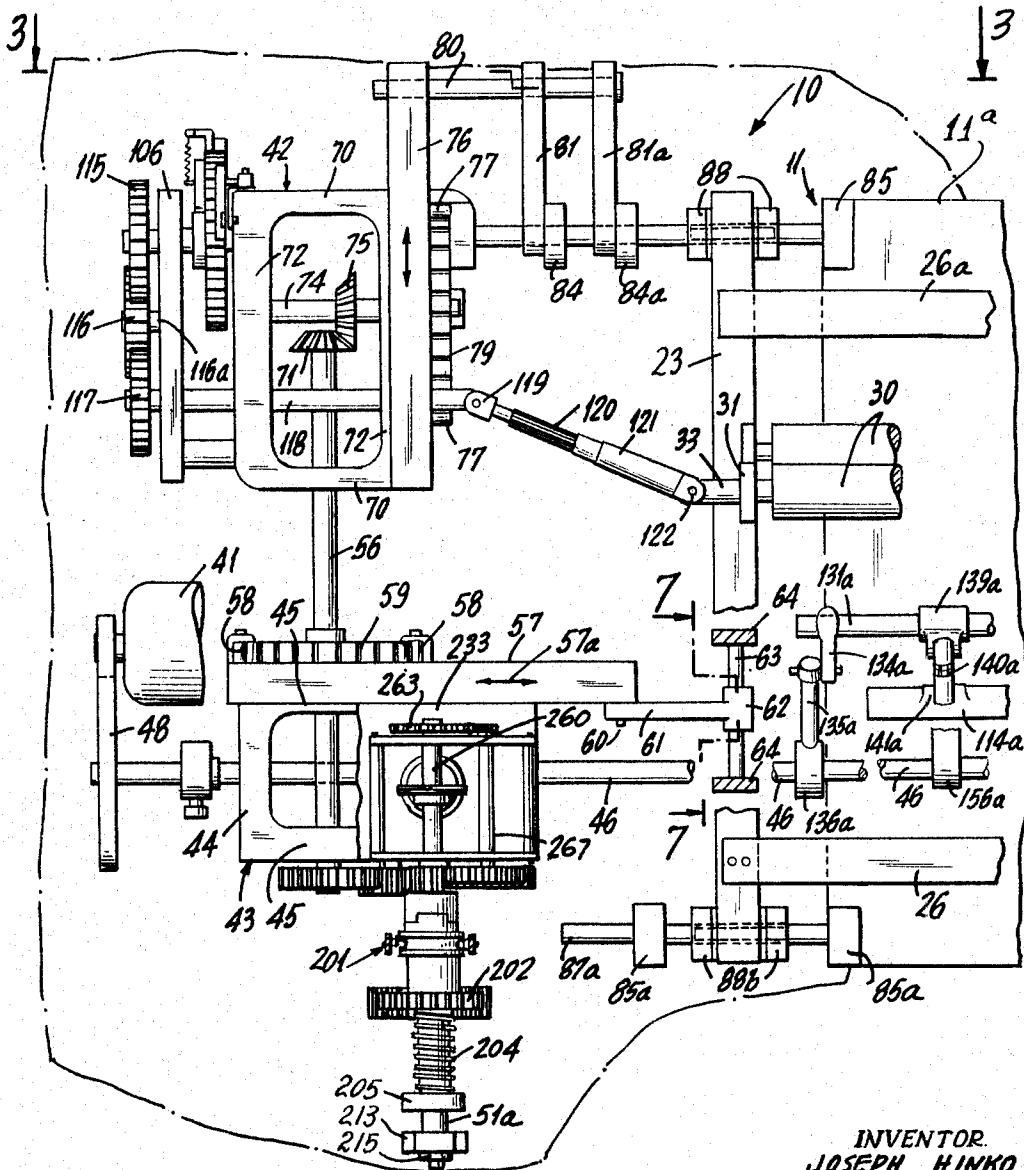


FIG. 2

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6 Sheets-Sheet 2

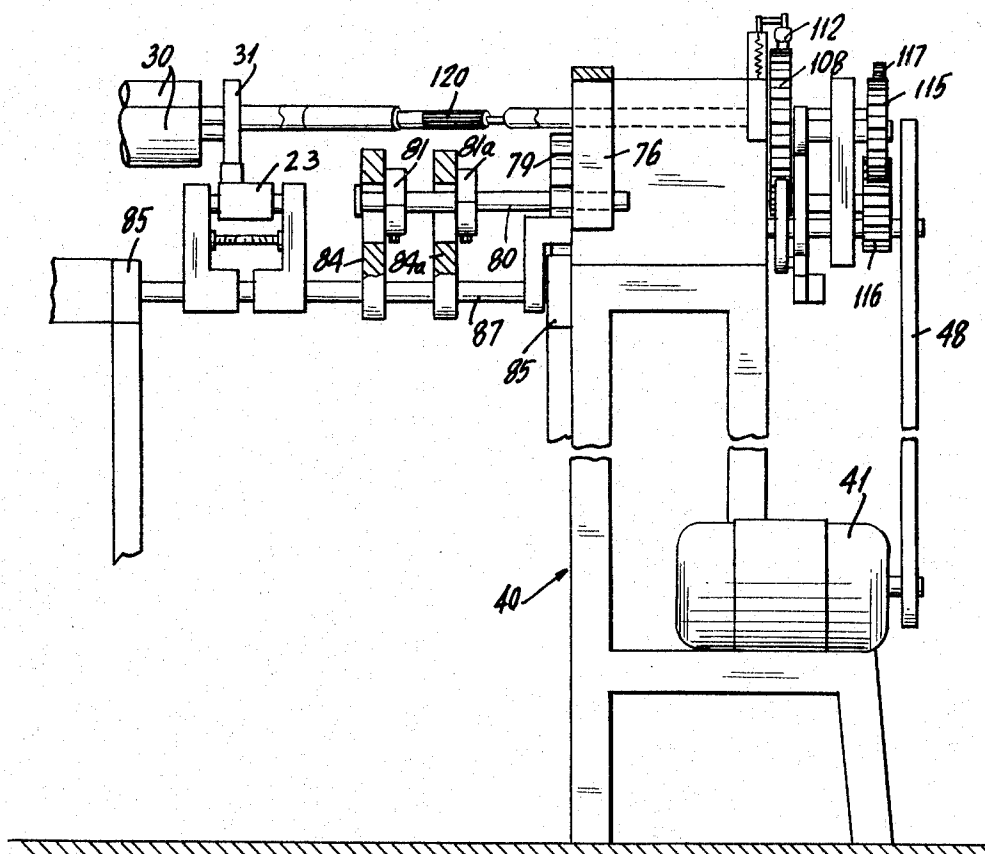


FIG. 3

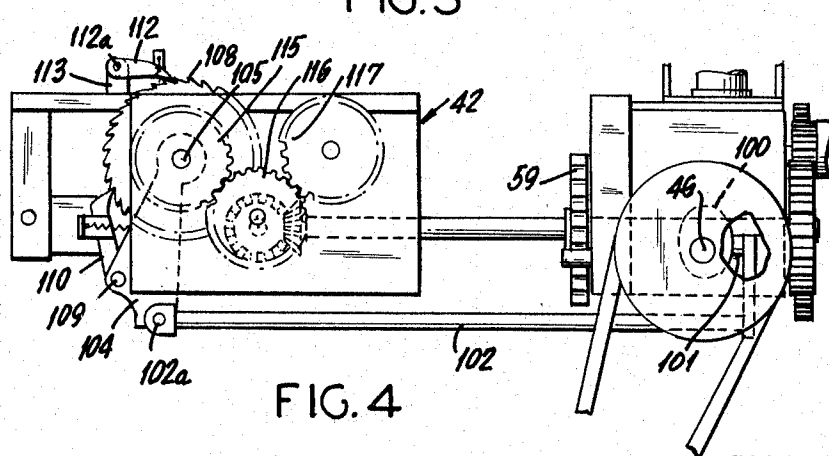


FIG. 4

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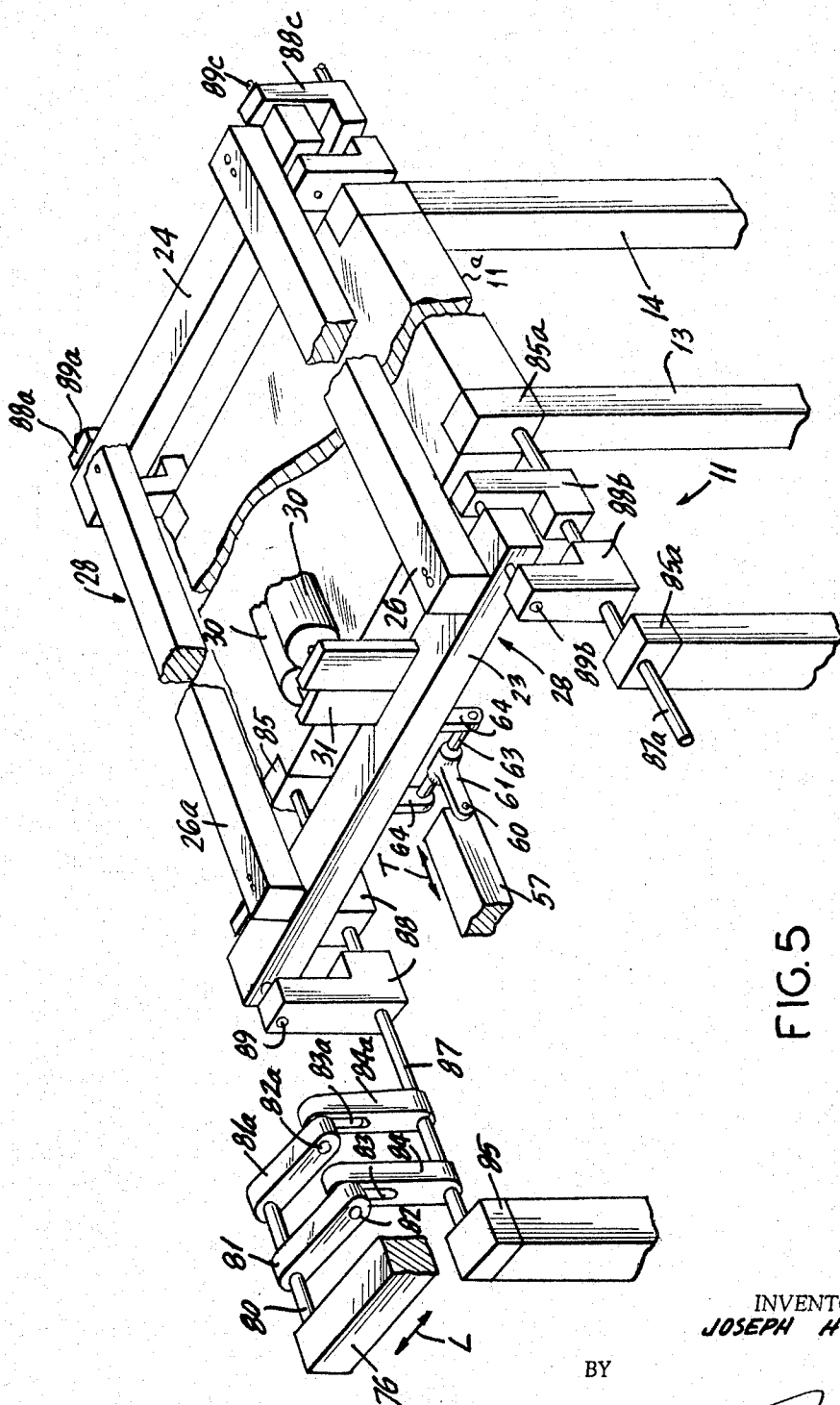


FIG. 5

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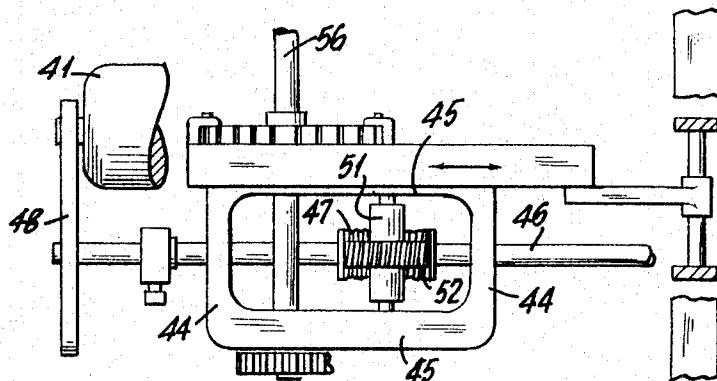


FIG. 6

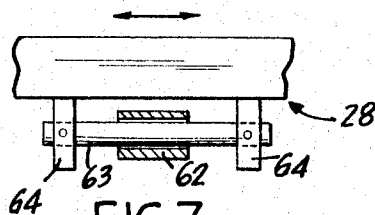


FIG. 7

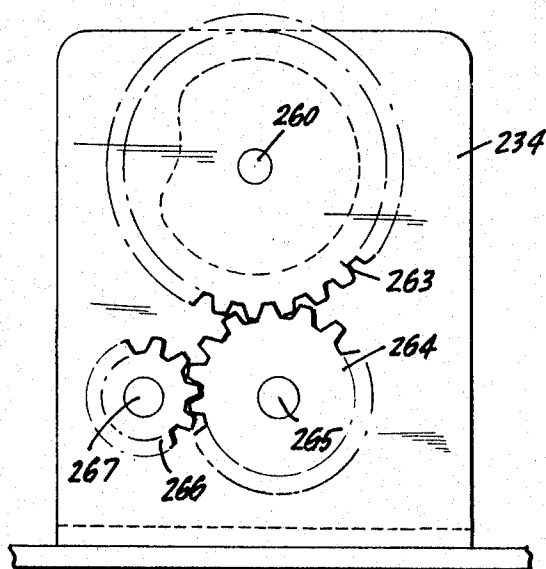


FIG. 11

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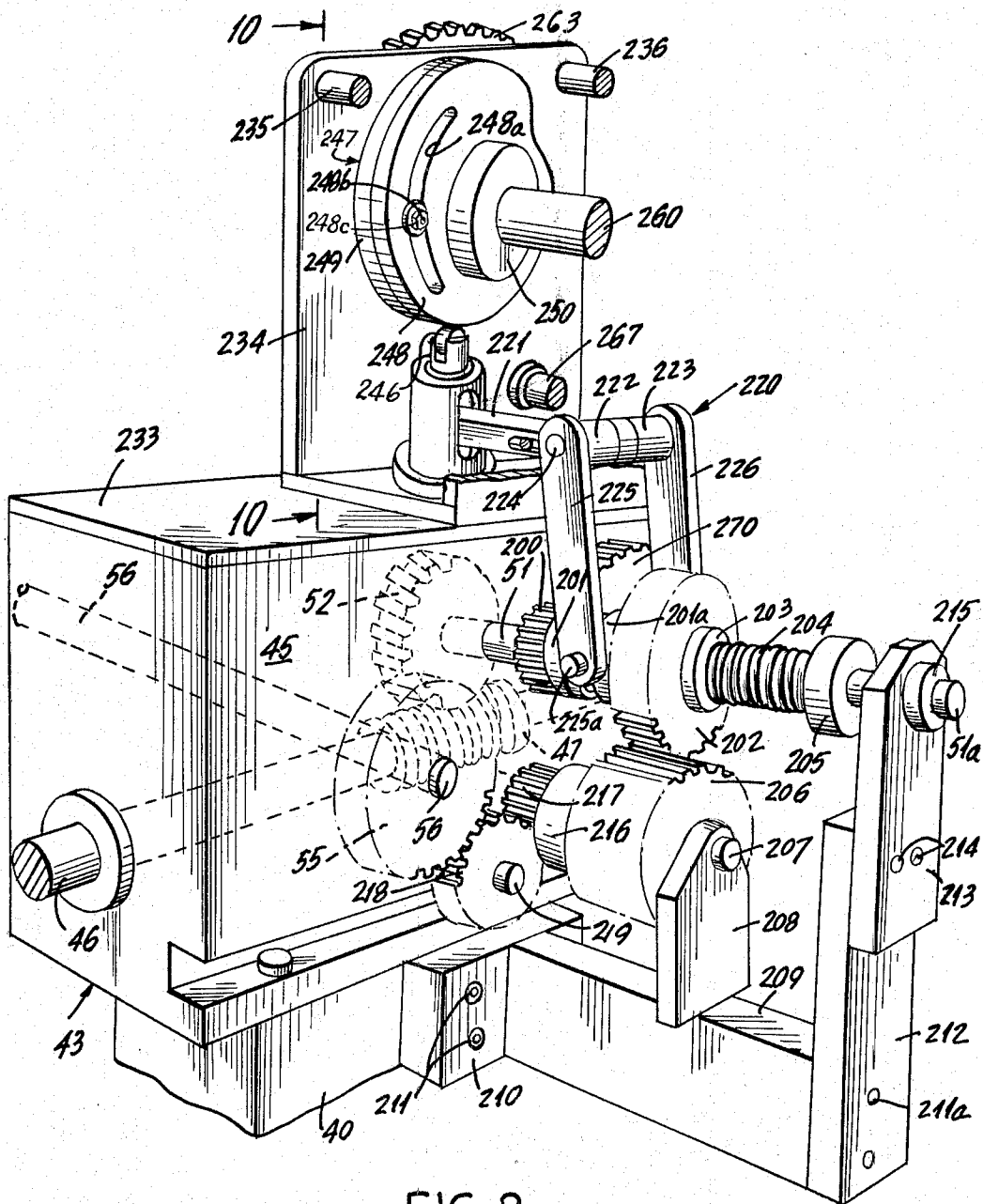
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MULTI-NEEDLE EMBROIDERY MACHINES

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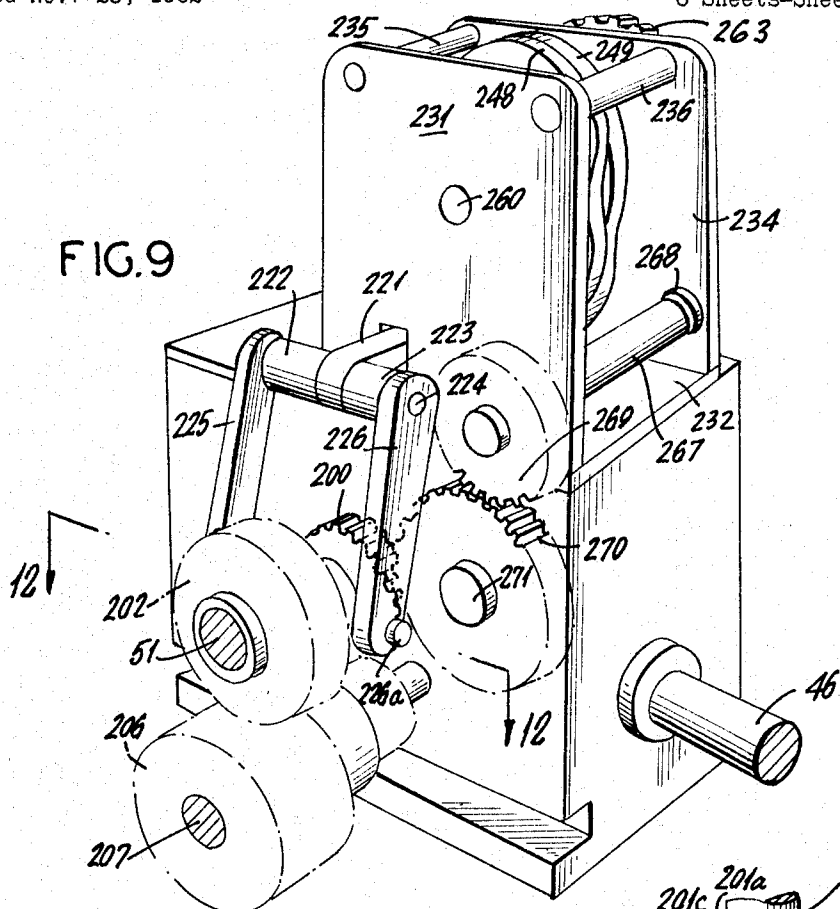
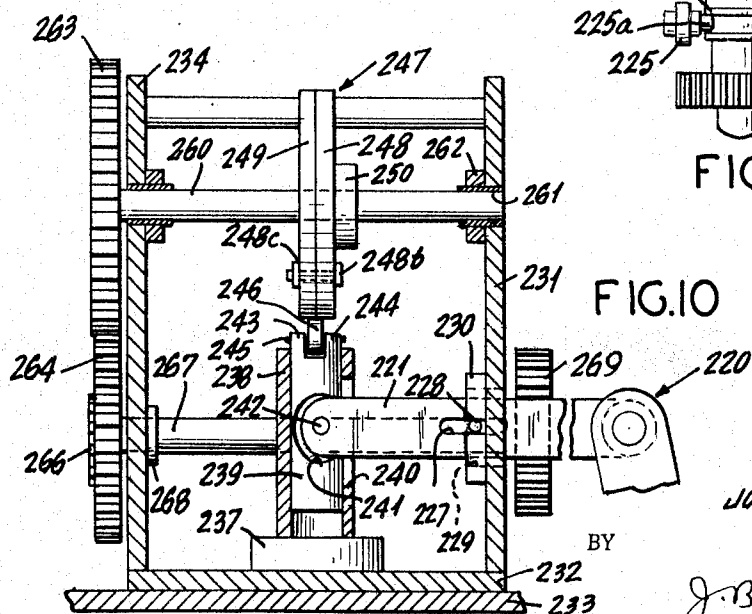
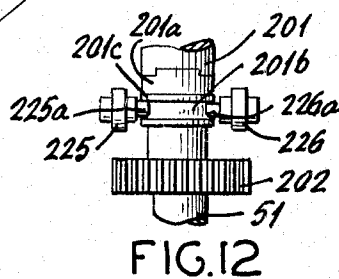
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MULTI-NEEDLE EMBROIDERY MACHINES

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6 Sheets-Sheet 6



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MULTI-NEEDLE EMBROIDERY MACHINES

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Filed Nov. 23, 1962, Ser. No. 239,482
11 Claims. (Cl. 112-118)

This invention relates to multi-needle embroidery machines, and more particularly, to a machine for producing areas of embroidery stitching alternating with areas of straight-line stitching.

Embroidery quilting machines as heretofore constructed in the prior art generally comprised a carriage movably mounted for both longitudinal and lateral movement, material feeding means mounted on the carriage for feeding two sheets of textile material in superimposed relation, and a series of needles for continuously stitching the advancing superimposed sheets. During this stitching operation the carriage was reciprocated both longitudinally and laterally so that the needles produced a predetermined embroidery pattern in the sheets. The transverse embroidery patterns produced by these prior art machines were identically repeated throughout the entire length of the sheets. That is, each lateral band or area of the sheets had the same pattern as every other lateral area.

A primary object of the present invention is to provide a novel embroidery machine which may produce alternate areas of embroidery stitching and straight-line stitching. As the longitudinal sheets are advanced past the needles, the carriage of the present invention will undergo longitudinal and lateral reciprocal movements for a predetermined period of time to produce an area of embroidery stitching, after which carriage movements will automatically cease for a predetermined period of time to produce an area of straight-line stitching, also known as "bar" stitching. This cycle is then automatically repeated continuously throughout the roll of sheet material. There is thus provided in the sheet repeated areas of embroidery stitching alternately with areas of bar stitching interposed therebetween.

Another object of the present invention is to provide a strong, rugged and durable machine of the character described which shall be relatively inexpensive to manufacture, which shall be smooth and positive in operation, which shall permit a greater variety of embroidery designs, and which shall nevertheless be practical and efficient to a high degree in use.

Although for purposes of illustration the present invention is disclosed as an embroidery quilting machine which stitches two superimposed sheets to form a quilted material, it may also be embodied in an embroidery machine for stitching only a single sheet.

Other objects and advantages of the present invention are either inherent in the structure disclosed herein or will become apparent to those skilled in the art as the detailed description proceeds in connection with the accompanying drawings wherein:

FIG. 1 is a plan view of a portion of a longitudinal sheet of material showing one example of the type of combined embroidery and straight-line stitching which may be produced by a machine embodying the present invention;

FIG. 2 is a partial top plan view of a portion of an embroidery machine in accordance with the present invention;

FIG. 3 is a vertical sectional view taken on the line 3-3 of FIG. 2;

FIG. 4 is a partial end elevational view as seen from the left-hand end of FIG. 2;

FIG. 5 is a partial perspective view showing the arrangement for mounting the carriage for both longitudinal and lateral reciprocating movements;

FIG. 6 is a top plan view of a part of the machine shown in FIG. 2 but with the cover plate of a gear box, and the mechanism mounted on the plate, removed to show the gears within the interior of the box;

FIG. 7 is a vertical sectional view taken substantially on line 7-7 of FIG. 2;

FIG. 8 is a perspective view showing the automatic arrangement for periodically actuating and deactuating the carriage reciprocating means to produce alternating intervals of embroidery stitching and straight-line or bar stitching;

FIG. 9 is a perspective view of the automatic arrangement of FIG. 8 but taken from another viewpoint;

FIG. 10 is a vertical sectional view taken substantially on line 10-10 of FIG. 8;

FIG. 11 is a rear elevational view as seen from the left-hand side of FIG. 10; and

FIG. 12 is a horizontal sectional view taken on line 12-12 of FIG. 9.

Referring now in detail to the drawing, the reference numeral 10 designates generally a multi-needle embroidery machine embodying the invention. Multi-needle embroidery machines are well known in which a carriage which supports cloth or other sheet material to be stitched, is moved both longitudinally and transversely while the material is fed step by step and multi-needle mechanisms mounted on a fixed stand stitch the cloth, with provision to stop the movement of the carriage while the needles go down into the cloth or other material to be stitched, so as not to bend or break the needles.

Machine 10 comprises a stand 11 (FIG. 5) having corner legs 13 at one end and corner legs 14 at the opposite end. The multi-needle stitching mechanism is supported on stand 11. It may be of usual construction such as that shown in United States Patent No. 1,948,876 and comprising a needle bar 114a (FIG. 2) carrying needles (not shown). A rotatably mounted shaft 131a has secured thereto an arm 134a to which is connected a link 135a whose lower extremity is formed into a yoke 136a enveloping an eccentric (not shown) secured on drive shaft 46. Shaft 131a also has secured thereto an arm 139a connected to a depending link 140a connected at 141a to needle bar 114a.

As drive shaft 46 rotates, shaft 131a is oscillated by elements 134a, 135a, 136a. This in turn causes needle bar 114a to be vertically reciprocated by elements 139a, 140a, 141a thereby actuating the needles to stitch the sheet or sheets of material advancing therebeneath. It will be noted that the above-designated reference numerals referring to the needle mechanism are the same as the corresponding numerals employed in said Patent No. 1,948,876 except that they are suffixed by the letter "a." Said patent is referred to for further details of the structure and operation of the needle mechanism, although any other suitable mechanism may be employed. Stand 11 has a top wall 11a.

Also on shaft 46 is another eccentric engaged and enveloped by one end of an eccentric rod 156a connected at its other end to actuate the usual bobbin mechanism (not shown) as disclosed in said Patent No. 1,948,876.

A pair of transverse horizontal parallel coplanar cross-bars 23 and 24 are interconnected by a pair of parallel longitudinal bars 26, 26a fixed to said cross-bar in any suitable manner thereby forming a horizontal rectangular carriage indicated generally at 28.

Due to the mounting arrangement to be described below, said carriage 28 may move longitudinally and transversely simultaneously. The longitudinal direction is indicated by the arrow L and the transverse direction is indicated by the arrow T in FIG. 5. Cloth or other sheet material, or padding material to be stitched, may be fed by means of rollers 30 (FIG. 2) mounted on frame 28, by

means of well known bracket means 31. One of the rollers 30 has a shaft 33 which is driven or rotated in the manner hereinafter explained. The means for interconnecting the rollers 30 for simultaneous feeding of the material to be stitched is not shown, since it is well known.

Means is provided to move the carriage 28 as well as to rotate the rollers 30 and operate the needle mechanism. To this end, there is provided a second stand 40 (FIG. 3) which may be fixed to stand 11 if desired. Stand 40 is located beyond one end of stand 11 and supports a motor 41 at a lower level, a box 42 (FIG. 2) at a higher level, and a second box 43 at right angles to and spaced from box 42.

Box 43 has a pair of end vertical transverse walls 44 (FIGS. 2 and 6) connected by longitudinal vertical walls 45. Walls 44 support said rotary shaft 46 which carries a worm 47 within the box. The teeth of worm 47 have portions which extend helically and other portions which extend circularly without any feed angle, so that a worm wheel 52 is driven intermittently while engaging the helical portions, and remains stationary while engaging the no-feed circular portions. Shaft 46 carries a pulley belted to motor 41 by belt 48. Journalled in walls 45 is a cross-shaft 51 carrying said worm wheel 52 meshing with worm 47, thereby imparting an intermittent rotation to shaft 51 for the purpose hereinafter appearing.

In a manner to be described below, shaft 46 may be drivingly connected to a shaft 56 (FIG. 2) journalled in walls 45 of box 43. Slidably mounted on suitable tracks on one wall 45 of box 43 is a slider 57 carrying followers 58. On shaft 56 is a cam 59 disposed between and engaging followers 58. As shaft 56 rotates, cam 59 reciprocates slider 57 in the direction indicated by arrow 57a.

Pivoted to slider 57 on pin 60 is a link 61 carrying a sleeve 62 slidable on a shaft 63 supported on brackets 64 (FIG. 7) fixed to the underside of carriage 28. As slider 57 reciprocates, link 61 will reciprocate carriage 28 transversely while allowing longitudinal movement of carriage 28. Such longitudinal movement is permitted because sleeve 62 slidably receives shaft 63.

Shaft 56 is also journalled in one of the end walls 70 of box 42, and carries a bevel gear 71. End walls 70 are interconnected by transverse walls 72. Journalled in walls 72 is a shaft 74 carrying a bevel gear 75 meshing with gear 71. Slidably mounted on one wall 72 of the box is a slider 76 which reciprocates on suitable tracks, in a longitudinal direction at right angles to the transverse direction of sliding movement of slider 57. Slider 76 carries followers 77. Shaft 74 carries a cam 79 disposed between followers 77. As cam 79 rotates, slider 76 will reciprocate longitudinally.

Fixed to slider 76 is a pin 80 (FIG. 5) having connected thereto a pair of links 81, 81a. The ends of the latter are provided with pins 82, 82a slidably engaged within slots 83, 83a formed in a pair of arms 84, 84a fixed to a shaft 87 rotatably and slidably mounted within a pair of bearings 85 fixed to stand 11. Fixed to shaft 87 are a pair of arms 88 which extend upwardly and are pivoted at their upper ends by pivot pin 89 to one end of carriage member 23 which has said one end sandwiched between arms 88.

It will now be observed that as slider 76 reciprocates longitudinally in the direction indicated by the arrow L, shaft 87 will oscillate about its axis. One end of carriage member 24 is similarly mounted to shaft 87 by arms 88a and pivot pin 89a. The opposite ends of carriage members 23, 24 are similarly mounted by arms 88b, 88c and pivot pins 89b, 89c to a shaft 87a rotatably and slidably mounted within bearings 85a fixed to stand 11.

It will now be understood that as slider 76 is reciprocated and shaft 87 oscillated, arms 88 will reciprocate carriage 28 longitudinally while allowing transverse movement of the carriage. This transverse movement is permitted because shafts 87, 87a may slide in bearings 85, 85a.

Means is provided to intermittently rotate shaft 33 in

the same direction, as carriage 28 is reciprocated longitudinally and transversely. To this end shaft 46 carries a cam 100 (FIG. 4) which engages lug 101 on a connector 102 pivoted as at 102a to the lower end of a crank 104 pivoted on a shaft 105 journalled on wall 106 (FIG. 2) fixed to one wall 72 of box 42, in spaced parallel relation thereto. Thus, as shaft 46 rotates, crank 104 will oscillate about shaft 105.

On said shaft 105 is a ratchet wheel 108. Pivoted to crank 104, as at 109 is a pawl 110 engaging the ratchet wheel 108 and spring pressed thereagainst. Oscillation of crank 104 will hence cause step by step advance of ratchet wheel 108. A pawl 112 pivoted as at 112a to bracket 113 on box 42 is spring pressed against ratchet wheel 108 and prevents back rotation of the latter.

Fixed to ratchet wheel 108 for rotation therewith is a pinion 115 meshing with a pinion 116 on a shaft 116a (FIG. 2) journalled in wall 106. Pinion 116 meshes with pinion 117 on a shaft 118 journalled in box 42. Shaft 118 is connected by a universal joint 119 to an externally ribbed rod 120 slidably engaging the ribs of an internally ribbed sleeve 121 which in turn is connected by a universal joint 122 to said shaft 33.

The structure described in detail above is old in the art. While shaft 56 remains drivingly connected to shaft 46, carriage 28 will be continuously reciprocated longitudinally and laterally in intermittent step-by-step movements to provide an embroidery stitch pattern in the advancing sheets. A typical example of such an embroidery pattern is indicated by the reference letter E in FIG. 1. Of course, other patterns may be obtained by substituting other variously shaped cams for cams 59, 79. However, the quilting machines of the prior art can produce only repeated embroidery patterns whereas the machine of the present invention is capable of producing areas of embroidery stitching E alternating with areas of straight-line or bar stitching indicated at S in FIG. 1.

To accomplish this objective, the present invention provides a novel arrangement for periodically engaging and disengaging shaft 56 to and from shaft 46 so as to periodically actuate and deactuate the carriage reciprocating means. That is, when shaft 56 is drivingly engaged with shaft 46, carriage 28 will be reciprocated to produce embroidery stitching, and when shaft 56 is disengaged from shaft 46, carriage 28 will remain stationary so that the material sheets M will move past the needle mechanism rectilinearly to provide an area of straight-line stitching indicated at S.

More specifically, fixed to shaft 51 are a gear 200 (FIG. 8) and a clutch element 201. The latter is adapted to be engaged by a movable clutch element 201a slidably and rotatably mounted on shaft 51 along with a gear 202 having a hub 203 engaged by the inner end of a coiled compression spring 204. The outer end of spring 204 rests against a collar 205 fixed to shaft 51 thereby enabling spring 204 to urge gear 202 and clutch element 201a longitudinally inwardly toward a position where clutch element 201a is in driving engagement with clutch element 201.

In engagement with gear 202 so as to be driven thereby is a relatively wide gear 206 mounted upon a shaft 207 rotatably supported in a bracket 208 fixed to a horizontal beam 209. The inner end of beam 209 is secured by welding to a plate 210 secured to stand 40 by bolts 211. The outer end of beam 209 has secured thereto by bolts 211a an upstanding member 212 having fixed to its upper end by bolts 214 a bearing support member 213. The upper end of member 213 is provided with a bearing 215 within which is journalled the outer end 51a of shaft 51.

Also mounted on shaft 207 is a gear 217 spaced from gear 206 by a spacer sleeve 216 and engaging a gear 218 mounted on a shaft 219. Gear 218 is in driving engagement with a gear 55 secured to shaft 56.

Clutch element 201a is moved into and out of en-

gagement with clutch element 201 by a lever indicated generally at 220 and comprising a horizontal portion 221, a pair of spacer sleeves 222, 223 mounted on a pin 224, and a pair of spaced downwardly extending arms 225, 226 having their upper ends mounted on the respective opposite ends of pin 224. The outer end of lever portion 221 is provided with an aperture (not shown) through which pin 224 extends. It will be noted that elements 221 to 226 inclusive are rigidly secured to each other by welding so as to constitute in effect an integral downwardly projecting bifurcation at the outer end of horizontal lever portion 221.

The lower ends of arms 225, 226 are provided with horizontally extending pins 225a, 226a engaged within a circumferential groove 201b formed in clutch element 201a so as to slide the latter together with gear 202 longitudinally along shaft 51 in response to movement of lever 220.

As best seen in FIG. 10, the horizontal portion 221 of lever 220 is provided with a horizontally extending slot 227 through which extends a pin 228 having its opposite ends mounted within the sides of an opening 229 formed within a block 230 secured to the inner surface of a vertical plate 231. The lower end of plate 231 is welded to a horizontal base plate 232 along the outer edge of the latter. Base plate 232 is in turn secured to a top cover plate 233 of gear box 43. A second vertical plate 234 is secured at its lower edge to the inner edge of base plate 232. Plates 231, 234 are maintained in properly spaced relation by a pair of struts 235, 236 extending therebetween.

Secured to the intermediate portion of base plate 232 is a block 237 on which is mounted an upstanding cylindrical housing 238. A cam follower 239 is vertically reciprocally slidable within housing 238. The wall of the latter is provided with an opening 240 through which projects the inner end of horizontal portion 221 of lever 220. The inner end of portion 221 extends within a recess 241 formed in cam follower 239 and is pivotally connected to the latter by a pivot pin 242.

The upper end of cam follower 239 is bifurcated to provide a pair of upstanding spaced ears 243, 244 for mounting therebetween a horizontal pin 245 upon which is rotatably mounted a follower roller 246 engaging the peripheral surface of a cam indicated generally at 247.

Cam 247 is formed in two segments 248, 249. Cam segment 248 is provided with a hub 250 fixedly secured to a horizontal shaft 260. The other cam segment 249 is mounted in face-to-face relation to cam segment 248 and is adjustable thereon so as to regulate the respective lengths of the rise and dwell portions of cam 247. More specifically, cam segment 248 is provided with an arcuately extending slot 248a through which extends a bolt 248b which also extends through a suitable aperture (not shown) provided in cam segment 249. Bolt 248b has a nut 248c on the outer end thereof. It will thus be seen that cam segment 249 may be adjustably rotated with respect to cam segment 248 and locked in a fixed position with respect thereto by bolt 248b and nut 248c.

The opposite ends of shaft 260 are rotatably mounted in bearing sleeves 261 (FIG. 10) secured within bearing blocks 262 fixed to vertical plates 231, 234. One end of shaft 260 has secured thereto a gear 263 which is in driving engagement with a gear 264 (FIG. 11) mounted on a shaft 265 rotatably mounted in plate 234. Another gear 266 is in engagement with gear 264 and is secured to a shaft 267 which extends entirely across the space between plates 231, 234 and is rotatably mounted in the latter. Shaft 267 has secured to its opposite ends a gear 269 (FIG. 9) in driving engagement with a gear 270 mounted on a shaft 271. Gear 270 is in turn drivingly engaged with gear 200 which was previously described as fixedly secured to shaft 51.

It will thus be seen that cam 247 is continuously rotated through the following drive arrangement from shaft 46.

Worm 47 on shaft 46 drives worm wheel 52 to rotate shaft 51 and thereby to cause gear 200 to drive gear 270. The latter in turn drives gear 269 to rotate shaft 267 and thereby cause gear 266 to drive gear 263 through the intermediate idler gear 264. Gear 263 is secured to shaft 260 to which cam 247 is also secured and thus cam 247 is continuously rotated due to the drive connection with shaft 46.

The mode of operation of machine 10 embodying the present invention is as follows:

Spring 204 normally urges gear 202 and clutch element 201a longitudinally inwardly along shaft 51 so that clutch element 201a is in engagement with clutch element 201. The shoulder 201c of groove 201b thus presses against pins 225a, 226a so as to pivot lever 220 about pin 228 in a clockwise direction as viewed in FIG. 10 thereby causing the inner end of lever portion 221 to move upwardly so as to maintain follower roller 246 in contacting engagement with the periphery of cam 247. Of course, follower 246 is not free to move upwardly in response to the urging action of spring 204 unless follower 246 is at a dwell portion of cam 247.

As cam 247 rotates, roller 246 will eventually ride out of the dwell portion of cam 247 and onto a rise portion thereof so that cam 247 will force follower 239 downwardly and thereby pivot lever 220 about pivot pin 228 so as to cause pins 225a, 226a to press against shoulder 201c of groove 201b so as to urge clutch element 201a and gear 202 outwardly against the action of spring 204. This causes clutch elements 201, 201a to become disengaged during the period that follower roller 246 rides along the rise portion of cam 247.

It will thus be seen that cam 247 periodically causes clutch element 201a to move into and out of engagement with clutch element 201. When clutch elements 201, 201a are in engagement, shaft 56 is drivingly connected to shaft 46 through the gear chain comprising worm 47, worm wheel 52, shaft 51, gear 202, gear 206, shaft 207, gear 217, gear 218 and gear 55. When shaft 56 is thus driven, carriage 28 will undergo reciprocal movements as described above so as to produce embroidery stitching in the advancing sheets of material M as they pass the multiple needle mechanism.

However, when follower roller 246 is in engagement with the rise portion of cam 247, the latter will force follower 239 downwardly so as to pivot lever 220 in a counterclockwise direction about pin 228, as viewed in FIG. 10, to urge clutch element 201a out of engagement with clutch element 201 so as to open the drive connection between shafts 46 and 56. Shaft 56 will no longer rotate and hence carriage 28 will remain stationary. The sheets M will thus be advanced by feeding rolls 30 rectilinearly beneath the stitching needles so as to provide rows of straight-line or bar stitching as indicated at S in FIG. 1.

The straight-line stitching will extend throughout an area whose length depends upon the time duration of disengagement of clutch elements 201, 201a. This time duration is in turn dependent upon the length of the rise portion of cam 247. By adjustably varying the angular position of cam segment 249 with respect to cam segment 248, this rise portion may be varied so as to regulate the lengths of the areas of straight-line stitching.

It is to be understood that the specific embodiment of the invention disclosed herein is merely illustrative of one of the many forms which the invention may take in practice without departing from the scope thereof as delineated in the appended claims, and that the claims are to be construed as broadly as permitted by the prior art.

I claim:

1. An embroidery stitching machine comprising a stand, a carriage, means mounting the carriage for both longitudinal and lateral movement on the stand, material feeding means mounted on said carriage for advancing a sheet of material with respect to said carriage, means mounted on the stand for continuously controlling stitch-

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ing of the advancing sheet, means actuable to reciprocate said carriage longitudinally and laterally during the advancing movement of the sheet so as to produce embroidery stitching therein, and automatic means for periodically actuating and deactuating said reciprocating means while permitting actuation of the feeding means and of said controlling means, to produce alternating areas of embroidery stitching and straight-line stitching in the sheet as it is advanced by said feeding means.

2. A machine as set forth in claim 1 and comprising drive means, said automatic means comprising clutch means engageable to drivingly connect said reciprocating means to said drive means, and clutch actuating means for periodically engaging and disengaging said clutch means.

3. A machine as set forth in claim 2 wherein said clutch means comprises a pair of clutch elements, one of said clutch elements being mounted for movement into and out of engagement with the other clutch element, said clutch actuating means comprising cam means for periodically moving said movable clutch element alternately into and out of engagement with the other clutch element.

4. A machine as set forth in claim 3 wherein said cam means which is adjustable comprises means for selectably varying the durations of the engaged and disengaged periods of said clutch elements so as to vary the respective lengths of said alternating areas of embroidery stitching and straight-line stitching.

5. A machine as set forth in claim 3 wherein said cam means comprises a rotatable cam drivingly rotated by said drive means, a movable cam follower engaging said cam, and means operatively connecting cam follower and said movable clutch element, and wherein said last-recited connecting means comprises a lever pivotally mounted to said stand and having one end connected to said cam follower and an opposite end connected to said movable clutch element.

6. A machine as set forth in claim 1 wherein said automatic means comprises means adjustable for selectably varying the duration of the actuating and deactuating periods of said automatic means so as to vary the respective lengths of said alternating areas of embroidery stitching and straight-line stitching.

7. A quilting machine as set forth in claim 3 wherein said cam comprises two segments angularly adjustable with respect to each other to vary the lengths of the rise and dwell portions of the cam, and means to secure said segments to each other in a selected angular relationship whereby the lengths of said alternating areas of embroidery stitching and straight-line stitching may be selectably varied.

8. A quilting machine as set forth in claim 7 and means operatively connecting said cam follower and said movable clutch element wherein said last-recited connecting means comprises a lever pivotally mounted to said stand and having one end connected to said cam follower,

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spring means urging said movable clutch element in one direction, and means connecting the other end of the lever to said movable clutch element to move the latter in the opposite direction against the action of said spring means in response to pivotal movement of the lever by said cam follower.

9. In combination, a support, a carriage, means to mount said carriage for movement on said support longitudinally and transversely of said support, means on said carriage to advance a sheet in increments, cam controlled means to move said carriage simultaneously in longitudinal and transverse directions in increments coordinated with the increment movement of said advancing means, and means to render the moving means inoperative at regular periodic intervals and for regular periods while the advancing means continues to operate.

10. In combination, a support, a carriage, means to mount said carriage for movement on said support longitudinally and transversely of said support, means on said carriage to advance a sheet in increments, cam controlled means to move said carriage simultaneously in longitudinal and transverse directions in increments coordinated with the increment movement of said advancing means, means to render the moving means inoperative at regular periodic intervals and for regular periods while the advancing means continues to operate, and means coordinated with said advancing means to control stitching of the sheet as it advances in increments.

11. In combination, a support, a carriage, means to mount said carriage for movement on said support longitudinally and transversely of said support, means on said carriage to advance a sheet in increments, cam controlled means to move said carriage simultaneously in longitudinal and transverse directions in increments coordinated with the increment movement of said advancing means, means to sequentially render the moving means inoperative for equal periods while the advancing means continues to operate, means coordinated with said advancing means to stitch the sheet as it advances in increments, said stitching means including stitching needles, and means controlled by said moving means to retain the needles out of the sheet each time it is advanced.

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