Jan. 31, 1933. J. HUNTBACH 1,895,994

EMBROIDERY MACHINE

Filed March 7, 1930 2 Sheets-Sheet 1

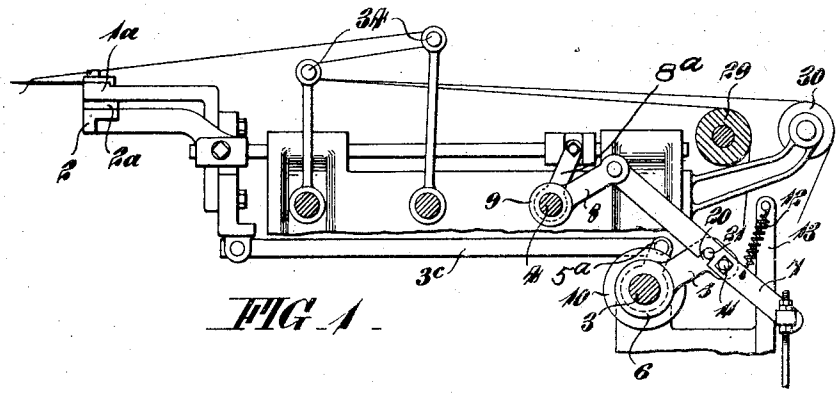


FIG. 1.

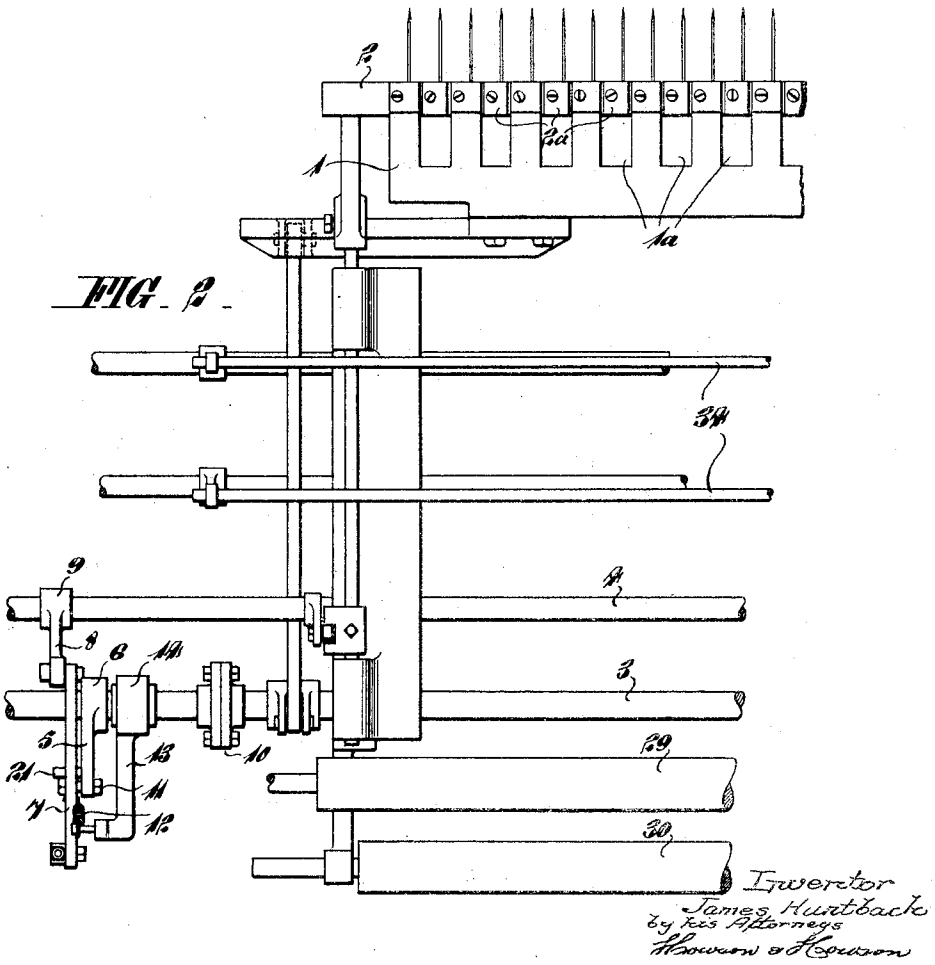


FIG. 2.

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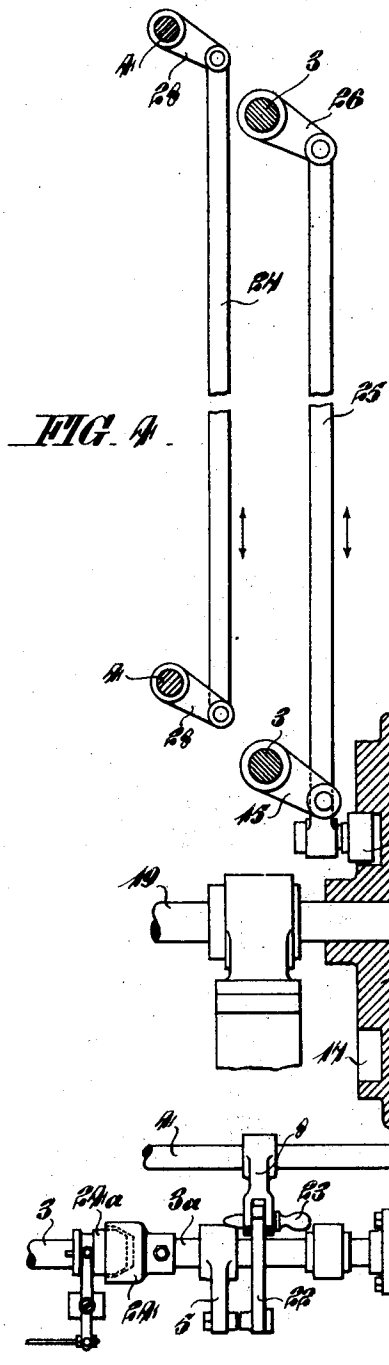


FIG. 4.

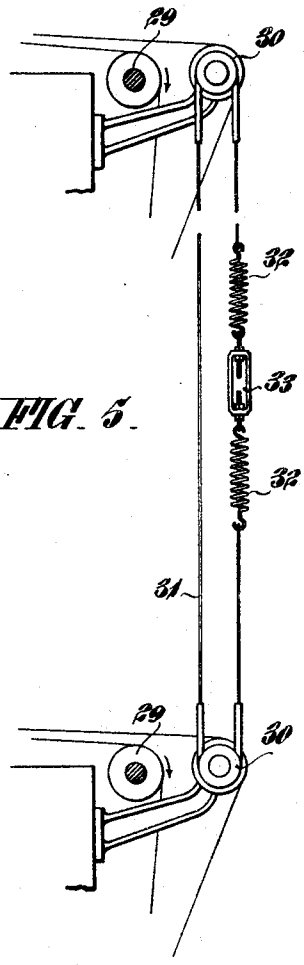


FIG. 5.

FIG. 3.

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UNITED STATES PATENT OFFICE

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EMBROIDERY MACHINE

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This invention comprises improvements in or relating to embroidery machines and refers to that type of machine wherein needles projecting at intervals from a carrier bar are operated to move to and fro and pierce the fabric to be embroidered, thread shuttles being associated to produce with the needles the embroidered stitch in the fabric, and said fabric being stretched on a frame which is moved relatively to the needles by the operation of a pantograph device.

Heretofore in this type of machine a single needle carrier bar has been employed, the spacing of the needle along said bar being determined by the size or range of the pattern to be produced on the fabric. In this type of machine, however, the disadvantage has existed in that when it is desired to change the yarn to be used in the pattern it has been necessary to remove from the needles the yarn threaded therethrough and re-thread such needles with the fresh yarn. This operation necessitates a considerable loss of time, while in addition a considerable amount of the yarn extending to each needle is cut away and wasted.

Further, when in said existing machine it is desired to vary the range of the machine, i. e. the size of the pattern embroidered, it has been necessary to remove certain of the needles from the carrier bar, and a considerable amount of yarn wastage is again inevitable.

An object of the present invention is to facilitate and expedite considerably the operation of changing the yarn with which embroidering is being effected and eliminate yarn wastage.

Another object of the invention is to increase the speed of operation of embroidery machines, while a further object is to increase the range of patterns capable of being produced on such machines and to enable a change in the dimensions of the pattern to be effected without removal of the needles or displacement of same relatively to their carriers.

According to the present invention an embroidery machine is provided wherein a proportion or fraction of the full complement of needles can be moved into and out of operation as required without displacing any of said needles relatively to the carrying means therefor, thus enabling either a full complement or only a part of the full complement of needles to be employed at any time.

Another feature of the invention resides in the provision of a plurality of needle carrier bars each carrying a proportion of the full complement of needles together with means for selectively bringing into operation any one or more of the bars as required.

Another feature of the present invention consists in the provision of means, more fully described hereinafter, for imparting motion either independently or collectively to the plurality of needle bars, and for applying tension to the yarn fed to the needles of one needle bar independently of that applied to the yarn fed to the needles of another needle bar.

For the purpose of more fully describing the nature of this invention reference will now be made to the accompanying drawings, wherein:—

Figure 1 is a sectional end elevation through part of a machine in accordance with this invention.

Figure 2 is a plan of Figure 1.

Figure 3 is a plan view illustrating a modification.

Figure 4 illustrates in sectional and elevation means for linking up two sets of needle operating bars.

Figure 5 illustrates a method of applying braking action to thread tensioning rollers.

In one method of carrying out the invention, a machine will be described employing two needle carrier bars 1 and 2, and in such arrangement said bars are located one over the other, the upper bar 1 having at predetermined intervals along its length a plurality of slots 1*a* into which project upwardly extending portions 2*a* on the second and lower bar 2. The needles appertaining to the lower bar 2 are connected to and project forwardly from the upwardly projecting portions 2*a* accommodated in the slots 1*a* in the upper bar 1 while the needles of said upper bar 1 are connected thereto at positions between

the needles of the lower bar, that is to say, the needles of one bar alternate with those of the other bar and are advantageously spaced equally along the bars, the whole of the needles lying in the same horizontal plane.

The necessary to and fro motion of the upper bar 1, which will be described as the main needle bar, is transmitted from the customary operating shaft 3 by means of a crank arm 5—*a* thereon and a link 3—*c* connected thereto. Motion is imparted to the shaft 3 first in one direction and then in the other in the well known manner. For imparting the to and fro motion to the lower needle bar 2, which will be described as the additional bar, a second operating shaft 4 is provided, and means are provided whereby motion transmitted to the main needle bar operating shaft may also be communicated to the operating shaft of the additional needle bar so that both bars 1 and 2 are simultaneously operated.

Additionally means are provided whereby the main needle bar operating shaft 3 is disconnected from the additional needle bar operating shaft 4 and by so doing movement is transmitted only to the main needle bar 1. In this latter case the main needle bar 1 moves relatively to the additional needle bar 2, the slots 1*a* in the main bar accommodating the needle-carrying projections 2*a* of the additional bar being sufficiently large to permit this relative movement.

In the arrangement shown in Figures 1 and 2 an arm 5 projecting from a sleeve or boss 6 fixed on the main shaft 3 and rotating therewith is adapted to be connected by link 7 to a second arm 8 projecting from a sleeve 9 fixed to the additional needle bar operating shaft 4. A further arm 8—*a* on sleeve 9 applies motion to the bar 2. The shaft 3 is divided in its length, the two parts being suitably coupled as at 10.

When the two thread bars 1, 2 require to be driven simultaneously, the arm 5 is positively connected to the link 7 by a pin, bolt or the like 11. When only the main needle bar 1 is to be driven, the pin 11 is removed and the link 7 is disconnected from the arm 5 by a spring 12 which may be carried by a stationary upstanding arm 13 extending from a bearing 14 for the main shaft 3. When, however, only the additional needle bar 2 is to be operated, the coupling 10 is disconnected and the two shafts 3, 4 are linked for simultaneous motion by inserting the pin 11.

From the above it will be appreciated that when it is desired to change the yarns in the embroidery being produced the additional needle bar 2 is first thrown out of operation and the pattern or part of same produced by the yarn fed to the needles of the main bar 1, after which the additional bar 2 is brought into operation and the pattern repeated or another part of same produced by the different yarn fed to the needles thereof, thus no changing of yarn in the needles is required.

Further, by moving one set of needles out of operation the size of pattern produced can be increased without necessitating displacement of any needles from the needle bar.

A further important advantage over existing machines gained by the employment of the present invention is that different sized needles can be employed for operating with yarns of different thickness, the needles of one carrier bar stitching with comparatively thick yarn and those of another bar with comparatively thin yarn. In this way it will be appreciated an embroidered design can be made which is composed of a heavy understitched part of thick yarn and a surface stitching of comparatively fine yarn.

When employing a machine of the existing one-bar type for producing a pattern wherein a plurality of different yarns is utilized, the disadvantages exists in that during the time the machine is standing idle for the purpose of removing one set of yarns and re-threading the needles, the fabric upon which embroidering is being effected becomes somewhat distorted; therefore, when the pattern is repeated or another part of the pattern produced by the second yarn, the lines of embroidered stitches on the fabric produced subsequent to the yarn change do not coincide with or appear in exact required position relatively to the lines of stitches produced by the first yarn. This disadvantage is, however, obviated by the employment of the present invention wherein the speedy change from one yarn to another does not permit of the distortion of the fabric. Further, comparatively small portions of a complete pattern can be produced without necessitating the completion of the full pattern before changing the yarn.

The drive to the needle bar operating shafts is effected through suitable link or lever mechanism from a single cam or equivalent device. For example, a crank arm 15 fixed to the main bar operating shaft 3 may have connected thereto a part carrying a truck or roller 16 (Figure 4) which runs in a cam groove 17 in a disc 18 fixed to the main drive shaft 19 of the machine.

The invention also includes means whereby patterns can be produced embodying long stitches which have been impossible on the machine as heretofore constructed; and in this connection it will be appreciated that the fabric can only be moved during the comparatively short space of time that the needles are withdrawn therefrom, therefore on existing machines when a long stitch is required it is necessary to form same of a succession of short stitches.

In this invention, however, means are pro-

vided whereby the period during which the needles are held out of the fabric can be varied, thereby enabling a part of a design to be spanned by a single long stitch where hitherto a series of shorter stitches would be necessary. Thus a more solid appearance is given to the embroidered design.

Conveniently the long stitches are produced by the needles of the additional needle bar, and to accomplish this the link 7 (Figures 1 and 2) is provided with a slot 20 adapted, when the pin or bolt 11 is removed, to be moved into and out of engagement with a pin or projection 21 on the arm 5 moving with that part or section of the shaft 3 to which drive is transmitted. The spring 12 normally holds the pin 21 and slot 20 out of engagement so as to cause drive to be transmitted only to the shaft 3.

A treadle or equivalent lever device is suitably connected to an extension of the link 7, said treadle being operable to pivot said link and move said pin and slot 21, 20 into engagement.

It will be appreciated, therefore, that motion is transmitted only to the additional bar 2 by uncoupling the coupling 10 between the sections of shaft 3 and bringing into engagement the pin and slot connection between the link 7 and arm 5. When, therefore, long pantograph stitches are required, the treadle or the like is operated to couple the two bars 3, 4 at each end of a stitch only.

If desired means similar to that just previously described may be provided for delaying the motion of either or both the main or/and the additional needle bar.

In one method of accomplishing this (see Figure 3) the shaft 3 may be connected to shaft 4 by a linking-up device embodying an arm 5 fixed to the shaft 3, a bifurcated arm 8 fixed to shaft 4 and a connecting link 22 which is connected to the said bifurcated arm 8 by a removable pin 23. The shaft 3 is in this arrangement composed of three sections 3, 3*a* and 3*b*, the coupling 10 before-described being provided for connecting together the sections 3*a*, 3*b* and a friction clutch 24 being provided for connecting and disconnecting at will the sections 3, 3*a*. The slidable part 24*a* of friction clutch 24 is operable through suitable link and lever mechanism from a treadle or equivalent device as before-described, and the arrangement is such that if it is desired to operate the main thread bar 1 only, and delay the motion of such bar for the production of long stitches, the pin 23 is moved from the link device connecting together the shafts 3 and 4 and the treadle is operated to move the friction clutch 24 into the engaged position at each end of a stitch.

If, however, it is desired to embroider with both needle bars 1 and 2 in operation and to produce long pantograph stitches on both of said bars, the two operating shafts 3, 4 are connected for simultaneous movement by the insertion of pin 23 and the treadle operated to connect and disconnect the friction clutch 24 as and when desired. By disconnecting the coupling 10 between the shaft sections 3*a*, 3*b* and retaining the pin 23 in position to couple together the shafts 3 and 4, it will be appreciated that long stitches can be produced on the additional needle bar 2 only; the friction clutch being operated in this case as before-described. It will, of course, be understood that when the friction clutch 24 is disconnected no drive is transmitted to either of the needle bar operating shafts.

The invention is applicable to a machine wherein embroidering is effected on two or more pieces of fabric simultaneously, the frames carrying said fabric pieces being located one above the other, and needle bars 1, 2 with shafts 3, 4 and other operating mechanism as before described being provided in connection with each piece of fabric. In such arrangement simultaneous operation of the main needle bar operating shaft 3 of each set may be accomplished by linking together said shafts with one or more links 25 and crank arms 15 and 26 as shown in Figure 4. The additional needle bar operating shafts 4 may also be similarly connected for simultaneous motion by links 27 and crank arms 28.

The yarns extending to the needles of the main needle bar 1 (or bars) are suitably tensioned by passing same over one or more cloth-covered or similar rollers 29 to which a suitable braking action may be imparted advantageously by rotating same in an opposite direction to the traverse of the yarn. The yarns extending to the needles of the additional bar 2 may be passed over one or more similar cloth-covered or equivalent rollers or members 30, the rotation of which may be retarded by adjustable spring influenced means.

These braking means may comprise a band 31 extending over the two rollers 30, the two ends of said band being connected by springs 32 and adjustable screw coupling 33, it being understood that the manipulation of the screw coupling 33 varies the tension or pull exerted by the springs 32 and consequently the braking action on the roller. The existing hand rail in front of the known type of machine may be utilized for applying tension to the threads of the additional needle bar, said rail being preferably covered with cloth or the like.

The yarns extending to both sets of needles carried by the two bars 1, 2 may also extend over other bars or rods 34 which are customarily provided on embroidery machines and to which an oscillatory or rocking motion is imparted so as to effect a drawing off of the yarns from the supply bobbins and a feeding

motion to the needles at each forward motion imparted to said needles.

The additional needle carrier bar may, if desired, consist of the borer bar which is at present employed on existing embroidery machines of the one needle bar type, said borer bar being furnished with the aforesaid upwardly projecting needle-carrier portions, and the boring points being preferably removed therefrom. The operating shaft for the borer bar may in this case be employed as the operating shaft for the additional needle bar.

I claim:—

1. In an embroidery machine a plurality of needle carrier bars, needles carried thereon all lying in one plane, a main drive shaft, connecting elements between said drive shaft and each of the needle carrier bars, means for disconnecting any one of said connecting elements from the drive shaft for selective reciprocation of the needle carrier bars and means to couple all of the connecting elements to the drive shaft for simultaneous reciprocation of all of said needle carrier bars.

2. In an emboridery machine, two needle bars each carrying a proportion of the full complement of needles, one needle bar being disposed beneath the other, slots in the upper needle bar, projections on the lower needle bar extending up into the slots in said first-named bar, said projections carrying needles which lie in the same plane as and alternate with the needles in the upper bar, two needle bar operating shafts one appertaining to each bar, means for imparting rocking motion to one of said operating shafts, a link device for connecting together the two operating shafts, means for simultaneously imparting rocking motion to said shafts, said rocking motion being converted into a backward and forward motion at the needle bars, and means for driving only one of the needle operating shafts so as to impart motion to only one of the needle bars when desired.

3. In an embroidery machine, two needle bars each carrying a proportion of a complete row of needles, said needles extending in one horizontal plane, two needle bar operating shafts one appertaining to each needle bar, one operating shaft constituting a main shaft having imparted thereto a rocking motion, the second operating shaft being linked to said main operating shaft for simultaneous rocking movement, means for converting the rocking movement of said operating shafts into a backward and forward motion at the needle bars, the main operating shaft being divided into sections adapted to be coupled and uncoupled at will, means whereby motion is imparted only to the second operating shaft and the needle bar connected therewith when the said coupling is disconnected, means for imparting motion only to the main operating shaft and the needle bar operated thereby by disconnecting the link between the two operating shafts and connecting the said coupling between the main shaft sections, a clutch provided in the main operating shaft, and means for operating said clutch at predetermined intervals so as to throw into and out of opeartion the needle bars for predetermined periods so as to enable long pantograph stitches to be produced.

4. In an embroidery machine a plurality of needle carrier bars, needles secured to said carrier bars, a main drive shaft for applying reciprocatory motion to said needle carrier bars, a crank arm on said main shaft, a permanent connection leading from said crank arm to one of the reciprocating needle carriers, a second crank arm on said main shaft, a link for communicating motion from said second crank arm to another needle carrier bar and means for disengaging said link from said second crank arm.

5. In an embroidery machine a plurality of needle carrier bars, needles secured to said carrier bars, a rocking shaft serving to apply reciprocatory motion to selected of said reciprocating needle carrier bars, a permanent connection between a crank arm on said rocking shaft and one of the said needle carrier bars, a further crank arm on said rocking shaft, a pivotally mounted link adapted to engage said further crank arm and means for disengaging said pivotal link from said further crank arm to render the appertaining needle carrier bar inoperative.

6. In an embroidery machine a plurality of needle carrier bars each adapted to be independently reciprocated towards and away from the work, a rocking shaft to which drive is applied and serving to apply reciprocatory motion to one of the needle carrier bars by means of a permanent connection, a second rock shaft operated from said first mentioned rock shaft, said second rock shaft embodying a projecting arm adapted to apply reciprocatory motion to another needle carrier bar, a crank arm on said second rock shaft, a pivotal link carried on said arm, a slot in said pivotal link, a second crank arm upon the main rock shaft, a stud on said second crank arm and means for displacing said pivotal arm to disengage said slot from said stud whereby the said second rock shaft and its associated needle carrier bar can be maintained inoperative when desired.

7. In an embroidery machine, two needle carrier bars, the needles appertaining to one carrier bar alternating with those of the other carrier bar, means for supporting said carrier bars while permitting individual reciprocatory movement thereof, a main rock shaft, an arm projecting from said rock shaft, a connecting link leading between said arm and one of said needle carrier bars, a

second rock shaft, an arm projecting from said second rock shaft and serving to apply reciprocatory motion to the second needle carrier bar, a further arm projecting from said second rock shaft, a pivotally mounted link associated with said further arm, a second crank arm on the main rock shaft, a projecting stud on said second crank arm, a slot in said pivotal link adapted to engage the projecting stud on the second crank arm associated with the main drive shaft and manually operable means for raising said link out of engagement with said stud.

8. In an embroidery machine a plurality of needle carrier bars, needles mounted thereon, means for supporting said needle carrier bars to permit reciprocation thereof, a main drive shaft, a disconnectible coupling associated with said drive shaft, a permanent connecting link associated with a crank arm on the driven side of said coupling and serving to apply reciprocatory movement to one of said needle carrier bars, a further crank arm on the driving side of said coupling, a disconnectible connection associated with said further crank arm and adapted to apply reciprocatory movement to another needle carrier bar and means for operating said disconnectible connection.

9. In an embroidery machine two needle carrier bars, one needle carrier bar having slots within which projecting elements of the other needle bar are adapted to pass, needles carried on said carrier bars, the needles associated with one bar alternating with the needles associated with the other bar, means for supporting said needle bars and permitting individual sliding movement thereof, a main drive shaft to which a rocking motion is applied, a coupling associated with said main shaft, a crank arm on the driven side of said coupling, a permanent connection leading from said crank arm to one of said needle carrier bars, a second rock shaft, a crank arm on said second rock shaft serving to apply reciprocatory movement to the second needle carrier bar, a further crank arm for reciprocating said second rock shaft, a pivotal link association with said further crank arm, a second crank arm on said main rock shaft and on the driving side of the coupling thereon, a stud on said second crank arm and manually operable means for causing engagement of said pivotal link with the said stud carried on said crank arm.

10. In an embroidery machine, a plurality of needle carrier bars, needles carried on said carrier bars, a main drive shaft to which rocking motion is applied, a second rock shaft, means for reciprocating one needle carrier bar from the main rock shaft, means for applying reciprocatory movement to a second needle carrier bar from the second rock shaft, a disconnectible flange coupling in the length of said main drive shaft, the drive for the first mentioned reciprocating needle carrier being taken from the driven side of said flange coupling, means for reciprocating the second rock shaft from the main rock shaft and from the driving side of said flange coupling and a disconnectible clutch serving to disconnect the driving mechanism for both of the needle carrier bars.

11. In an embroidery machine two needle carrier bars, slots in one needle carrier bar within which projecting portions of the other carrier bar are adapted to slide, needles associated with said two carrier bars, the needles of one bar alternating with the needles of the other bar, means for supporting said needle carrier bars and permitting individual reciprocatory movement thereof, a main drive shaft to which a rocking motion is applied, a flange coupling in the length of said rock shaft, a crank arm on the driven side of said flange coupling, a permanently connected link associated with said crank arm and serving to transmit reciprocatory motion to one needle carrier bar, a second crank arm on the driven side of said flange coupling, a pivotal link associated with said crank arm, a second rock shaft, a crank arm carried on said second rock shaft, means for causing driving engagement between said pivotal link operated from the main drive shaft and the crank arm on said second rock shaft, a further crank arm on said second rock shaft serving to apply reciprocatory movement to the other needle carrier bar and a clutch associated with the main rock shaft serving to disconnect the whole of the operative mechanism.

12. In an embroidery machine, a plurality of needle-carrier bars, needles mounted thereon, means for reciprocating said bars individually, means for supplying thread to said needles, means for applying tension to said threads, a rock shaft, a crank arm on said rock shaft, a permanent link leading from said crank arm to one of said needle carrier bars, a second crank arm on said rock shaft, a disconnectible link adapted to be engaged with said second crank arm and means whereby said link is adapted to apply reciprocatory movement to another needle carrier bar when engaged with said second crank arm.

13. In an embroidery machine, a plurality of needle carrier bars, needles associated therewith, the needles associated with one bar alternating with those associated with the other bar and lying substantially in the same plane, means for supplying thread to said needles, a plurality of rods around which the thread is passed to said needles, frictional thread tensioning means over which the thread passes on its way to said needles, a main rock shaft, a secondary rock shaft, crank arms associated with both of said rock shafts each serving to apply reciprocatory movement individually to one of said needle carrier bars, means for operating said secondary

rock shaft from said main rock shaft and means for uncoupling said secondary rock shaft.

14. In an embroidery machine, two needle carrier bars, needles carried thereon the needles of one bar alternating with those of the other bar and lying substantially in the same plane, means for supplying thread to said needles, a plurality of bars around which the threads pass to said needles in a sinuous path, a plurality of cloth covered rollers over which the threads pass to said needles, a main rock shaft, a disconnectible coupling in the length of said main rock shaft, a crank arm on the driven side of said main rock shaft, a permanent link leading from said crank arm to one of said needle carrier bars, a second rock shaft, means for applying motion from said second rock shaft to the other needle carrier bar, a crank arm on said secondary rock shaft, a pivotal link attached to said crank arm, a slot in said link, a further crank arm on the driving side of said main rock shaft, a stud carried on said crank arm and means for causing said slot to engage said stud.

15. In an embroidery machine, a plurality of needle carrier bars, a main rock shaft, means for applying oscillatory motion to said rock shaft, a crank arm associated with said main rock shaft serving to apply motion to one of said needle carrier bars, a secondary rock shaft, means for causing said secondary rock shaft to apply motion to another of said needle carrier bars, a disengageable connecting link between said main and said secondary rock shafts, a duplicated set of needle carrying and operating mechanism including duplicated main and secondary rock shafts and means for operating said duplicated main and secondary rock shafts in unison with the directly driven set, said means comprising uprightly extending connecting rods connected between crank arms on said upper and lower sets of rock shafts.

16. An embroidery machine having the combination of parts specified in claim 15 including also means for supplying threads to the needles, friction rollers over which the thread passes on its way to said needles and means for simultaneously tensioning the upper and lower sets of friction rollers, said means comprising a band passing over said upper and lower sets of rollers and including a screw coupling and spring means serving to apply tension to said band.

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