June 9, 1959 K. G. SCHEIBEL 2,889,792

MULTI-NEEDLE EMBROIDERY MACHINE

Filed Jan. 19, 1955 4 Sheets-Sheet 1

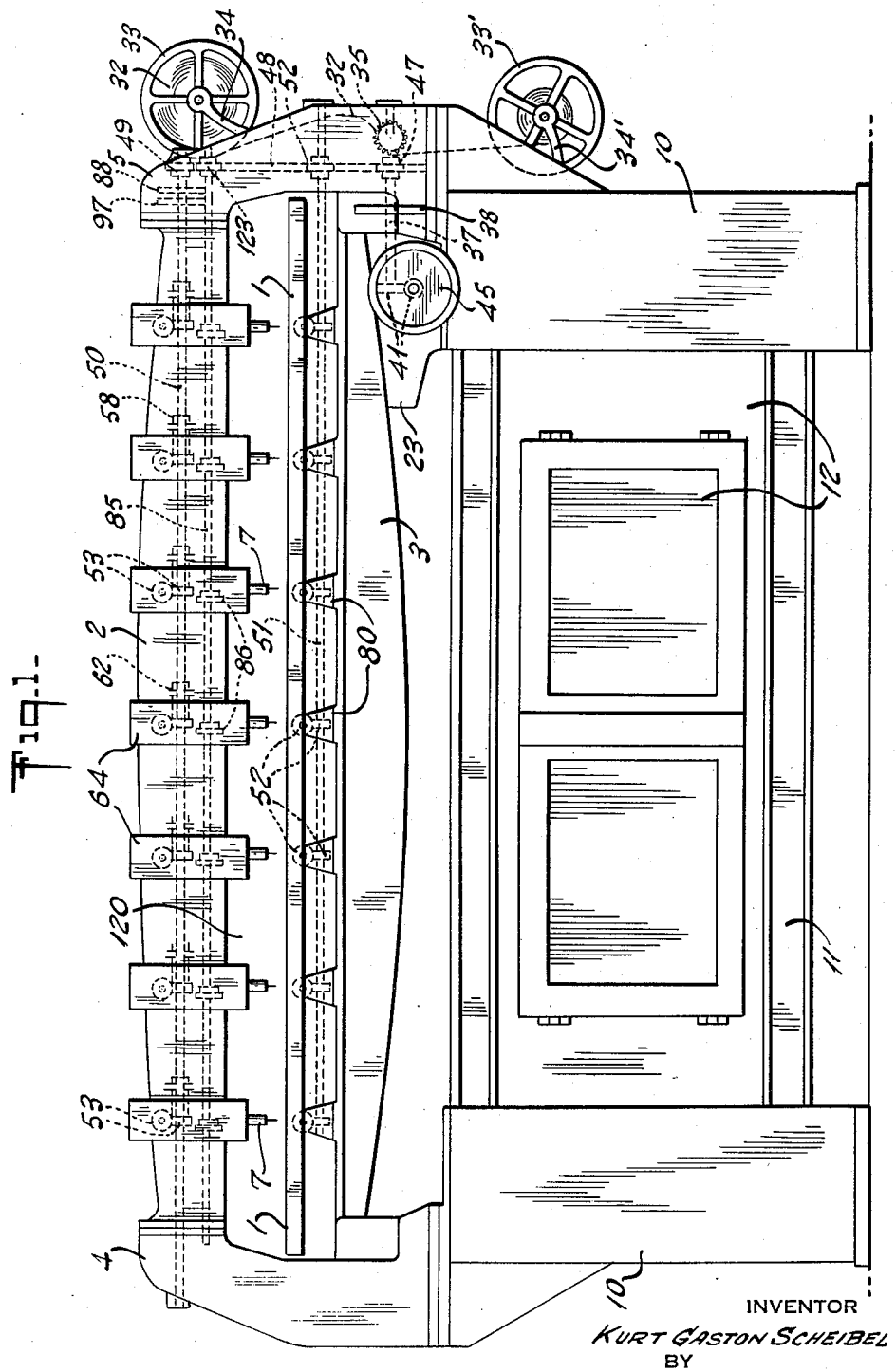


Fig. 1.

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Filed Jan. 19, 1955 4 Sheets-Sheet 2

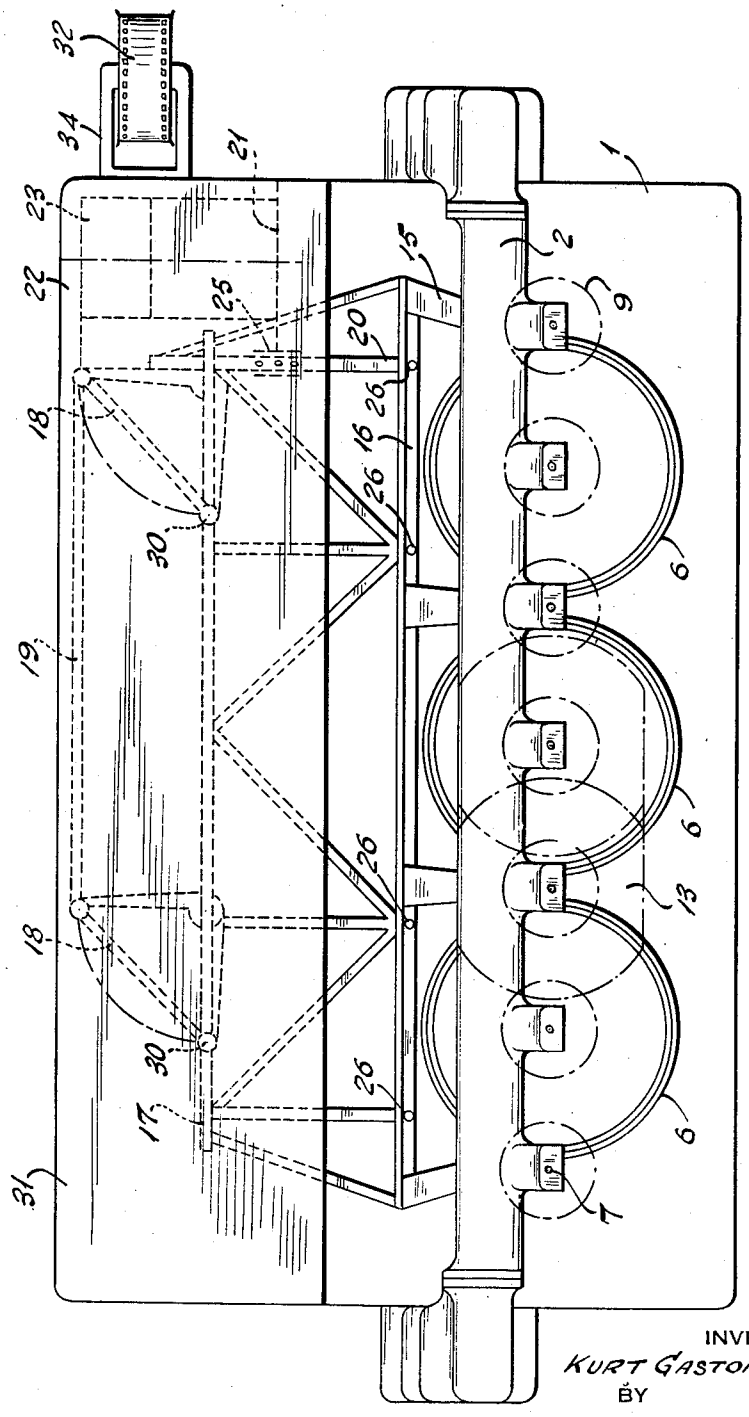


FIG. 2.

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Filed Jan. 19, 1955 4 Sheets-Sheet 3

Fig. 5.

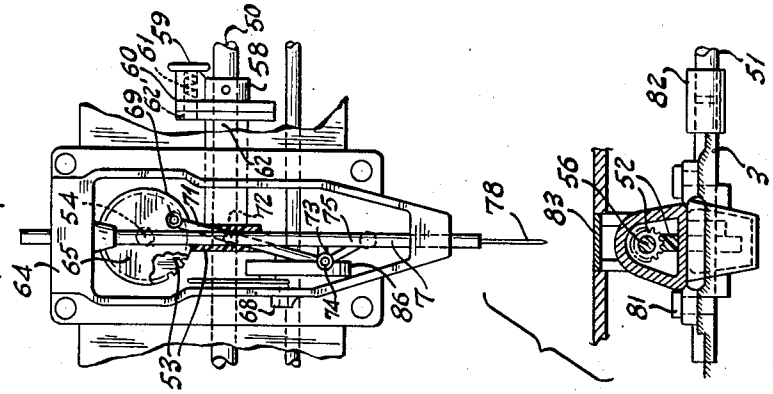


Fig. 4.

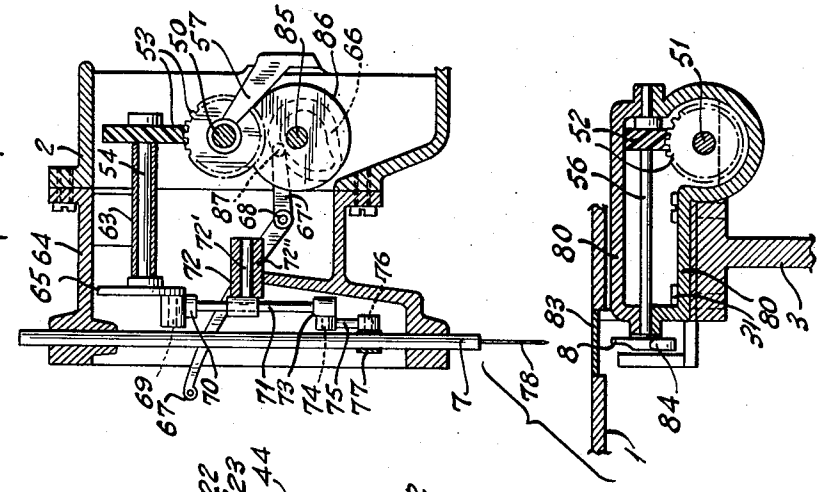
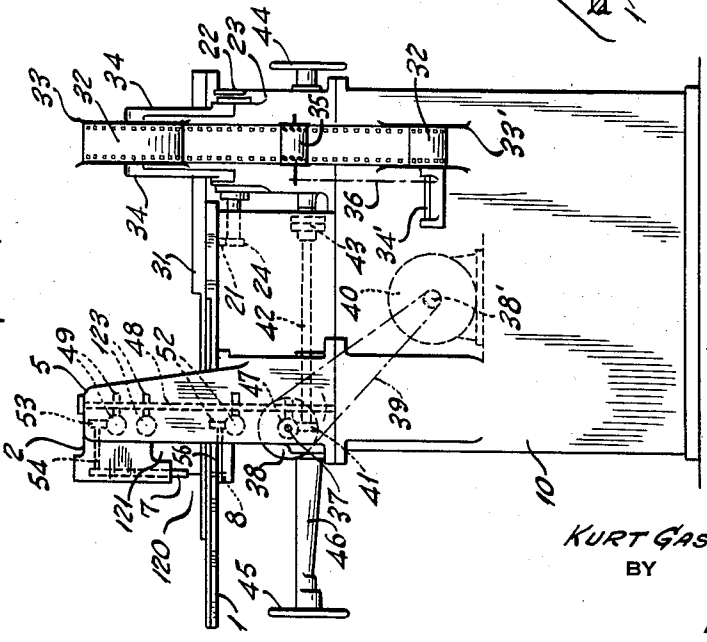


Fig. 3.



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Filed Jan. 19, 1955 4 Sheets-Sheet 4

Fig. 6.

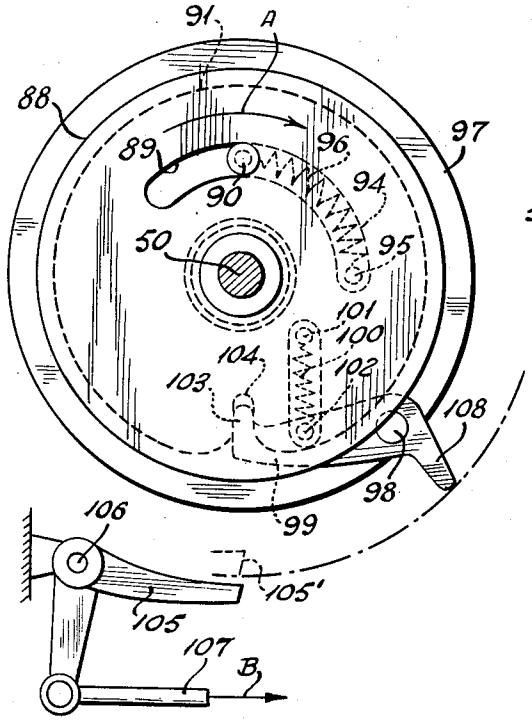


Fig. 7.

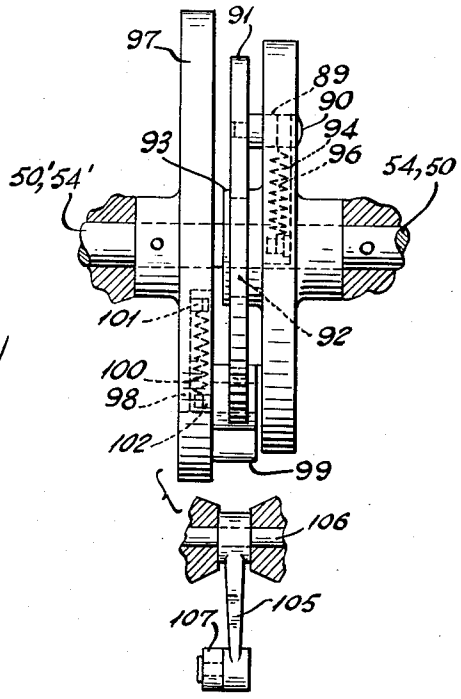
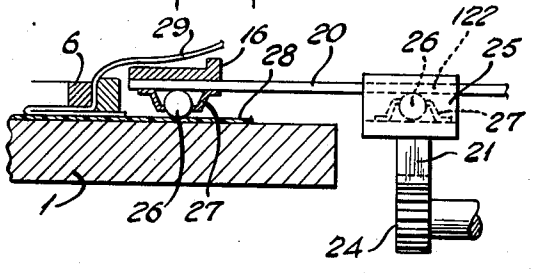


Fig. 8.



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MULTI-NEEDLE EMBROIDERY MACHINE

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Application January 19, 1955, Serial No. 482,906

5 Claims. (Cl. 112—98)

This invention relates to embroidery machines, and more particularly to multi-needle table embroidery machines wherein the embroidering frame or frames are controlled by hand or by a Jacquard automat.

An object of the invention is to provide a table embroidery machine which may be operated at high speeds.

Another object of the invention is to provide a table embroidery machine, by means of which small or large surfaces of a fabric may be readily embroidered.

A further object of the invention is to provide a table embroidery machine wherein the weight of the guiding machanism of the embroidering frames is reduced to a minimum.

Another object of the invention is to provide a table embroidery machine, by means of which the entire width of a length of fabric may be embroidered.

A further object of the invention is to provide a table embroidery machine, by means of which bands, strips or the like may be embroidered.

Another object of the invention is to improve on the construction of embroidery machines as now customarily made.

Other objects and structural details of the invention will be apparent from the following description when read in conjunction with the accompanying drawings forming part of this specification, wherein:

Fig. 1 is a front elevational view of a table embroidery machine according to the invention,

Fig. 2 is a top plan view of the embroidery machine shown in Fig. 1,

Fig. 3 is a side elevational view of the right hand end of the machine shown in Fig. 1,

Fig. 4 is a vertical sectional view of a detail illustrating the mechanisms actuating a needle and a looper associated with said needle,

Fig. 5 is a front elevational view, partly in section of the detail shown in Fig. 4,

Fig. 6 is a side elevational view of a controlling clutch for rendering active or inactive the needle movement,

Fig. 7 is a front elevational view of the clutch shown in Fig. 6, and

Fig. 8 is a fragmentary elevational view, partly in section, of a detail of the machine illustrating the means for displacing and supporting the guiding mechanism of the embroidering frames.

Referring now to Figs. 1–3, the embroidery machine according to the invention comprises the bridge-like supports 2 and 3 arranged above and below the table 1. Said supports 2 and 3 are connected with each other at their ends by means of arms 4 and 5 respectively, so that a free passage 120 extending along the length of the machine is formed between said two supports. The table 1 arranged for carrying the embroidering frames 6 passes through said passage 120 between the supports 2 and 3. Therefore the size of the mechanism for guiding the embroidering frames may be reduced to a minimum, so that it is limited only by the size of the embroidery surface 13 determined by the Jacquard automat 23. The

latter, being indicated schematically in the drawing, may be of any conventional design and construction immaterial to the present invention. Furthermore, the entire width of a fabric 29 (See Fig. 8) may be passed without obstruction through the free passage 120, so that the fabric may be embroidered along its entire width; in such a case, of course, the circular embroidering frames 6 shown in Fig. 2 should be replaced by rectangular embroidering frames extending from one end of the machine to the other.

The upper support 2 carries the embroidering mechanisms for the needle movement, while the lower support 3 carries the embroidering mechanisms for the looper movement. As best shown in Figs. 2 and 3, the embroidering mechanisms are arranged in such a manner that the needle bars 7 and the loopers 8 are outside the longitudinal axes of the supports 2 and 3. Thus, another passage 121 is formed in the longitudinal direction of the row of the needle bars 7, which permits the embroidering of corresponding widths, so that band-like fabrics may be embroidered by repeats.

The distances between the needle bars 7 and the axis of the support 2 on one hand and between the loopers 8 and the axis of the support 3 on the other hand may be chosen in such a way that the entire width of the embroidery surface is utilized. According to the embodiment shown in Fig. 2, said distance is utilized for a small round embroidery surface 9; in such a case all of the needle bars 7 and loopers 8 are active.

The supports 2 and 3 together with the arms 4 and 5 form a closed frame, free from oscillations; the arms 4 and 5 of said frame are attached to the walls 10 of the base of the machine, said walls 10 being connected with each other by rails 11. This arrangement is advantageous for the assembling and the shipping of the machine, as the frame 2, 3, 4, 5, i.e. the embroidering device proper, may be assembled and shipped as a unit for itself, while the base 10, 11 may be shipped in disassembled condition for assembling at the place of use. Moreover, the group-like disassembling of the machine results in a substantial saving on space for the manufacture.

A closet 12 for storing Jacquard cards, fabrics, embroidering threads, etc. may be arranged in the space below the support 3 between the walls 10 of the base.

If the machine is used for embroidering small embroidery surfaces 9, all of the needle bars 7 are rendered active; if, however, the machine is used for embroidering larger embroidery surfaces, such as indicated by 13, while the embroidering frames 6 are used, only every second needle bar 7 is rendered active. The distances between the needle bars 7 are chosen in such a manner, that the embroidery surfaces 13 limited by the Jacquard automat 23 overlap each other in the direction of the longitudinal axis of the support 2. Thus an embroidery extending throughout the entire width of a fabric may be produced with all needles, if an embroidering frame extending substantially from end to end of the machine is used.

The embroidering frames 6 are attached to holders 15 in a manner known per se. Said holders 15 are mounted on the front longitudinal rod 16 of the guiding mechanism 16, 17, 20 of the embroidering frames.

As best shown in Fig. 2, the guiding mechanism 16, 17, 20 is in the shape of a closed, braced frame. Two bell-crank levers 18 swingably mounted on a stationary part of the machine and connected with each other by a connecting rod 19 are slidably engaged at 30 with the rear longitudinal rod 17 of said guiding mechanism 16, 17, 20.

The cross-rod 20 of the guiding mechanism 16, 17, 20, acting as a guiding rail, is supported in a known manner by the rack 21 of one of the component works of

the Jacquard automat 23, while the bell-crank levers 18 are controlled by the rack 22 of the other component work of said Jacquard automat. Thus, the guiding mechanism 16, 17, 20 of the embroidering frames may be moved in two directions perpendicular to each other, so that inclined stitches may be produced by means of combined movements imparted to the guiding mechanism 16, 17, 20 (Fig. 2).

The Jacquard automat 23 is attached to the wall 10 of the base below the table 1, so that the guiding mechanism 16, 17, 20 of the embroidering frames is supported by the two bell-crank levers 18, by the displacing rack 21 and by the front portion of the table 1.

For an increase of the output of the table embroidery machine according to the invention, the friction of the guiding mechanism 16, 17, 20 of the embroidering frames is reduced by the arrangement of antifriction bearings carrying said guiding mechanism. As best shown in Fig. 8, the rack 21 is in mesh with the driving pinion 24 of one of the component works of the Jacquard automat. The head 25 of the rack 21 is provided with a channel 122 or the like, said channel 122 being perpendicular to the longitudinal axis of the rack 21 is slidably engaged with the cross-rod 20 of the guiding mechanism 16, 17, 20. A displacement of the cross-rod 20 in said channel 122 relative to the latter is caused by the rack 22 of the other component works of the Jacquard automat acting on the bell-crank levers 18 as described above. The cross-rod 20 is rigidly connected with the longitudinal rod 16 of the guiding mechanism 16, 17, 20. The weight of said guiding mechanism 16, 17, 20 is borne by the head 25 of the rack 21 and by the longitudinal rod 16 of the table 1. A series of balls 26 is in engagement with the lower surfaces of the longitudinal rod 16 and the cross-rod 20. The balls 26 are carried by cages 27. The balls 26 engaged with the longitudinal rod 16 contact a layer 28 of synthetic material attached to the table 1. The layer 28 being very smooth is not subjected to wear and tear. Furthermore, the layer 28 prevents a soiling of the fabric 29 which may pass along said layer 28 with a minimum of friction. Furthermore, the layer 28 of synthetic material deadens noises which may be caused by the balls 26 during movement of the embroidering frames. As mentioned above, a ball 26 mounted in a cage 27 is arranged in the head 25 of the rack 21. Furthermore, additional balls mounted in cages are arranged in the sliding heads 30 (see Fig. 2) of the bell-crank levers 18 for engagement with the rear longitudinal rod 17. Thus, the entire weight of the guiding mechanism 16, 17, 20 rests on the balls 26, so that during a displacement of said guiding mechanism almost only the mass of the latter must be moved. Therefore, the Jacquard automat 23 or the operator displacing the guiding mechanism 16, 17, 20 of the embroidering frames is substantially relieved, so that a high speed of embroidering may be obtained. As will be readily understood from above, the guiding mechanism 16, 17, 20 of the embroidering frames is not obstructed by embroidering heads similar to the heads of sewing machines. Therefore the driving mechanism comprising the racks 21 and 22, the bell-crank levers 18, the connecting rod 19 and a portion of the guiding mechanism 16, 17, 20, may be covered by a guard plate 31, so that overhanging portions of the fabric cannot be caught and soiled by the guiding mechanism of the embroidering frames. Furthermore, the guard plate 31 prevents disturbing parts from dropping into the guiding mechanism of the embroidering frames. Moreover, an endless Jacquard card may be readily guided along the guard plate 31, if such an endless card is used.

According to Figs. 1 and 3 the Jacquard card 32 being unwound from a first drum 33 journalled in bearings of a fork 34 is wound on a second drum 33' journalled in bearings of a fork 34' and driven by a drive 36 of any suitable type. During its passage from the drum 33 to the drum 33' the Jacquard card 32 is guided over the feed roller 35 of the Jacquard automat.

The embroidery machine is driven by the main shaft 37 (see Figs. 1 and 3) which in turn is driven by a motor 40 through the medium of a belt drive 38, 38', 39. The motor 40 is covered by a wall 10 of the base of the machine. The main shaft 37 being journalled in the arm 5 drives an intermediate shaft 42 by means of a pair of gears 41 meshing with each other. The intermediate shaft 42 is connected with the driving shaft of the Jacquard automat 23 by means of a disk clutch 43. A first hand-wheel 44 is secured to said driving shaft of the Jacquard automat 23 to the right of the latter as viewed in Fig. 3. A second hand-wheel 45 is secured to the extension of the intermediate shaft 42 at the left side of the machine as viewed in Fig. 3. The extension of the intermediate shaft 42 is journalled in bearings of a bracket 46. The Jacquard automat 23 is moved by hand-wheel 44, while the operation of the embroidery machine is carried out by means of the hand-wheel 45.

Furthermore, the main shaft 37 causes a rotation of the driving shaft 48 of the embroidery machine through the medium of a pair of gears 47 meshing with each other. The driving shaft 48 being journalled in the arm 5, in turn actuates through a pair of gears 49, the horizontal shaft 50 of the mechanism driving the needle bars 7. Furthermore, the driving shaft 48 rotates a second horizontal shaft 51 through the medium of a pair of gears 52, said second horizontal shaft 51 being arranged below the plate 1 for actuating the looper drive. This arrangement has the advantage, that the drive of the Jacquard automat 23 and of the embroidery machine by the main shaft 37 takes place in parallel, so that a play in the pairs of gears 41, 47, 49, 52 does not add up.

The first mentioned horizontal shaft 50 drives, through a series of pairs of gears 53, a series of shafts 54, each shaft 54 being arranged for actuating an associated needle bar 7, (see Figs. 1, 3 and 4). The second mentioned horizontal shaft 51 actuates, through a series of pairs of gears 55, a series of shafts 56 arranged for actuating the associated looper 8 (see Figs. 1, 3 and 4).

Figs. 4 and 5 illustrate the drive of the needles and loopers more in detail. A series of arms 57 arranged on the upper support 2 is associated with the series of needle bars 7. The horizontal shaft 50 is journalled in said series of arms 57. The drive of the needle bars 7 by the horizontal shaft 50 is identical for each needle shaft, so that it is sufficient to describe only one of them. A member 58 of a clutch is rigidly connected with the horizontal shaft 50. The other member 62 of said clutch being rotatably, but axially immovably arranged on said horizontal shaft 50, carries one of the gears of the pair of gears 53. The rotatable clutch member 62 is provided with a bore 62'. A spring loaded index element 59 slidably arranged in a bore 61 of the clutch member 58 may be manually engaged with the bore 62' of the clutch member 62 for causing an actuation of the needle bar 7 or may be manually disengaged from said bore 62' for rendering the needle bar 7 inactive. Thus, as the above described coupling means 58–62 is provided for each bar 54 driving the associated needle shaft 7, each needle bar 7 may be manually rendered inactive as required. This inactivation of one or more needle bars 7 becomes necessary, if for example only three needles are to be used for embroidering a large embroidery surface 13 (see Fig. 2).

As shown in Fig. 4, the driving shaft 54 carrying one gear 53 of the pairs of gears 53 is journalled in the sleeve 63 of the casing 64 attached to the support 2. A crank disk 65 secured to the shaft 54 at its end projecting into the casing 64 carries a pin 69. A head 70 rigidly connected with a connecting rod 71 is rotatably mounted on said crank pin 69. The connecting rod 71 is slidably engaged with a sleeve 72 rigidly connected with a shaft 72' rotatably arranged in a bearing 72'' of the casing 64. The

lower end of the connecting rod **71** carries an element **73** having a pin **74** rotatably engaged with the upper end of a link **75**. The lower end of said link **75** is rotatably engaged with a pin **76** carried by a member **77** rigidly connected with the needle bar **7**. As the crank pin **69** rotates uniformly, the pin **74** carried by the connecting rod **71** moves along an egg-shaped curve whereby it subjects the link **75** to a high acceleration during its movement in the lower part of said egg-shaped curve, while it causes a retardation of the link **75** during its movements through the upper part of said egg-shaped curve. Therefore the needle **78** carried by the needle bar **7** pierces the fabric only for a short time for the looping of the thread when the needle is in its lower position; during the movement of the needle **78** outside the fabric, however, the crank pin **69** passes through a considerably larger angle of rotation. Thus, the embroidering frames **6** may be displaced during the rotation of the crank pin **69**. Furthermore, the displacement of the embroidering frames **6** during the rotation of the crank pin **69** is facilitated by the fact, that the looper **8** performs a double rotation in relation to the needle bar **7**. For this purpose the pair of gears **55** (see Fig. 4) interposed between the horizontal shaft **51** and the looper shaft **56** has a ratio of transmission of 2:1. The shaft **56** being journalled in the casing **80** carries at one end thereof the looper **8**. The larger one of the pair of gears **55** keyed to the horizontal shaft **51** rotates in an oil bath provided for in a chamber of the casing **80**. The casing **80** being oiltight is attached to the lower support **3** below the plate **1** by means of screws **81**. The casing **80** may be readily adjusted in line with the needle **78**. Preferably the horizontal shaft **51** is made of a plurality of sections connected with each other by sleeve clutches **82** or the like of known construction, as shown in Fig. 5. Furthermore, the casing **80** carries the stitch-plate **83** and the supporting member **84** for the bobbin, so that the driving means for the looper motion form a unit.

In the hitherto customary embodiments of embroidery machines the looper performing only a single rotation in relation to the needle movement draws about two millimeters of lower thread from the bobbin, so that the fabric must draw additional thread from the bobbin, if more lower thread is needed. Therefore a heavy pull is exerted on the guiding mechanism of the embroidering frames in the hitherto customary multi-needle embroidery machines. In order to reduce this pull, hitherto customary large embroidery machines are equipped with means for imparting an additional oscillation to the member carrying the bobbin so as to draw in this manner the lower thread from the bobbin.

The application of such a device to multi-needle table embroidery machines, however, is too complicated, as the longitudinal axis of the looper shaft **56** is arranged in a horizontal direction. Furthermore the hitherto customary embroidery machines comprise a crank slot drive between the embroidering heads and the looper whereby the latter is subjected to a non-uniform movement. According to the invention the looper **8** is subjected to a uniform rotation by means of the pair of gears **55**, whereby a simple drive is obtained. Owing to the ratio of 2:1 of the pair of gears **55** the looper **8** of the embroidery machine according to the invention is subjected to two revolutions during one oscillation of the needle **78**. The first revolution is utilized for the looping of the thread with the needle **78** while the second, idle revolution draws again approximately two millimeters of lower thread from the bobbin in addition to the two millimeters of lower thread drawn during the first revolution, so that a total of approximately four millimeters of lower thread is available.

As best shown in Fig. 4, the thread guide **67** swingably mounted in the casing **64** at **68** has an arm **67'** carrying a roller **87** slidably engaged with a groove **66** of a cam disk **86** rigidly secured to a horizontal shaft **85**. Said horizontal shaft **85** is driven by the driving shaft **48** (see

Figs. 1 and 2) through the medium of a pair of gears **123**. The above described drives of the thread guide **67** by the horizontal shaft **85** and of the looper **8** by the horizontal shaft **51** permit a continuation of the movements of the thread guide **67** and the looper **8** during a stopping of the movement of the needle bar **7** while the fabric is displaced on the plate **1** by the mechanism of the Jacquard automat **23**. Such an operation is necessary, if the same colored embroidery thread shall be used for the embroidering of a remote portion of the fabric. In hitherto customary embroidery machines wherein the oscillation of the thread guide **67** is dependent on the movement of the needle, a displacement of the fabric for bringing such a remote portion to the needle cannot be carried out without making large stitches, which later on must be removed by hand; after removal of the stitches, however, the piercing holes made by the needle remain visible. As will be described hereinafter, however, the needle bars **7** of an embroidery machine according to the invention may be automatically rendered inactive, so that during a displacement of the fabric **29** the loopers **8** and the thread guides **67** draw the necessary lengths of thread from the bobbins so that when the needle **78** pierces again into the fabric only a single long stitch has been made and later on only a single long thread must be removed by cutting.

Figs. 6 and 7 illustrate a mechanism for the stopping of the movement of the needles. A disk-like member **88** of a clutch having a slot **89** is rigidly connected with the horizontal shaft **50**. A bolt **90** secured to an intermediate disk **91** is slidably engaged with the slot **89** of the disk **88**. The intermediate disk **91** is rotatably arranged on a reduced portion **92** of the hub of the disk **88**. The element **93** and the wider portion of the hub of the disk **88** prevent the intermediate disk **91** from axial displacement. The rotation of the intermediate disk **91** relative to the disk **88** depending on the length of the slot **89** is limited by the bolt **90** engaged with said slot **89**. Furthermore the disk **88** has a recess **94**, the depth of which is less than the width of the disk **88**. A bolt **95** arranged at the end of the recess **94** is rigidly connected with the disk **88**. The ends of the tension spring **96** are connected with the bolts **90** and **95** respectively. Said spring **96** tends to urge the bolt **90** and thus the intermediate disk **91** towards the right hand end (as viewed in Fig. 6) of the slot **89**. An additional disk **97** of the coupling device is rigidly connected with the other part **50'** of the horizontal shaft. Said disk **97** carries a pin **98**. A pawl **99** is swingably mounted on said pin **98**. The ends of a tension spring **100** are engaged with a pin **101** attached to the disk **97** and a pin **102** attached to the pawl **99**. Said tension spring **100** tends to urge the pawl **99** towards the center of the disk **97**. The long arm of the pawl **99** has a rounded locking tooth **103** at its end, said locking tooth **103** being capable of engagement with a radially extending recess **104** of the intermediate disk **91**. The open end of said recess **104** is widened. When the disk **88** is rotated in the direction of the arrow A, the tension spring **96** takes along the bolt **90** and thus the intermediate disk **91**. Therefore the locking tooth **103** of the pawl **99** engaged with the recess **104** of the intermediate disk **91** is also taken along, whereby the disk **97** carrying the pawl **99** is likewise rotated in the direction of the arrow A. The tension spring **96** is strong enough to overcome the entire frictional resistance of the needle mechanism.

As best shown in Fig. 1, the clutch **88, 97** is arranged at the right hand end of the machine. According to Figs. 6 and 7 a locking lever **105** in the shape of a bell-crank lever is swingably mounted on a shaft **106** carried by a stationary portion of the machine. One end of a controlling rod **107** is pivotally connected with one arm of said locking lever **105**. The other end of said controlling rod **107** is in operative engagement with the controlling mechanism or an electromagnetic device of the Jacquard automat.

When the members of the clutch 88, 91, 97 are engaged with each other, all of the needle bars 7 are rendered active. On the other hand, when the members of the clutch are disengaged, all of the needle bars 7 are rendered inactive.

The Jacquard card 32 may be provided with a special hole through which a jack of the Jacquard automat may pass for controlling the movement of the needle bars 7. If a jack of the Jacquard automat passes through such a hole of a Jacquard card 32, it actuates the controlling mechanism or the electromagnetic device for causing a movement of the controlling rod 107 in the direction of the arrow B (see Fig. 6), whereby the locking lever 105 is swung into the position 105'. Now, when during a rotation of the disk 97 the short arm 108 of the pawl 99 abuts against the locking lever 105 being in the position 105', the locking tooth 103 of said pawl 99 is withdrawn from the conical recess 104, whereby the disk 97 of the clutch is disengaged from the disk 88 of the clutch. While the disk 88 continues its rotation with the portion 50 of the horizontal shaft driven by the shaft 48 (see Figs. 1 and 3) through the gears 49, the disk 97 rigidly connected with the portion 50' of the horizontal shaft operatively connected with all of the needle bars is stopped. Therefore the short arm 108 of the pawl 99 remains in contact with the locking lever 105 being in the position 105'. When the disk 97 is thus locked in this position, the needles 78 of the various needle bars 7 are in their upper position, so that the fabric 29 may be freely displaced below the needles 78. As soon as the fabric has been displaced for bringing the previously embroidered portion out of the range of the needle and bringing another portion to be embroidered into the range of the needle, the controlling mechanism or electromagnetic device of the Jacquard automat 23 controlled by the Jacquard card 32 causes a return movement of the controlling rod 107, whereby the locking lever 105 is returned into its inactive position shown in full lines in Fig. 6. Thus, the short arm 108 of the pawl 99 is released by the locking lever 105, so that the tension spring 100 may swing the pawl 99 in clockwise direction around its pivot 98 until the locking tooth 103 is engaged with the recess 104. Upon an engagement of the locking tooth 103 with the recess 104, the disk 97 of the clutch and accordingly the portion 50' of the horizontal needle driving shaft participate again in the rotation of the driving portion 50 of the horizontal needle driving shaft. If a sudden engagement or disengagement of the pawl 99 occurs, the shock is dampened by the resilient intermediate disk 91, as the bolt 90 secured to said intermediate disk 91 may be displaced in the slot 89 against its direction of rotation. After the engagement or disengagement of the clutch member the bolt 90 is immediately returned into the relative position shown in Fig. 6 by means of the spring 96. Preferably the intermediate disk 91 is made of a synthetic material interspersed with fabric whereby the shock is even more reduced.

The controlling clutch may also act as a spontaneous brake. It is important, however, that the needle retains always its original position relative to the looper movement, as this is the case by means of the locking tooth 103 coming into engagement with the conical recess 104 of the above described controlling clutch.

As will be readily understood from above, all driving shafts and main shafts of the machine rotate at a uniform speed and only for the last element of the mechanism, i.e. the needle bars, the rotating movement is changed into an oscillating movement.

The above described drive for an embroidery machine may also be used in machines wherein a great number of needle bars are mounted on a support which is carried by means of sewing-machine-like embroidery heads. Then the rotating movement may be passed through one of the embroidering heads, whereby the oscillating movements are eliminated which are caused by the hitherto customary oscillating mechanisms.

The characteristic features for the movements of the needle bars and loopers and thread guides according to the invention may also be applied to embroidery machines having sewing-machine-like embroidery heads.

I have described a preferred embodiment of my invention, but it is understood that this disclosure is for the purpose of illustration, and that various omissions and changes in shape, proportion and arrangement of parts, as well as the substitution of equivalent elements for the arrangements shown and described may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

For example, the members of the controlling clutch, shown in Figs. 6 and 7, for rendering a needle bar active or inactive could also be connected with two portions of an intermediate needle driving shaft 54 (see Fig. 4) instead of the shaft 50 as described above. In such a case it would be possible to control individually each needle bar 7 of the machine in an automatic manner by means of the Jacquard automat. In Fig. 7 the reference numerals 54 and 54' indicating the two portions of such an intermediate needle driving shaft have been applied (in parentheses) to the two ends of the shaft shown in said Fig. 7.

What I claim is:

1. In a multi-needle table embroidery machine including an automatic embroidery pattern control means; the improvement comprising a base, a pair of upright supporting posts mounted on opposite ends of said base, a first horizontal arm extending between and connected at each of its ends to the upper end of said upright posts, a second horizontal arm extending between and secured at each of its ends adjacent the lower end of said posts and defining with said first horizontal arm an unobstructed free passageway extending substantially the entire lengths of said arms, a plurality of needle heads mounted on said first arm and spaced forwardly of said pair of uprights, cooperating looper mechanisms for each needle head mounted on said second horizontal arm and spaced forwardly of said pair of uprights, a stationary unitary work table having a width coextensive with the width of and extending through said passageway forwardly and rearwardly of said arms, an embroidery frame support mechanism actuated by the pattern control means and supported by and arranged for movement in a plane upon said work table, said embroidery frame support mechanism being disposed substantially behind said posts, a common source of power for each of said sewing heads and cooperating looper mechanisms, a needle bar driving shaft mounted on said first arm operatively connected to each of said needle heads and said common source of power, and a looper driving shaft mounted on said second horizontal arm operatively connected to each of said cooperating looper mechanisms, whereby there is provided access space for material to be embroidered upon on said table and by said needle heads and looper mechanisms, not only in the direction perpendicular to the longitudinal direction of the machine and between said upright posts, but also in the longitudinal direction of the machine and in front of said upright posts.

2. The invention as defined in claim 1 in which at least one of said upright posts is formed as a hollow member and in which there is disposed a common driving shaft connecting said needle head drive shaft and said looper drive shaft to said common source of power.

3. The invention as defined in claim 1 in which there is provided on said needle head shaft a coupling for each of said heads such that each of said heads may be selectively and individually connected or disconnected from said driving means.

4. The invention as defined in claim 2 in which there

are means connecting said common drive shaft with said automatic embroidery control means.

5. The invention as defined in claim 1 in which said embroidery frame support mechanism comprises a plurality of embroidery frames, one for each of said needle heads.

References Cited in the file of this patent

UNITED STATES PATENTS

325,599	Freese	Sept. 1, 1885
906,311	Sefton et al.	Dec. 8, 1908
1,034,759	Bourquin et al.	Aug. 6, 1912
1,139,375	Saurer	May 11, 1915
1,262,441	Briggs	Apr. 9, 1918
1,364,571	Maxwell et al.	Jan. 4, 1921
1,704,009	Lehmann	Mar. 5, 1929
1,948,876	Boettcher	Feb. 27, 1934
2,050,780	Bohmann et al.	Aug. 11, 1936
2,091,727	Bohmann et al.	Aug. 31, 1937
2,483,466	Johnson	Oct. 4, 1949
2,649,065	Casper	Aug. 18, 1953