An embroidering sewing machine is disclosed, the sewing machine comprising a needle vertically reciprocated to stitch a work; an embroidering frame for holding the work to be stitched a base (2) enclosed to provide a predetermined space therein a driver means arranged in the base (2) and including a carriage assembly operatively connected to the embroidering frame and operated in synchronism with vertical movement of the needle to move in X-direction and in Y-direction normal to X-direction, thereby to move the embroidering frame relative to the needle in accordance with movement of the carriage assembly, the carriage assembly including a base carriage (5) moveable in X-direction, an intermediate carriage (6) operatively connected to the base carriage (5) to move therewith and being movable in Y-direction relative to the base carriage (5), a distal end carriage (7) operatively connected to the intermediate carriage (6) to move therewith a transmission means arranged between the intermediate carriage (6) and the distal end carriage (7) and transmitting the movement of the intermediate carriage (6) to the distal end carriage (7) to move the distal end carriage (7), the transmission means including an endless belt (11) wound around a pair of pulleys (10a), (10b) arranged on the intermediate carriage (6) with a predetermined space provided therebetween in Y-direction and fixedly connected to the distal end carriage (7) at a point (Fa).
Abstract

An embroidering sewing machine is disclosed, the sewing machine comprising a needle vertically reciprocated to stitch a work; an embroidering frame for holding the work to be stitched; a base (2) enclosed to provide a predetermined space therein; a driver means arranged in the base (2) and including a carriage assembly operatively connected to the embroidering frame and operated in synchronism with vertical movement of the needle to move in X-direction and in Y-direction normal to X-direction, thereby to move the embroidering frame relative to the needle in accordance with movement of the carriage assembly, the carriage assembly including a base carriage (5) movable in X-direction, an intermediate carriage (6) operatively connected to the base carriage (5) to move therewith and being movable in Y-direction relative to the base carriage (5), a distal end carriage (7) operatively connected to the intermediate carriage (6) to move therewith; a transmission means arranged between the intermediate carriage (6) and the distal end carriage (7) and transmitting the movement of the intermediate carriage (6) to the distal end carriage (7) to move the distal end carriage (7), the transmission means including an endless belt (11) wound around a pair of pulleys (10a), (10b) arranged on the intermediate carriage (6) with a predetermined space provided therebetwen in Y-direction and fixedly connected to the distal end carriage (7) at a point (Fa).
SPECIFICATION

Title of the Invention

Embroidering Sewing Machine

Background of the Invention

Field of the Invention

The present invention relates to a sewing machine, more particularly relates to an embroidering sewing machine having a needle vertically reciprocated relative to a work held on an embroidering frame to be stitched and a consult frame driver including a carriage which is operatively connected to the embroidering frame and is operated in synchronism with vertical reciprocation of the needle to move in a first direction and in a second direction normal to the first direction, thereby to move the embroidering frame in accordance with the movement of the carriage relative to the needle.

Prior Art

It has been generally known that the embroidering sewing machine has a driver for drivingly move an embroidering frame holding a work to be stitched. The embroidering frame driver includes a carriage operatively connected to the embroidering frame and is operated in synchronism with vertical reciprocation of the needle to move in a first direction (X-direction) and in a direction (Y-direction) normal to the first direction. The embroidering frame driver is normally arranged in a base of the sewing machine or in a casing which is separated from the sewing machine. In any
case, the carriage is partly extended out of the base or the casing to hold the embroidering frame which is to be moved in accordance with movement of the carriage relative to the needle.

Therefore, the area where the embroidering frame driver including a carriage can move is determined by the size of sewing machine or by the size of embroidering frame driver because the embroidering frame driver can not move machine beyond a limited size of the base of sewing machine or a limited size of separate casing in which the embroidering frame driver is housed. This makes it impossible to continuously stitch a large sized pattern without interruption of stitching operation. In order to stitch a large sized pattern, it has been required to reset the work to the embroidering frame so often while the sewing machine is stopped until the pattern is completed.

For the purpose of solving this problem, it has been designed to enlarge the base of sewing machine or the separate casing in which the embroidering frame is housed, thereby to enlarge the area where stitching operation is performed. Such a sewing machine will be inevitably bulky and heavy and, therefore, will not be adapted to being used in the houses in general.

Objects of the Invention

The invention has been provided to eliminate the defects and disadvantages of the prior art.

It is, therefore, an object of the invention to provide an embroidering sewing machine which may stitch a large sized pattern continuously
without interruption of stitching operation halfway for resetting a work to the embroidering frame.

It is another object of the invention to provide an embroidering sewing machine which is compact in structure and smooth in operation.

It is another object of the invention to provide an embroidering frame driver including a carriage assembly and a transmission means which are operatively connected to move the carriage assembly in one direction to partly extend exceeding a conventionally limited area where stitching operation is performed.

It is another object of the invention to provide a carriage assembly including a first carriage and a second carriage which is operatively connected to the first carriage through a belt such that the first carriage is moved to further increase the moving amount of the second carriage which holds the embroidering frame.

It is still another object of the invention to make it possible to use a relatively large sized embroidering frame to stitch a relatively large sized pattern.

Summary of the Invention

For attaining the objects, the embroidering sewing machine of the invention comprises a needle vertically reciprocated to stitch a work, an embroidering frame for holding the work to be stitched, a driver means including a carriage assembly operatively connected to the embroidering frame and operated in synchronism with vertical movement of the needle to move in a first direction within a limited distance and in a second direction
normal to the first direction within a limited distance, thereby to move the
embroidering frame relative to the needle in accordance with movement of
the carriage assembly, the carriage assembly including a first carriage and a
second carriage, the sewing machine further comprising a transmission
means arranged between the first carriage and the second carriage and
transmitting the movement of the first carriage to the second carriage to
move the second carriage within a distance exceeding the limited distance.

Brief description of the Drawings

Fig.1 is a perspective view of an embroidering sewing machine
according to the invention:

Fig.2 is a plan elevational view of a base of the sewing machine
laterally sectioned to show the interior thereof:

Fig.3 (A) is an enlarged plan elevational view of a carriage drive device
of the sewing machine:

Fig.3 (B) is a further enlarged plan elevational view of an essential
part of the carriage drive device of the sewing machine;

Fig.4 (A) is an enlarged perspective view of the carriage drive device
composed of a base carriage, an intermediate carriage, a distal end carriage
and transmission belts:

Fig.4 (B) is a perspective view of a part of the carriage drive device;

Fig.5 (A) through Fig.5 (C) are plan elevational views of the carriage
drive device for explaining the operations thereof:

Fig.6 is a perspective view of a second embodiment of the carriage
drive device shown in combination with X-Y drive mechanism:
Fig. 7 (A) is a plan elevational view of the carriage drive device;

Fig. 7 (B) is a plan elevational view of the carriage drive device shown in lateral section:

Fig. 8 is a perspective view of the carriage drive device partly broken to show the interior thereof:

Fig. 9 (A) is a perspective view of the carriage drive device shown in combination with X-Y drive mechanism;

Fig. 9 (B) is a plan elevational view of a modified embodiment of transmission belt which may be employed in the embodiment:

Fig. 10 (A) is a plan elevational views of a transmission belt of the carriage drive device shown as is at the initial position:

Fig. 10 (B) is a plan elevational views of a transmission belt of the carriage drive device shown as is moved to maximum extent:

Fig. 11 (A) through Fig. 11 (C) are plan elevational views of the carriage drive device for explaining the operations thereof:

Fig. 12 (A) is a perspective view of a slightly modified embodiment of the carriage drive device shown as partly broken:

Fig. 12 (B) is a plan elevational view of the modified embodiment of Fig. 12 (A):

Fig. 13 is a perspective view of a third embodiment of the carriage drive device;

Fig. 14 is a perspective view of a fourth embodiment of the carriage drive device; in combination with X-Y drive mechanism:
Fig.15 (A) and Fig.15 (B) are perspective views of the embodiment for explaining the operations thereof:

Fig.16 (A) is a plan elevational view of the embodiment wherein the carriage assembly is at the initial position:

Fig.16 (B) is a plan elevational views of the embodiment wherein the carriage assembly is moved to maximum extent from the initial position: and

Fig.17 (A) through Fig.17 (C) are elevational views of the embodiment for explaining the operations of the carriage drive device.

Detailed Description of the Preferred Embodiments

The invention will now be described in reference to the attached drawings. Fig 1 shows the outline of a sewing machine. Fig.2 is a plan elevational view of a base 2 of the sewing machine shown in lateral section to show the interior thereof wherein a X·Y drive device A is housed.

In an arm 1 of the sewing machine, there is provided a stitching device including a rotary drive shaft and a needle bar which is vertically reciprocated in association with rotation of the drive shaft.

The arrow X shows a width direction of the sewing machine while arrow Y shows a depth direction of the sewing machine.

The drive device A has a portion 20 to which an embroidering frame 21 is attached rearwardly of the base 2 in the direction Y. The embroidering frame attaching portion 20 is extended out of the base 2 through a guide groove 2a formed at the rear side of the base 2, such that the embroidering frame 21 attached to the embroidering frame attaching portion 20 may be
moved by the drive device A in the directions X and Y.

The embroidering frame attaching portion 20 is an extension end of an distal end carriage 7 which forms a carriage structure together with an intermediate carriage 6 and a base carriage 5 which is moved by a drive motor 19 only in the direction X.

As shown in Fig. 3(A), the base carriage 5 is composed of a flat plate 5a extended in the direction Y and having a sectionally circular guide shaft 5b1 and a guide rail 5b2 which is located opposite to the guide shaft 5b1 in the direction X, the guide shaft and guide rail extending in the direction Y respectively. The guide shaft 5b1 is supported by beatings 5a1, 5a2 formed at the opposite sides of the flat plate 5a in the direction Y by bending up the flat plate 5a while the guide rail 5b2 is formed by bending up the flat plate 5a and further horizontally bent inside above the flat plate 5a.

The flat plate 5a has a pair of opposite pulleys 8a, 8b spaced from each other in the direction Y. An endless belt 9 is wound around the pulleys 8a, 8b and is extended in parallel with the guide shaft 5b1.

One of the pulleys 8a, 8b is operatively connected to a drive motor 15 through a gear assembly 14, the drive motor 15 being supported on lower side of the flat plate 5a. The drive motor 15 is driven to rotate one of the pulleys 8a, 8b, thereby to move the endless belt around the pulleys 8a, 8b. The gear assembly 14 includes a plurality of gears including an intermediate gear 14b in mesh with a drive gear of the motor 15 and a follower gear 14a which is in mesh with the intermediate gear 14b and coaxial with the pulley 8a to rotate the pulley 8a at a reduced speed, thereby to reduce the moving speed of the endless belt 9 which is moved
around the pulleys 8a, 8b.

As shown in Fig.4 (A), the intermediate carriage 6 has guide portions 6c formed at the opposite sides thereof in the direction X. One of the engaging portions 6c is in engagement with the guide rail 5b2 while the other two engaging portions 6c are in engagement with the guide shaft 5b1. The intermediate carriage 6 has a portion 6d fixedly connected to the endless belt 9 at a connecting point indicated by Fo in Fig.5 (A) through Fig.5 (C) such that the intermediate carriage 6 may be reciprocatingly moved relative to the base carriage 5 in the direction Y as guided by the guide shaft 5b1 and the guide rail 5b2 when the drive motor 15 is driven.

The intermediate carriage 6 is a flat plate partly formed with a hollow frame 6a extending in the direction Y and further has a pair of opposite pulleys 10a located thereon spaced from each other in the direction Y. An endless belt 11 is wound around the pulleys 10a. The endless belt 11 is fixedly connected to the base carriage 5 at a point Fa defined as a connecting point. Precisely a connector 12 fixedly provided on the base carriage 5 as shown in Fig. (4B) is fixedly connected to the belt 11 at one of the opposite sides thereof with the spaced pair of pulleys 10a located therebetween.

As shown in Fig.5 (A) through Fig.5 (C), the connector 12 is extended up through an elongated opening 6a1 formed at the flat plate of the intermediate carriage 6 and extending in the direction Y in parallel with the endless belt 11. The length of the elongated opening 6a1 is more than the length of stroke of the intermediate carriage 6 in the direction Y.

Since the endless belt 11 is fixedly connected to the base carriage 5 at
the point Fa which is located at one of the opposite sides of the endless belt 11 with the spaced pair of pulleys 10a located therebetween, the endless belt 11 is moved around the pulleys 10a as the intermediate carriage 6 is reciprocatingly moved in the direction Y relative to the base carriage 5.

The distal end carriage 7 is operatively connected to the intermediate carriage 6 and is reciprocatingly moved relative thereto in the direction Y into and out of the hollow frame 6a of the intermediate carriage 6.

The distal end carriage 7 is composed of an elongated flat hollow frame 7a extending in the direction Y and inserted into the hollow frame 6a of the intermediate carriage 6 and having an upstanding free end 20 to which an embroidering frame is attached. The distal end carriage 7 has an engaging portion 7b which is in sliding engagement with a guide shaft 6b provided on the intermediate carriage 6 and extending in the direction Y. The distal end carriage 7 is further fixedly connected to the endless belt 11 at a point Fb which is located at the other of the opposite sides of the endless belt 11 with a pair of spaced pulleys 10a being located therebetween. Precisely the distal end carriage 7 has a connector 13 formed thereon and fixedly connected to the endless belt 11 at the point Fb as shown in Fig. (A) through Fig. 5 (C).

It is preferred to provide one of the connecting point Fa and Fb at a position adjacent to one of the pulleys 10a and 10b and provide the other of the connecting point Fa and Fb at a position adjacent to the other of the pulleys 10a and 10b. With the connecting points Fa and Fb being thus positioned, the opposite sides of the endless belt 11 will obtain effective strokes respectively in the movements of opposite directions.

For example, as shown in Fig. 5 (A), when the connecting point Fa is
moved to the position adjacent to the pulley 10b while the endless belt 11 is moved, the connecting point Fb is moved to the position adjacent to the pulley 10a. The positional relation is contrary as shown in Fig.5 (C). Thus the connecting point Fb may be moved substantially the length of the endless belt 11 between the opposite pulleys 10a and 10b in the direction Y. The intermediate carriage 6, which is connected to the endless belt 11 at the connecting point Fa, may be reciprocatingly moved substantially the length of the endless belt 11 relative to the base carriage 5 between the opposite pulleys 10a and 10b in the direction Y. Therefore, the distal end carriage 7 connected to the endless belt 11 at the connecting point Fb may be reciprocatingly moved substantially the length of the endless belt 11 between the opposite pulleys 10a and 10b in the direction Y.

In this connection, the endless belt 11 is toothed and is in mesh with the toothed pulley as shown in Fig.3 (B). However, the toothed belt may be replaced by a flat, V-belt or a wire in combination with the correspondingly designed pulley.

The base carriage 5 carrying the intermediate carriage 6 may be moved in the direction X by a drive motor 19 supported on the base plate 5a of the base carriage 5 as shown in Fig.2 and Fig.3 (A). The base carriage 5 is supported at the opposite ends thereof in the direction Y on a pair of spaced guide rails 16, 16 extending in the direction X. The base carriage 5 has an engaging portion 18 secured thereto and extending in the direction Y and being in slide engagement with the guide shaft 16. The engaging portion 18 is fixedly connected to an endless belt 17a which is wound around a pair of pulleys 17b which are spaced from each other in the direction X. One of the
pulleys 17b is operatively connected to the drive motor 19 and is rotated thereby such that the endless belt 17a may be moved around the pulleys 17b, thereby to move the base carriage 5 in the direction Y. Therefore, the end portion 20 of the distal end carriage 7 extended out of the base 2 through the guide groove 2a, to which an embroidering frame is attached, may be moved in the directions X and Y.

According to the embodiment of the invention, a single stage of carriage drive mechanism is disclosed including the intermediate carriage 6 and the distal end carriage 7. It is, however, possible to occasionally provide a multi-stage of carriage drive mechanisms including plural set of the intermediate carriage 6 and the distal end carriage 7 to further increase the moving distance of the carriage carrying an embroidering frame.

The operations of the embodiment will now be described in reference to Fig.5 (A) through Fig.5 (C).

The intermediate carriage 6 is moved in the direction Y by the endless belt 9 which is operatively connected to the drive motor 15 and is moved thereby, the drive motor 15 being supported on the base carriage 5 and driven by control signal supplied from a control device (not shown).

Since the endless belt 11 is fixedly connected to the base carriage 5 at the point Fa, the endless belt 11 is moved in the direction Y around the pulleys 10a and 10b as the intermediate carriage 6 is moved in the direction Y.

As shown in Fig.5 (B), in case the intermediate carriage 6 is moved in the right direction from the position as shown in Fig.5 (A), the connecting point Fb, which is located on the opposite side of the connecting point Fa, is
moved in the same direction with the intermediate carriage 6. It is, therefore, apparent that the distal end carriage 7, which is fixedly connected to the endless belt 11 at the point Fb, is moved while the intermediate carriage 6 is moved and remains stopped while the intermediate carriage 6 is stopped.

Actually the distal end carriage 7 is moved in association with the movement of the endless belt 11. Therefore, the moving amount of the distal end carriage 7 is determined by the moving amount of the endless belt 11 moving around the two pulleys 10a and 10b. Namely the movement amount of the distal end carriage 7 is equivalent to the moving amount of the endless belt 11. Since the endless belt 11 is rotationally moved around the pulleys 10a and 10b and the opposite sides of the endless belt 11 are moved substantially in parallel with each other in the direction Y, one side moving in one direction while the opposite side moving in the opposite direction, it is apparent that the moving amount of one side of the endless belt 11 is equivalent to the moving amount of the opposite side of the endless belt 11. Thus movement amount of the endless belt 11 is twice of the moving amount of the intermediate carriage 6. Therefore, the movement amount of the distal end carriage 7 is twice of the moving amount of the intermediate carriage 6. Namely provided that the moving amount of the intermediate carriage 6 is S, the movement amount of the distal end carriage 7 is 2S.

More precisely, provided that the axial center of the pulley 10b is a reference moving point Q of the intermediate carriage 6, the point Q is moved with a maximum stroke S indicating a maximum moving amount of the intermediate carriage 6 from the position as shown in Fig. (A) where the
intermediate carriage 6 is completely housed in the base carriage 5 to the position as shown in Fig. 5 (C) where the intermediate carriage 6 has been moved in maximum.

On the other hand, provided that the distal end 7c of the distal end carriage 7 is a reference moving point P of the distal end carriage 7, the point P is moved with a maximum stroke 2S indicating a maximum moving amount of the distal end carriage 7 from the position as shown in Fig. (A) where the distal end carriage 7 is completely housed in the base carriage 5 to the position as shown in Fig. 5 (C) where the distal end carriage 7 has been moved in maximum.

Thus it is possible to obtain, in the direction Y, an extremely increased moving amount of the distal end carriage 7 having the distal end 20 to which an embroidering frame is attached, the distal end carriage 7 being otherwise placed under limitation of movement in the base 2 of sewing machine.

Subsequently, a second embodiment of the invention will be described.

According to the second embodiment, there is provided a carriage assembly including a carriage 44 and a distal end carriage 47 operatively connected to the carriage 44 and being capable of moving in X and Y directions. The distal end carriage 47 has a distal end 47a to which an embroidering frame is attached by means of an adapter 53.

A pair of guide rails 35, 35' are provided as extending in the direction X and supported on bearings 37. Another pair of guide rails 36, 36' are provided as extending in the direction Y and supported on bearings 37. A pair of endless belts 38, 38' are provided as extending in the direction Y
along the guide rails 35, 35' respectively and wound around a pair of pulleys 40 secured to the guide rails 35, 35' respectively. Another pair of endless belts 39, 39' are provided as extending in the direction Y along the guide rails 36, 36' and wound around a pair of pulleys 40 secures to the guide rails 36, 36' respectively. The pulley 40 are operatively connected to drive motors M respectively and rotated by the motors to move the endless belts therearound.

As particularly shown in Fig.9, an X-direction carrier 41 includes slide members 41a, 41b oppositely located in the direction Y as slidably mounted on the guide rails 35, 35' respectively and a member 41c for connecting the two slide members 41a, 41b. The slide members 41a, 41b are fixedly connected to the endless belts 38, 38' respectively so as to be slingly moved along the guide rails 35, 35' as the endless belts 38, 38' are moved.

A Y-direction carrier 42 includes slide members 42a, 42b oppositely located in the direction X as slidably mounted on the guide rails 36, 36' respectively and guide shafts 42c connecting the two slide members 41a, 41b. The slide members 41a, 41b are fixedly connected to the endless belts 39, 39' respectively so as to be slingly moved along the guide rails 35, 35' as the endless belts 39, 39' are moved.

As shown in Fig.6, a slide member 43 is mounted on the on the guide shafts 42c and is slingly movable theralong.

The carriage 44 has one end fixedly connected to the slide member 43 and has the opposite end mounted on the carrier 41 so as to be slingly movable in the direction Y.

As shown in Fig.7, a pair of pulleys 45a, 45b are rotatably mounted on
the carriage 44 with the central axes thereof being displaced in the direction X in the manner that a tangent line is common to the two pulleys 45a, 45b and is in alignment with the Y axis. A cord-belt 49 is wound around the pulleys 45a, 45b in formation generally of S-shape. The belt 49 has one end 49a fixedly connected to the slide member 41a and the opposite end 49b fixedly connected to the slide member 41b.

As shown in Figs. 7, 8 and 9, a pair of guide shafts 46, 46 are provided on the base carriage 44 as extended in the direction Y with a predetermined space provided therebetween in the direction X for enabling the distal end carriage 47 to reciprocatingly move in the direction Y.

The distal end carriage 47 has a pair of engaging portions 48, 48 which are in slide engagement with the guide shafts 46, 46 respectively. One of the engaging portions 48, 48 is fixedly connected to the belt 49 at the point F located between the two pulleys 45a, 45b.

As the carriage 44 is moved in the direction Y, the belt 49 is rotatively moved around the pulleys 45a, 45b. The connecting point F is linearly moved with the carriage 44 in the same direction between the two pulleys 45a, 45b.

The distal end carriage 47 is moved in association with the movement of the belt 49 which is moved in association with the carriage 44. Therefore, the moving amount of the distal end carriage 47 is determined by the moving amount of the belt 49 which is twice of the moving amount of carriage 44 on the reason as has been already described hereinbefore in connection with the first embodiment of the invention. Therefore, the movement amount of the distal end carriage 47 is twice of the moving
amount of the carriage 44. Namely provided that the moving amount of the carriage 44 is $S$, the movement amount of the distal end carriage 47 is $2S$.

As shown in Fig.11 (C), the length $L$ is an addition of a maximum moving amount $L_a$ of the carriage 44 and a maximum moving amount $L_b$ of the distal end carriage 47 to the right in the direction $Y$, wherein $L_a$ equals $L_b$. In this connection, Fig.9 (B) shows in detail a part of a toothed 19 which is in mesh with a toothed pulley 15, which may be employed in place of the cord-belt 49 and the corresponding pulleys 45a, 45b. Further a wire may be used in place of the cord-belt 49.

Fig.12 (A) and Fig.12 (B) show a modified embodiment wherein one of the pulleys 45a, 45b, that is, the pulley 45b is arranged to rotate in vertical plane and is mounted to the distal end carriage 47 while the position at which the end 49b of the belt 49 is fixed differs from the opposite end 49a in vertical direction.

Fig.13 shows a third embodiment of the invention, wherein a carriage drive belt assembly 50 is mounted on the X-direction carrier 41 to move the carriage 44 in the direction $Y$. The carriage drive belt assembly 50 includes a drive belt 50a wound around a pair of pulleys 50b located on the X-direction carrier 41 as spaced from each other in the direction $Y$. The drive belt 50a is fixedly connected to the carriage 44 by means of a connector 51. One of the pulleys 50b is operatively connected to a drive motor 52 mounted on the X-direction carrier 41 to be rotated thereby. Thus the drive belt 50a is rotatingly moved around the pulleys 50b to slidingly move the carriage 44 in the direction $Y$.

A fourth embodiment of the invention will be described in reference to
Figs. 14 through 17, wherein an intermediate support assembly 60 is additionally employed in the embodiment as shown in Fig. 6. Therefore, the common elements are designated with the same reference numerals.

A carriage 44 has a guide 44a provided at the distal end thereof in the direction Y. A slide carriage 57 is composed of a pair of slide shafts 57b extending in the direction Y and having a support 57a secured to one end thereof for supporting an embroidering frame and having a stopper 57c secured to the opposite end thereof. The pair of slide shafts 57b are extended through a pair of guide holes 44a1 of the guide 44a.

The stopper 57c of the slide carriage 57 is fixedly connected to a cord 49 at a point F2, the cord 19 being wound around a pair of pulleys 45a, 45b located on the carriage 44 with a predetermined space provided therebetween in the direction Y and displaced in the direction X. The cord 49 has one end 49a secured to a carrier 41a and the opposite end 49b secured to a carrier 41b. The connecting point F2 is located at a part of the cord 49 extending between two pulleys 45a, 45b.

An intermediate support assembly 60 is provided, which is composed of a support 60a and a pair of shafts 60b extending in parallel with each other in the direction Y from the support 60a and passing through guide holes 44a2 formed at the guide 44a and further passing through guide portions 44c of the carriage 44 such that the intermediate support assembly 60 may slidingly moved relative to the carriage 44 in a stabilized condition. The slide shafts 57b of the slide carriage 57 are extended through guide holes 60a1 formed at the support 60a such that the intermediate support assembly 60 and the slide carriage 57 may be slidingly movable relative to
each other.

The slide carriage 57 has a rack 63 extended in the direction Y and being opposite to a rack 64 provided on the carriage 44 and extending in the direction Y. A connector 61 is provided, which is extended in the direction X and has one end fixedly connected to one of the shafts 60b of the intermediate support assembly 60. The connector 61 has a pinion 62 mounted to the opposite end thereof. The pinion 62 is located between the rack 63 and the rack 64 and is in mesh with both racks 63, 64 such that the slide carriage 57 and the intermediate support assembly 60 may be moved in association with movement of the carriage 44 in the direction Y.

The pinion 62 and the racks 63, 64 are designed to move the intermediate support assembly 60 half of a distance that the slide carriage 57 is moved. Thus the intermediate support assembly 60 supports the slide carriage 57 at the intermediate portion thereof in case the slide carriage 57 is moved out to a maximum extent.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations or modifications are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications are intended to be included within the scope of the following claims.
What is claimed is:

1. An embroidering sewing machine comprising a needle vertically reciprocated to stitch a work; an embroidering frame for holding the work to be stitched; a base enclosed to provide a predetermined space therein; a driver means arranged in said base and including a carriage assembly operatively connected to said embroidering frame and operated in synchronism with vertical movement of said needle to move in a first direction and in a second direction normal to said first direction, thereby to move said embroidering frame relative to said needle in accordance with movement of said carriage assembly; and a transmission means operatively connected to said carriage assembly and operated to move said carriage assembly in one of said first direction and said second direction exceeding said predetermined space defined by said base.

2. An embroidering sewing machine comprising a needle vertically reciprocated to stitch a work; an embroidering frame for holding the work to be stitched; a base enclosed to provide a predetermined space therein; a driver means arranged in said base and including a carriage assembly operatively connected to said embroidering frame and operated in synchronism with vertical movement of said needle to move in a first direction and in a second direction normal to said first direction, thereby to move said embroidering frame relative to said needle in accordance with movement of said carriage assembly, said carriage assembly including a first carriage and a second carriage operatively connected to said first
carriage; and a transmission means arranged between said first carriage and said second carriage and transmitting the movement of said first carriage to said second carriage to move said second carriage in none of said first and second directions exceeding said predetermined space defined by said base.

3. The embroidering sewing machine as defined in claim 2, wherein said transmission means includes a pair of pulleys arranged with a predetermined space provided therebetween on said first carriage and a transmission belt wound around said pulleys, said transmission belt being fixedly connected to said second carriage at one point thereof.

4. The embroidering sewing machine as defined in claim 3, wherein said transmission means includes an endless belt wound around said pulleys and fixedly connected to said second carriage at one point thereof.

5. The embroidering sewing machine as defined in claim 3, wherein said transmission means includes an endless cord wound around said pulleys and fixedly connected to said second carriage at one point thereof.

6. The embroidering sewing machine as defined in claim 3, wherein said transmission means includes an endless wire wound around said pulleys and fixedly connected to said second carriage at one point thereof.

7. The embroidering sewing machine as defined in any of claim 3, wherein
said transmission means includes a cord wound around said pulleys and having the opposite ends fixedly anchored.

8. The embroidering sewing machine as defined in any of claim 3, wherein said transmission means includes a wire wound around said pulleys and having the opposite ends fixedly anchored.

9. The embroidering sewing machine as defined in any of claim 2, further comprising intermediate support means which is operatively connected to said first carriage and said second carriage and moved with said second carriage relative to said first carriage as said first carriage is moved, thereby to support said second carriage.

10. The embroidering sewing machine as defined in any of claim 9, wherein said intermediate support means includes a support member which is moved within a limited distance relative to said second carriage.

11. An embroidering sewing machine comprising a needle vertically reciprocated to stitch a work; an embroidering frame for holding the work to be stitched; a base enclosed to provide a predetermined space therein; a driver means arranged in said base and including a carriage assembly operatively connected to said embroidering frame and operated in synchronism with vertical movement of said needle to move in X-direction and in Y-direction normal to X-direction, thereby to move said embroidering frame relative to said needle in accordance with movement of said carriage
assembly, said carriage assembly including a base carriage, an intermediate carriage operatively connected to said base carriage to move therewith and a distal end carriage operatively connected to said intermediate carriage to move therewith; a transmission means arranged between said intermediate carriage and said distal end carriage and transmitting the movement of said intermediate carriage to said distal end carriage to move said distal end carriage; a first driving means including a first drive motor for moving said base carriage in X-direction; and a second driving means including a second drive motor and a transmission member operated by said second drive motor to move said intermediate carriage in Y-direction, said intermediate carriage being moved to operate said transmission means to move said said distal end carriage in Y-direction exceeding said predetermined space defined by said base.

12. The embroidering sewing machine as defined in claim 11, wherein said transmission means includes a pair of pulleys arranged with a predetermined space provided therebetween on said intermediate carriage and a transmission belt wound around said pulleys, said transmission belt being fixedly connected to said distal end carriage at one point thereof.

13. The embroidering sewing machine as defined in claim 11, wherein said transmission member is a transmission belt connected at one point thereof to said intermediate carriage.

14. The embroidering sewing machine as defined in any of claim 2, further
comprising intermediate support means which is operatively connected to said intermediate carriage and said distal end carriage and moved with said distal end carriage relative to said intermediate carriage as said intermediate carriage is moved, thereby to support said distal end carriage.

15. The embroidering sewing machine as defined in any of claim 14, wherein said intermediate support means includes a support member which is moved within a limited distance relative to said distal end carriage.