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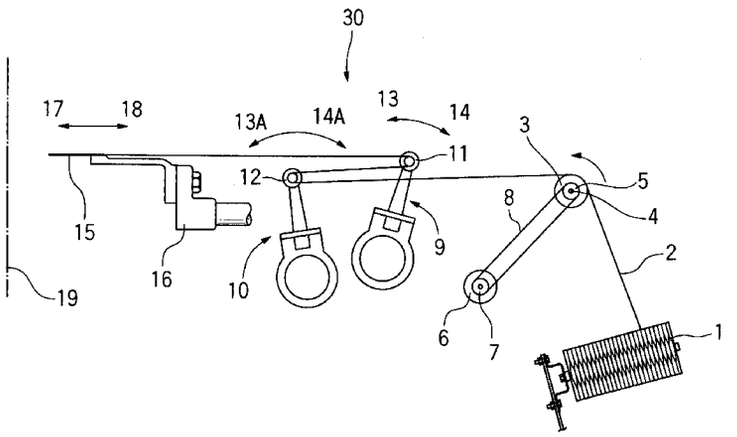
(54) Embroidery/lace machine

(57) In the present invention, a shuttle type embroidery/lace machine includes a frontal thread storage means, a driven type-thread feeding means for feeding the frontal thread from the frontal thread storage means, a movable thread guide for advancing and retreating the frontal thread, a needle carrier for supporting the needles, a cloth frame, a shuttle, and a control unit for controlling said thread feeding means, said movable thread guide, said needle carrier, said cloth frame and said shuttle, characterized in that, said control unit controls said drive type thread feeding means so as to feed a portion of an amount of the frontal thread actually necessary for the embroidering, and said shuttle type embroidery/lace machine further includes means for allowing the remainder of the amount of the frontal thread actually necessary for the embroidering to be fed by pulling the remainder of the amount of the frontal thread out of said frontal thread storage means due to a tension applied to the frontal thread produced by an insufficient amount of the frontal thread actually necessary for embroidering, stitches being formed by pulling both said frontal thread and a dorsal thread of said shuttle.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

[Field of the Invention]

[0001] This invention relates to a shuttle type embroidery/lace machine.

[Prior Art]

[0002] In known shuttle type embroidery/lace machines, an amount or a length of a frontal thread necessary to enable needles to be passed through an embroidery foundation, form loops and allow shuttles to pass through the loops, is fed by a forward movement of the first thread guide. Then, the frontal thread is retracted by the rearward movement of the first thread guide which takes place when the neede is moved back. Amount of the frontal thread fed is not sufficient due to a subsequent movement of a cloth frame, which forces a thread roller to be rotated so that more of the frontal thread is additionally fed from a thread storage unit.

[0003] However, such a lace machine has a disadvantage in that a tension is applied to the frontal thread so that the thread roller is rotated upon the movement of the cloth frame, whereby the frontal thread may be cut and the needle may be broken. Particularly, lace machines manufactured in recent years are designed to operate at high speed and therefore the frontal thread is subjected to rapid tension/relaxation cycles, thereby increasing the inertia of the thread roller and the tensile force applied to the frontal thread, so that cutting of the frontal threads and breaking of needles may occur very frequently.

[0004] Japanese Patent Application Laid-Open No. 8-35162 describes an improvement in which the thread guide feeds an amount of a frontal thread necessary to form a loop and allows the shuttle to pass through the loop, and a thread feeding unit driven by a motor feeds an amount of the frontal thread which is to remain in the embroidery foundation after the formation of a stitch, so that the frontal thread is substantially held in a tension-free state.

[0005] However, the improvement disclosed in this Japanese Patent Application also involves a drawback in that it is practically impossible to feed a proper amount of the frontal thread from the thread feeding unit so that a tension strong enough to pull the frontal thread out of the bobbin is not applied to the frontal thread.

[0006] More specifically, it is well known that the amount of the frontal thread to be used depends not only on the movement of the cloth frame and a tension to be applied to a frontal thread (that is, whether the frontal thread is tightened or loosened) but also on the thickness of the foundation, the length the needle is driven, the material of the foundation, the stitching orientation and the tension of the dorsal thread. Furthermore, in the case of a borer pattern, the amount of the frontal thread to be used also depends on the size of the bores and the sharpness of the borer.

[0007] For example, if the foundation is thick, the amount of the frontal thread to be used increases. If the length the needle is driven is small, the amount of the frontal thread to be used is reduced because the foundation is pulled by the frontal thread in the vicinity of an eye formed therein by the needle. When a large bore is formed by a borer, the amount of the frontal thread to be used is reduced relative to the movement of the needle determined on the basis of the pattern data when the periphery of the bore is stitched. Additionally, if the borer cutting is done well, the amount of the frontal thread to be used for stitching the periphery of the bore is reduced because the foundation is cut deeply.

[0008] However, while the improved machine of Japanese Patent Application Laid-Open No. 8-35162 estimates the necessary amount of the frontal thread to be fed in advance and feeds an amount of the thread on the basis of the estimate, it is difficult or even impossible to make an accurate estimate of this amount. Thus, if a greater amount of the frontal thread is fed than an amount actually necessary for embroidering, a loose embroidery product can be produced and/or the surplus thread can be caught and cut by the roller etc. If, on the other hand, an amount of the frontal thread smaller than the necessary amount is fed, an undesirably tight embroidery product can be produced and/or the thread can be cut.

[0009] In view of the problems of embroidery/lace machines as pointed out above, it is therefore the object of the present invention to provide an improved embroidery/lace machine capable of feeding an amount of a frontal thread actually necessary for conducting the embroidery operation.

SUMMARY OF THE INVENTION

[0010] According to the invention, the above object is achieved by providing a shuttle type embroidery/lace machine including a frontal thread storage means, a driven type-thread feeding means for feeding the frontal thread from the frontal thread storage means, a movable thread guide for advancing and retreating the frontal thread, a needle carrier for supporting the needles, a cloth frame, a shuttle, and a control unit for controlling said thread feeding means, said movable thread guide, said needle carrier, said cloth frame and said shuttle, characterized in that, said control unit controls said drive type thread feeding means so as to feed a portion of an amount of the frontal thread actually necessary for the embroidering, and said shuttle type embroidery/lace machine further includes means for allowing the remainder of the amount of the frontal thread actually necessary for the embroidering to be fed by pulling the remainder of the amount of the frontal thread out of said frontal thread storage means due to a tension being applied to

the frontal thread produced by an insufficient amount of the frontal thread actually necessary for embroidering, stitches being formed by pulling both said frontal thread and a dorsal thread of said shuttle.

[0011] Preferably, said driven type-thread feeding means includes a motor, a shaft to be driven by the motor and a thread roller connected to the shaft.

[0012] Preferably, said means for allowing the remainder of the amount of the frontal thread actually necessary for the embroidering to be fed includes a one-way clutch connected to said shaft and said thread roller so as to rotate said thread roller only in the direction in which said frontal thread is pulled out.

[0013] Preferably, said driven type-thread feeding means includes a braking means for preventing said thread roller from being rotated by inertia.

[0014] With the above mentioned shuttle type embroidery/lace machine according to the invention, the portion of the amount of the thread actually necessary for embroidering is fed by the driven type-thread feeding means. Thus, the tension applied to the frontal thread in a lace machine according to the invention is greatly reduced if compared with a known lace machine wherein an amount of the frontal thread used is larger than expected due to the movement of the cloth frame and then the thread roller being rotated due to the fed amount of the frontal thread not being sufficient so that the frontal thread is fed.

[0015] Additionally, with the shuttle type embroidery/lace machine according to the invention, the amount of the frontal thread fed by the driven type-thread feeding means is smaller than that actually necessary for embroidering, and the remainder of the frontal thread actually necessary for embroidering is pulled out of the frontal thread storage means due to the tension applied to the frontal thread. As discussed above, it is difficult or even impossible to accurately estimate the amount of the frontal thread actually necessary for embroidering for various reasons. Therefore, in any prior lace machines wherein all of the frontal thread is fed by the driven type-thread feeding means, it is often not possible to accurately feed the amount of the frontal thread actually necessary for embroidering, which causes the frontal thread to be excessively loosened or tightened. On the contrary, with the lace machine according to the present invention, the amount of the frontal thread actually necessary for embroidering can be supplied.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] FIG. 1 is a schematic view of an embodiment of a shuttle type embroidery/lace machine according to the invention.

[0017] FIG. 2 is an enlarged schematic view of the driven type-thread feeding means of the lace machine of FIG. 1.

[0018] FIG. 3 is an enlarged schematic view of an alternative embodiment of the driven type-thread feeding means of the lace machine of FIG. 1.

[0019] FIG. 4 is an enlarged schematic view of another alternative embodiment of the driven type-thread feed means of the lace machine of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0020] Now, the present invention will be described by referring to the accompanying drawings that illustrate a preferred embodiment of the invention. In the embodiment, the present invention is applied to a shuttle type embroidery/lace machine.

[0021] Referring to FIG. 1, a shuttle type embroidery/lace machine generally indicated by reference numeral 30 includes a frontal thread storage means or bobbin 1 for storing a frontal thread 2. The frontal thread 2 is pulled out of the bobbin 1 to be wound around a driven type-thread feeding means, or thread roller 3. The thread roller 3 is provided with a shaft 4 laterally projecting therefrom, to which shaft a pulley 5 is attached. The pulley 5 is connected to a motor 6 by a pulley 7 attached to an output shaft of the motor 6 and by an endless belt 8 wound around the pulleys 5 and 7 so that the thread roller 3 is driven by the motor 6.

[0022] A first movable thread guide 9 and a second movable thread guide 10 for forwardly and rearwardly moving the frontal thread are provided downstream of the thread roller 3. The guides 9 and 10 have guide members 11 and 12 attached to the tops thereof, respectively. The frontal thread from the thread roller 3 is firstly wound around the guide member 12 to be deflected, and then wound around the guide member 11 to be deflected once again. The thread guides 9, 10 are pivotably attached to support members (not shown), respectively, so that the guide members 11 and 12 can be pivoted in directions indicated by arrows 13, 14 and 13A, 14A, respectively.

[0023] A needle carrier(s) 16 for supporting needles 15 is provided downstream of the guides 9 and 10, and the frontal thread 2 deflected by the guide 9 is introduced into an eye of the needle 15. The needle carrier 16 is adapted to be moved in directions indicated by arrows 17 and 18.

[0024] A cloth frame (not shown) for supporting an embroidery foundation 19 is arranged in front of the arrow 17 and a shuttle (not shown) is provided adjacent to the cloth frame at the side thereof opposite to the needle carrier 16.

[0025] The driving of the driven type-thread feeding means (particularly, the driving of the motor 6, which motor constitutes along with the thread roller 3 the driven type-thread feeding means), the pivot movement of the thread guides 9 and 10, the forward and rearward movements of the needle carrier 16, the movement of the cloth frame, and the movement of the shuttle are adapted to be controlled by a control unit (not shown).

[0026] Now, referring to FIG. 2, the driven type-thread feeding means is shown in greater detail.

[0027] That is, the shaft 4 and the thread roller 3 are connected to each other by way of a one-way clutch 20 to allow the thread roller 3 to be rotated relative to the shaft 4 only in a direction in which the frontal thread 2 can be pulled out of the bobbin 1. A braking means for preventing the thread roller 3 from being rotated by inertia, or stopper 21 designed to be engageably attached to the thread roller 3, is provided adjacent to the thread roller 3. The stopper 21 is also controlled by the control unit.

[0028] Now, the operation of the embroidery/lace machine 30 will be described below.

[0029] Firstly, the needle carrier 16 is moved in the direction of the arrow 17 under the control of the control unit from the state illustrated in FIG. 1 and, almost simultaneously, the first movable thread guide 9 is pivoted in the direction of the arrow 13. The movement of the guide 9 causes the frontal thread 2 to be fed to the embroidery foundation 19. Then, the forward movement of the needle carrier 16 causes the needle 15 supported by the needle carrier 16 to penetrate into the embroidery foundation 19 mounted on the cloth frame.

[0030] Then, the needle carrier 16 is slightly retracted in the direction of the arrow 18 so that a loop is formed by the frontal thread 2 and, thereafter, the needle carrier 16 is advanced further, while the shuttle with a dorsal thread is passed through the loop.

[0031] Subsequently, the needle carrier 16 is rearwardly moved in the direction of the arrow 18, and the first movable thread guide 19 is pivoted in the direction of the arrow 14 to rearwardly pull the frontal thread 2. Thereafter, the shuttle is returned to its original position to downwardly pull the dorsal thread so that an entangled section (or a stitch) is produced by the frontal thread 2 and the dorsal thread.

[0032] When the first movable thread guide 9 is pivoted in the direction of the arrow 14, the motor 6 is so controlled that an amount of the frontal thread 2 smaller than an amount of the frontal thread estimated to be necessary for forming a stitch is pulled out of the bobbin 1, which estimation is based on the embroidery data for the embroidery operation to be conducted. When the first movable thread guide 9 is pivoted in the direction of the arrow 14 to pull the frontal thread 2, the amount of the frontal thread 2 pulled by the guide 9 is not sufficient to form the stitch so that a tension will be applied to the frontal thread 2 by the subsequent operation of the lace machine. Consequently, the tension applied to the frontal thread 2 causes the frontal thread 2 to be pulled out of the bobbin 1 by a necessary additional amount or length by the one-way clutch 20. In other words, the one-way clutch 20 causes the thread roller 3 to be rotated relative to the shaft 4 only when the frontal thread 2 is pulled toward the cloth frame.

[0033] When the thread roller 3 is rotated with the shaft 4 by the motor 6 or relative to the shaft 4 due to the tension applied to the frontal thread 2, if the thread roller 3 is rotated excessively by inertia, the stopper 21 is pressed against the thread roller 3 to stop the rotation of the thread roller 3.

[0034] Additionally, an extent to which the stitch should be tightened can be adjusted by forwardly pivoting the second movable thread guide 10 to reduce the amount of the frontal thread 2 to be fed toward the cloth frame when the needle carrier is advanced and the first movable thread guide 9 is forwardly pivoted in correspondence to the advancement of the needle carrier.

[0035] The present invention is not limited to the above described embodiment, which can be modified in various different ways.

[0036] For example, while the second thread guide 10 is adapted to be rotated in the above embodiment, it may alternatively be stationary.

[0037] Furthermore, while the driven type-thread feeding means in the above embodiment comprises a motor 6, a shaft 4, and a thread roller 2, as shown in FIG.3, the driven type-thread feeding means may additionally include disks 40 disposed in respective embroidering locations and engageably attached to the thread roller 3. In such an arrangement, each of the disks 40 is provided with a gear which engages with a corresponding gear formed in the thread roller 3, and each of the disks is adapted to be selectively engaged with or disengaged from the thread roller 3 manually or automatically.

[0038] More specifically, a rotary shaft 41 of the disk 40 is rotatably attached to an end of a supporting member 42, while the other end of the supporting member 42 is pivotably attached to a fixed member 43. The supporting member 42 is urged by a biasing means, or spring 44, so as to engage the disk 40 with the thread roller 3.

[0039] Thus, with such a modified embodiment, the frontal thread 2 fed from the bobbin 1 and wound around the disk 40 is fed toward the second thread guide 10 only when the motor 6 is driven and the disk is held in engagement with the thread roller 3. The modified embodiment differs from the above embodiment only in this respect. That is, it is identical to the above mentioned embodiment in all other respects including that the frontal thread is pulled by a one-way clutch. Furthermore, it should be noted that the components of the embroidery/lace machine in FIG. 3 corresponding to the components of the machine in FIG. 1 are denoted by the same reference symbols as those used to indicate said corresponding components of the machine in FIG. 1.

[0040] In another alternative embodiment, as shown in FIG. 4, the driven type-thread feeding means may includes disks 50 disposed in respective embroidering locations and frictionally engaged with the thread roller 3. Each of the disks 50 is adapted to be frictionally engaged with and disengaged from the thread roller 3 manually or automatically.

[0041] More specifically a rotary shaft 51 of the disk 50 is rotatably attached to one end of a supporting member 52, while the other end of the supporting member

52 is pivotally attached to a fixed member 53. The supporting member 52 is urged by a biasing means, or spring 54, so that the disk 50 is engaged with the thread roller 3.

[0042] By this arrangement, the frontal thread 2 pulled out of the bobbin 1 is introduced between the thread roller 3 and the disk 50 so that the feeding of the frontal thread 2 is performed only when the motor 6 is driven and the disk 50 is held in frictional engagement with the thread roller 3.

[0043] As described above in detail, according to the present invention, an improved embroidery/lace machine capable of feeding an amount of the frontal thread actually necessary for conducting the embroidery operation can be provided.

Claims

1. A shuttle type embroidery/lace machine including:

   a frontal thread storage means;
   a driven type-thread feeding means for feeding the frontal thread from the frontal thread storage means;
   a movable thread guide for advancing and retreating the frontal thread;
   a needle carrier for supporting the needles;
   a cloth frame;
   a shuttle; and
   a control unit for controlling said thread feeding means, said movable thread guide, said needle carrier, said cloth frame and said shuttle; characterized in that:
   said control unit controls said drive type thread feeding means so as to feed a portion of an amount of the frontal thread actually necessary for the embroidering; and
   said shuttle type embroidery/lace machine further includes means for allowing the remainder of the amount of the frontal thread actually necessary for the embroidering to be fed by pulling the remainder of the amount of the frontal thread out of said frontal thread storage means due to a tension being applied to the frontal thread produced by an insufficient amount of the frontal thread actually necessary for embroidering;
   stitches being formed by pulling both said frontal thread and a dorsal thread of said shuttle.

2. An embroidery/lace machine according to claim 1, wherein said driven type-thread feeding means includes a motor, a shaft to be driven by the motor and a thread roller connected to the shaft.

3. An embroidery/lace machine according to claim 2, wherein said means for causing the remainder of the amount of the frontal thread actually necessary for the embroidering to be fed includes a one-way clutch connected to said shaft and said thread roller so as to rotate said thread roller only in the direction in which said frontal thread is pulled out.

4. An embroidery/lace machine according to claim 3, wherein said driven type-thread feeding means includes a braking means for preventing said thread roller from being rotated by inertia.

FIG. 1

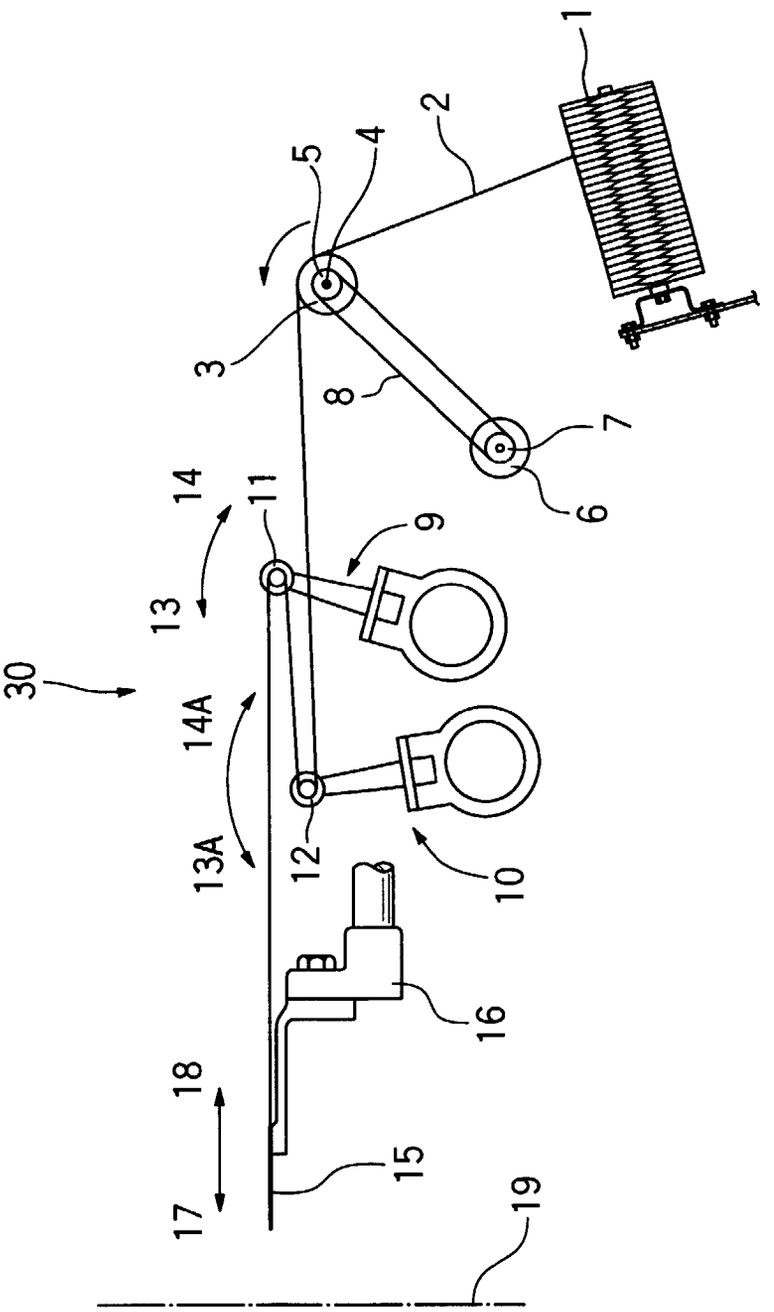

FIG. 2

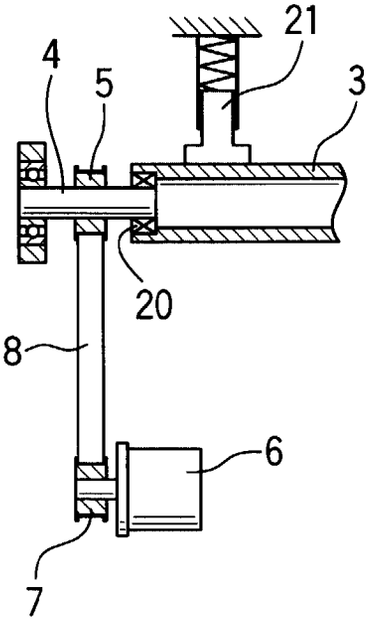

FIG. 3

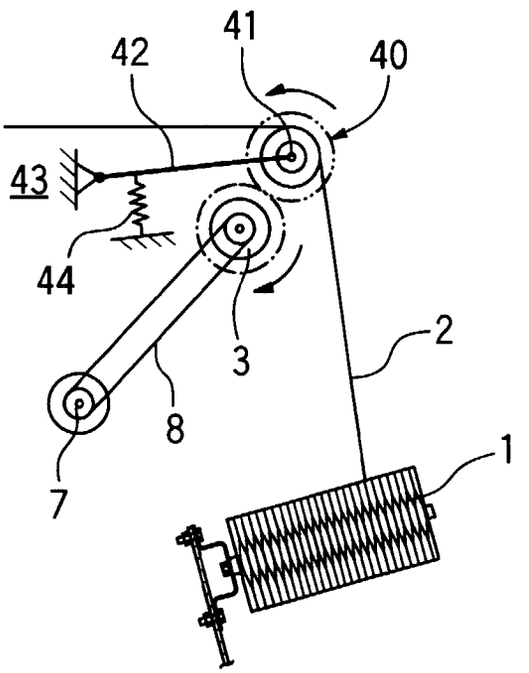

FIG. 4