A method for editing images representing sewing elements (10) on a display of a sewing machine (1) for manipulating images of sewing elements (10) to be sewn on a fabric (2) arranged in the sewing machine (1), the method includes the steps, displaying at least one sewing element (10) image on said display (11), selecting at least one of said at least one sewing element (10) image, selecting an image editing function among a predetermined number of base editing functions, setting, by said selecting of an image editing function, members (35a-35c) of a selector group (35) to toggle to operate manipulator functions corresponding to said selected base function, manipulating said selected image of a sewing element (10) according to the selected base function by operating at least one of said members (35a-35c) of said selector group (35). The invention includes a device for performing the method.
SEWING MACHINE MODIFICATION TOOLS

TECHNICAL FIELD

[0001] The present invention relates to a method of editing graphics and sewing elements for manipulating sewing elements on a sewing machine. Further, the invention relates to a human-machine interface for performing the method.

TECHNICAL BACKGROUND

[0002] Conventionally, a sewing machine with an embroidery function has a sewing mechanism for forming stitches by driving a needle bar, a thread take-up lever and a rotary hook. A fabric to be embroidered with the sewing elements is arranged in an embroidery frame, which is moved and driven by an embroidery frame driving mechanism controlled by a processor of the sewing machine based on sewing data for the sewing elements. In embroidering a fabric using the technology currently available it is possible to use ready designed embroidery elements which are stored in a memory, either in the sewing machine or an external memory unit.

[0003] To precisely and clearly being able to adjust graphics and sewing elements with respect to size, rotation, scaling and panning of the sewing elements displayed on a display of the sewing machine a lot of space has traditionally been occupied and requested by buttons, icons or other kinds of commanding tools on the display or the area around the display for the interface purposes.

[0004] An example of a device for editing patterns containing sewing elements shown as graphics elements on a display is disclosed in U.S. Pat. No. 6,321,670. According to the device shown therein a plurality of buttons are needed to edit the sewing element, such as separate buttons for size, rotation and spacing. Furthermore, a plurality of navigation buttons are used for moving or editing the objects selected on the display in a wanted direction or edited as desired.

[0005] Displays of e.g. sewing machines and handheld computers are relatively small compared to screens used for personal computers, whereby the demands on innovative and space-saving solutions are high. On sewing machines the area of the display must be optimally used to allow for an attractive, creative and user-friendly human-machine interface. A complex and full-loaded human-machine interface with keys, text and pictures does not promote the user-friendliness.

SUMMARY OF THE INVENTION

[0006] According to one aspect of the present invention a method is provided for editing images representing sewing elements on a display of a sewing machine for manipulating images of sewing elements to be sewn on a fabric arranged in the sewing machine, the method includes the steps of:

[0007] displaying at least one sewing element image on said display,
[0008] selecting at least one of said at least one sewing element image,
[0009] selecting an image editing function among a predetermined number of base editing functions,
[0010] setting, by said selecting of an image editing function, members of a selector group to toggle to operate manipulator functions corresponding to said selected base function,
[0011] manipulating said selected image of a sewing element according to the selected base function by operating at least one of said members of said selector group.

[0012] According to a further aspect of the invention there is provided a human machine interface of the sewing machine according to the independent device claim.

[0013] Further embodiments and aspects of the invention are disclosed in the dependent claims as summarized below.

[0014] The method according to the invention thus includes setting said base functions to incorporate at least one step from the group of:

[0015] movement of the selected sewing element on the display,
[0016] rotation of the selected sewing element,
[0017] scaling the selected sewing element,
[0018] panning around on the display.

[0019] The method further includes arranging each base editing function to be represented by a toggle button.

[0020] The method still further includes arranging said selector group to include manipulator buttons for one of:

[0021] moving one or a group of selected sewing element images in a predetermined direction,
[0022] rotating one or a group of selected sewing element images an arbitrary angle,
[0023] scaling one or a group of selected sewing element images arbitrarily up or down in size,
[0024] panning the display in a predetermined direction, while keeping the selection of sewing element images.

[0025] A further aspect of the invention is to provide a human machine interface arranged on a sewing machine for editing images representing sewing elements on a display associated with the sewing machine for manipulating images of sewing elements to be sewn on a fabric arranged in the sewing machine, characterized in that associated with said display is:

[0026] a control member for selecting one or a group of sewing element images on said display,
[0027] a predetermined number of base function selectors for toggling between said base functions,
[0028] a selector group including selector group members for operating manipulator functions corresponding to said selected base function.

[0029] Said human machine interface includes said base function selectors being performed as toggle buttons.

[0030] Still further said human machine interface includes said base functions representing at least one of:

[0031] movement of the selected sewing element on the display,
[0032] rotation of the selected sewing element,
[0033] scaling the selected sewing element,
[0034] panning around on the display, and said base function being assigned a specific toggle button.

[0035] The human machine interface includes each toggle button setting an operative function of the selector group.

[0036] Still further, the human machine interface includes that said selector group members, in dependence of the set operative function of the selector group, are represented by buttons for any one of:

[0037] moving one or a group of selected sewing element images in a predetermined direction,
[0038] rotating one or a group of selected sewing element images an arbitrary angle,
[0039] scaling one or a group of selected sewing element images arbitrarily up or down in size,
[0040] panning the display in a predetermined direction, while keeping the selection of sewing element images.
An aspect of the invention is further a sewing machine provided with the human machine interface according to any of the embodiments described above.

The invention provides a user interface which is optimized both in minimal needed space and maximum usability. By use of the invention the possibility to create advanced creations on a small area is maximized. The invention further enhances maximal editing flexibility without any loss of usability or functionality. Further, the working area is maximized.

Still further, the ergonomics for the user is improved. Another important feature is the minimization of the number of the buttons needed for editing and manipulation the sewing element images on the display.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows an example of a sewing machine having a display for displaying sewing elements as graphical symbols for an operator of the machine.

FIGS. 2 to 6 shows buttons, in this specific example, performed as graphical elements on a display area, which preferably is arranged as a window of the display of the sewing machine.

The different figures show different presentations of the graphically illustrated buttons according to different selecting editing modes, such as movement, rotation, scaling and panning.

EMBODIMENTS OF THE INVENTION

A number of embodiments of the invention are described below with reference to the attached drawings.

By way of example of the functioning of a lock stitch sewing machine for performing the inventive method, FIG. 1 depicts symbolically a sewing machine 1, where in a conventional manner a fabric 2 is fed forward between a bottom thread 3 and an upper thread 4 in order to execute a desired embroidery comprising stitches effected by means of a needle 5 which moves periodically through the fabric 2. In this example, the fabric 2 is moved across a sewing table 6, which also accommodates a horizontally disposed bottom thread bobbin (not shown) intended for the bottom thread 3 and encased in a gripper (not shown) in a lower arm 1a of the sewing machine. The sewing table 6 also has a stitch plate, over which the actual seam is executed. The upper thread 4 is led via a take-up lever 9, which by a cyclic up and down movement creates a loop of the upper thread 4 when the needle 5, through the eye of which the upper thread runs, has carried the upper thread through the fabric 2 and the take-up lever 9 reverses back upwards from its lowest position. Conventionally, a gripper tip hooks into the loop when the gripper rotates. To execute a stitch, in this case a lock stitch, the needle 5 performs reciprocating movement so that it leads the upper thread 4 down through the fabric 2, after which the gripper leads the upper thread 4 round the bobbin, which carries the bottom thread 3, resulting in a knot in the fabric when the needle 5 moves up through the fabric and the take-up lever 9 tightens the knot in the fabric.

The machine is provided with a control program, which, for example, is stored in a processor C. Further the sewing machine has an available memory M, preferably being accommodated in the machine, although the memory M as well may be external and accessible from the processor C. In the memory M, the sewing machine sewing elements for composing embroideries may be stored in the form of stitch data. A display 11 is provided, on which the images representing embroidery elements can be displayed to a user.

As an example of use of sewing elements, in FIG. 1 is also shown an embroidery frame 20 arranged with the sewing machine. A piece of fabric 2 is stretched in the embroidery frame 20. The piece of fabric 2 is only symbolically shown, whereby in the figure covering only a part of the embroidery frame and illustrated by means of dashed lines to make the arrangement more illustrative. The embroidery frame 20 is attached to an embroidery unit controlled by the processor C, wherein said embroidery unit includes a first feeding means operated by a first step motor (not shown) for operating the embroidery frame in an x-direction. The embroidery frame 20 is in a corresponding manner attached to a second feeding means of the embroidery unit and correspondingly operated by a second step motor (not shown) operating the embroidery frame in a y-direction. By a control of the first and second step motors with signals from the processor C the embroidery frame 20, along with the housed stretched piece of fabric, may be steered to be displaced in an arbitrary direction in the xy-plane.

Sewing elements 10 can be recovered from the memory and displayed on the display 11 of the sewing machine. A sewing element 10 can as an alternative be designed by a user directly on the display 11, whereupon the sewing element 10 is stored in the memory M as a stitch data object. An aspect of the present invention is to enable editing and manipulating said sewing element 10 or a group of sewing elements 10 before they are sewn on the fabric 2. In FIG. 1 a computer mouse 21 is further illustrated. A user of the sewing machine may use the computer mouse 21 for performing manipulations of the sewing elements 10 in combination with the actions according to the present embodiments of the invention as will be discussed below.

A sewing element 10 is defined as a stitch data object, being at least one element of any one from the group of: a pattern, a pattern sequence, a design, an embroidery character, a sew character.

When conventional embroidery is performed in an embroidery machine of the discussed type, the machine controls the movements of the embroidery frame fully according to stitch data stored in the memory M of the sewing machine according to all aspects concerning stitch types, sewing directions, and so on, according to prior art.

According to prior art, there is known to use a plurality of buttons and value windows to achieve the operations necessary when editing sewing elements 10, such as 20 buttons, or more, for different functions and operations. FIG. 2 shows an example of an embodiment of the present invention, wherein all necessary operations related to editing by means of the described operations: movement, rotation, scaling and panning of the sewing elements 10 involved in an editing process can be accomplished by means of the use of 9 touch buttons only. These exemplified buttons are four toggle buttons 31 to 34 for setting an image editing function, in this case one of: movement, rotation, scaling and panning, and a selector group 35, in this case containing 5 separate buttons 35a-35e arranged in a pattern recognized as navigation buttons.

The identified buttons are in the specific example performed as graphical elements on a display area, which preferably is arranged as a window 30 of the display 11, when an editing mode is chosen on the sewing machine. All buttons are thus represented as touch buttons on the window 30 and
can be operated by means of a pressure from a finger or a stylus. Of course, there would be possible to arrange the identified buttons 31 to 35 by means of mechanically operated buttons, but in that case the buttons would occupy space on the sewing machine exterior. Anyhow, the present invention includes all kinds of buttons, wherein the term button shall include all kinds of operating means performing the selecting operations according to the claims.

In the example illustrated in FIG. 2, there is above the selector group 35 arranged a value window 36, wherein the values shown in said value window 36 adapt its values and appearance according to the base function selected by the toggle buttons 31 to 34. The middle button 35e of the selector group 35 adapts its function in correspondence to the selected base function. The use of the buttons and the editing possibilities will be described as follows with one base function at a time.

Movement

One or several sewing elements 10 visible on the display 11 are selected. Base function “movement” is chosen by operating toggle button 32. As a result of said operating the selector group 35 will adapt its appearance as shown in FIG. 2, wherein the symbols displayed on the separate image editing buttons 35a to 35e pop up as directional pointers. Regarding editing the sewing elements (herein sometimes called objects) when related to movement, this can as an alternative be performed by selecting the objects by utilizing a form of a coordinate sensor, such as a computer mouse, a joystick, a stylus, etc., herein called a control means and exemplified by a computer mouse 21, then capturing the desired object/objects and move it/them to the desired position on the display. By use of the image editing buttons 35a to 35e the objects are moved to desired positions and can be fine adjusted by use of any of the image editing buttons 35a to 35e in a desired direction corresponding to the direction illustrated by the pointer on the respective button. The position of the selected object is shown in the value window 36 above the selector group 35, in this case displaying positions, horizontally and vertically in a coordinate system related to the image of the display 11. The centre button 35e adapts its function in relation to the selected base function and in the case of “movement base function” moves the selected object to the centre of the working area of the display.

Rotation

One or several sewing elements 10 visible on the display 11 are selected. Base function “rotation” is chosen by operating toggle button 32. As a result of said operating the selector group 35 will adapt its appearance as shown in FIG. 3, wherein the pop up indicators on the image editing buttons in the rotation mode are displayed on the buttons, wherein the left button 35f, indicated with a left directed arrow corresponds to rotation of the object counterclockwise. The right button 35b, in this mode, indicated with a right directed arrow, rotates the object clockwise when being operated. Editing the object(s) selected can be performed either by utilizing a control means 21 (e.g. mouse or stylus as mentioned) for manipulating the selected object by rotating it by use of the control means or by utilizing fine adjustment using any of image editing buttons 35b and 35f as indicated, or a combination of both methods. The centre image editing button 35e displaying, in this mode, a 90 degree angle will, self-explanatory, rotate the object 90 degrees when being operated. Also in this case the figures shown in the value window 36 adapt to the selected mode, and accordingly displays the angle of rotation being carried out.

Scaling

One or several sewing elements 10 visible on the display 11 are selected. Base function “scaling” is chosen by operating toggle button 33. As a result of said operating the selector group 35 will, in this mode, adapt its appearance as shown in FIG. 4. The uppermost button 35a, in this mode, will magnify the view of the selected elements on the display, when operated, while the lowermost button 35c will reduce the scale, such that the view of the selected elements are reduced when operated. Scaling the object(s) selected can be performed either by utilizing a control means 21 (e.g. mouse or stylus as mentioned) for manipulating the selected object(s) by scaling it/them by use of the control means (made by dragging a corner or a drag point indicated on the selected object) or by utilizing fine adjustments by use of any of image editing buttons 35b and 35d as indicated, or a combination of both methods. The centre button 35e displays, in this mode, a padlock indicating that the scaling can be switched between proportional (locked) and unproportional (unlocked) scaling, when the scaling centre button is operated, i.e. the centre button 35e of the selector group 35. Correspondingly, in this case the figures shown in the value window 36 adapt to the selected mode, and accordingly displays the magnification factor of the selected original object(s) horizontally and vertically, respectively. It should be noted here that the icons of the buttons 35a to 35d change their appearance when the unproportional scaling is selected by the operation of the centre button 35e. In this mode it is possible to scale the object(s) horizontally and vertically independently of each other. The buttons 35a to 35e are in this mode used for scaling vertically, which is self-explanatory illustrated by vertically directed arrow icons popping up on said vertically aligned buttons 35a to 35e. The buttons 35b and 35d are used for scaling horizontally, which is self-explanatory illustrated by horizontally directed arrow icons popping up on said horizontally aligned buttons 35b and 35d.

Panning

When the panning mode (one of the base functions) is chosen, the previously performed selection of the object(s) is kept. The appearance of the selector group 35 will change to the look according to FIG. 5. In this embodiment the buttons of the selector group 35 disclose icons corresponding to the four directions horizontally and vertically. The user can perform the panning either by dragging the object(s) either by dragging it/them by utilizing the control means 21 or by using the fine adjustment by operating any of image editing buttons 35a to 35d. The centre button 35e could according to one embodiment be used for returning to the original position of the object(s).

1. A method for editing images representing sewing elements (10) on a display (11) of a sewing machine (1) for manipulating images of sewing elements (10) to be sewn on a fabric (2) arranged at the sewing machine (1), the method including the steps of:
   - displaying at least one sewing element (10) image on said display (11),
selecting at least one of said at least one sewing element (10) image,
selecting an image editing function among a predetermined number of base editing functions,
setting, by said selecting of an image editing function, members (35a-35e) of a selector group (35) to toggle to operate manipulator functions corresponding to said selected base function,
manipulating said selected image of a sewing element (10) according to the selected base function by operating at least one of said member (35a-35e) of said selector group (35).
2. The method according to claim 1, further including the step of:
setting said base functions to incorporate at least one from the group of:
movement of the selected sewing element (10) on the display,
rotation of the selected sewing element (10),
scaling the selected sewing element (10),
panning around on the display (11).
3. The method according to claim 1 or 2, further including the steps of:
arranging each base editing function to be represented by a toggle button (31-34).
4. The method according to claim 1 or 2, further including the step of:
arranging said selector group (35) to include manipulator buttons (35a-35e) for one of:
moving one or a group of selected sewing element (10) images in a predetermined direction.
rotating one or a group of selected sewing element (10) images an arbitrary angle.
scaling one or a group of selected sewing element (10) images arbitrarily up or down in size.
panning the display (11) in a predetermined direction, while keeping the selection of sewing element (10) images.
5. A human machine interface arranged on a sewing machine (1) for editing images representing sewing elements (10) on a display (11) associated with the sewing machine (1) for manipulating images of sewing elements (10) to be sewn on a fabric (2) arranged in the sewing machine (1), characterized in that associated with said display (11) is:
a control member (21) for selecting one or a group of sewing element (10) images on said display (11),
a predetermined number of base function selectors (31-34) for toggling between said base functions,
a selector group (35) including selector group members (35a-35e) for operating manipulator functions corresponding to said selected base function.
6. The human machine interface according to claim 5, wherein said base function selectors (31-34) are performed as toggle buttons.
7. The human machine interface according to claim 6, wherein said base functions represent at least one of:
movement of the selected sewing element (10) on the display,
rotation of the selected sewing element (10),
scaling the selected sewing element (10),
panning around on the display (11), and said base function being assigned a specific toggle button (31-34).
8. The human machine interface according to claim 7, wherein each toggle button (31-34) sets an operative function of the selector group (35).
9. The human machine interface according to claim 8, wherein said selector group members (35a-35e), in dependence of the set operative function of the selector group (35), are represented by buttons (31-34) for any one of:
moving one or a group of selected sewing element (10) images in a predetermined direction.
rotating one or a group of selected sewing element (10) images an arbitrary angle.
scaling one or a group of selected sewing element (10) images arbitrarily up or down in size.
panning the display (11) in a predetermined direction, while keeping the selection of sewing element (10) images.
10. The human machine interface according to any of the preceding claims, wherein a value window (36) is arranged in a relationship to said selector group (35) for displaying figures related to the manipulation performed with respect to the selected base function.
11. A sewing machine (1) provided with the human machine interface according to claim 5.

* * * * *