

Description

BACKGROUND OF THE INVENTION

1. Field of Invention

[0001] The invention relates to a label printer for producing a self-adhesive label and to a method of producing a label. More particularly, the invention relates to the label printer and to the method for producing a label of various widths.

2. Description of Related Art

[0002] There has been widely used a label to identify personal items and to organize a collection of items. In general, such a label is produced by a label printer comprising a cassette housing a label tape (as a printing medium) therein and detachable from a label printer body; and a printing unit that prints images on the label tape drawn out from the cassette based on inputted image data. The label tape is formed of a printing layer, on which the images (such as characters and symbols) are printed, and an adhesive layer for pasting the label tape to any object. Among others, a laminate-type label tape has become increasingly popular. This kind of label tape is formed of, for example, a printing layer and a releasable layer laminated with an adhesive layer therebetween. The laminate-type label tape does not adhere to any portions inside the label printer while the adhesive layer is covered with the releasable layer, whereby printing is smoothly processed. Once the releasable layer is peeled from the adhesive layer, the label tape can be easily pasted to any object with the adhesive layer. For that reason, a laminate-type label tape is considered to be user-friendly, and various sizes of the laminate-type label tape (such as a narrow or a broad tape) are now available, depending on its use.

[0003] Accordingly, the label printer must load any size cassette, such as a thick cassette housing a broad label tape and a thin cassette housing a narrow label tape, thereby producing labels of various sizes using a single label printer. However, the label printer does not work with a narrow tape, especially a tape of less than 6mm in width. Such a narrow tape can deviate from the feed path due to weak stiffness thereof, while being transported inside the label printer. It causes the label tape to jam or to be improperly printed such as being misaligned. Although there has been a need to use a label tape of less than 6mm in width for various purposes, it has not been possible to produce such a narrow tape reliably, because of the problems described above.

[0004] Further, character trains are conventionally printed on an elongated label tape along the longitudinal direction of the label tape. That is, the labels are printed in a horizontal line orientation or in a vertical line orientation along the longitudinal direction of the label

tape. The label has a given label length along its character train orientation, based on the characters, and may not be pasted to the object, such as one page of a table book, because of a lack of space. In order to produce and paste the label seemingly for the limited space, the label must have a length sized to fit in the limited space, especially along its character train orientation. Heretofore, a user has had to regulate the label length to create such a label by setting the label length, causing the user to perform an extra operation.

SUMMARY OF THE INVENTION

[0005] The invention has been developed to solve the problems noted above. Herein, the label length is referred to as a length of an edge of the label that extends along the image orientation. The label width is referred to as a length of an edge of the label that extends perpendicular to the label length, i.e., from top to bottom in a horizontal orientation and side to side in a vertical orientation. Further, the longitudinal direction of the label tape is referred to as a direction in which the label tape is elongated. The width direction of the label tape is referred to as a direction perpendicular to the longitudinal direction of the label tape.

[0006] One object of the invention is to provide a label printer capable of producing various sized labels including a label of less than 6mm in width. In order to attain the object, there is provided a label tape having a printing layer and a releasable layer laminated with an adhesive layer therebetween, wherein at least one first half slit is formed on the printing layer along the longitudinal direction of the label tape to divide the label tape into tape rows so that each tape row corresponds to one label. Printing is performed simultaneously on all the tape rows, whereby the label tape acts like a broad tape. For use of the labels, the label tape is separated into the tape rows, forming a narrow label on each tape row. The label tape may be provided with second half slits formed on the printing layer, the second half slit defining blank spaces along both side edges of the label tape. The blank spaces are cut off after printing, thus, it is possible to print images throughout the tape rows without worry about damaging a tape feeding unit. There is further provided a label printer for printing images on the above-mentioned label tape, comprising an inputting unit for inputting the images; a printing unit that prints the image on each tape row; and a cutting unit that cuts the label tape. The printing unit prints the images on each of the tape rows along the longitudinal direction of the label tape. Further, the cutting unit cuts the label tape relative to the label length. When the label length varies on each tape row, the cutting unit cuts the label tape relative to the length of the longest printed label. In such a case, the printing unit preferably prints a cutting mark, which indicates the end of the label, on the tape row of the shorter printed label, so that it makes easy to cut off an excess space on the label tape.

[0007] Another object of the invention is to provide a label printer that produces a label of various label widths and of not greater than a predetermined label length. In order to attain this object, there is provided a label printer comprising an inputting unit for inputting an image to be printed; a printing unit that prints the image along the width direction of the label tape; and a cutting length setting unit that sets a cutting length at which the label tape is to be cut. The label printer allows the production of a label of varying label widths by optionally setting the cutting length, and of not greater than a predetermined label length (that is, shorter than the tape width). In the case where the label printed in a line is shorter than the tape width, the printing unit preferably prints a cutting mark, indicative of the end of the label, so that excess space on the label tape is easily cut off.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The invention will be more clearly understood from the following description, given by the way of example only, with reference to the accompanying drawings, in which:

- Fig. 1 is a top view of a label tape according to a preferred embodiment of the invention;
- Fig. 2 is a sectional view of the label tape of Fig. 1, along the width direction thereof;
- Fig. 3 is a top view of a label tape according to another preferred embodiment of the invention;
- Fig. 4 is a top view of a label printer according to still another embodiment of the invention;
- Fig. 5 is a top view of a printing unit of the label printer of Fig. 4;
- Fig. 6 is a sectional view of the printing unit along 6-6 line of Fig. 5;
- Fig. 7 is a partial side view of the printing unit, when viewed in the A direction in Fig. 5;
- Fig. 8 is a block diagram of the label printer;
- Fig. 9 is a flow chart showing the operation of the label printer;
- Fig. 10 is a top view of a label tape printed with a label printer according to yet another embodiment of the invention;
- Fig. 11 is a sectional view of a label printer for printing the label of Fig. 10; and
- Fig. 12 is a flow chart showing the operation of the label printer for printing the label of Fig. 10.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0009] Hereinafter, an explanation will be given of a label tape and a label printer in accordance with the invention based on the following embodiments.

[0010] Fig. 1 is a top view of a label tape 1, and Fig. 2 is a sectional view in the thickness direction of the label tape 1, according to one embodiment of the inven-

tion. As shown in Figs. 1 and 2, the label tape 1 has a printing layer 11, an adhesive layer 12 and a releasable layer 13 laminated with each other. A half slit, or perforations, 14 is provided at the center of the label tape 1 along the longitudinal direction thereof.

[0011] The half slit 14 defines a cut from the printing layer 11 through the adhesive layer 12 so that the label tape 1 is divided into two tape rows along the longitudinal direction of the label tape 1. The releasable layer 13 brings the printing layer 11 and the adhesive layer 12 together while the label tape 1 is loaded and transported inside a label printer for printing, whereby the label tape 1 acts like an integrated tape. The half slit 14 may be provided only on the top surface of the printing layer 11, on the condition that the printing layer 11 is easily separated by hand along the half slit 14 together with the adhesive layer 12 when the releasable layer 13 is peeled off. The label tape 1 has a heat-sensitive coloring layer 11A above the printing layer 11 on which a printing unit (described below) forms images in reaction to heat, according to the present embodiment of the invention. The label tape 1 does not necessarily need to include the heat-sensitive coloring layer 11A, for example, the image may be formed with ink transferred from an ink ribbon (not shown).

[0012] According to the invention, the images are formed on each of an upper tape row 140 and a lower tape row 141 of the printing layer 11, which are divided from one another by the half slit 14. For example, as shown in Fig. 1, a character train 140C (having a length of L1) is printed on the upper tape row 140 with margins 140F, 140R (each having a length of L2) on both sides of the character train 140C, thereby forming a label 140L (having a total length of L). Another character train 141C (having a length of M1) is printed on the lower tape row 141 with margins 141F, 141R (each having a length of M2) on both sides of the character train 141C, thereby forming a label 141L (having a total length of M). In Fig. 1, when the label 140L is longer than the label 141L a cutting device 180 (described below) of the label printer cuts the label tape 1 relative to the length L of the label 140L. As a result, there exists an excessive space 141N (having a length of N) on the lower tape row 141. This excessive space 141N is cut off, for example, by a pair of scissors along a cutting mark 16 which indicates the end of the label 141L on the lower tape row 141. The cutting mark 16 is printed by a printing unit (described below) simultaneously with the character trains 140C, 141C.

[0013] To paste the printed labels, the label tape 1 is bent along the half slit 14. At that time the printing layer 11 and the adhesive layer 12, joined together, are released from the releasable layer 13. In the case of pasting the labels 140L, 141L, the label 140L is first peeled from the releasable layer 13 thereof, and then is pasted to any desired object. Next, the lower tape row 141 is cut along the cutting mark 16, for example, by using scissors. Then, the label 141L is peeled from the

releasable layer 13 thereof, and is pasted to an object.

[0014] As described above, two labels having a half width of the label tape 1 are simultaneously produced. According to the invention, the label tape 1 acts like an integrated tape having a predetermined width of W during printing, although the label tape 1 is divided by the half slit 14 along the longitudinal direction of the label tape 1. This allows printing the image on each tape row of the label tape 1 unfaillingly without misalignment, because the label tape 1 is transported stably inside the label printer without winding its way. Further, because the label tape 1 can be easily separated along the half slit 14 into two narrow tapes, the label tape 1 of the invention has excellent usability.

[0015] Fig. 3 is a top view of a label tape 2 according to another preferred embodiment of the invention. The label tape 2 has components similar to the label tape 1 shown in Figs. 1 and 2. In addition, half slits 15A, 15B are further provided along both side edges of the label tape 2 in the longitudinal direction thereof. In the unlikely event of printing the images outside of the label tape 2, that is, contacting a thermal head to a platen roller to a side of the label tape 2, due to some error of the label printer 9, the platen roller 128 can be damaged. It is therefore preferable to retain some blank spaces for safety's sake, without printing at both side edges of the label tape 2, so that the platen roller is protected from such damage.

[0016] The half slits 15A, 15B define cuts for cutting off such blank spaces after printing. It is therefore possible to print the images throughout the tape rows without worrying about damaging the platen roller by providing the half slits 15A, 15B, thereby proving a buffer area along the tape edges, and to then easily cut off the blank spaces, i.e., the buffer spaces.

[0017] Printing is done on the label tape 2 in the same manner as the label tape 1. As shown in Fig. 3, if a label printed on the lower tape row is shorter than the one printed on an upper tape row of the label tape 2, a cutting mark 16, indicative of the end of the label, is printed on the lower tape row so that excessive space is easily cut off.

[0018] To use the printed labels shown in Fig. 3, the label tape 2 is bent along the half slit 14 and along the half slit 15A. The label printed on the upper tape row is peeled from the releasable layer (not shown), and is pasted to any desired object. Then, the lower tape row is cut along the cutting mark 16 by, for example, using a pair of scissors. The label printed on the lower tape row is peeled from the releasable layer, and is pasted to a desired object.

[0019] Next, a label printer 9, suitable for producing a label from the label tape 1 or the label tape 2, will be explained referring to Figs. 4 to 7. Fig. 4 is a top view of a label printer 9 according to one embodiment of the invention. As shown Fig. 4, the label printer 9 comprises a printing unit 135 to which a cassette 6 is detachably mounted, and a body frame 136 housing the printing

unit 135 and a battery, or batteries, 139 therein.

[0020] The body frame 136 has a keyboard 137 (including character keys, number keys, a return key, a print key for executing printing, a tape feed key for feeding the label tape and a margin set key for selecting a margin set mode) on its front left side, and a LCD 138 for displaying a print image thereon on its front right side.

[0021] The printing unit 135 is illustrated in detail in Figs. 5 and 6. Fig. 5 is a top view of the printing unit 135 of the label printer 9 shown in Fig. 4. Fig. 6 is a sectional view of the printing unit 135 along 6-6 line of Fig. 5. The printing unit 135 comprises a base 141, a shaft 142 and a shaft 143 rotably disposed on the base 141, a thermal head 145 being movable against the shaft 143, and a cutting unit 180 adjacent to the thermal head 145 downstream in the transport direction of the label tape. The shaft 143 is driven by a motor 146 via a driving mechanism. The driving mechanism includes a worm gear 147 fit in the motor 146, a worm wheel 148 that engages with the worm gear 147, a gearwheel 149 concentric with the worm wheel 148, a gearwheel 150 that engages with the gearwheel 148, the shaft 143, and a gearwheel 151 that engages with the gearwheel 150 and pivots around the shaft 143. A latch 154 is provided on the shaft 142 to generate rotary friction to the spool 126. A stage 155 is further provided on the base 141 to support the cassette 6.

[0022] The cutting unit 180 comprises a cutting blade 180A that protrudes under the control of an electromagnetic solenoid 180B. The printed label tape 1 is cut off by the cutting blade 180A when extended.

[0023] The cassette 6 is detachably mounted to the printing unit 135. The cassette 6 is formed of a transparent material, wherein a case 125 is separable into an upper portion and a lower portion, and supports the spool 126 and a platen roller 128 rotatably in the case 125. An unprinted label tape 1, rolled around a core 129, is mounted to the spool 126. The platen roller 128 is positioned where the unprinted label tape 1 fully rolled around the core 129 does not contact thereto, and guides the label tape 1 extended from the spool 126.

[0024] The spool 126 and the platen roller 128 are positioned so as to be connected to the shaft 142 and the shaft 143 respectively, whereas the stage 155 supports the cassette 6. The platen roller 128 is driven with a predetermined torque in synchronization with the motor 146. The spool 126 rotates, being effected by the operation of the platen roller 128, to feed the label tape. At the same time, friction is moderately imparted to the shaft 142 by the latch 154 to control the movement of the spool 126.

[0025] The thermal head 145 (which serves as a printing portion) has a plurality of heating elements 157A in a line at one end of an arm 157. The arm 157 is supported around an axis 157B at the center thereof with a spring 157C, so that the heating elements 157A confront with the shaft 143.

[0026] A switch lever 158 is provided at another end of the arm 157 with an axis 158A and a curved portion 158B, as shown in Fig. 7. The switch lever 158 is rotated around the axis 158A to lie horizontally or to stand vertically. When the switch lever 158 is set vertically (along a dotted line shown in Fig. 7), the curved portion 158B pushes the arm 157 of the thermal head 145, whereby the heating elements 157A come away from the shaft 143. In this condition, the cassette 6 is easily mounted to the printing unit 135 without being obstructed by the thermal head 145. When the switch lever 158 is set horizontally (along a solid line shown in Fig. 7) after mounting the cassette 6, the heating elements 157A confront with the shaft 143 and are pressed against the platen roller 128 through the label tape 1.

[0027] While the platen roller 128 is driven to pass the label tape 1 between the heating elements 157A and the platen roller 128, the heating elements 157A are selectively energized so that a desired image is formed on the heat-sensitive coloring layer 11A. As shown in Fig. 6, the cassette 6 houses the label tape 1 wound around the core 129. The half slit 14 is provided at the center of the label tape 1 in the width direction thereof (the height direction as viewed in the figure). The thermal head 145 prints images, such as characters, on each of the upper and the lower tape rows 14A, 14B divided by the half slit 14, as noted above. The thermal head 145 also prints the cutting mark 16, indicative of the end of the printed label, on the tape row of the shorter printed label (the lower tape row in Fig. 6). Then, the cutting unit 180 cuts the label tape 1 relative to the length of a longer printed label (on the upper tape row in Fig. 6).

[0028] The control unit 160 for controlling the operation of the label printer 160 will be explained with reference to Fig. 8. Fig. 8 is a block diagram of the label printer 9 according to one embodiment of the invention.

[0029] The control unit 160 controls the printing unit (thermal head) 145 to form images in the upper tape row and the lower tape row of the label tape 1, and also controls the cutting unit 180 to cut the label tape 1 relative to the length of the printed labels. The control unit 160 has a CPU 162, a ROM 163, a RAM 164, a CGROM 165, and an I/O interface 166, all connected to one another through a bus 167. The ROM 163 stores various programs and data for controlling the label printer 9, such as a display control program for controlling a LCD 138 and a drive control program for controlling the thermal head 145, the motor 146 and the cutting unit 180. The CGROM 165 stores dot pattern data indicative of various types of characters. The RAM 164 has a printing buffer that stores data to be printed, including a text buffer and an image buffer, and a buffer that temporarily stores calculation results executed by the CPU 162.

[0030] The I/O interface is connected with the LCD 138 via a LCDC 168, a head drive circuit 169 for driving the thermal head 145, a motor drive circuit 170 for driving the tape feeding motor 146, a cutting unit drive cir-

cuit 181 for driving the cutting unit 180, and sensors (not shown) for detecting the type of a cassette mounted to the label printer 9.

[0031] The operation of the label printer 9 under the control of the control unit 160 will be described with reference to Fig. 9 by giving an example of producing the labels 140L, 141L shown in Fig. 1. Fig. 9 is a flow chart showing the operation of the label printer 9 according to one embodiment of the invention. The label printer 9 generally operates in response to commands from the CPU 162, based on the programs stored in the ROM 163, unless otherwise noted below.

[0032] Firstly, the cassette housing the label tape 1 is mounted to the label printer 9, then, the sensors of the label printer 9 detect the presence of the label tape in the cassette 6 and the kind of the label tape. If the label tape has only one tape row thereon (S1: No), text, composed of characters and symbols, is inputted with the operation of the keyboard 137 in step S21, and is printed on the tape row in step S22.

[0033] If the label tape 1 has two tape rows (S1: Yes), text (the character train 140C in this case) is inputted for the upper tape row 140 with the operation of the keyboard 137, and is stored in the text buffer in step S2. Further, the margins 140F, 140R are determined for the both sides of the character train 140C on the upper tape row 140 in step S3 through use of the keyboard 137. In step S4, the length L of the label 140L is calculated using the programs stored in the ROM 163, based on the inputted character train 140C and the margins 140F, 140R. The length of the label can be calculated, for example, by summing the lengths of individual characters and symbols with side margins. In step S5, text (the character train 141C) is inputted for the lower tape row 141 using the keyboard 137, and is also stored in the text buffer. The margins 141F, 141R are determined for both sides of the character train 141C on the lower tape row 141 in step S6. Next, the length M of the label 141L is calculated using the programs stored in the ROM 163, based on the inputted character train 141C and the margins 141F, 141R. In step S8, printing is directed using the keyboard 137. In step S9, the lengths of the labels 140L, 141L are compared with each other.

[0034] With respect to the foregoing, format, such as typeface and font size, for the character trains 140C, 141C needs to be set in order to calculate the label lengths 140L, 141L. According to the invention, the format can be determined before inputting the text; in other words, the format is preset before the characters are inputted. Alternatively, the format could be set after inputting the text; that is, target characters are selected from the inputted characters, then, the format is set for the target characters. Further, the format could be set automatically based on a size of the tape rows so that the inputted text fits in the tape row, according to the procedure disclosed in U.S. Patent No. 5,314,256, the disclosure of which is incorporated herein by reference.

[0035] If the labels 140L, 141L are equal in length,

character data indicative of the character trains 140C, 141C are retrieved character by character from the text buffer, converted into bit image data, and stored in the image buffer in step S10. The thermal heads 145 are driven by the head drive circuit 169 based on the bit image data to respectively print the character trains 140C, 141C on the upper and the lower tape rows 140, 141, thereby forming the labels 140L, 141L. In synchronization with printing, the motor drive circuit 170 drives the tape feed motor 146 to feed the label tape 1.

[0036] If the label 140L is longer than the label 141L, the character data indicative of the character train 140C is first retrieved, converted into bit image data, and stored in the image buffer in step S11. Next, the character data indicative of the character train 141C is retrieved, and converted into bit image data. At the same time, bit image data corresponding to a cutting mark 16 is created after blank data corresponding to the margin 141R. All the bit image data that is indicative of character train 141C and is indicative of the cutting mark 16 is stored in the image buffer. Based on all the bit image data, the character trains 140C, 141C and the cutting mark 16 are printed simultaneously by the thermal heads 145.

[0037] If the label 140L is shorter than the label 141L, the character data indicative of the character train 140C is converted into bit image data in step S12. At the same time, bit image data corresponding to a cutting mark 16 is created after blank data corresponding to the margin 140R. All the bit image data that is indicative of the character train 140C and is indicative of the cutting mark 16 is stored in the image buffer. Then, the character data indicative of the character train 141C is converted into bit image data, and stored in the image buffer. Based on all the bit image data, the character trains 140C, 141C and the cutting mark 16 are printed simultaneously by the thermal head 145.

[0038] When the labels 140L, 141L are printed and the label tape 1 is fed to a position where the cutting unit 180 cuts the label tape, the cutting unit drive circuit 181 drives the cutting unit 180 in step S13, so that the label tape 1 is cut off as shown in Fig. 6. Alternatively, the cutting unit 180 may be operated manually.

[0039] To use the labels 140L, 141L, the longest printed label 140L, 141L is peeled from the releasable layer 13 to be used as one label. Then, the shortest lower tape label 140L, 141L is then cut along the cutting mark 16 using scissors. After that, the shortest label 140L, 141L is peeled from the releasable layer 13 to be used as a second label. If the labels 140L, 141L are the same length then either label may be peeled first for use.

[0040] For instance, in the case of printing on a label tape of 8mm in width with a half slit at the center thereof, two labels of 4mm in width are produced as described above. While transported inside the label printer 9, such a label tape acts like an integrated label tape having a width of 8mm. Therefore, printing is per-

formed stably and smoothly without the label tape rewinding its way or deviating from the feed path otherwise causing a jam.

[0041] According to another embodiment of the invention, there is provided a label printer 10 capable of printing images on the label tape in the width direction thereof and cutting the label tape by a cutting length.

[0042] As shown in Fig. 10 by way of example, images are printed on a label tape 3 having a width A of 96mm in the width direction of the label tape, thereby producing labels having not greater than a predetermined label length along its character train orientation. Further, if the label tape is cut by a cutting length B1 (4mm) or B2 (5mm), a narrow label less than 6mm in width can be created. If the total length E of the printed label is shorter than the tape width A, a cutting mark 17 is printed to indicate the end of the label.

[0043] Fig. 11 is a sectional view of a label printer 10 according to another embodiment of the invention. The label printer 10 has a unit configuration similar to the label printer 9, which has been described with reference to Figs. 4 to 8. Therefore, a detailed explanation regarding the unit configuration of the label printer 10 will be left out in order to avoid duplication. Differing from the label printer 9 shown in Fig. 9, the label printer 10 is capable of loading a thick cassette 7 housing a broad label tape 3 of a width C (for example, 96mm in width) as shown in Fig. 11. Because of this, the label printer 10 has longer shafts 242 and 243 than the shafts 142 and 143 of the label printer 9 shown in Fig. 6, whereby the height D of the printing unit 135 of the label printer 10 becomes higher than that of the label printer 9.

[0044] The printing operation of the label printer 10 will be explained with reference to Fig. 12.

[0045] In step S31, sensors (not shown) of the label printer 10 detect the presence of the label tape in the cassette 7 and the kind of the label tape. If the label tape is not suitable for printing along the width direction of the label tape (S31: No), text is input with the operation of a keyboard 137 in step S51, and printing proceeds in the conventional way in step S52.

[0046] If the label tape 3 is suitable for printing along the width direction thereof (S31: Yes), a desired value of a cutting length of the label tape 3 is inputted using the keyboard 137, or may be selected from a list of cutting lengths in step S32. Further, text, composed of characters, is input using the keyboard 137 in step S33, and stored in a text buffer of a RAM 164. In step S34, margins are determined for both sides of the inputted text.

[0047] The label length is calculated using the programs stored in the ROM 163, based on the inputted text and the margins in step S35. The calculation can be executed in the same manner as step S4 described above.

[0048] In the same way as the aforementioned embodiment, format, such as typeface and font size,

needs to be set in order to calculate the label length. The format may be determined before inputting the text; in other words, the format is preset for the text to be inputted. Alternatively, the format may be determined after inputting the text; that is, target characters are selected among the inputted characters, then, the format is set for the target characters. Further, the format may be set automatically based on the cutting length so that the image fits in the cutting length, according to the procedure disclosed U.S. Patent No. 5,314,256, the disclosure of which is incorporated herein by reference. Alternatively, the format may be set automatically based on the tape width so as to fit the image in the tape width, according to the procedure disclosed in U.S. Patent No. 5,230,572, the disclosure of which is incorporated herein by reference.

[0049] When printing is directed using the keyboard 137 in step S36, the label tape width (A in Fig. 10) and the label length (E in Fig. 10) are compared in step S37. If the label tape width is longer than the label length, the inputted text and a cutting mark are printed in step S38. If the label tape width and the label length are equal, the inputted text only is printed in step S39.

[0050] To print the text and the cutting mark, the text data is retrieved from the text buffer, converted into bit image data, and stored in a work area of the RAM 164. Then, the bit image data stored in the work area is rotated by 90 degrees, and stored in an image buffer of the RAM 164. The thermal head 145 is driven by a thermal head drive circuit 169 to print based on the bit image data stored in the image buffer. The text data can be processed all together, or character by character, for printing. If the label tape width A is shorter than the label length E, an alarm is given indicating that the text can not be printed, for example, by an error message displayed on the LCD 138.

[0051] When the label is printed, the label tape 3 is fed to a position where a cutting unit 180 cuts off the label tape 3. For example, the tape feeding operation is performed according to the similar control disclosed in U.S. Patent No. 5,131,772, the disclosure of which is herein incorporated by reference. The cutting unit 180 is driven by a cutting unit drive circuit 181 in step S40, or may be operated manually. The label tape 3 is cut off by the cutting length determined in step S32, as shown in Fig. 11.

[0052] In a case where the printed label is shorter than the tape width A, the label tape 3 is cut along the cutting mark, for example, using scissors. The printed label is peeled from the releasable layer to paste the label to any desired object.

[0053] As explained above, a label of various label widths and of not greater than a predetermined label length along its character train orientation can be produced by the label printer 10. If the cutting length is short, a label having a narrow label width can be created without causing the label tape to wind off the transport path or to jam, because it is transported stably

inside the label printer.

[0054] Although the cutting length is determined before inputting text in the above-described embodiment, the cutting length may be determined after inputting the text.

[0055] Further, the cutting length can be automatically determined based on the amount of the inputted data, though the cutting length is inputted in a desired value or selected from a list of cutting lengths. That is, the cutting length can be automatically determined in accordance with the end of the text printed by the set format. In this case, new lines are started upon printing, if necessary.

[0056] Still further, in the case of producing a plurality of labels by the label printer 10, the printing unit and the cutting unit may be driven relatively after a user input of all the image data for all the labels at one time. In this way, a plurality of labels can be produced sequentially without the user inputting the images one by one at each label-producing operation, thereby not repeating the same operation.

[0057] Yet further, the label printers 9, 10 according to the embodiments described above are preferable for the use of the label tape including the printing layer and the heat-sensitive coloring layer thereon, as mentioned above. However, the label printer or the cassette may house an ink ribbon therein. In this case, the ink ribbon is transported together with the label tape so that an image is formed on the surface of the printing layer with ink transferred from the ink ribbon.

[0058] While the invention has been described in detail with reference to specific embodiments thereof, it would be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit and the scope of the invention.

Claims

1. A label printer, for printing an image on a label tape that is elongated in a longitudinal direction thereof with a predetermined label tape width, thereby producing a label, comprising:

an input unit for inputting the image to be printed on the label tape;
a cutting length setting unit that sets a cutting length based on an area in which the entire image is printed, the label tape to be cut by the cutting length; and
a printing unit that prints the inputted image on the label tape, a direction in which the image is consistent with a width direction of the label tape perpendicular to the longitudinal direction thereof.

2. The label printer as claimed in claim 1, wherein the cutting length setting unit includes a cutting length

input unit inputting the cutting length.

3. The label printer as claimed in claim 2, further comprising a control unit, and wherein the control unit calculates, based on the input image, a length of the label in the direction in which the image is continued, and compares the calculated length of the label and the label tape width. 5
4. The label printer as claimed in claim 3, wherein the control unit controls the printing unit to further print a mark indicative of an end of the label, when the calculation result by the control unit indicates that the calculated length of the label is shorter than the label tape width. 10
5. The label printer as claimed in claim 3, where the control unit controls the printing unit to halt the printing operation, when the calculation result by the control unit indicates that the calculated length of the label is longer than the label tape width. 20
6. The label printer as claimed in claim 5, wherein the control unit includes a signal generator that gives a signal for indicating that the calculated length of the label is longer than the label tape width. 25
7. A label printer for printing images on a label tape that is elongated in a longitudinal direction thereof and is able to be divided into at least two tape rows along the longitudinal direction of the label tape, comprising: 30
 - an input unit for inputting the image to be printed on each tape row; and 35
 - a printing unit that prints the images on the tape rows, each tape row corresponding to one label.
8. The label printer as claimed in claim 7, further comprising a control unit, and wherein the control unit calculates a length of the label on each tape row and compares the calculated label lengths. 40
9. The label printer as claimed in claim 8, further comprising a cutting unit that cuts off the label tape, and wherein the control unit controls the cutting unit to cut off the label tape based on the longest label length. 45
10. The label printer as claimed in claim 7, wherein the control unit controls the printing unit to further print a mark indicative of an end of the shorter label. 50
11. The label printer as claimed in claim 7, wherein the printing unit prints the images on the at least two tape rows at once. 55

12. A label tape for the use of the label printer as claimed in claim 7, comprising a printing layer, an adhesive layer and a releasable layer, and wherein the label tape is divided into at least two tape rows by first half slits formed along the longitudinal direction of the label tape, the first half slits defining cuts on at least the printing layer.
13. The label tape as claimed in claim 11, wherein second half slits are provided along both edges of the label tape in the longitudinal direction thereof, the second half slits defining cuts on at least the printing layer.
14. A method for printing narrow labels using a label printing machine, comprising:
 - placing a wide tape in the label printing machine;
 - inputting text for at least one label;
 - determining margins for the at least one label;
 - calculating label length for the at least one label;
 - determining a need for a cutting mark for the at least one label;
 - printing the at least one label and, when appropriate, the cutting mark;
 - and
 - cutting the at least one label from the wide tape.
15. The method according to claim 14, wherein the step of inputting text comprises inputting text for two labels to be printed arranged along the longitudinal axis of the wide tape and the wide tape has a series of perforations extending along a longitudinal center line to divide the tape into an upper label portion and a lower label portion as defined in the widthwise direction.
16. The method according to claim 15, wherein the inputting text, determining margins and calculating length are executed sequentially for each of the two labels with an upper label created first and a lower label second.
17. The method according claim 16, wherein the step of determining a requirement for a cutting mark comprises comparing a length of the upper label and a length of the lower label and creating the cutting mark on a label having the shortest length.
18. The method according to claim 16, wherein the at least one label is cut from the wide tape based on the length of the longest label of the upper label and the lower label.
19. The method according to claim 15, wherein the

wide tape further has a second and a third series of perforations offset from a top edge and a bottom edge of the wide tape by a predetermined distance.

20. The method according to claim 14, further comprising establishing a width of the at least one label and instructing printing of the at least one label arrayed in a widthwise direction of the tape. 5
21. The method according to claim 20, further comprising comparing the label length and a tape width after the calculating label length. 10
22. The method according to claim 21, further comprising outputting an error message when the label length exceeds the tape width. 15

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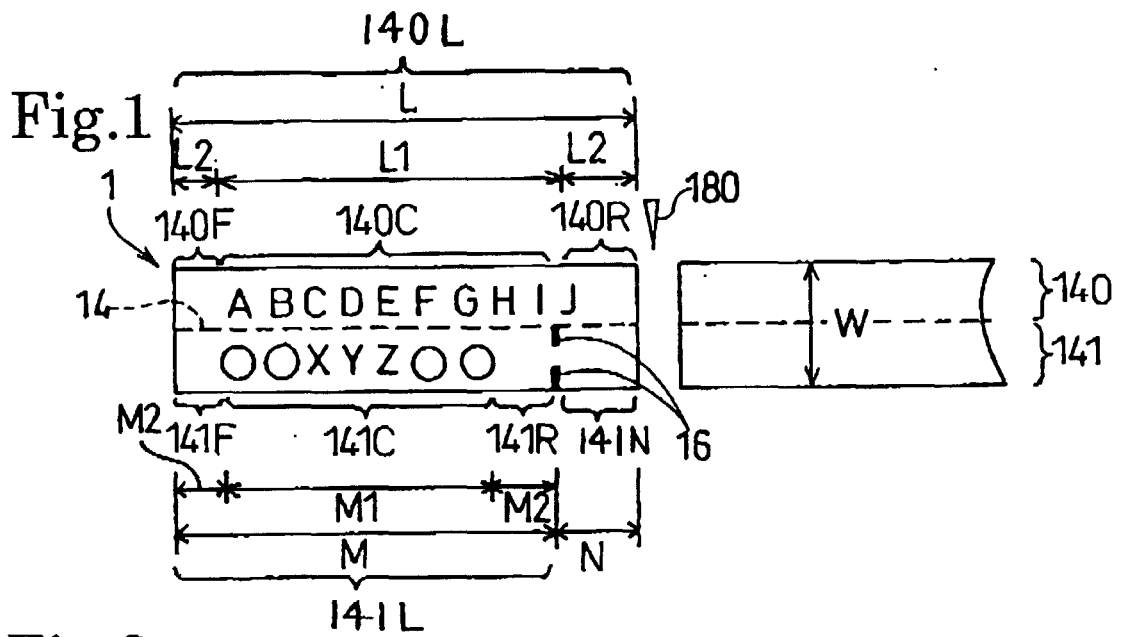


Fig.2

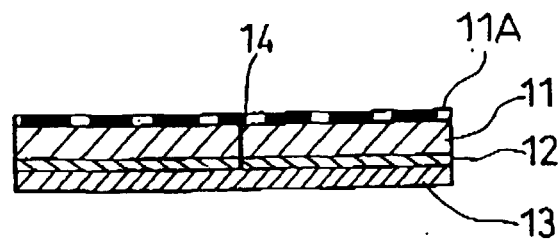


Fig.3

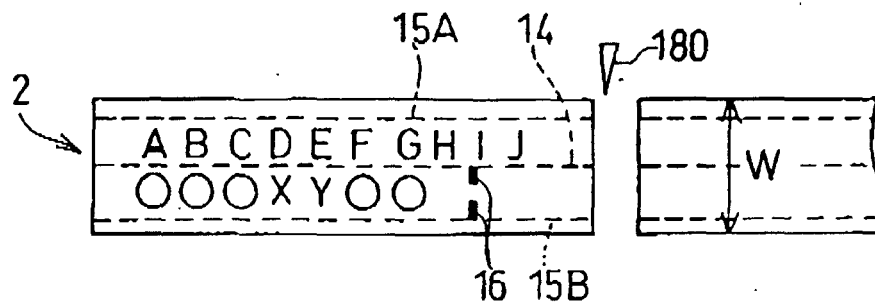


Fig.4

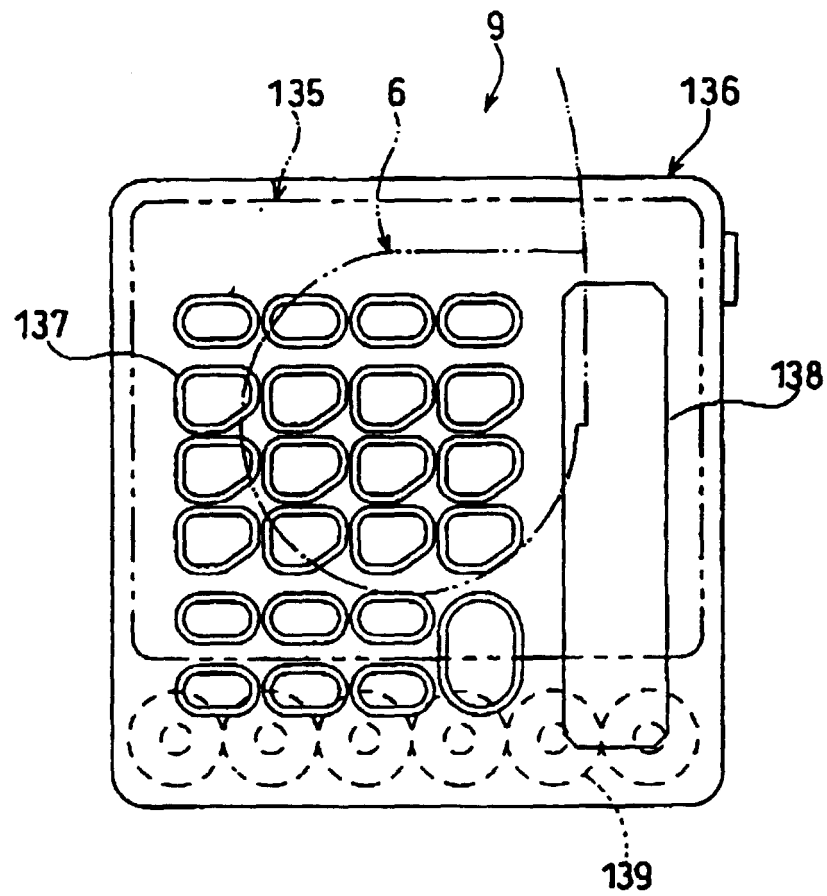


Fig.5

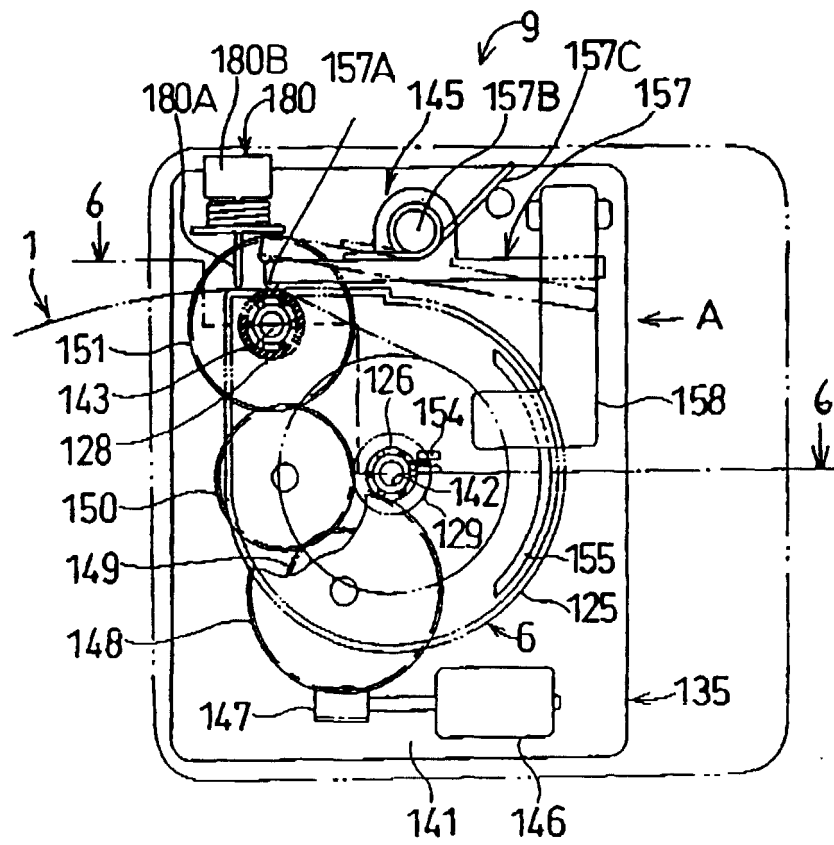


Fig.6

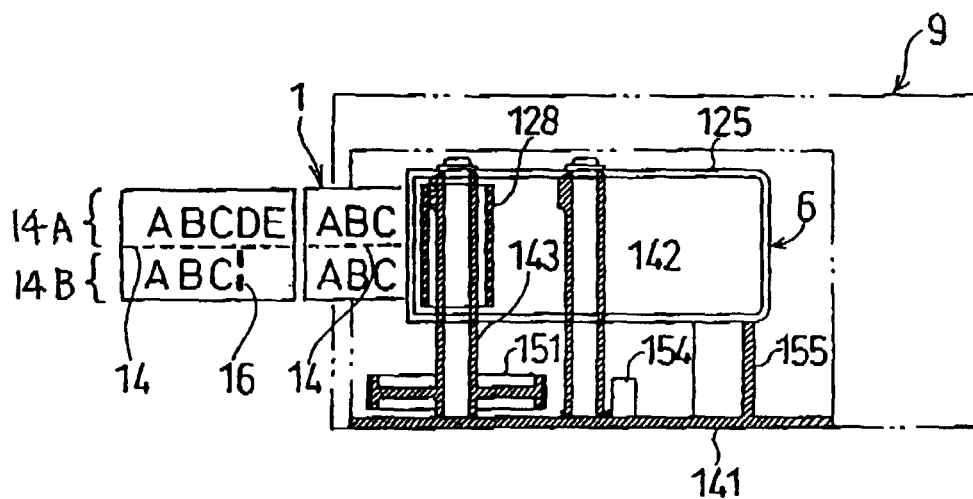


Fig.7

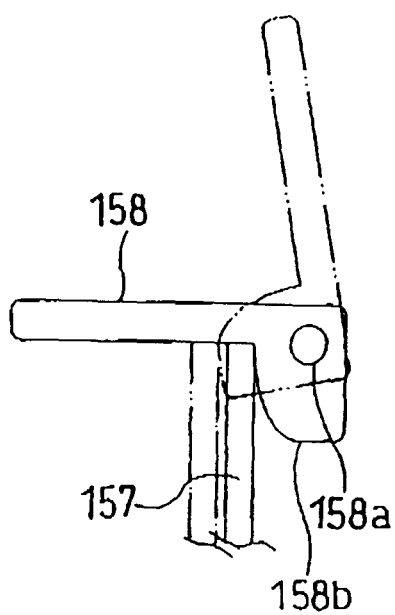


Fig.8

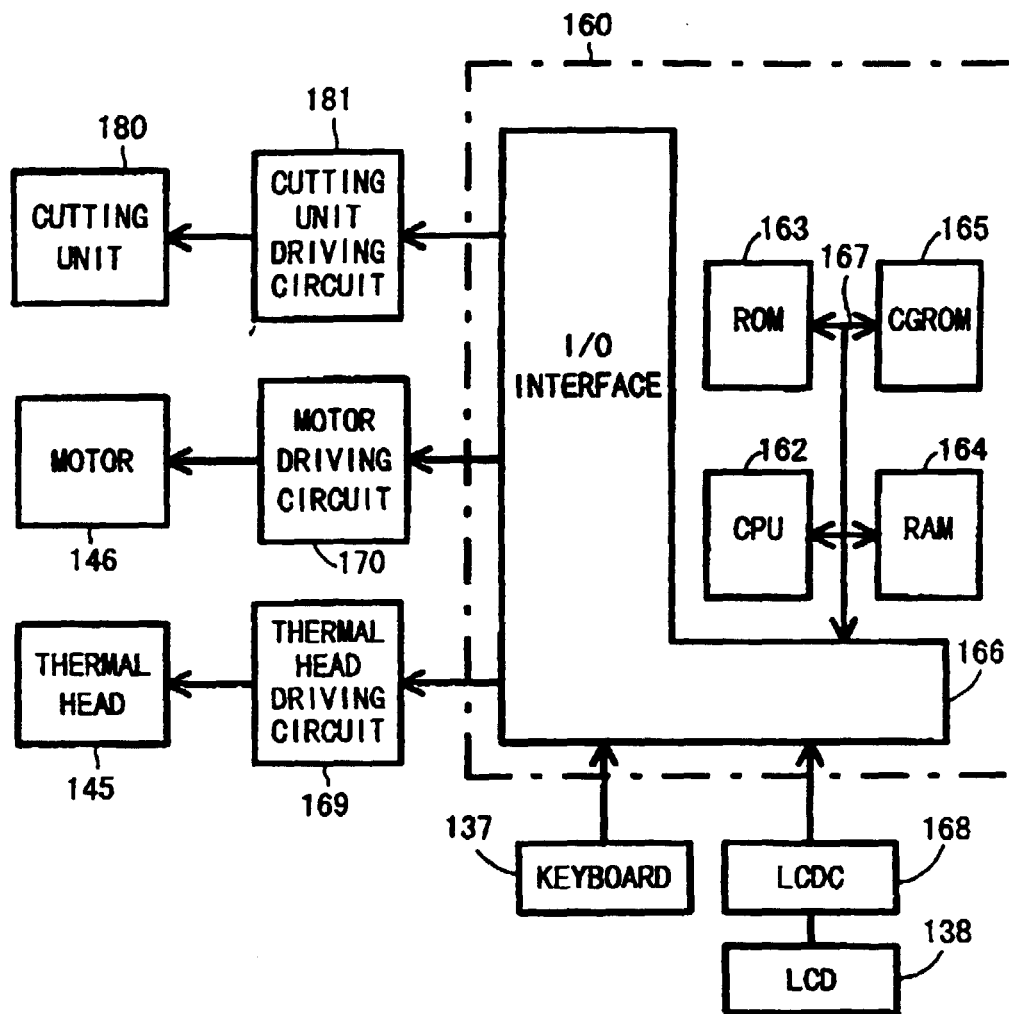


Fig.9

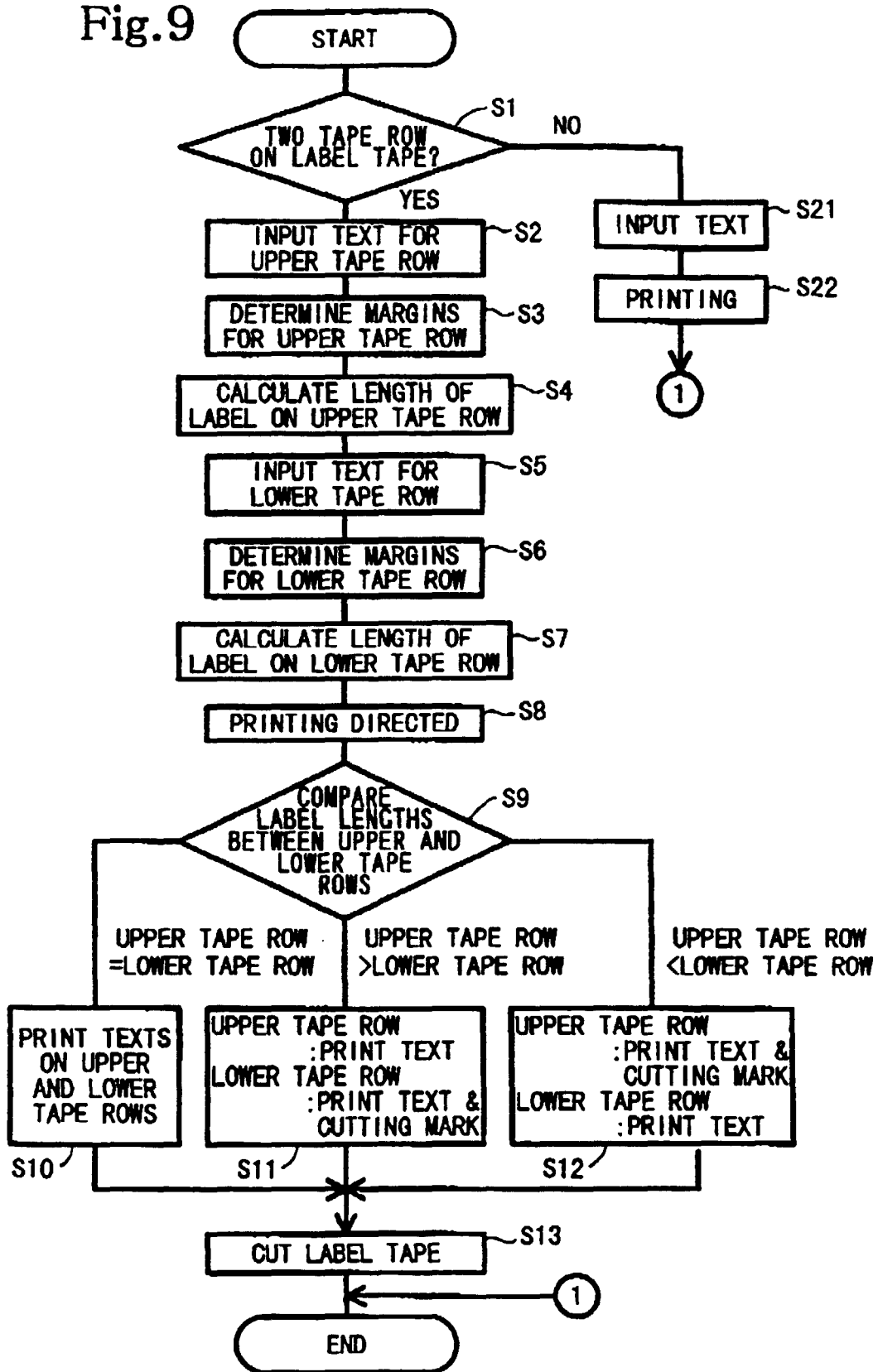


Fig.10

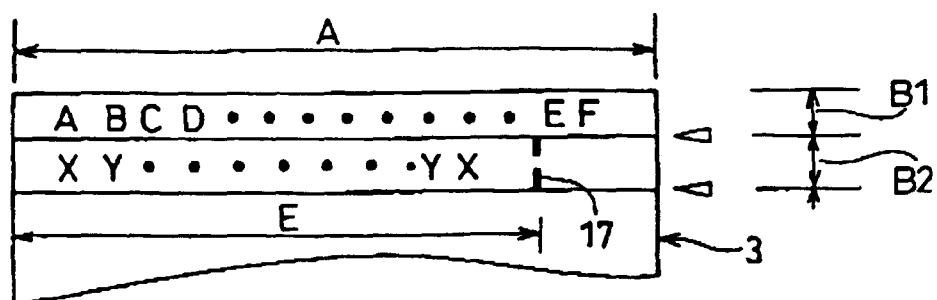


Fig.11

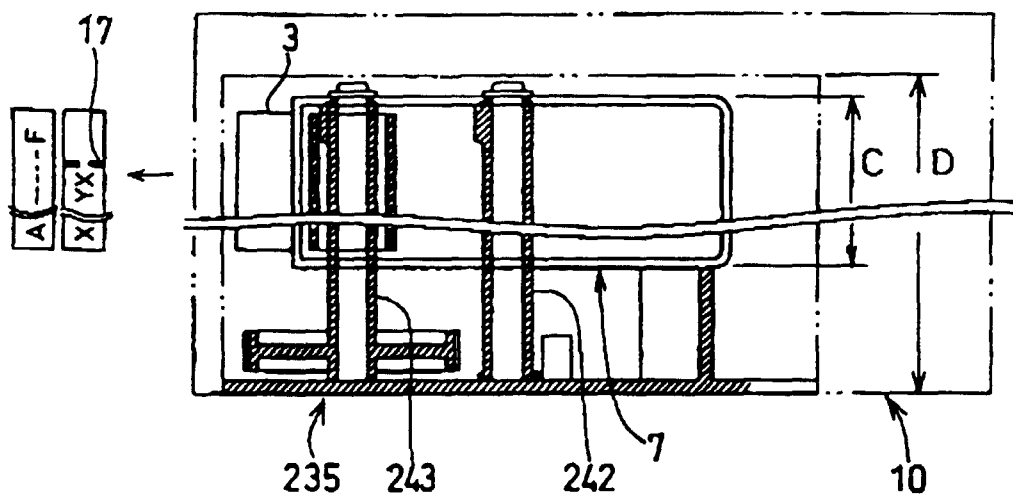
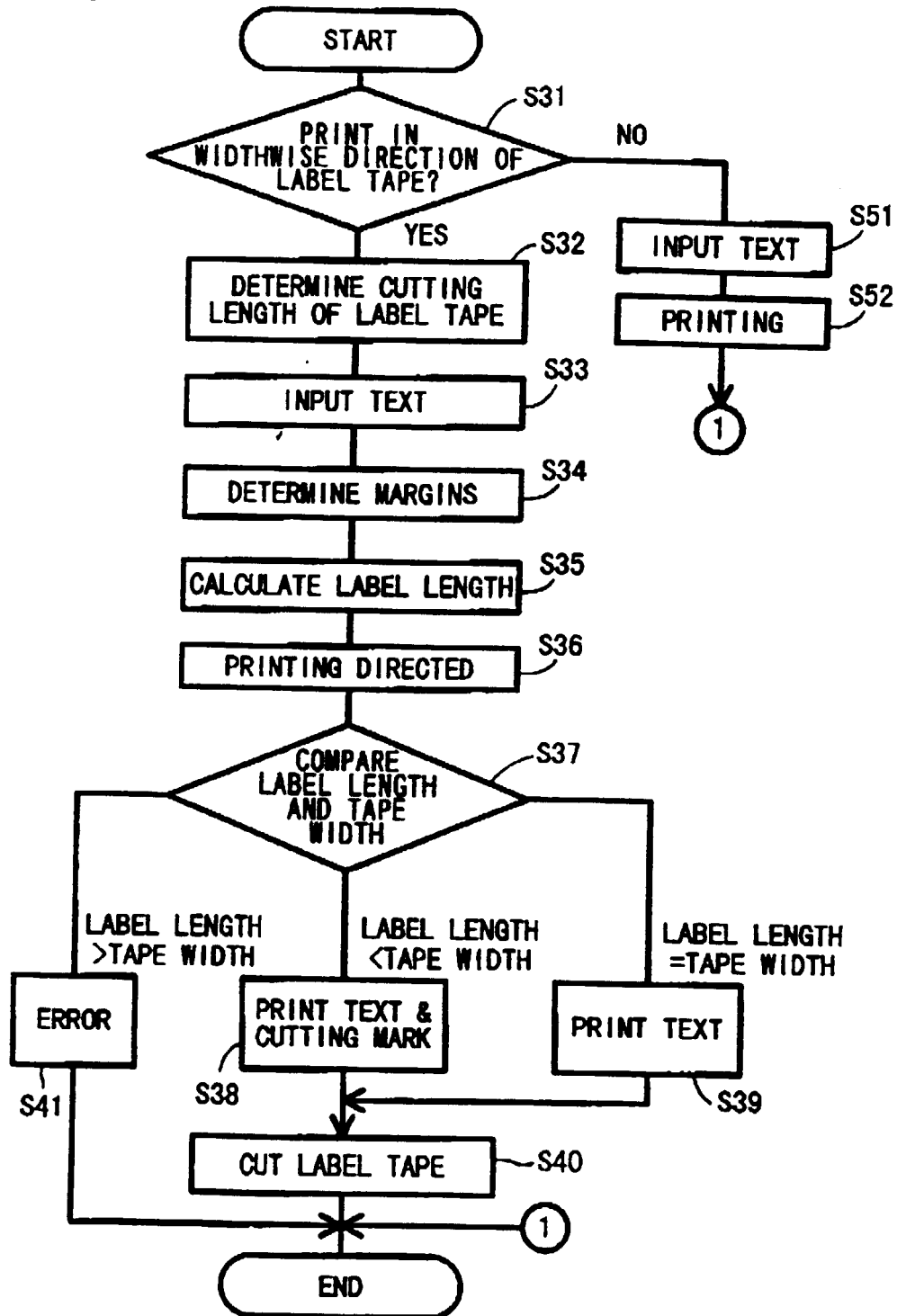


Fig.12





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X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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