

A Method For Aligning A Cutter For Cutting A Decorative Panel From A Printed Board

Cross-Reference to Related Applications

[0001] The present application claims the benefit of Singapore Patent Application No. 10202201083R filed February 4, 2022; which is incorporated by reference herein.

Technical Field

[0002] The present invention relates to a method for aligning a cutter for cutting a decorative panel from a printed board. Preferably, the present invention relates to a method of fabricating a decorative panel.

Background

[0003] When fabricating a decorative panel, e.g. for a cabinet door or display panel, an image of the decorative panel may first be printed onto a board, e.g. high-pressure laminate (HPL). Alternatively, the image may first be printed onto a film, e.g. vinyl sticker, then laminated onto the board. The printed layer may be known as a decorative layer. Fig. 1 shows an example of the decorative panel. In Fig. 1, the decorative panel comprises a plurality of cabinet doors, i.e. two elongated panels for drawers and four rectangular panels for doors. The printed board may be further laminated with protective overlay.

[0004] After the board is printed, a cutter is used to cut the decorative panel from the printed board. The cutter may be a CNC machine with a cutting tool. The outline of the decorative panel to be cut may be converted into a vector file to be uploaded into the CNC machine. The vector file provides instruction to the cutter to cut the printed board. The cutter then traces the vector lines in the vector file to cut the printed board to obtain the decorative panel. However, it is often that the vector lines are misaligned to the decorative panel and hence does not trace the outline of the decorative panel accurately. This results in inaccurate cutting and destroys the decorative panel. Ultimately, it causes a waste of material and time and increases costs.

[0005] Therefore, it would be beneficial to provide a cost-effective solution to address the above problem.

Summary

[0006] According to various embodiments, a method for aligning a cutter for cutting a decorative panel from a printed board is provided. The decorative panel has a decorative pattern printed thereon. The printed board has an image printed thereon, such that the image includes the decorative pattern and a first mark and a second mark spaced from the decorative pattern and is converted into a cutting path and uploaded to the cutter. The method includes marking a first position on the printed board, adjusting the cutting path to enable the cutter to mark the first position onto the first mark printed on the printed board, marking a second position on the printed board, rotating the cutting path about the first position to enable the cutter to mark the second position onto the second mark printed on the printed board, such that the cutter is aligned to cut the printed board when the first position and the second position coincides with the first mark and the second mark printed on the printed board.

[0007] According to various embodiments, marking the first position on the printed board may include cutting the first mark on the printed board to create a first cut on the printed board.

[0008] According to various embodiments, the method may further include identifying an interval between the first position and the first mark printed on the printed board.

[0009] According to various embodiments, adjusting the cutting path may include shifting the cutting path longitudinally and/or laterally by the interval toward the first mark on the printed board.

[0010] According to various embodiments, marking the second position on the printed board may include cutting a second mark on the printed board to create a second cut on the printed board.

[0011] According to various embodiments, the method may further include identifying an arc length between the second position and the printed second mark whereby the centre of the arc is at the first position and/or identifying an arc angle of the arc length.

[0012] According to various embodiments, the cutting path may be rotated by the arc angle toward the second mark on the printed board.

[0013] According to various embodiments, the first mark may include a dot.

[0014] According to various embodiments, the first mark on the printed board may further include a grid, such that the dot is within the grid and such that the cutter is configured to cut the dot on the printed board.

[0015] According to various embodiments, the second mark may include a line aligned to the first mark.

[0016] According to various embodiments, the second mark on the printed board may further include an arcuated scale, such that the second mark is part of the arcuated scale and such that the cutter is configured to cut a line on the printed board.

Brief Description of Drawings

[0017] Fig. 1 shows an example of the decorative panel.

[0018] Fig. 2 shows a flow diagram of an exemplary method for aligning a cutter for cutting a decorative panel from a printed board.

[0019] Fig. 3 shows a top view of an exemplary embodiment of the printed board.

[0020] Fig. 4 shows a schematic diagram of an exemplary embodiment of the cutting path.

[0021] Fig. 5 shows a top view of the printed board in Fig. 3 with the cutting path in Fig. 4 superimposed thereon.

[0022] Fig. 6 shows a partial top view of the printed board in Fig. 3.

[0023] Fig. 7 shows a top view of the printed board in Fig. 3 with the first cut aligned to the first mark.

[0024] Fig. 8 shows a top view of the printed board in Fig. 7.

[0025] Fig. 9 shows a top view of the printed board in Fig. 8 with the second cut aligned to the second mark.

[0026] Fig. 10 shows an exemplary embodiment of the first mark.

[0027] Fig. 11 shows an exemplary embodiment of the second mark.

Detailed Description

[0028] Fig. 2 shows a flow diagram of an exemplary method for aligning a cutter for cutting a decorative panel from a printed board. The decorative panel has a decorative pattern printed thereon. The printed board has an image printed thereon, such that the image includes the decorative pattern and a first mark and a second mark spaced from the decorative pattern and the image is converted into a cutting path and uploaded to the cutter. Method includes marking a first position on the printed board in Block 1100, adjusting the cutting path to enable the cutter to mark the first position onto the first mark printed on the printed board in Block 1200, marking a second position on the printed board in Block 1300, rotating the cutting path about the first position to enable the cutter to mark the second position onto the second mark printed on the printed board in Block 1400. The cutter is aligned to cut the printed board when the first position and the second position coincides with the first mark and the second mark printed on the printed board. Once aligned, the cutter is able to cut along

the outline of the decorative pattern accurately and retrieve the decorative panel from the printed board. Method provides an economical and cost-effective way to cut printed boards and fabricate panels of any dimension and design. Consequently, the method saves time and avoid material waste and ultimately reduces costs to fabricate panels.

[0029] Fig. 3 shows a top view of an exemplary embodiment of the printed board 100. Printed board 100 has an image printed thereon. Image may include the decorative pattern 110, a first mark 122 and a second mark 124. First mark 122 and the second mark 124 are spaced from the decorative pattern 110. In this example, there are a plurality of decorative panels, e.g. two decorative panels, to be cut. Decorative pattern 110 may also be of any shape suitable to be cut by the cutter. First mark 122 may be positioned at a lower end 100L of the printed board 100 and the second mark 124 may be position at an upper end 100U of the printed board 100 opposite the lower end 100L. It is advantageous to have the first mark 122 and the second mark 124 spaced as far apart as possible from each other so that the accuracy of the alignment is as high as possible. Decorative panel has a decorative pattern 110 printed thereon and may be customized according to the requirement of the designer or customer. While the method is applicable to a 2-dimensional panel, it is also applicable to a 3-dimensional block.

[0030] Fig. 4 shows a schematic diagram of an exemplary embodiment of the cutting path 130. As shown in Fig. 4, the cutting path 130 includes vector lines 132V, i.e. cutting distance and direction, which provide the path taken by the cutting tool when cutting the printed board 100 (as shown in Fig. 3). Outline of the decorative pattern 110 in the image is converted into vector lines 132V and stored in a vector file, which is uploaded to the cutter. Vector file provides cutting instruction and cutting path 130 to the cutter to cut the printed board 100. The cutter is configured to trace the vector lines 132V in the vector file to cut the printed board 100 to extract the plurality of decorative panels from the printed board 100. Corresponding to the image on the printed board 100, the cutting path 130 includes cutting paths 132,134,136 for the decorative pattern 110, the first mark 122 and the second mark 124 respectively. Cutting path 130 may be linear, curved or a point, e.g. cutting path 134.

[0031] Fig. 5 shows a top view of the printed board 100 in Fig. 3 with the cutting path 130 in Fig. 4 superimposed thereon. As shown in Fig. 5, when the cutting path 130 is not aligned to the image on the printed board 100, the cut will not be in line with the outline of the decorative pattern 110. Hence, the cut is not accurate, and the printed board 100 will have to be discarded and be wasted.

[0032] Fig. 6 shows a partial top view of the printed board 100 in Fig. 3. As shown in Fig. 6, the first mark 122 is printed at the lower end 100L of the printed board 100. Cutter is configured to mark a first position 122P on the printed board 100. Cutter may be configured to mark the first position 122P by cutting the first mark 122 on the printed board 100 to create a first cut 122C on the printed board 100. Alternatively, the cutter may be configured to project a light on the printed board 100 to mark the first position 122P. Once the first position 122P is marked, it is possible to identify any misalignment between the first position 122P and the first mark 122. As shown in Fig. 6, an interval 122N is identified between the first position 122P and the first mark 122 printed on the printed board 100. Interval 122N may be represented by units in the longitudinal and lateral direction. Cutter may be configured to capture an image of the first position 122P and the first mark 122 and identify the interval 122N. When the misalignment or interval 122N is identified, the cutting path 130 may be adjusted to enable the cutter to mark the first position 122P onto the first mark 122 printed on the printed board 100. Cutting path 130 may be adjusted by shifting the cutting path 130 longitudinally and/or laterally by the interval 122N toward the first mark 122 on the printed board 100. A x-y co-ordinate reference is shown in Fig. 6 to denote the longitudinal and lateral directions of the cutter, where the y-axis may be the longitudinal direction and the x-axis may be the lateral direction. Referring to the example in Fig. 6, the first position 122P is moved to the right laterally and upward longitudinally to coincide with the first mark 122. By adjusting the cutting path 130 of the first mark 122 to align the first position 122P to the first mark 122, the cutting paths 132,136 are adjusted correspondingly.

[0033] Fig. 7 shows a top view of the printed board 100 in Fig. 3 with the first cut 122C aligned to the first mark 122. Cutter may be configured to mark the first position 122P and the adjustment may be made repeatedly until the first position 122P is aligned to the first mark 122. For example, the first cut 122C may be made and if an interval 122N (as shown in Fig. 6) is identified, an adjustment is made to shift the first position 122P toward the first

mark 122. Thereafter, another first cut 122C is made and if an interval 122N is again identified, another adjustment is made. This process is repeated until the first cut 122C, which denotes the first position 122P, coincides with the first mark 122. First position 122P is aligned to the first mark 122 when the first position 122P and the first mark 122 coincide. Fig. 7 shows the cutting paths 130 in Fig. 4 superimposed onto the printed board 100 to show the position of the cutting path 130 with respect to the decorative pattern 110 when the first position 122P is aligned to the first mark 122. Although the first position 122P is aligned to the first mark 122, the other cutting paths 132, 134 may still not be aligned to the remaining parts of the image, e.g. decorative pattern 110 and second mark 124.

[0034] Fig. 8 shows a top view of the printed board 100 in Fig. 7. As shown in Fig. 8, after the first position 122P is aligned to the first mark 122, the second mark 124 is made at the upper end 100U of the printed board 100. Cutter is configured to mark a second position 124P on the printed board 100. Cutter may be configured to mark the second position 124P by cutting the second mark 124 on the printed board 100 to create a second cut 124C on the printed board 100. Alternatively, the cutter may be configured to project a light on the printed board 100 to mark the second position 124P. Once the second position 124P is marked, it is possible to identify any misalignment between the second position 124P and the second mark 124. As shown in Fig. 8, an arc length 124L is identified between the second position 124P and the printed second mark 124 whereby the centre of the arc is at the first position 122P and an arc angle 124A of the arc length 124L is identified between a first line 124FL projected from the first position 122P to the second mark 124 and a second line 124SL projected from the first position 122P to the second position 124P. As shown in Fig. 8, the arc angle 124A may be about 5 degrees. Cutter may be configured to capture an image of the second position 124P and the second mark 124 and identify the arc angle 124A required to rotate the cutting path 130. When the misalignment or arc length 124L is identified, the cutting path 130 may be rotated about the first position 122P to enable the cutter to mark the second position 124P onto the second mark 124 printed on the printed board 100. Cutting path 130 may be rotated by the arc angle 124A clockwise or anti-clockwise about the first position 122P toward the second mark 124 on the printed board 100. Referring to Fig. 8, the second position 124P may be rotated counter-clockwise to coincide with the second mark 124 and the second position 124P.

[0035] Fig. 9 shows a top view of the printed board 100 in Fig. 8 with the second cut 124C aligned to the second mark 124 (not shown in Fig. 9). Cutter may be configured to mark the second position 124P and rotation may be made repeatedly until the second position 124P is aligned to the second mark 124. For example, the second cut 124C may be made and if an arc length 124L (as shown in Fig. 8) is identified, a rotation is made at about the first position 122P to rotate the second position 124P toward the second mark 124. Thereafter, another second cut 124C is made and if an arc length 124L is again identified, another rotation is made. This process is repeated until the second cut 124C, which denotes the second position 124P, coincides with the second mark. Second position 124P is aligned to the second mark 124 when the second position 124P and the second mark 124 coincide. Fig. 9 shows the cutting path 130 in Fig. 4 superimposed onto the printed board 100 to show the position of the cutting path 130 with respect to the decorative pattern 110 when the second position 124P is aligned to the second mark 124. Cutter is able to cut the printed board 100 accurately when the first position 122P and the second position 124P coincides with the first mark 122 and the second mark 124 printed on the printed board 100. When they coincide, the cutter is able to cut along the outline of the decorative pattern 110 accurately to obtain the decorative panel. As shown in the earlier examples, the first mark 122 may be a dot and the second mark 124 may be a line aligned to the first mark 122 (as shown in Fig. 8). First mark 122 may also be a cross and the second mark may be a dot. First position 122P and second position 124P may be indications of positions by the cutter, which may be indicated by a light or cut.

[0036] Fig. 10 shows an exemplary embodiment of the first mark 122. As shown in Fig. 10, the first mark 122 on the printed board 100 may further include a grid 122G, such that the dot is within the grid 122G. Grid 122G may be scaled in units of inch or centimetre and may be of any size. Cutter may be configured to cut the dot, i.e. first cut 122C, on the printed board 100 without cutting the grid 122G to mark the first position 122P. Grid 122G provides a fast identification of the interval 122N between the first mark 122 and the first position 122P. Referring to Fig. 10, it is relative fast to identify that the first position 122P is 1.5 units to the left of and 1 unit below the first mark 122. Hence, the cutting path 130 may be adjusted accordingly as earlier described. In this way, repetitive adjustment of the cutting path 130 may be eliminated, and time taken to fabricate the decorative panel is reduced significantly.

[0037] Fig. 11 shows an exemplary embodiment of the second mark 124. As shown in Fig. 11, the second mark 124 on the printed board 100 may further include an arcuated scale 124S such that the second mark 124 is part of the arcuated scale 124S. Cutter may be configured to cut a line, i.e. second cut 124C, on the printed board 100 without cutting the arcuated scale 124S to mark the second position 124P. Arcuated scale 124S provides a fast identification of the arc length 124L and arc angle 124A (not shown in Fig. 11) between the second mark 124 and the second position 124P. Referring to Fig. 11, it is relative fast to identify that the second position 124P is 2 units to the right of the second mark 124. Hence, the cutting path 130 may be rotated accordingly as earlier described. In this way, repetitive rotation of the cutting path 130 may be eliminated, and time taken to fabricate the decorative panel is reduced significantly.

[0038] Cutter may be a CNC machine with a cutting tool and a controller for controlling the cutting tool. Cutter may include a camera for capturing images, e.g. interval 122N between the first position 122P and the first mark 122, arc length 124L, arc angle 124A, of the printed board 100. Controller may be configured to identify the interval 122N and the arc length 124L and/or arc angle 124A and adjust and rotate the cutting path 130 accordingly to align the first position 122P and second position 124P to the first mark 122 and the second mark 124 accordingly.

[0039] A skilled person would appreciate that the features described in one example may not be restricted to that example and may be combined with any one of the other examples.

[0040] The present invention relates to a method for aligning a cutter for cutting a decorative panel from a printed board 100 generally as herein described, with reference to and/or illustrated in the accompanying drawings.

Claim

1. A method for aligning a cutter for cutting a decorative panel from a printed board, the decorative panel having a decorative pattern printed thereon, wherein the printed board has an image printed thereon, wherein the image comprises the decorative pattern and a first mark and a second mark spaced from the decorative pattern and is converted into a cutting path and uploaded to the cutter, the method comprising,
 - marking a first position on the printed board,
 - adjusting the cutting path to enable the cutter to mark the first position onto the first mark printed on the printed board,
 - marking a second position on the printed board,
 - rotating the cutting path about the first position to enable the cutter to mark the second position onto the second mark printed on the printed board,
 - wherein the cutter is aligned to cut the printed board when the first position and the second position coincides with the first mark and the second mark printed on the printed board.
2. The method according to claim 1, wherein marking the first position on the printed board comprises cutting the first mark on the printed board to create a first cut on the printed board.
3. The method according to claim 1 or 2, further comprises identifying an interval between the first position and the first mark printed on the printed board.
4. The method according to any one of claims 1 to 3, wherein adjusting the cutting path comprises shifting the cutting path longitudinally and/or laterally by the interval toward the first mark on the printed board.
5. The method according to any one of claims 1 to 4, wherein marking the second position on the printed board comprises cutting a second mark on the printed board to create a second cut on the printed board.

6. The method according to any one of claims 1 to 5, further comprising identifying an arc length between the second position and the printed second mark whereby the centre of the arc is at the first position and identifying an arc angle of the arc length.
7. The method according to claim 6, wherein the cutting path is rotated by the arc angle toward the second mark on the printed board.
8. The method according to any one of claims 1 to 7, wherein the first mark comprises a dot.
9. The method according to claim 8, wherein the first mark on the printed board further comprises a grid, wherein the dot is within the grid and wherein the cutter is configured to cut the dot on the printed board.
10. The method according to any one of claims 1 to 9, wherein the second mark comprises a line aligned to the first mark.
11. The method according to claim 10, wherein the second mark on the printed board further comprises an arcuated scale, wherein the second mark is part of the arcuated scale and wherein the cutter is configured to cut a line on the printed board.