Aug. 10, 1965 W. B. LEAVENS 3,199,450

METHOD OF INSPECTING LABELS TO DETERMINE IF SUCH HAVE BEEN PROPERLY PRINTED AND CUT

Original Filed July 17, 1961

Fig. 1.

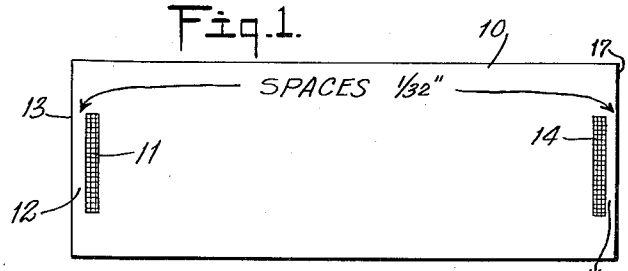
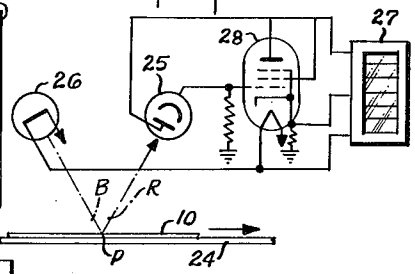


Fig. 7.



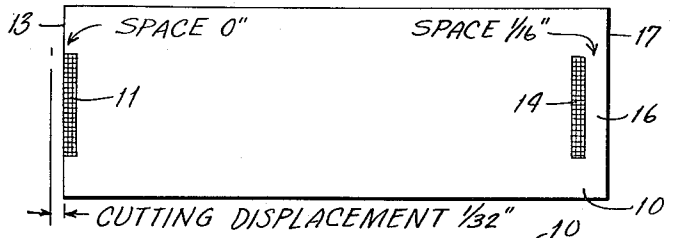


Fig. 2.

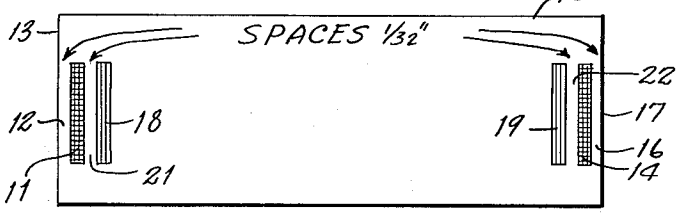


Fig. 3.

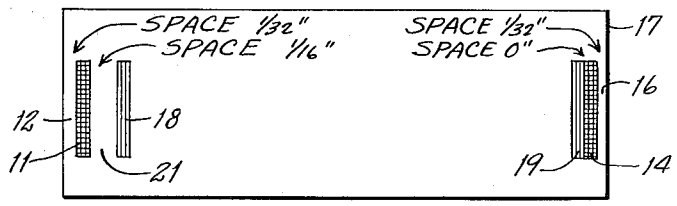


Fig. 4.

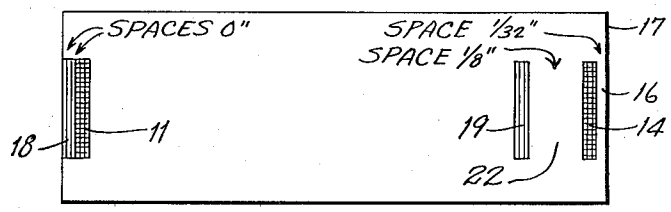


Fig. 5.

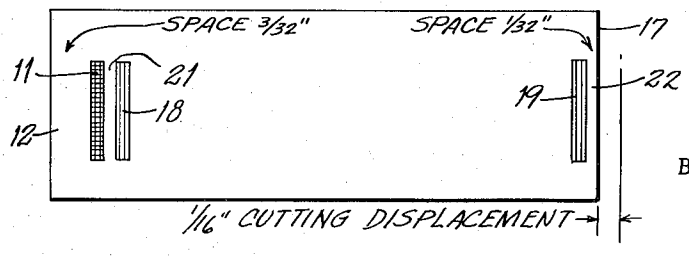


Fig. 6.

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METHOD OF INSPECTING LABELS TO DETERMINE IF SUCH HAVE BEEN PROPERLY PRINTED AND CUT

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Continuation of application Ser. No. 124,679, July 17, 1961. This application Oct. 15, 1963, Ser. No. 316,798

1 Claim. (Cl. 101—211)

The present invention relates to electronic inspection of line codes on printed material and, more particularly, relates to improvements over those disclosed in my code inspecting application bearing Serial No. 662,312 and filing date of May 24, 1957, now Patent No. 3,035,380 of May 22, 1962. This is a continuation of my application bearing Ser. No. 124,679, filed July 17, 1961 and now abandoned.

In my said prior patent there are disclosed a plurality of code marks or lines arranged in one or more rows on a contrasting surface, whereby alternate light and dark portions of different light reflecting values are provided. In order to prevent mixing of similar folding boxes but carrying different products, such code lines are placed on a glue lap of the box and are inspected as the box is being glued, so that the appearance of the finished box is unchanged. In addition, the code lines are placed on the box surface for inspection of the folding boxes at the final packaging operation.

In my present invention means are provided for inspecting correct positioning of printed code marks or lines on printed material, such as labels, folding boxes, etc., in order to determine whether the label or folding box has been cut within the required tolerances in regard to the printing position. The latter is termed print-to-cut register. It might be mentioned at this point that in conventional practice a plurality of labels are printed on a single sheet and these labels, after the printing operation, are severed from the printed sheet in a cutting operation.

Accordingly, an object of my present invention is to provide a print-to-cut register inspection which can be made simultaneously with the mixed codes and in the presence of color inspection taught in my said patent.

In my present invention said means are also adapted for inspecting correct positioning of multi-colored code marks or lines on printed material, such as labels, folding boxes, etc., in order to determine whether the marks or lines of one color have been displaced with respect to marks or lines of another color. The latter is termed color-to-color register.

Accordingly, a further object of my invention is to provide a color-to-color register inspection which can be made simultaneously with the foregoing print-to-cut register and with the mixed codes and in the presence of color inspection taught in my said patent.

Other and further objects will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claim, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

In accordance with my present invention, the foregoing objects are accomplished by printing on a panel of a label or folding box a line at a predetermined distance from one edge position and another line at a like distance from the other edge position. If the label or box is cut accurately, said two lines will be counted. However, if the label or box is cut inaccurately with either of the two lines varying from said predetermined amount, one of the two lines will be cut off to produce an insufficient count and thereby signal a failure.

For color-to-color register the above two print-to-cut lines are printed on the label or box in one color and a line of a different color is printed thereon at a predetermined distance from each of the two print-to-cut register lines, so that there is normally a minimum of four lines to to counted. If the spacing of one colored line varies beyond the predetermined allowance, one of the lines of one color will print over a line of another color, leaving only three colors to be counted; or in the edge space, leaving only two lines to be counted; or even off the label or box, leaving three lines to be counted. Consequently, since the required number of lines is not presented, a failure is signalled.

A preferred embodiment of the invention has been chosen for the purpose of illustration and description and is shown in the accompanying drawing, forming a part of the specification, wherein:

FIG. 1 is a plan view of a label showing a line printed at a predetermined distance from each edge of the label for print-to-cut register.

FIG. 2 is a plan view similar to FIG. 1 showing the label improperly cut.

FIG. 3 is a plan view of a label showing the two lines of FIG. 1 (print-to-cut register) printed in one color and two additional lines of a second color printed at a predetermined distance from the first two lines for color-to-color register.

FIGS. 4 and 5 are plan views similar to FIG. 3 showing improper color-to-color printings.

FIG. 6 is a plan view similar to FIG. 3 showing an improper print-to-cut printing wherein the right edge print-to-cut line has been cut off.

FIG. 7 is a schematic view of apparatus embodying the present invention including a diagram of the electrical connections.

Referring now to the drawing in detail, particularly to FIG. 1, there is shown a label **10** arranged for print-to-cut register, which label may be a panel of a carton for illustration purposes, having a line **11** spaced a predetermined distance **12** from a left edge **13** and a line **14** a predetermined distance **16** from a right edge **17** of the label **10**. For example, said predetermined distances or margins **12** and **16** may be set at $\frac{1}{32}$ inch and the thickness of each line **11** and **14** also set at $\frac{1}{32}$ inch. Thus, if the label is cut properly, as shown in FIG. 1, from the printed sheet (not shown) electronic inspection thereof will indicate a count of two lines.

However, if the label is improperly cut, as shown in FIG. 2, electronic inspection thereof will indicate a count of only one line, namely, line **14** adjacent the right edge **17** of the label **10**, thereby rejecting this label. It is readily seen in FIG. 2 that the label **10** was displaced $\frac{1}{32}$ inch to the left during the cutting operation, so that the left margin **12** was eliminated and the right margin **16** doubled to $\frac{1}{16}$ inch in thickness. Since there is now no space between the left edge **13** and the left line **11**, the left line cannot be counted, and only the right line **14**, during inspection.

Considering the above from another standpoint, assume that the label **10** is colored white and the lines **11** and **14** are colored black. An inspection of the properly cut label in FIG. 1 would indicate three (3) white spaces, that is, the left and right margins **12**, **16** and the space between the two lines **11** and **14**; while an inspection of the improperly cut label in FIG. 2 would only indicate two (2) spaces, that between the two lines **11**, **14** and the right margin **16**.

In FIG. 3 the print-to-cut register label of FIG. 1 has been supplemented with color-to-color register, for example, by red colored lines **18**, **19**, each disposed a predetermined distance inwardly of the print-to-cut register lines **11** and **14**, respectively, to provide respective mar-

gins or spaces 21 and 22 therebetween. As in FIG. 1 for print-to-cut register, a spacing of 1/32 inch has been chosen for the spaces 21, 22 for color-to-color register. Thus for both print-to-cut register and color-to-color register a minimum of four code lines and a minimum of five spaces are required for satisfactory inspection of the label.

Should placement of the colored lines 18, 19 vary from the predetermined distances, one of the colored lines 19, as seen in FIG. 4, will print over one of the lines (line 14) of the other color and thereby cause only three lines to be read during inspection; or as seen in FIG. 5, colored line 18 will print in the edge space 12 and cause only two lines 19, 14 to be read; or as seen in FIG. 6, one of the black lines (14) will be even off the cut label and cause only three lines to be read during inspection, whereby print-to-cut register is checked with color-to-color register. In each of FIGS. 4, 5, and 6 the improper placement of the lines would cause rejection of the labels during inspection.

In both print-to-cut and color-to-color registers the predetermined position is one that is affected by the width or thickness of the printed lines and by the minimum width of space between two lines that is recognized in electronic scanning. In the foregoing examples the line widths have been made equal to the desired spaces between the edges of the label and between the lines. It is evident that added lines may be printed in the space between lines 11, 14 of FIGS. 1 and 2, or in the space between lines 18, 19 of FIGS. 3–6, so as to combine a code or presence of color inspection (indicated in my aforesaid patent) with the print-to-cut and/or the color-to-color register.

In FIG. 7 there is shown an example of a code inspecting apparatus, identical with that shown in my said prior patent, which apparatus comprises means for providing an inspection zone, such as an endless belt conveyor 24 for moving labels 10 having code marks or lines thereon through this zone; a photoelectric device including light sensitive means, such as a phototube 25, which is focused on a point P through which the articles are to be passed by the conveyor 24; a source of light, such as a lamp 26 having a filament, the reflected image of which is preferably of the same length and width as a code line, for directing a narrow light beam B on the point P, whereby portions of the code are adapted to reflect as a beam R onto the light sensitive means of the phototube 25; and an electronic counter 27 electronically connected to the photoelectric device for actuation thereby through a thermionic tube 26, which may be considered part of the photoelectric device and which is adapted to transmit impulses to the counter in response to signals produced by the phototube.

From the foregoing description it will be seen that the present invention provides an improved, simple, reliable and economical method for inspecting labels and the like for print-to-cut register, color-to-color register, and additional codes in combination therewith.

As various changes may be made in the form, construction, and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matters are to be interpreted as illustrative and not in any limiting sense.

What is claimed is:

In the art of multicolor printing and cutting of a sheet to form a plurality of labels, a method which comprises the steps of:

simultaneously printing in one color on each of said labels data in a body portion thereof and a pair of spaced lines along a longitudinal edge portion thereof,

printing said lines perpendicularly to said longitudinal edge portion and printing each of said lines a predetermined distance from an associated transverse edge portion of said label,

subsequently printing in a second color on each of said labels additional data in a body portion thereof and an additional pair of spaced lines parallel to and at a predetermined distance from said first mentioned lines,

cutting said sheet to obtain individual labels therefrom,

and electronically inspecting said individual labels to determine if all of said lines are separately distinguishable so as to determine if the first and second colors printed are in register with each other and to determine if the cut was properly registered with each of the printed colors.

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WILLIAM B. PENN, *Examiner.*