United States Patent

Scholl

[15] **3,670,615**

[45] **June 20, 1972**

[54] WEB MARKING DEVICE

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[22] Filed: **Nov. 18, 1970**

[21] Appl. No.: **90,537**

[52] **U.S. Cl.** **83/367,** 83/923

[51] **Int. Cl.** **B26d 5/00**

[58] **Field of Search** 83/360, 364, 367, 923

[56] **References Cited**

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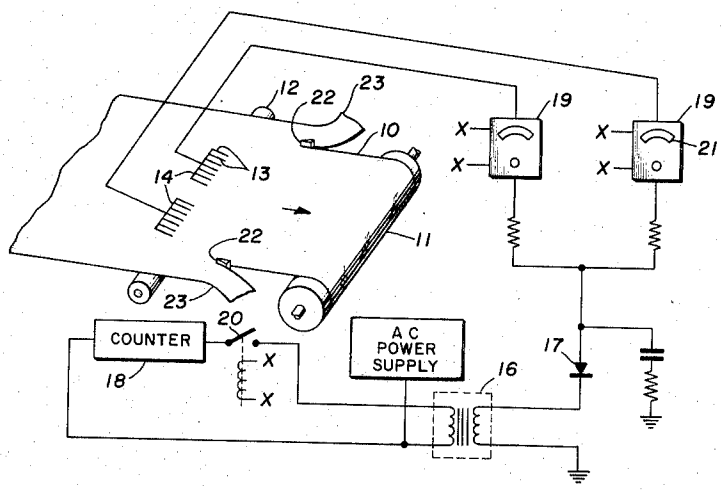
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[57] **ABSTRACT**

A marking device is employed in conjunction with a system for electrically detecting defects in a nonwoven web. The marking device uses the trimmings or waste portions of the web rather than marking the usable portion of the web. In response to a signal indicating the presence of a defect, the marking device moves the web laterally inward thereby leaving at least a portion of the trim attached to the web at the location of the defect.

3 Claims, 3 Drawing Figures



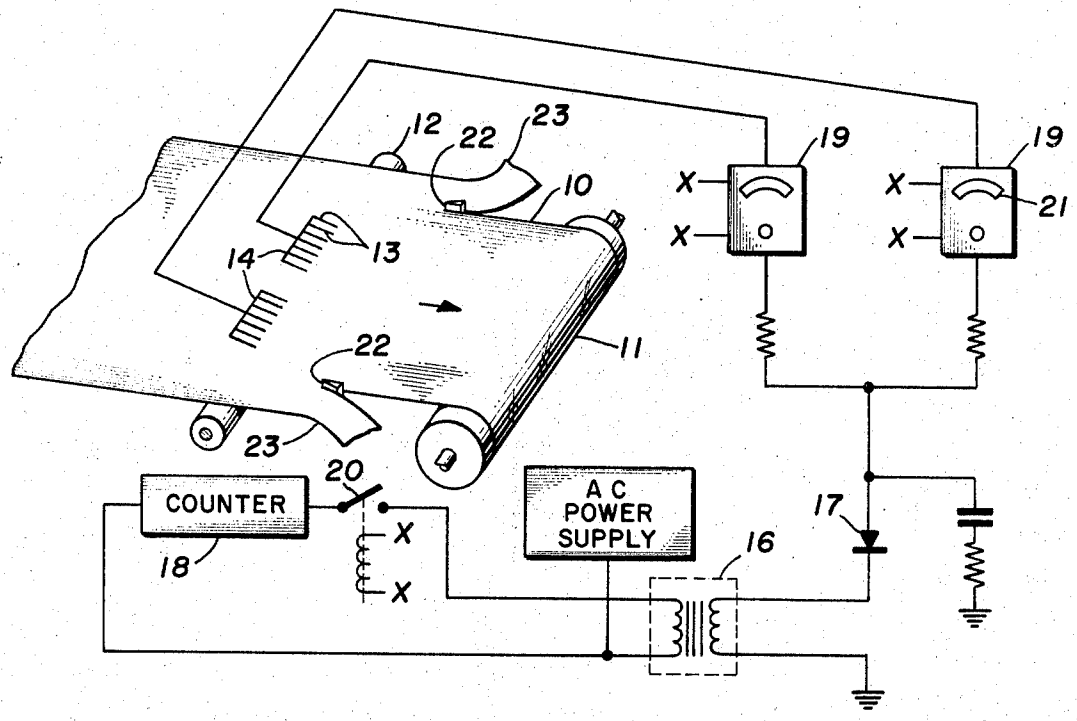


FIG. 1.

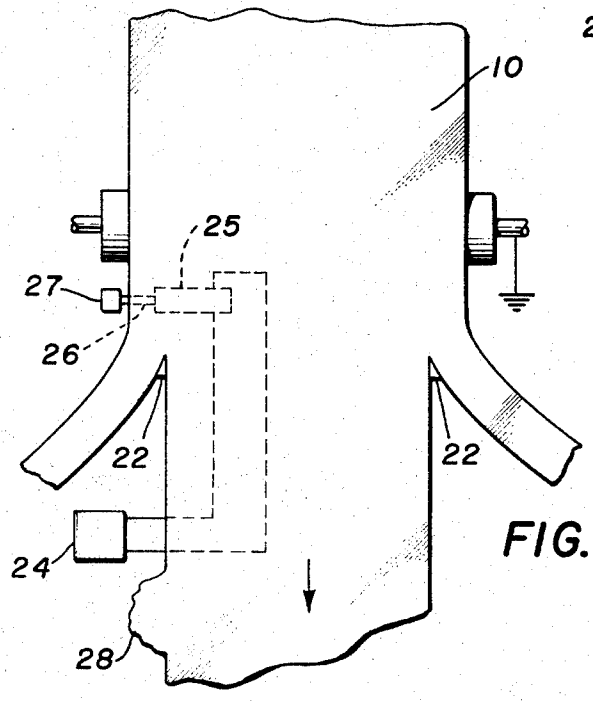


FIG. 2.

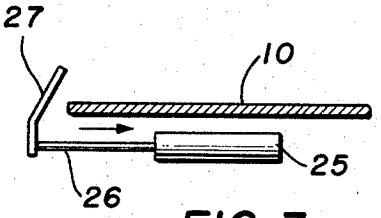


FIG. 3.

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WEB MARKING DEVICE

CROSS-REFERENCES TO RELATED INVENTIONS

The present invention is related to concurrently filed application Ser. No. 90,555.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a device for marking a web at the location of a defect.

2. Discussion of the Prior Art

The increasing popularity of nonwoven webs and their varied applications have placed greater burdens on quality control. Web defects generally take the form of a non-uniformity in the web thickness such as a tenuous or thin region. The overall thinness of the webs make visual observations of the defects extremely difficult, if not impossible. In my copending and concurrently filed application, I have discussed and claimed a method and device for the detection of web regions thinner than a predetermined standard thickness. Briefly, the web is caused to move over an electric conductive member. A contacting means contacts the web along its width as it passes over the electric conductive member. The member and contacting means are part of an electric circuit in which a small current may flow. When a thin web region passes between the conductive member and contacting means, the current increases in value due to the decreased resistance therebetween. A circuit element such as a relay preset to respond to current variations closes a switch when the current exceeds the preset value. A counting means then cycles to count the presence of a defect. This arrangement then provides an automatic arrangement for indicating both the presence and total number of defects.

SUMMARY

I have provided for a new and improved device for marking locations of a web adjacent to regions containing thin defects. The device advantageously uses portions of the webs such as trim which are otherwise to be discarded to identify the defects. Briefly, and in accordance with my invention, as the web moves by a detector such as described in my referenced copending application, an electrical signal is generated. The web is moved laterally inward in close proximity to the trimming means in response to the signal. Thus, trim is left attached to the web at the location of the defect. The remaining trim provides a readily identifiable visual signal of the defect even when the web is on a take-up roll.

The features of the present invention which I desire to be protected are set forth in the claims. The present invention along with other features may be best understood through a reading of the following description taken in conjunction with the following drawings in which:

FIG. **1** is a schematic of a web defect detector which may be employed in cooperation with my present invention.

FIG. **2** is a top plan view of a defect marker construed in accordance with one embodiment of my present invention.

FIG. **3** is a view in vertical cross-section of a solenoid operated air cylinder and arm which comprise a portion of the present invention.

DESCRIPTION

Since the marking device of the present invention is intended for cooperative use with a device for detection of web defects, it may be best understood by initially discussing the elements comprising an operation of a detection system such as the one described and claimed in the referenced application.

As seen in FIG. **1**, a web **10** is being moved toward take-up roll **11**. The movement may be supplied by roll **11** itself or some other driving means not shown. Web **10** and take-up roll **11** as illustrated may constitute the final stages of a web fabrication process. For simplicity, this process is not shown.

Prior to take-up, web **10** passes over an electric conductive member **12** which is grounded. A plurality of drop wires **13** contact web **19** along its width while web **10** is passing over member **12**.

Drop wires **13** as indicated are arranged into a pair of groups **14** each of which is connected to a meter relay **15** or some other form of current sensing device. The power supply for meter relay **15** is provided by AC to DC transformer **16** which, by way of example, transforms 115 volts AC to 170 volts DC rectified by diode **17**. In parallel with transformer **16** is a counter means **18**. A switch **20** shown in an open position acts as a circuit breaker.

Relays **15** are preset so as to remain passive when web **10** passing between drop wires **13** and member **12** is of a predetermined thickness. More particularly, relays **15** are adjusted so as to have a setpoint of a value essentially equal to a current which will pass through relays **15** when web **10** is of the predetermined thickness. Relays of the type employed, for example, may be a Simpson 0–100 microampere, single control, Model 32–26XA and commercially purchasable from Allied Electronic Supply Company.

When, for example, a web region of about 0.002 mil thickness or less, i.e., a web defect, passes between member **12** and drop wires **13**, the current increases because the resistivity of the thin region is less than that of a web region with the predetermined thickness. Relays **15** then function to cause switch **20** to close. Counter means **18**, such as a digital counter, for example, then cycles one count to indicate a defect. The total number of defects may be visually determined from counter means **18**. Relays **15** may be provided with a dial **21** to visually indicate the portion of the web having the defect.

The number of drop wires, drop wire groups, and present relays employed depends upon the accuracy desired. Increased accuracy, that is, the precise location of the defect, would necessitate a larger number of drop wire groups and corresponding preset relays. The proper setpoint on the relays is dictated by the magnitude of the current passing through the relay when a web of the proper thickness moves between member **12** and drop wires **13**.

FIG. **1** also illustrates a trimming element **22** such as a knife edge which trims off portions **23** of the web along the edges. The trim portions **23** are depicted by the dashed lines. Trimming is generally necessary to tailor the web to predetermined width specifications. Cutting elements **22** may be knife edges or, alternatively, an electrically operated cutting device such as opposing rotating cutting wheels.

A marking device of the present invention is depicted in FIG. **2** which illustrates in top planar view web **10** moving over electric conductive member **12**. For simplicity, other elements of the circuit shown in FIG. **1** are depicted generally as detector circuit **24**. A solenoid operated air cylinder **25** positioned adjacent cutting elements **22** is connected in parallel with detector circuit **24**. An arm **26** protrudes from cylinder **25** beyond the edge of web **10**. As seen in FIG. **3**, arm **26** has a right angle portion **27** which extends upward above the plane of web **10**.

In operation, cylinder **25** is activated when detector circuit **24** detects a thin region in web **10**. For example, detection may take place in the manner described for the circuit of FIG. **1**. Thus, due to an increase in current across the web, relays **15** cause switch **20** to close. Referring back to FIGS. **2** and **3**, cylinder **25** then withdraws arm **26** which through right angle portion **27** pulls web **10** inwardly. The inward movement of web **10** causes a wrinkling in the fabric about one of the cutting elements **22** resulting in an uneven cut in trim portion **28**. The uneven cut leaves a portion of the trim cut in a sawtooth pattern attached to the web. Such a pattern is illustrated in FIG. **2** by portion **28**. Portion **28** thus visually indicates the location of a thin region defect even when web **10** is wound upon a take-up roll.

Although cutting elements **22** and cylinder **24** are illustrated as closely adjacent to the contact between web **10** and electric

conductive member **12**, both may be displaced away from the contact region through the use of conventional time delay relays set to trigger cylinder **22** in a time delayed response. The time delay may be appropriately calculated according to magnitude of the displacement and web speed.

It also should be understood that the magnitude of web displacement by arm **26** may be altered as desired. Thus, web **10** may be moved completely away from cutting elements **22**. The only requirement is that a portion of the trim be left attached to the web.

In summary, I have disclosed a device by which defects may be readily located by using the trim portions of the web as an indicator. In response to a signal generated by a defect detector circuit, the web is moved laterally inward in the vicinity of the trimming means. A portion of the trim is then left attached to the web visually identifying the defect location. Other variations and changes will be obvious to those skilled in the art after a reading of the instant disclosure. Such changes and modifications are intended to be within the scope of the present invention as defined by the claims.

What I claim is:

1. A marking device to mark locations of defects in a moving web comprising:

a. a means for longitudinally moving said web;

b. a trimming means for removing excess strips from the edges of said web;

c. a detector circuit for generating an electric signal when a web defect is detected;

d. means for moving said web laterally inward, said means positioned adjacent said trimming means and moving said web in response to said electrical signal thereby leaving a portion of the web trim attached to said web.

2. The device of claim **1** in which said marking means includes an arm positioned adjacent said trimming means and said web, said arm moving the web laterally inward in response to the signal from said circuit means and causing said trimming means to trim said web in an irregular pattern.

3. The device of claim **2** in which said marking means further includes a solenoid operated air cylinder connected to said arm, said air cylinder in response to the signal moving said arm.

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