United States Patent

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[54] **METHOD OF CONTROLLING PATTERN REPEAT LENGTH**
1 Claim, 1 Drawing Fig.

[52] **U.S. Cl.** **101/32,** 101/181; 250/219; 226/28; 318/286; 101/248, 101/219

[51] **Int. Cl.** **B44c 1/24,** B41f 13/10; G01n 21/30

[50] **Field of Search** 101/23, 22, 181, 182, 176, 178, 184, 185, 248, 219; 250/219, 219F, 219RG, 219ID; 226/28, 30, 29, 31; 318/286

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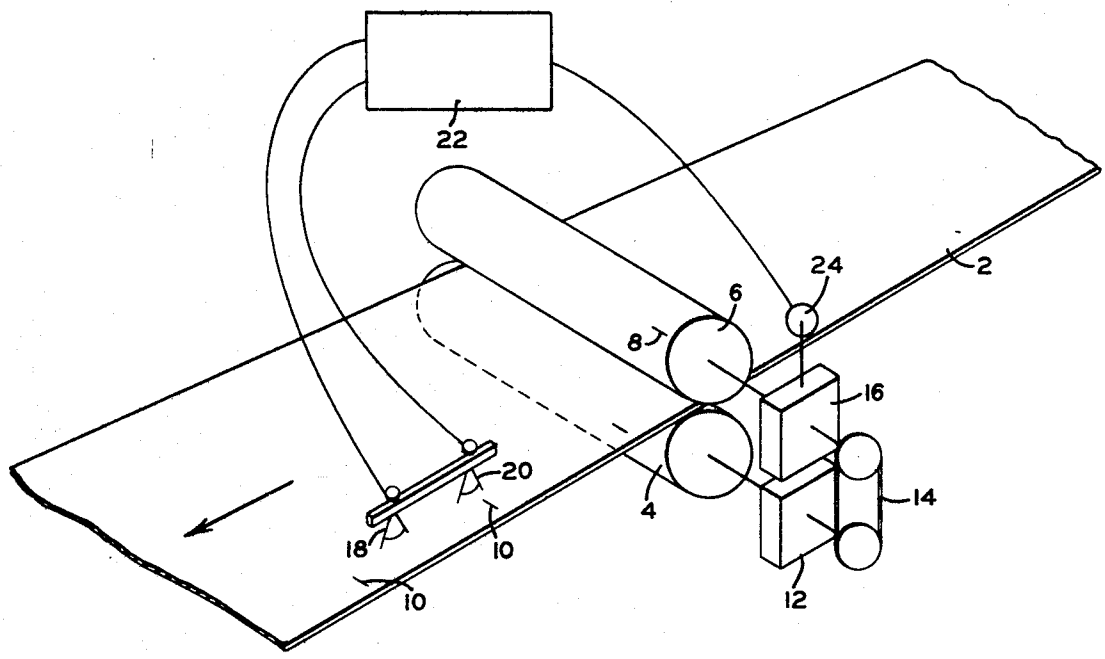
ABSTRACT: The method of controlling the repeat length of a pattern to be embossed on sheet flooring. The embossed material is provided with register marks which appear once for each pattern length. Photocells scan the register marks on the embossed product and sense any deviation from a predetermined spacing. The information sensed by the photocells is transmitted to a computer which operates a DC correction motor to adjust the drive of the embossing roll to return the spacing of the register marks to the predetermined spacing.



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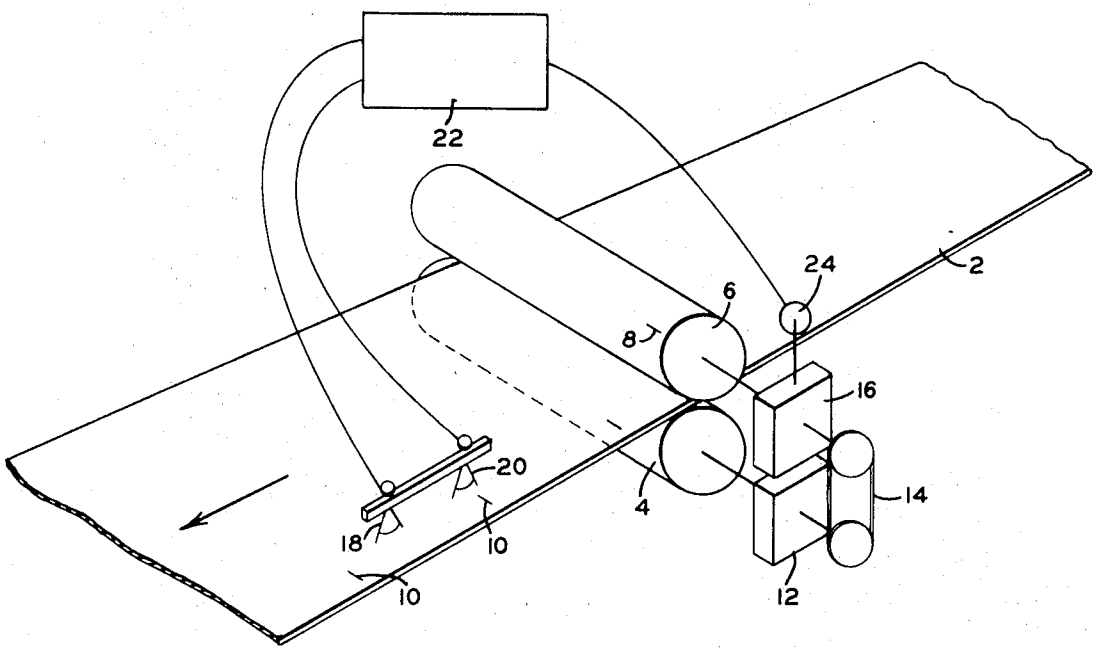

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METHOD OF CONTROLLING PATTERN REPEAT LENGTH

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates generally to rotary printing and/or embossing equipment and, more particularly, to rotary embossing equipment providing a repeat pattern which must be at a controlled spacing.

2. Description of the Prior Art

The state of the art in the flooring industry has reached a point that it is now necessary to provide goods with an embossed design, which embossed design must match up with the design on adjacent goods to form a continuous-type design. In other words, flooring is being made so that it has an embossed design; and in order to secure the proper registration of one sheet of flooring with an adjacent sheet so that the sheets blend into an overall configuration, it is necessary that the sheets be embossed with the same pattern repeat length for each sheet.

If the embossing roll forming the sheet material moves too fast relative to the sheet material, the repeat length of the embossed pattern is compressed, while too slow movement of the embossing roll relative to the sheet material will cause the stretching out of the embossed pattern. Consequently, it is necessary that the embossing roll and sheet material move at exactly the proper relative speeds at all times. Due to normal wear, slippage and other factors in the production line, it is impossible normally to maintain the speed of the sheet material and the embossing roll the same all the time. There is a tendency for the speed of one relative to the other to be either too fast or too slow, and this in turn results in a shrinking or stretching of the embossed pattern. Consequently, when the sheet material is installed with the repeat lengths varying, the designs on adjacent sheets will not be in coordination.

At present, the only way being used to see that the repeat length of the embossed pattern is maintained is a manual control procedure. An inspector measures the repeat spacing of the embossed patterns shortly after they are formed on the sheet. If any irregularity is discovered, a manual control is operated to retard or speed up the drive for the embossing roll. Such an operation is barely acceptable at best as a means of controlling the repeat spacing of the embossed patterns.

It is the object of the invention herein to provide an automatic structure for measuring and controlling the repeat spacing of embossed patterns on sheet goods. The automatic measurement is then used through a computer-type structure to automatically adjust the speed of the embossing roll to bring the pattern repeat spacings back into the required predetermined spacing.

SUMMARY OF THE INVENTION

The invention here is the provision of a repeat control mechanism being provided on a conventional sheet flooring embossing line. A lower drive backup roll is placed under the sheet material, while over the sheet material is placed the embossing roll. The lower roll is direct motor driven while a mechanical differential transmission is connected between the drive for the lower roll and the drive shaft of the embossing roll. Therefore, it is possible to minutely change the speed of the upper roll relative to the lower roll.

The upper roll embosses registration marks on the sheet material along with the embossed pattern. These registration marks indicate the repeat length being generated on the goods. A photocell structure senses the marks on the sheet material; and since these photocells are spaced at the desired repeat length, failure of the two photocells to sense a signal at the same instance indicates a deviation from this desired repeat length. A computer-type structure takes the variation and converts it into the necessary information to drive a DC correction motor. The DC correction motor is connected to the differential drive transmission so as to vary the speed of the embossing roll to return the pattern repeat spacing to the correct dimension.

BRIEF DESCRIPTION OF THE DRAWING

The single FIGURE of the drawing is a perspective view of the invention herein.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The sheet material **2** is a conventional vinyl floor covering which is approximately .090 inch thick. The material is fed over a drive and backup roll **4**. Directly above roll **4** is an embossing roll **6** which is used to emboss the sheet material with a design pattern. Obviously the embossed pattern will be a repeat pattern since a roll embosser is being used. The upper roll **6** has a registration marks **8** which are formed on the sheet material as registration marks **10**. The spacing between any two adjacent registration marks **10** is an indication of the length of a repeat pattern. A conventional motor **12** drives the lower roll **4**. Appropriate connecting mechanism **14** connects motor **12** to a differential draw transmission **16**. The transmission **16** is in turn connected with the embossing roll **6** and drives this roll. Ideally, both rolls would be moving at the same speed, and the sheet material **2** would be moving also at the same speed.

Due to any number of factors such as wear on the drive machinery, slippage along the production line, etc., the sheet material **2** may be driven at a speed greater than or less than the circumferential speed of the embossing roll. When the circumferential speed of the embossing roll and the sheet material differ, this will vary the repeat spacing. Too fast movement of the embossing roll relative to the sheet material causes the repeat spacing to be smaller than the standard repeat spacing while too slow movement of the embossing roll relative to the sheet material causes the repeat spacing to be longer than the standard repeat spacing.

When the spacing between any two registration marks **10** varies from the standard, it is necessary to immediately note this factor and correct the speed of the embossing roll.

The apparatus for correcting the speed of the embossing roll utilizes two photocells which are mounted on a common mounting bar. The first photocell **18** is fixedly mounted while the second photocell **20** is adjustably mounted so tat the two photocells may be set apart the standard repeat spacing. The photocells are positioned to sense the register reference marks **10**. If both photocells sense marks at the same instance, then the repeat spacing must be the required standard spacing. When the photocells sense marking at different instances, it is, therefore, necessary to correct the speed of the embossing roll. Depending on whether the repeat length is shorter than the standard or longer than the standard, either photocell **18** or **20** will sense the mark first; and the time difference between the sensing of the marks by the two photocells will indicate the amount of error. The particular cell which senses first determines in which direction the error exists.

The information secured by the photocells is fed to a computer-type structure **22**, which is similar to that shown in U.S. Pat. No. 3,073,997, issued Jan. 15, 1963. Such a computer-type structure is conventional in the art and merely takes the information sensed by the photocells and generates a correction signal. The correction signal indicates in which direction and by what magnitude there is an error in the repeat spacing. The correction signal is fed to a DC correction motor **24**, which is connected to the differential draw transmission **16**. Depending upon whether the repeat spacing is too long or too short and to what extend, the DC correction motor operates to alter the transmission so that the speed of the embossing roll is changed in the right direction and by the right magnitude to return the repeat pattern spacing to its correct spacing.

While the preferred embodiment describes an embossed operation, the concept is equally applicable to a rotary printing operation wherein the printing operation merely provides

printed design in lieu of an embossed design. The concept is also applicable to a combined printing and embossing operation.

I claim:

1. A method of controlling the repeat spacing of an embossed pattern on a sheet flooring material, the steps of embossing the sheet material with a repeat pattern, placing registration marks on the sheet material with a spacing the same as the repeat spacing of the embossed pattern, positioning two photocells relative to the registration marks, spacing the photocells apart the distance of the standard desired repeat spacing, sensing the registration marks with the photocells, feeding the sensing of the photocells to a computer means,

which fails to operate when both photocells sense marks at the same instance, but operates to create a correction signal when the photocells sense marks at different instances, providing a power drive for the embossing roll, providing a DC correction motor drive for the power of the embossing roll to adjust its speed and feeding the correction signal from the computer means to the DC correction drive whereby variations in pattern repeat spacing as sensed by the photocell structures is fed to the computer means to generate a correction signal to operate the embossing roll drive to correct the speed of the embossing roll drive to return the repeat pattern spacing to the required standard spacing.