United States Patent [19]

Stone

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[54] **SYSTEM AND METHOD FOR MEASURING DRYING TIME**

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[52] **U.S. Cl.** ..... **73/150 R**

[51] **Int. Cl.** **G01n 33/32**

[58] **Field of Search** ..... 73/150 R, 7

[56] **References Cited**

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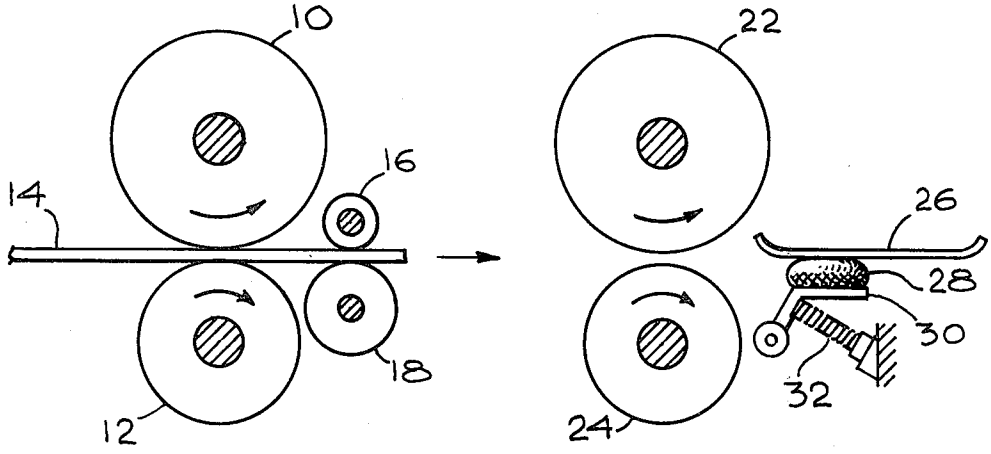
[57] **ABSTRACT**

The drying time of the ink used for printing an image is determined by applying spaced ink markings on a recording medium, for example paper, metal or the like. The recording medium is moved past an abrader. From the number of unsmeared ink marks which occur prior to the first smeared ink mark, the drying time for the ink may be determined.

2 Claims, 2 Drawing Figures



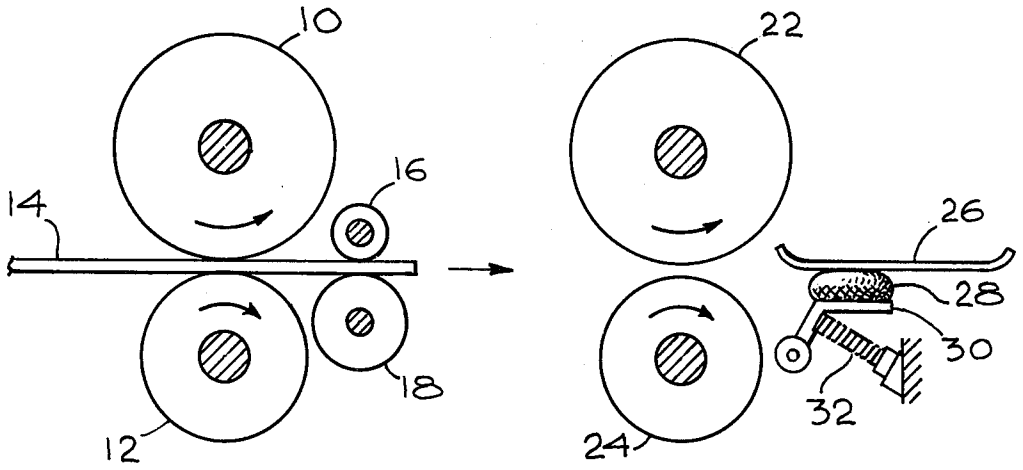


Fig. 1

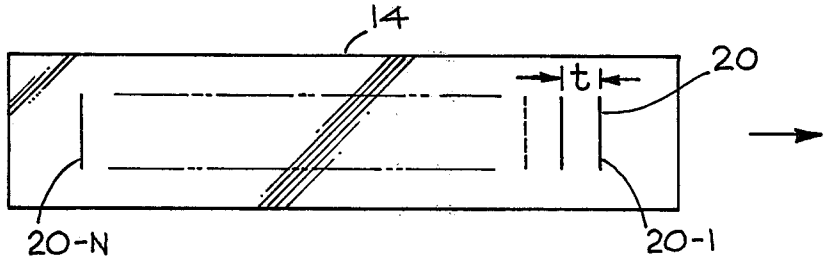


Fig. 2

SYSTEM AND METHOD FOR MEASURING DRYING TIME

BACKGROUND OF THE INVENTION

This invention relates to a method and means for determining the drying time of an inked image and more particularly to improvements therein.

One of the problems in testing printing is the determination of the drying time of the image printed. In practical situations, the material upon which images are printed must be transported from the printer to various output stations. In the process of conveying the document, the material contacts rollers, guides and belts. The printed images must not, as a result of these contacts, be smeared, distorted or offset to an extent that may cause problems in the later use of the images. It is therefore important to determine the maximum time that must be provided by the equipment to assure that the images are smear free.

OBJECTS AND SUMMARY OF THE INVENTION

An object of this invention is the provision of a novel method and means for determining the drying time of a marking fluid image, drying time being used in the broad sense of the time necessary for the deposited marking fluid to achieve smear free status.

Yet, another object of this invention is the provision of a simple and useful method and means for determining the drying time of an inked image.

These and other objects of the invention are achieved in an arrangement wherein an exemplary recording medium in the form of a sheet of paper is moved through a printer at a uniform rate and the printer applies uniformly spaced markings to the paper. When the last image or marking has been applied to the paper, the record medium is accelerated to quickly reach an abrader. The abrader has the function of smearing any one of the images which are not dry. The point along the printed pattern at which smearing first appears is used as an indication of the drying time.

The rational for determining the drying time from the foregoing is as follows. The first marking which appears under the abrader has the longest time to dry since it is printed first. The time to dry of the other markings is shorter by the time required for the paper to advance under the printer. Since the time interval between these markings is known, and since the time for the first marking to have been printed to reach the abrader is determinable, the drying time is equal to the time for the first image or marking printed from the instant of printing to the time it reaches the abrader less the number of markings between it and the first smeared marking.

The novel features of the invention are set forth with particularity in the appended claims. The invention will best be understood from the following description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a chematic drawing of the printing apparatus employed in this invention.

FIG. 2 illustrates the type of printing which may be used in accordance with invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. **1**, a first pair of drive rollers, respectively **10, 12,** drive a sheet of paper, **14,** through a printing station consisting of a printing roller, **16,** and a backing roller, **18.** The printing station applies regular timing markings to the paper **14** with the ink whose drying time is desired to be calculated.

FIG. **2** shows a sheet of paper, **14,** upon which timing markings such as the lines **20,** are applied. There are N of these markings **20** applied to a sheet of paper. The one closest to the leading edge of the paper will be designated as **20-1** and the one which is closest to the trailing edge of the paper is designated as **20-N.** The interval required for the paper to move between markings during printing is designated as *t*.

As soon as the last of the markings has been applied to the paper **14,** the leading edge of the paper reaches a second pair of drive rollers, respectively **22, 24.** The second pair of drive rollers operate to move the paper at a very much higher velocity than the drive rollers adjacent the printing station. Also the second pair of rollers are positioned so that when they contact the paper they do not smear the ink. In other words, they may contact the paper or seize the paper at an edge or at both edges, if required. The very, very quickly moved paper is then pushed through an abrading station. This comprises a plate **26** which is opposed by a pressure pad **28.** The pad is urged against the plate by means of an angle bracket **30,** which is urged by a spring **32** in a direction to move the pad into pressing contact with the plate **26.** The paper is examined after it passes through the abrading station. The bar on the paper at which smearing first occurs provides an indication of the drying time of the ink.

The first timing mark, **20-1,** to be printed on the recording medium has the longest time to dry since it will not be moved to the abrading station until all of the following timing marks have been printed. This time can be measured. It is designated as T_1.

The last timing mark, **20-N,** to be printed has the shortest time to dry since it is quickly accelerated toward the abrader. This time can also be measured. It is designated as T_2.

The uniformly timed marks provide a measuring scale between Mark **20-1** and Mark **20-N** such that the time of passage of any specific mark, **20-*n***, may be determined by the following formula:

$$T = T_1 + (T_2 - T_1)(n-1/N-1)$$

In the foregoing, T is the time interval from the printing of Mark **20-*n*** until it passes under the abrader **28** and, as previously indicated, T_1 is the time required for the first timing mark to reach the abrader, T_2 is the time required for the last timing mark to reach the abrader, and n is the number of the first timing mark to be smeared. Thus, if the Mark **20-*n*** is the first one to be smeared, T is a measure of the drying time.

There has accordingly been described and shown a novel and useful method and means for determining the drying time of a marking fluid on any recording medium on which various marking fluids can be deposited. It should be recognized that the printing means described herein utilizing a pair of rollers and ink as the marking fluid is exemplary only and that a system in accordance with the invention is applicable to other

printing techniques such as ink jet, spray, etc., using various marking fluids.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A system for determining the drying time of a marking fluid deposited on a recording medium comprising

marking fluid deposition means for applying marking fluid timing marks at known intervals therebetween to the recording medium which is advanced therethrough,

first means for advancing the recording medium through said marking fluid deposition means at a regular known rate,

an abrading station for smearing deposited marking fluid prior to its drying on the recording medium,

second means for advancing said recording medium through said abrading station, after the application of a predetermined number of timing marks to said recording medium, at a rate which is very much higher than the rate at which that recording medium was advanced for marking fluid deposition, whereby the drying time of the marking fluid equals

$$T_1 + (T_2 - T_1)\ ((n-1)/(N-1))$$

where T_1 is the time required for the first timing mark to reach the abrader,

T_2 is the time required for the last timing mark to reach the abrader,

n is the number of the first timing mark to be smeared counted in the sequence of timing marks commencing with the first mark to be deposited, and

N is the number of the last timing mark to be deposited.

2. A method of measuring the time required for drying ink on a sheet of paper comprising

printing timing marks in said ink at regular spaced intervals on said sheet of paper at a first rate,

advancing said sheet of paper after the last of the timing marks has been printed thereon through an abrading station at a second rate which is very much higher than the first rate, whereby the time required for drying said ink equals

$$T_1 + (T_2 - T_1)\ ((n-1)/(N-1))$$

where T_1 is the time required for the first timing mark to reach the abrader,

T_2 is the time required for the last timing mark to reach the abrader,

n is the number of the first timing mark to be smeared counted in the sequence of timing marks commencing with the first mark to be deposited, and

N is the number of the last timing mark to be deposited.

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