

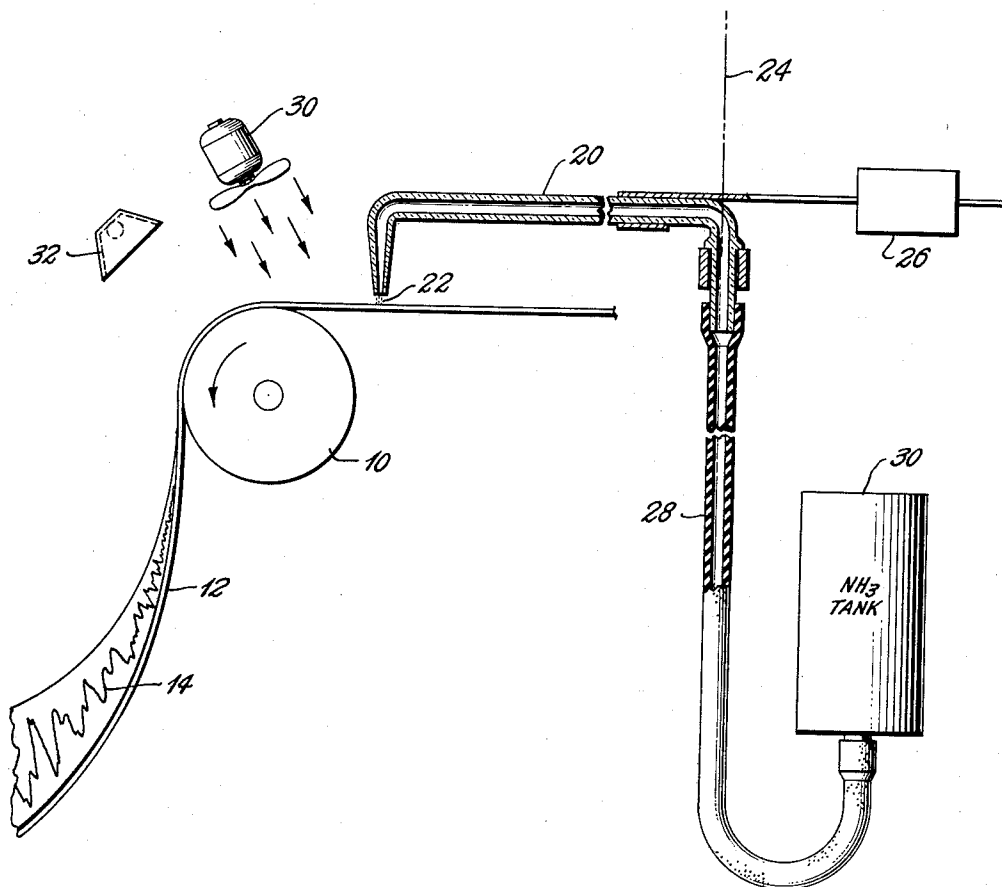
Nov. 6, 1962

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3,063,050

INKLESS RECORDING METHOD

Filed Dec. 17, 1958



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3,063,050

INKLESS RECORDING METHOD

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Filed Dec. 17, 1958, Ser. No. 780,965

2 Claims. (Cl. 346—1)

This invention relates to a method of recording and more particularly to an improved method utilizing a thin stream of fluid issuing from a hollow moving pen and reacting with a chemically treated recording medium to form a dye and trace the locus of pen movement.

The recording instruments in common use are usually comprised of a pen, actuated in its movements in accordance with the data to be recorded, which rides on a moving web of paper and deposits an ink trace. Such instruments are subject to the disadvantage of frictional engagement of the pen with the paper causing a drag which opposes the pen movement. This drag materially affects the accuracy of recording so that when very precise measurements are necessary, they are unobtainable on commercial instruments. Efforts have been made to reduce the drag effect and increase the efficiency of the recorder by removing the pen from the recording paper and blowing a stream of air containing droplets of ink through the pen. In another instance, the stream of air contained no such printing medium, but instead the pressure of the air stream forced a colored liquid from the paper interstices. In still another instance, the air stream pressed the paper against a marking medium positioned on the reverse side of the paper. Such efforts have been subject to numerous disadvantages including: the frequent clogging of the ink in the pen passage, the spread of the liquid ink on the paper, the complexity of the apparatus required, the difficulty of making necessary adjustments, and the need for special apparatus and recording mediums not generally or easily available.

In the instant invention, frictional drag of the pen is eliminated by moving the pen from the recording paper but the recording trace is very simply obtained with commercially available materials and common apparatus only slightly modified. The improved method contemplates blowing a fine jet of gas through the pen against a recording paper treated with a reagent which chemically reacts with or in the presence of the gas at the points of impingement to form a dye and leave an accurate trace of the data to be recorded. The improved method preferably uses materials, chemical compositions, and reactions available and known in normal Ozalid or similar processes of reproduction.

The present most common Ozalid reproduction process is the two component method. In this method, paper or any other suitable base is coated with a solution that contains a light-sensitive stabilized diazo, such as diazo anhydrides stabilized by employment of metal salt complexes, and an azo coupling component, such as hydroxy derivatives of naphthalene, resorcinol, and the like. The paper is exposed to ultra-violet or fluorescent light under a pattern. Where the pattern is transparent, the light penetrates the pattern and decomposes the diazo. Where the pattern is opaque to light, the diazo remains undecomposed. On treatment of the exposed paper with ammonia vapors or with an alkaline solution, an azo dye is formed at those places where the diazo was not destroyed through coupling of the residual diazo compound with the coupling component; no dye is formed at those places where the diazo was fixed or burned out. In the method of the present invention the ammonia, captive in a fine jet stream, is released under pressure to follow a precise recording instrument and form a delicate pat-

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tern on the recording paper. The paper is then fixed by decomposing the light-sensitive diazo. This is substantially a reversal of the Ozalid procedure which first applies light and then ammonia. Such reversal if applied to normal Ozalid reproduction processes and machines would yield no usable prints.

It is a primary object of the present invention to provide an improved method of recording which will permit more accurate recording results by elimination of the friction of the recording pen or stylus.

Another object of the invention is to provide an inkless method of recording which depends upon the immediate chemical reaction of a fluid carried by the moving pen with a reagent composition coating or impregnating the recording medium.

A further object of the invention is to provide an improved recording method which is simple in its operation and may be easily carried out with readily available materials and apparatus requiring only slight modification.

The novel features that are characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment when read in connection with the accompanying drawing.

In the attached drawing, the single FIGURE is a diagrammatic sketch with conventional parts omitted of apparatus capable of performing the method of the present invention, wherein reference numeral 10 indicates a drive drum of a recording instrument over which is trained a strip of recording paper 12. The recording medium 12 is preferably paper coated with a diazo emulsion of a yellowish color which reacts with ammonia gas or vapor to form a blue, brown or black dye. The ammonia used in the process is contained under pressure in a tank 30 and fed to the hollow pen or stylus 20 by means of flexible rubber or other suitable tubing 28. Appropriate controls in the form of valves or stopcocks, not shown, may be inserted in the line to control the pressure and movement of the ammonia. The hollow stylus 20 is pivoted for movement about an axis 24 according to the force applied by a measuring instrument, and is counterbalanced by adjustable weight 26 so that it will move in proximity to the paper 12 but without touching the paper. A fine stream of ammonia gas 22 is directed from the stylus 20 against the paper 12 and an immediate reaction at the points of impingement of the stream of ammonia is obtained to form the color trace 14 of the movement of the pen. A fan 31 may be simultaneously operated to blow air against the paper adjacent to the point of the stylus. This dissipates any spreading ammonia vapor so that only the concentrated and thin stream which strikes the paper will produce a sensitive and accurate trace of the pen movement, and prevents unwanted blurring by ammonia excess to the jet from the pen. Preferably, the paper is subjected to fluorescent or ultra-violet light from lamp 32 after the dye trace has been chemically formed so that the unreacted portions of the paper are fixed and will not later discolor as a result of the presence of ammonia in the environment or atmosphere to which the paper may be removed.

In performance of the methods with the described apparatus, the velocity of the ammonia jet is first regulated by adjustment of the gas pressure, and the pen is adjusted to float just above the paper by appropriately setting the weight 26. The recording instrument is then placed in operation to move the pen to register the data to be recorded. The ammonia gas is fed from tank 30 through the stylus 20 and from its open end, in a fine stream, to the paper 12. A practically instantaneous

chemical reaction occurs in the paper coating at the points of impingement of the ammonia jet to discolor the paper and leave a color trace. The instrument drum 10 moves the paper at a proper speed so that a continuous and precise trace 14 of the data being recorded by the stylus 20 is obtained. During the operation, the fan 31 dissipates the ammonia vapor not used in the reaction with the paper coating. The ultra-violet light from lamp 32 fixes the unreacted portions of the paper by decomposing the diazo in the coating. It has been found that excellent results are obtained with a relatively low pressure of about 5 pounds per square inch of the ammonia gas to write at speeds up to about 1" per second on the paper. Higher pressure will allow a higher rate of speed.

It is evident that only slight modification of commercially available recording instruments is necessary to practice the instant invention, e.g., the addition of the ammonia tank and control, and the provision for adjustment of the pen away from the paper. The paper is commercially available and is used in Ozalid processes. The ammonia gas is also commercially available. Thus, the improved method may be utilized with little difficulty or expense.

Although a movable recording element or pen has been described, it will be understood that the data may be recorded in the same manner with a fixed recording element provided the record medium is moved in accordance with the data to be recorded. If desired, an alkaline solution may be utilized in place of the ammonia gas to form the dye on the recording paper.

Although a certain specific embodiment of the invention has been shown and described, it is obvious that many modifications thereof are possible. The invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

What is claimed is:

1. A method of recording data comprising:
 - (a) supplying a gas under pressure to a hollow recording element in close proximity to a record treated with a chemical reagent adapted to be discolored by said gas,
 - (b) moving said recording element and record relatively without touching in accordance with the data to be recorded,
 - (c) emitting a fine stream of said gas from said recording element during said relative movement against said record to react chemically and form a thin color trace on said record at the locus of points of impingement of said gas,
 - (d) blowing a stream of air against said record in close proximity to said recording element at an area just ahead of said color trace to remove the unreacted portion of said gas therefrom immediately after contact and thereby avoiding further chemical reaction and blurring of said color trace, and
 - (e) immediately ahead of the area where said air is directed against said record exposing said record to an environment to fix said record from any further chemical reaction.
2. The method of claim 1 wherein said gas is ammonia.

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