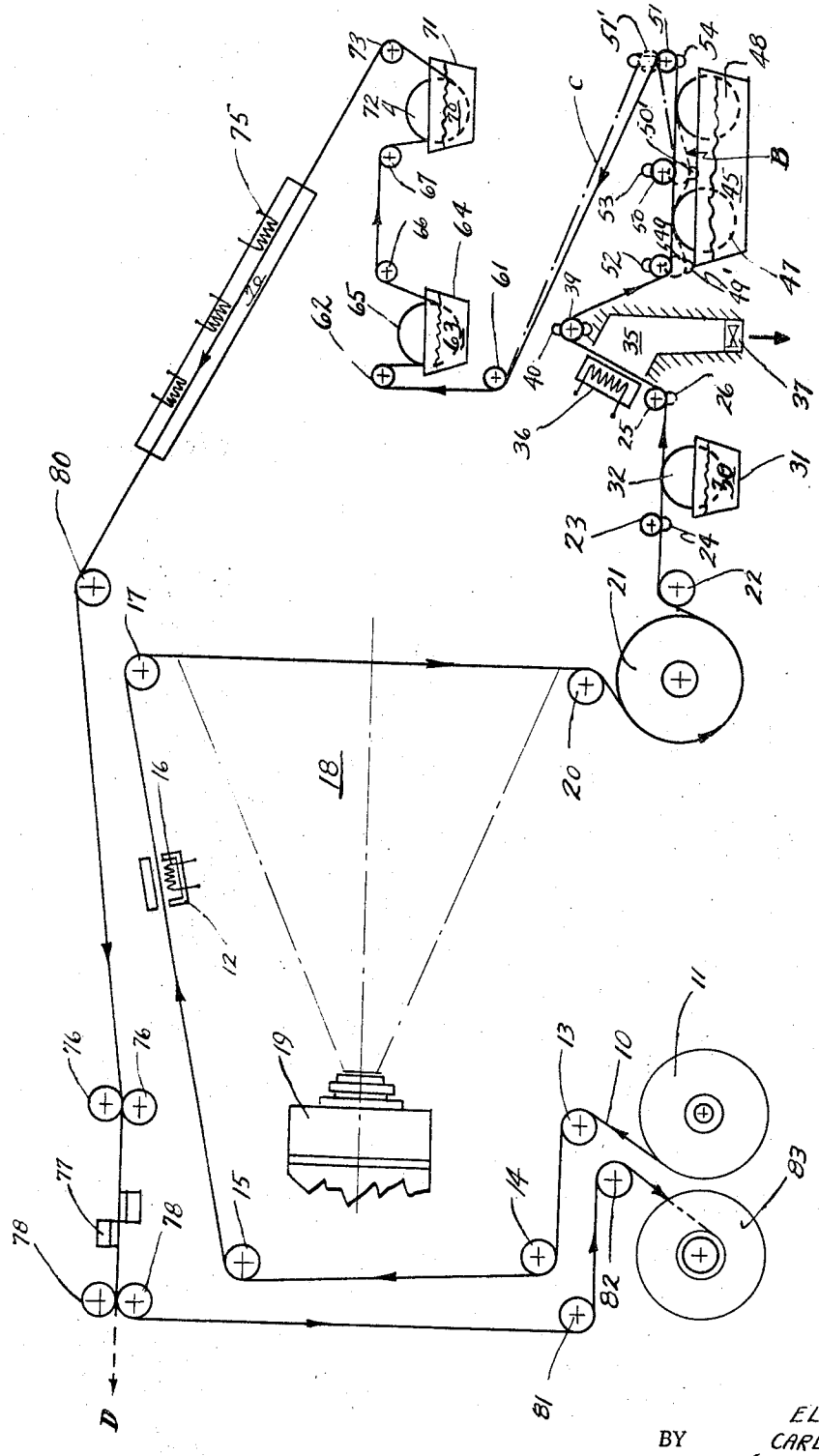
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E. BERMAN ET AL

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DATA PROCESSING SYSTEM

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DATA PROCESSING SYSTEM

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ABSTRACT OF THE DISCLOSURE

The invention relates to a data storage process wherein a photoconductive medium is exposed to an image and developed by sequential contact with a first solution containing metallic ions and then a second solution containing a reducing agent for said ions. Background discoloration is substantially reduced by drying the medium after contact with the first solution and prior to contact with the second solution.

The invention relates to systems, methods and apparatus for data storage. The invention more particularly relates to improvements and systems for processing photographic copy media of the type disclosed in commonly owned copending application Ser. No. 199,211 filed May 14, 1962, now abandoned.

Commonly owned copending Berman et al. application Ser. No. 199,211 filed May 14, 1962, the details of which are incorporated herein by reference, discloses a photographic imaging or copy media comprising photoconductive materials, i.e. materials having light activatable electrons, adaptable to use in the systems of the present invention. Exposure of such media to an image pattern of activating radiation renders chemically reactive those portions of the photoconductor media which are struck by radiation. For example, according to the teachings of the copending application a filled or coated paper comprising a photoconductor such as titanium dioxide in exposed to an image pattern of radiation, and is then developed by simple contact with a developer system forming an image by redox reactions occurring at activated chemically reactive portions of the photoconductor. For example, the exposed medium may be contacted with a solution containing ions of a metal such as copper, silver, mercury, and gold. The ions are reduced to free metal on contact with activated chemically reactive portions of the copy medium. Although exposures can be used which are sufficient to cause precipitation of such an amount of metal ion to free metal as will form a visible image in the copy medium, shorter exposure times can also be used. These result in the deposition of amounts of free metal which are insufficient to form visible images. Such "latent developed images" can be subsequently amplified by contact with developer systems of a type known in the silver halide photographic arts, for example, such as those comprising silver ion in admixture with a reagent forming a redox system, such as hydroquinone. Developer systems of this type tend to deposit further free metal on a surface where free metal is already present, and can be used in the present invention to amplify a priorly formed "latent developed image" or can be used along in a single developing step to form a visible image directly.

In a copending application assigned to the common assignee of the instant application, Ser. No. 360,112, filed Apr. 15, 1964, there are disclosed various developer systems useful in the instant data processing system. In one embodiment disclosed therein, a titanium dioxide coated paper after exposure is developed by contacting the sheet with a developer bath containing a source of ionic silver, in the form of silver nitrate to produce a latent developed

image. The latent developed image is then brought into contact with an amplifying solution containing, for example, Phenidone which causes the image to be amplified and become visible. The exposed, developed and amplified prints are then stabilized or fixed as desired, and then washed. In order to achieve an economical processing system, it is desirable that the silver be put on the exposed sheet in controlled amounts to form the latent developed image. It has further been found that the presence of moist ionic silver on the surface of the sheet as it enters the amplifying solution tends to cause background discoloration in nonimage areas.

Accordingly, it is an object of the present invention to provide an improved data processing system.

Another object of the present invention is to provide a data processing system that is economical in its operation.

A still further object of the present invention is to provide a data processing system in which background discoloration of the copying medium is substantially reduced.

For a better understanding of the present invention, together with other and further objects thereof, reference is made to the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

In the drawings:

FIG. 1 is a schematic illustration of a data processing system embodying the invention.

In FIG. 1 the date storage medium is shown as an elongated web **10** stored on a supply spool **11**. For the sake of simplicity in describing the inventive data processing system, details such as housings, drive motors, light baffles, seals, etc. have been omitted.

The data storage medium **10** comprising a photoconductive material of the type described in copending application Ser. No. 199,211, including materials such as Ge, BN, TiO_2, ZnO, ZrO_2, GeO_2, In_2O_3, $K_2Al_6Si_6O_{22}$, $2H_2O$, SnO, Bi_2O_3, PbO, BeO, Sb_2O_5, SiO_2, $BaTiO_3$, Ta_2O_5, TeO_2, B_2O_3, ZnS, and SnS_2, for example. Many of these compounds are photoconductive compounds of metals with non-metals of group VI A of the Periodic Table, for example metallic oxides and sulfides. The materials, suitably in the form of finely-divided water-insoluble particles, may be simply deposited on a substrate, as on a glass plate, or dispersed in a self-supporting material such as plastic foil or the fibrous web of a paper, or dispersed in a suitable binder and coated onto a substrate such as glass, wood, paper, metal, or other rigid or flexible insulating or conducting materials.

The data storage medium **10** in FIG. 1 is preferably a TiO_2 coated paper. The medium **10** is guided from the supply spool **11** to a deactivating means **12** by means of rollers **13**, **14** and **15**. The deactivating means **12** shown in FIG. 1 includes a light-shielded, electric heating coil **16**. Coil **16** is a source of infrared radiation which uniformly deactivates the photoconductive component of the data storage medium **10** rendering the medium uniformly receptive to activating radiation. Alternatively, a simple dark storage of the medium **10** will tend to deactivate any non-selectively activated portions thereof, but simultaneous use of infrared speeds deactivation. Still other deactivation techniques includes playing a corona discharge, as from a Tesla coil, onto the photoconductive medium.

After uniform deactivation in deactivation means **12**, the image receptive medium is transported over roller **17** and into an exposure means **18**. The exposure means, illustrated, includes a flash illuminated enlarging projector **19** as a source of activating radiation for enlarging or minifying data to be recorded on medium **10** through appropriate optical means. When recording on an elongated web, as shown in FIG. 1, use of a flash illumination permits exposure to be made without stopping the motion

of the web. After exposure the medium **10** is guided over rollers **20**, **21** and **22** into a developing station **30**. From the developing station **30**, the web passes through a drying station **35** into an amplifying station **45** to a fixing station **63** and washing station **70**. The solutions used in stations **30**, **45**, **63** and **70**, respectively, are disclosed in a copending application Ser. No. 360,112, filed Apr. 15, 1964 assigned to the common assignee of the present application. Said copending application is hereby incorporated by reference.

Developing station **30** includes a container **31** having a source of metal ions therein. In the preferred embodiment the metallic ions are silver, and the source thereof is a solution of silver nitrate. The medium **10** is guided through the developing station **30** by rollers **23** and **25**. Solution is applied to the activated portion of the medium by a roller **32** which coats liquid from tray **31** onto the activated surface of the medium **10**. The rollers **23** and **25** are mounted in slots **24** and **26**, respectively, to permit vertical adjustment thereof for varying the amount of wrap of the medium **10** around the roller **32**. By varying the wrap the time of contact of the medium with the developing solution is varied although the linear speed of the medium through the system may remain constant. In addition, applying the developer solution to the image bearing surface provides economic use thereof.

From the developer station **30** the sheet passes into a drying station **35**. The drying station includes a heated platen **36** which contacts the non-image surface of the sheet. Heating causes vaporization of moisture from the previously wetted surface. Moisture thus vaporized is vented to the atmosphere through a conduit **38** having an exhaust fan **37** coupled thereto. Upon leaving the drying station **35**, the medium **10** passes over a roller **39** may be moved in the slot **40** in conjunction with the variation of rollers **23** and **25** in the developing station **30**.

The amplifying station **45** includes a trough **46** containing an amplifying solution of the type disclosed in the aforementioned copending application. The amplifying solution is applied to the surface of the sheet by means of rollers **47** and **48**. The medium is guided through the amplifying station by means of rollers **49**, **50** and **51** mounted in slots **52**, **53** and **54**, respectively. The three rollers are adjustable in the slots to vary the amount of contact between the sheet and the applicator rollers **47** and **48**. For example, if the roller **49** is in position **49'** and roller **50** is in position **50'**, the path of the medium **10** would be as shown by the dash line B. That is, the amount of contact between the applicator roller **47** and medium **10** has been increased over that shown by the solid line. It may also be desirable to use only a single applicator roller if shorter contact time is desired. This is accomplished by raising the roller **51** to the position **51'** whereby the sheet will travel along the path indicated by the dot-dash line C. That is, the medium will only be contacted by the first applicator roller **47**. It will be apparent to those skilled in the art that great flexibility in application variation is provided by the illustrated configuration.

From the amplification station **45**, the medium travels over roller **61** into a fixing station **63**. Fixing station **63** includes a trough **64** and a guiding roller **65** which guides the medium **10** through the solution in the trough. The medium enters the station over roller **62**, contacts roller **65** and emerges over roller **66**. From the fixing station **63** the medium travels to a washing station **70** which includes a trough **71** and a guiding roller **72**. The medium **10** enters the washing station over roller **67**, is guided through trough **71** by roller **72** and emerges over a roller **73**. From the washing station the medium passes through

a dryer generally indicated at **70**. The dryer may be a heated coil type as shown by the coil **75** or any other dryer known in the art. From the dryer, the medium, passes over roller **80** through a pair of pinch rollers **76**. The pinch rollers **76** provide the driving tension for moving the medium through the entire system. A cutting station is shown at **77**, in the event it is desired to cut the medium. Where cut, the medium emerges from the system through the rollers **78** along the dash line D. In the alternative, it is often desirable to wind the processed medium onto a supply spool **83**. This is accomplished by not energizing the cutting means **77** and having the work continue over rollers **78**, **81** and **82** onto take-up spool **83**.

In a modification of the invention, the supply of data storage medium **10** may be completely deactivated prior to its being placed in the system, thus eliminating the need for deactivating means **12**. Further the invention need not be limited to a projection type exposure system but may also be used where other well known means of exposing the medium to an image pattern are used. Furthermore, the fixing station may be a stabilization station and the washing station eliminated if stabilized prints are desired.

While there has been described what is at present considered to be the preferred embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In a data storage system wherein a data storage medium, having a photoconductor itself sufficient as the photosensitive component of said medium, is exposed to a source of activating radiation modified by an image pattern and said exposed medium is contacted with a first solution comprising metallic ions which can be reduced at least as easily as ionic copper and said medium is then contacted with a second solution which comprises a reducing agent for said ions of said first solution, the improvement which comprises drying said medium after contact with said first solution and prior to contacting said medium with said second solution.

2. The improvement of claim **1** wherein said second solution comprises additional metallic ions and a reducing agent therefor.

3. The improvement of claim **1** wherein said second solution comprises silver ions and an organic reducing agent therefor.

4. The improvement of claim **1** wherein said metallic ions are silver ions.

5. The improvement of claim **4**, wherein said silver ions are provided by a silver nitrate solution.

6. The process as set forth in claim **1** wherein said photoconductor comprises titanium dioxide.

7. The process as set forth in claim **1** wherein said photoconductor comprises zinc oxide.

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