United States Patent

[11] 3,617,267

[72] Inventor **William C. Kinney**
Littleton, Mass.

[21] Appl. No. **819,075**
[22] Filed **Apr. 24, 1969**
[45] Patented **Nov. 2, 1971**

[73] Assignee **Itek Corporation**
Lexington, Mass.

[54] **PROCESS FOR FORMING A SERIES OF MASTERS IN REGISTER**
16 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **96/1**, 96/41, 96/27, 96/1.5, 101/456
[51] **Int. Cl.** **G03g 5/00**, G03c 5/04
[50] **Field of Search** 96/41, 44, 67, 75, 1, 1.5, 12

[56] **References Cited**

UNITED STATES PATENTS

2,814,565	11/1957	Long	96/12
3,157,499	11/1964	Trusheim	96/67
3,382,068	5/1968	Gold	96/27
3,429,706	2/1967	Shepard et al.	96/1 X

Primary Examiner—George F. Lesmes
Assistant Examiner—M. B. Wittenberg
Attorneys—Homer O. Blair, Robert L. Nathans, W. Gary Goodson and David E. Brook

ABSTRACT: A process is disclosed for forming a series of masters which reproduce in register selected portions of an original by using a plurality of photosensitive scribable copy media which can be updated. A visible image of the original is formed on each piece of photosensitive scribable copy medium and then an area of the scribable coating is scribed on one of the media corresponding to a selected portion of the original for which a separate master is to be formed. A visible image of the previously scribed area is then formed on another copy medium thereby updating said copy medium. If more than two masters are to be formed, the scribing and updating steps are repeated for each additional portion of the original for which a separate master is to be formed, except for the last of these portions. For the last portion, only the scribing step is repeated.

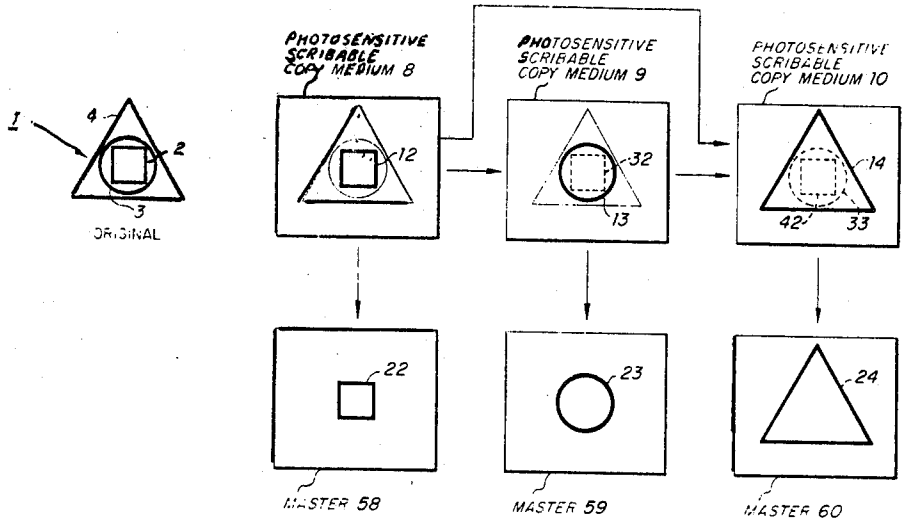


FIG. III.

FIG. I.

FIG. II.

WILLIAM C. KINNEY
INVENTOR

BY David E. Brook

ATTORNEY.

PROCESS FOR FORMING A SERIES OF MASTERS IN REGISTER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a process for using scribable copy media and more particularly to a process for using photosensitive scribable copy media capable of being updated to produce a series of masters which reproduce in register selected portions of an original.

2. Description of the Prior Art

Heretofore, there have been two methods for using photosensitive scribable copy media. In the first, the medium is scribed at selected areas and then used as a template. See Beeber et al., U.S. Pat. No. 2,999,016. In the second, the medium is selectively scribed down to a second intermediate photosensitive layer positioned between the base and scribable coating, exposed, and then color developed so that the scribed medium itself can be used as a master. See Trusheim, U.S. Pat. No. 3,157,499.

Neither of these previously known methods for using photosensitive scribable copy media are suitable for forming a series of masters which reproduce selected portions of an original so that the reproduced portions are in perfect register with each other.

SUMMARY OF THE INVENTION

The invention is a process for forming a series of masters which reproduce in register selected portions of an original. A plurality of photosensitive scribable copy media capable of being updated are used in this process.

A visible image of the original is formed on each of the plurality of photosensitive scribable copy media. One of the media is then scribed at areas corresponding to a selected portion of the original for which a separate master is to be formed.

Another piece of the photosensitive scribable copy medium having a visible image of the original thereon is updated by the addition of a visible image of all previously scribed areas. Thus, any error in the previous scribings can be compensated for or any subsequent scribing errors can be prevented when the updated copy medium is scribed so that perfect register between the various portions of the original will be preserved in reproductions because of the corrected masters.

The steps of scribing and updating the next copy medium to be scribed are repeated for each additional portion of the original for which a separate master is to be formed with the exception of the last portion. Only the scribing step is repeated for the last portion of the original for which a master is to be formed.

Masters can be formed from each scribed copy medium anytime subsequent to the scribing.

Although this process has many applications, it is particularly adapted to the field of colored mapmaking. In making copies of colored maps, it is customary to use a series of color separation printing plates to reproduce selected portions of the map. For example, one plate might reproduce the primary roads of a specific local which are to be red on the map, and another plate might reproduce the secondary roads of the same local which are to be blue on the map. Obviously each of the reproduced portions has to be in register with the other portions for mapmaking applications.

The claimed process allows the scriber to obtain perfect register between the reproduced portions even though one of the scribable copy media has been scribed out of registration. In other words, the claimed process allows the scriber to compensate for a registration error in scribing a prior copy medium because he can update all subsequent copy media before he actually scribes them. The updated copy media will show any errors in register due to the previous scribings, and the scriber simply takes these into account when he scribes the updated copy medium. Since the masters are formed from copy media which have been updated prior to being scribed, the masters will reproduce each selected portion of the original with perfect register.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view of an original which consists of a triangle, circle and square.

FIG. II is a perspective view of a photosensitive scribable copy medium capable of being updated.

FIG. III is a schematic diagram of a process for producing three masters which will reproduce the triangle, circle and square of the original in register.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The process of this invention is used to produce a series of masters, which will reproduce in register selected portions of an original. A composite reproduction of the original can be made by using each master in the series to reproduce its selected portion of the original.

For exact reproduction of the original, it is imperative that each reproduced portion be in register with all of the other reproduced portions. By "in register" is meant that the true alignment of portions of the original is maintained between those portions reproduced by the masters of this invention.

A plurality of photosensitive scribable copy media are used in the process of this invention. The specific number depends, of course, upon the number of selected portions of the original which are to be placed upon separate masters.

To be suitable for use with this invention, the photosensitive scribable copy media have to possess the capability to be updated. By "updating" is meant the addition of further data to a delineated area of a copy medium already carrying data. More specifically for purposes of this invention, updating can be considered to be the addition of a visible image upon another visible image previously placed on a copy medium. Usually, updating involves the desensitization of photosensitive material containing one visible image and the exposing and developing to form a second visible image on the photosensitive material. One such procedure suitable for updating copy media useful for this invention is described in more detail in Pfluke, U.S. Ser. No. 803,152, filed Feb. 2, 1969.

One copy medium having the capability of being updated is illustrated in FIG. II. A base 7 has a scribable coating 6 and a photosensitive photoconductor 5 which is capable of being reversibly activated by activating radiation. Preferred photoconductors for use in this copy medium are compounds of a metal with a nonmetallic element of Group VIA of the periodic chart such as titanium dioxide. That titanium dioxide which has an average particle size of below about 250 millimicrons and which has been pretreated by maintaining it at a temperature of at least about 200° C. for a period of at least about one-half hour in the presence of an oxidizing atmosphere is particularly preferred because of the excellent results obtained with such titanium dioxide. A more detailed description of this photosensitive scribable copy medium capable of being updated is presented in Berman, U.S. Ser. No. 812,191, filed Apr. 1, 1969.

Referring now to FIG. I, an original 1 is illustrated which consists of a square 2, circle 3 and triangle 4. Assume for purposes of this illustration that it is desired to produce separate masters for the square, circle and triangle which can be used to reproduce these portions of the original in register.

Three photosensitive scribable copy media, 8, 9 and 10 are used. Of course, a lesser or greater number could be used in other cases. If the copy media are of the type illustrated in FIG. II, they are desensitized by storage in the dark, exposure to infrared light or hydrogen peroxide, or by any equivalent desensitization techniques prior to use. After such desensitization, the photoconductor should not be exposed to radiation corresponding to its spectral sensitivity prior to use.

Initially, a visible image of the original is formed on the copy media 8, 9 and 10. Visible images are formed by ordinary exposure and development procedures. Techniques for exposing

the photoconductor to an image and developing a visible image are well known by those skilled in the art. Examples of suitable techniques are described in U.S. Pat. Nos. 3,152,903 3,380,823 and 3,382,068. The visible image of the original is represented in FIG. III by the light lines shown on each of the photosensitive scribable copy media **9** and **10**.

The scribable coating on one of the scribable copy media is scribed at areas corresponding to a selected portion of the original for which a separate master is to be formed. As shown by the dark solid line **12**, an area corresponding to the square **2** is scribed on photosensitive scribable copy medium **8**. Scribing can be accomplished by any standard means including heat, chemicals or the use of an instrument such as scribing tool commonly used by draftsmen.

Subsequently, a master **58** is formed using the scribed copy medium **8** which will reproduce the square **2**.

The term "master" is used to mean any article which can be formed from the scribed copy medium and which will reproduce one or more copies of a selected portion of the original. It includes but is not limited to printing plates such as lithographic printing plates which have an oleophilic-hydrophilic differentiation and a printing plate containing diazo materials. The masters of this invention are formed by techniques well known to those skilled in the art and they can be formed immediately after each copy medium is scribed as illustrated in FIG. III or at any later time.

A visible image of each of the previously scribed areas of the photosensitive scribable copy media are now formed on another of the copy media. This updates the visible image of the original initially placed on the photosensitive scribable copy medium because the scriber can now see any misregistration caused by scribing the various areas on preceding copy media. If a registration error has been made, the scriber can compensate for the error when he scribes the next area so that perfect relative alignment will be maintained in the reproductions.

The updating feature can be further illustrated by use of FIG. III. Before or after the master **58** has been formed, the scribed area **12** of copy medium **8** is used to form a visible image of the scribed area **12** on the medium **9**. The updating is indicated by the broken line **32** in the shape of a square on copy medium **9**. If an error had been made in scribing the square **12**, the updated square **32** would not coincide perfectly with the square portion of the visible image of the original initially placed upon photosensitive scribable copy medium **9**. For example, if the area **12** had been scribed slightly to the left of its proper location, the updated square **32** would appear slightly to the left of the square portion of the original initially placed on the copy medium **9** and the scriber could take this into account by scribing the area **13** slightly to the left thereby preserving the relative alignment between the square and circle in reproductions made from masters **58** and **59**.

Masters can be formed by passing activating radiation through the scribed areas of the photosensitive scribable copy media onto master material to form a latent image of the scribed areas and thereafter using standard master preparation techniques which are known to those skilled in the art. The term activating radiation includes visible light, electron beams and other forms of electromagnetic radiation capable of activating a photosensitive material. Contact printing or other similar techniques known to those skilled in the art can be used to update subsequent copy media with previously scribed areas.

Thereafter, the scribing and updating steps are performed for each remaining portion of the original for which a separate master is to be formed except the last portion. In FIG. III, the area **13** is scribed on the photosensitive scribable copy medium **9**, the master **59** is formed to reproduce the circle **23** which corresponds to the scribed area **13**, and the next photosensitive scribable copy medium **10** is updated by forming visible images of both the scribed area **12** and the scribed area **13** on the photosensitive scribable copy medium **10**. The updating is indicated by the broken lines **33** and **42**.

For the last portion of the original **1** for which a separate master is to be formed, the scribing step is repeated. As shown, the area **14** is scribed in the copy medium **10** and the master **60** is formed to reproduce the triangle **24** which corresponds to the scribed area **14** and the original tangle **4**.

By this process, a series of masters **58**, **59** and **60** are produced which each reproduce a predetermined portion of the original **1**. Since the scriber is able to compensate for errors made in scribing any previous areas and to prevent errors in subsequently scribed areas the masters will reproduce the original in register.

If it is desired to reproduce the original so that each portion has a different color, this can be easily accomplished with the masters formed by this process. Assume, for example, that it is desired to reproduce the original **1** so that the square is red, the circle is blue and the triangle is green. All that is required is to ink the master **58** with red link, the master **59** with blue ink and the master **60** with green ink. These masters will then reproduce copies of the original with a red square, a blue circle and a green triangle, and the relative alignment between each portion of the original will be maintained in the reproductions regardless of errors made in scribing the areas **2** or **13** because such errors are compensated for in scribing subsequent portions.

As is apparent from the above description, the process of this invention is useful for forming masters from which reproductions can be made. This process is particularly useful for any application in which it is desired to selectively place portions of an original on separate masters. It is especially applicable where each portion of the original is to be reproduced in a different color and where it is important to maintain the alignment of the portions, as for example, in the art of map-making.

The following example illustrates the invention. All parts and percentages are by weight unless otherwise specified.

EXAMPLE I

Six pounds of a homogenous dispersion of titanium dioxide in polyvinyl alcohol per 3,300 square feet are coated onto the surface of Keuffel and Esser scribable material, stock No. 44–3227, white with a red undercoat, and cured for 2½ minutes at 350° F. The pigment/binder ratio in the dispersion is 1:1 and the titanium dioxide has an average particle size of less than 250 millimicrons.

The coated scribable copy medium is then exposed once at an instrument setting of 10^{12} seconds using an EG&G Mark VI Sensitometer.

After exposure, the photosensitive scribable copy medium is placed in a beaker of 2.5N silver nitrate at 70° F. for 30 seconds with gentle agitation. Excess silver nitrate solution is removed with an air knife and the scribable copy medium is dried with hot air.

A developer solution having a pH of 3.5 and having the following ingredients is used:

Metol	34.0 g.
Diethylaminoethanethiol HCl	1.0 g.
Sodium Thioglycolate	0.25 g.
Potassium hydrogen phthalate	20.0 g.
Citric acid	3.0 g.
Water to 1.0 liter.	

The exposed and sensitized photosensitive scribable copy medium is placed in a covered container of the developer solution at 70° F., and after waiting 5 seconds, the container is rapidly shaken for 25 seconds. After removal from the developer solution, the material is washed with water at 70° F. for 3 minutes and dried with hot air.

A visible image having excellent overall quality is formed on the surface of the scribable material.

The same medium is updated by twice exposing it to an image pattern of activating radiation with the EG&G Mark VI Sensitometer set at 2×10^{13} seconds and processing it in the

same manner as following initial exposure. Following this, the medium is immersed in Kodax F–5 fixing solution for 30 seconds at 70° F., washed with water, and dried with hot air. A second visible image having excellent overall quality now appears superimposed on the first image.

Further updating can be accomplished prior to fixing if desired.

What is claimed is:

1. A process for forming a series of masters which reproduce in register selected portions of an original using a plurality of photoconductive photosensitive scribable copy media which can be updated, comprising:

a. forming a visible image of the original on the plurality of photoconductive photosensitive scribable copy media;

b. scribing a first area of the visible image of the original on one of said media to form a first scribed area on the copy medium corresponding to a selected portion of the original for which a master is to be formed;

c. forming a visible image of the first area of said photoconductive photosensitive scribable copy medium scribed in step (b) upon another of the copy media which already has thereon a visible image of original whereby an error made in scribing said first area can be noted and compensated for in the scribing of a second area corresponding to another selected portion of the original on a second copy medium; and;

d. scribing said second area of the visible image of the original on said second copy medium.

2. A process of claim 1 wherein each of said photosensitive scribable copy media comprises a base with a scribable coating and a photosensitive photoconductor thereon, said photoconductor being reversibly activated when exposed to activating radiation.

3. A process of claim 2 wherein said photosensitive photoconductor comprises a compound of a metal with a nonmetallic element of Group VIA of the periodic chart of the elements.

4. A process of claim 3 wherein said photosensitive photoconductor comprises titanium dioxide.

5. A process of claim 4 wherein said titanium dioxide has an average particle size of below about 250 millimicrons.

6. A process of claim 5 wherein said titanium dioxide has been pretreated by maintaining it at a temperature of at least about 200° C. for a period of at least about one-half hour in the presence of an oxidizing atmosphere.

7. A process of claim 6 wherein step (c) is accomplished by contact printing a visible image of the scribed area onto another photosensitive scribable copy medium which already has thereon a visible image of the original.

8. A process for forming a series of masters which reproduce in register selected portions of an original using a plurality of photoconductive photosensitive scribable copy media which can be updated, comprising:

a. forming a visible image of the original on the plurality of photoconductive photosensitive scribable copy media;

b. scribing an area of the visible image of the original on one of said copy media to form a scribed area on the copy medium corresponding to a selected portion of the original for which a master is to be formed;

c. forming a visible image of each area previously scribed in step (b) upon another of the copy media which already has thereon a visible image of the original whereby any errors made in scribing previous areas can be compensated for in scribing subsequent areas;

d. thereafter repeating steps (b) and (c) for all but the last of the remaining selected portions of the original for which a master is to be formed; and,

e. thereafter repeating only step (b) for the last selected portion of the original for which a master is to be formed.

9. A process of claim 8 wherein each of said photosensitive scribable copy media comprises a base with a scribable coating and a photosensitive photoconductor thereon, said photoconductor being reversibly activated when exposed to activating radiation.

10. A process of claim 9 wherein said photosensitive photoconductor is a compound of a metal with a nonmetallic element of Group VIA of the periodic chart of the elements.

11. A process of claim 10 wherein said photosensitive photoconductor comprises titanium dioxide.

12. A process of claim 11 wherein said titanium dioxide has an average particle size of below about 250 millimicrons.

13. A process of claim 12 wherein said titanium dioxide has been pretreated by maintaining it at a temperature of at least about 20° C. for a period of at least about one-half hour in the presence of an oxidizing atmosphere.

14. A process of claim 13 wherein step (c) is accomplished contact printing a visible image of the previously scribed areas onto another photosensitive scribable copy medium which already has thereon a visible image of the original.

15. A process of claim 3 including the additional step of forming a separate master from each of said scribed copy media.

16. A process of claim 9 including the additional step of forming a separate master from each of said scribed copy media.

* * * * *