DIFFUSION TRANSFER RECEIVING ELEMENT WITH VARYING CONCENTRATION OF PRECIPITATING NUCLEI


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Field of Search ................................. 96/29, 29 L, 33

References Cited

UNITED STATES PATENTS
3,220,837 11/1965 Land et al. 96/29 L
3,567,442 3/1971 Land 96/29 R
3,278,958 10/1966 Regan et al. 96/29 L
3,490,905 1/1970 Blake 96/29 L
2,563,342 8/1951 Land 96/29
3,345,165 10/1967 Land 96/29
2,834,676 5/1958 Stanley 96/29

FOREIGN PATENTS OR APPLICATIONS
746,948 3/1956 Great Britain 96/29

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ABSTRACT
Novel image-receiving elements for obtaining photographic images in silver and photomechanical procedures employing same as an inking master to obtain one or more ink reproductions of the original subject matter.

18 Claims, 1 Drawing Figure
DIFFUSION TRANSFER RECEIVING ELEMENT WITH VARYING CONCENTRATION OF PRECIPITATING NUCLEI

BACKGROUND OF THE INVENTION

Procedures for preparing photographic images in silver by diffusion transfer principles are well known in the art. In a typical procedure of this nature, an exposed light-sensitive silver halide emulsion containing a developable image is developed with an aqueous alkaline processing composition including a silver halide developing agent and a silver halide solvent to reduce exposed silver halide to silver while forming from unexposed silver halide an imagewise distribution of soluble silver complex which is then transferred at least in part, by imbibition, to a superposed silver-receptive stratum where it is reduced to image silver to impart thereto a positive silver transfer image. Procedures of this description are disclosed, for example, in U.S. Pat. No. 2,543,181 issued to Edwin H. Land.

It has heretofore been known that a silver transfer image obtained by silver diffusion transfer procedures such as described above may be employed as a printing master to obtain one or more ink reproductions of the original subject matter.

One particularly useful procedure for obtaining a printing master by silver diffusion transfer is described in U.S. Pat. No. 3,220,837 issued to Edwin H. Land and Merce M. Morse. This patent is predicated upon the discovery that if the silver transfer print has areas that contain silver concentrated primarily at the surface of the silver-receptive stratum in thin but essentially continuous, dense masses and other areas that are substantially silver-free or which do not contain these dense masses of silver, the areas containing these dense silver deposits are oleophilic and hence are inkable or wettable with an oleophilic ink; whereas the other areas which are initially hydrophilic retain their hydrophilic character and hence are not so inkable. In other words, a silver transfer print of this description is characterized as being such that when an oleophilic ink is applied uniformly over the surface of the print, this ink adheres only to the areas of dense silver deposits, so that the silver transfer image may be characterized further as being selectively inkable with an oleophilic or greasy ink of the type commonly employed in lithography. Thus, following application of the oleophilic ink, the inked silver transfer image may be employed in standard lithographic procedures to provide one or more ink reproductions of the original subject matter.

The hydrophilic silver-receptive stratum employed in such photomechanical reproduction procedures typically comprises one of the vigorous silver-precipitating environments such as is described in U.S. Pat. Nos. 2,698,237 and 2,698,245 issued to Edwin H. Land. Such an environment includes a layer containing silver-precipitating nuclei dispersed in a macroscopically continuous vehicle or matrix. This layer providing the silver-receptive stratum is contained on a suitable support material, typically a water-permeable material, e.g., a paper base, in which event a layer of a water-impermeable material is disposed between the silver-receptive stratum and the support. If the support is water-impermeable, this water-impermeable stratum need not be provided. In either instance, the image-receiving element employed in the aforementioned system for providing an ink transfer comprises a layer of silver-precipitating nuclei dispersed in a macroscopically continuous matrix, which layer is contained on the surface of a water-impermeable hydrophobic material.

According to the disclosure in the aforementioned U.S. Pat. No. 3,220,837, the silver-receptive stratum employed to prepare the silver image-printing master is preferably from 1 to 5 microns thick.

However, coating solutions of silver-precipitating nuclei employed to prepare such strata are extremely difficult to coat at these thicknesses. In particular, it has been found not to be feasible from the standpoint of commercial production to prepare strata of such thickness. Accordingly, prior to the present invention efforts to obtain a commercially acceptable image-receiving element for use in the aforementioned lithographic procedures were logically directed towards applying a thinner stratum.

While this use of thinner strata obviated the coating problem, certain new difficulties were presented. One major problem arising from the use of thinner silver-precipitating strata is that in making a plurality of ink reproductions in conventional lithographic procedures, it was found that the combined effects of the fountain solution commonly employed in such systems and the natural abrasive action of the rollers on the printing press tended gradually to remove the hydrophilic layer to bare the hydrophobic underlayer which is wettable with the oleophilic ink. This in turn caused background inking (ink in the highlight or white areas), so that if a great many ink copies are desired after a number have been run off, subsequent copies contained at least some amount of undesirable background inking.

It is to the aforementioned problems to which the present invention is directed.

SUMMARY OF THE INVENTION

According to the present invention, the silver-receptive stratum of image-receiving elements for use in the aforementioned lithographic procedures comprises a multilayer structure wherein each layer of the silver-receptive stratum contains a progressively increasing concentration of silver-precipitating nuclei with respect to the concentration of such nuclei contained in adjacent layers as the distance from the support carrying this stratum increases. In other words, the silver-receptive stratum comprises at least two layers, each of which contains a different concentration of silver-precipitating nuclei with the topmost layer containing the greatest concentration and the layer closest to the support containing the least.

DESCRIPTION OF PREFERRED EMBODIMENT

In the preferred embodiment, each of the layers of the silver-receptive stratum comprises the same silver-precipitating nuclei disposed in a macroscopically continuous vehicle or matrix of colloidal silica, i.e., a matrix formed of definite particles which are essentially silica and which are sufficiently small to be indistinguishable as particles by the naked eye when formed into a layer and whose minimum average size is of colloidal rather than of molecular proportions. In the most preferred embodiment, the silver-receptive stratum comprises two layers of the foregoing description.
The invention accordingly comprises the several steps and the relation and order of one or more of such steps with respect to each of the others, and the product possessing the features, properties and the relation of elements which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description and the drawing.

As was mentioned previously, the present invention is directed to photomechanical procedures for forming ink reproductions, and in particular to procedures of the type described in U.S. Pat. No. 3,220,837 wherein a photosensitive element comprising a light-sensitive silver halide layer is exposed to provide a developable image of the subject matter to be reproduced and the thus exposed element is then developed with an aqueous alkaline processing composition to reduce exposed silver halide and to form from unexposed silver halide an imagewise distribution of a soluble silver complex which is transferred at least in part, by diffusion, to a silver-receptive stratum to impart thereto a silver transfer image characterized as having image areas containing silver concentrated primarily at the surface of this stratum in dense oleophilic masses and non-image or highlight areas which are hydrophilic.

Because of the differential in wettability or inkability between the oleophilic silver image areas and the hydrophilic non-image areas of the silver-receptive stratum, the resulting silver transfer image may be employed as an inking master in standard lithographic procedures to prepare one or a plurality of ink reproductions of the original. Typically, the silver print is wetted with an oleophilic or greasy ink which selectively adheres only to the oleophilic silver areas. However, it is also possible to wet it with a hydrophilic or water-based ink which will preferentially adhere to the hydrophilic non-image areas. Accordingly, it is possible to obtain either positive or negative ink reproductions from such a master, depending upon whether an oleophilic or a hydrophilic ink is employed. As is also known in the art, continuous tone subject matter may be reproduced by such procedures by exposing the silver halide layer through a halftone screen to provide a halftone print.

The silver-receptive stratum employed to prepare the silver print-inking master in general consists essentially of a layer containing silver-precipitating nuclei dispersed in a macroscopically continuous hydrophilic vehicle or matrix. One useful class of silver-precipitating nuclei (often also referred to in the art as silver-precipitating agents) are the metallic sulfides and selenides, these terms being understood to include the selenosulfides, the polysulfides, and the polyselenides. Preferred in this group are the so-called heavy metal sulfides, particularly those whose solubility products in an aqueous medium at approximately 20° C vary between 10^{-20} and 10^{-30}. Useful heavy metal salt silver-precipitating nuclei include sulfides of zinc, chromium, gallium, iron, cadmium, cobalt, nickel, lead, antimony, bismuth, silver, cerium, arsenic, copper and rhodium; and the selenides of lead, zinc, antimony and nickel.

Another class of useful precipitating agents are heavy metals such as silver, gold, platinum, palladium
and mercury, and in this category the noble metals are preferred, these being preferably provided in the matrix as colloidal particles. The salts of these metals, preferably the simple inorganic and readily reducible salts such as silver nitrate, gold chloride and gold nitrate, are also useful as silver-precipitating agents.

Other useful silver-precipitating agents include certain of the thio compounds, e.g., dithiooxamate and its lead and zinc complexes, potassium dithiooxamate and the lead and nickel complexes thereof, thiourea, etc.

Preferred are the heavy metal sulfides, e.g., zinc, cadmium, silver, lead, etc.

The silver-precipitating nuclei are contained or dispersed in a suitable hydrophilic matrix formed of particles, preferably colloidal in size, of a chemically inert, absorbent material. Useful materials for forming the matrix include colloidal silica, such as silica aerogel, fuller's earth, diatomaceous earth, kieselguhr, wood flour, infusorial earth, bentonite, filter aids such as Celite and Super-floss (trade names of Johns-Manville Sales Corp. for diatomaceous earth filtration aids), and finely powdered glass, talc, mica or zinc oxide. Preferred are the colloidal silica matrices.

Silver-precipitating strata comprising a layer containing such silver-precipitating nuclei in a hydrophilic macroscopically continuous matrix of the foregoing description are disclosed in numerous patents of which mention may be made of U.S. Pat. Nos. 2,647,056, 2,698,237 and 2,698,245 issued to Edwin H. Land.

As is further disclosed in such patents, the silver-receptive stratum is typically contained on a suitable support material such as paper, regenerated cellulose, polyvinyl alcohol, cellulose ethers such as methyl cellulose, ethyl cellulose, or other plastic materials. Most preferably the support material is either water-repellant or a layer of a hydrophobic material may be disposed between the silver-receptive stratum and the support. This hydrophobic underlayer may comprise one of the class of hydrophobic materials known to adhere well to the silver-receptive stratum, e.g., one of the cellulose esters such as cellulose nitrate, cellulose acetate, cellulose butyrate, cellulose propionate, cellulose acetate butyrate, cellulose acetate propionate; a rubbery polymer such as polyvinyl butyral, etc.

Preferably the support is a paper base and the silver-receptive stratum is deposited on a hydrophobic layer of the foregoing description. Additional layers performing specific desired functions may also be contained on this support, for example, a stripping layer, e.g., gum arabic, cellulose acetate hydrogen phthalate, polyvinyl alcohol, hydroxyethyl cellulose, methyl cellulose, ethyl cellulose, sodium alginate, etc. may be provided over the silver receptive stratum in accordance with procedures well known in the art to facilitate clean separation of the image-receiving element containing the silver image following development.

As was mentioned previously, the silver-receptive stratum of image-receiving elements heretofore suggested for use in the photomechanical reproduction procedures to which this invention is directed comprised a single layer on the order of 1–8 microns thick. Because of the difficulty in the commercial production of silver-receptive strata of such thicknesses, attempts were made to provide them as thinner layers. However, the thinner layers inherently produced certain disadvantages, chief of which was the tendency for the silver-receptive stratum to be at least partially removed after repeated inkings by the combined effects of the fountain solution commonly employed in lithography and the abrasive action of the rollers on the printing press, so that ultimately the hydrophobic underlayer was partially revealed to in turn cause some background inking on subsequent copies.

In accordance with the present invention, the aforementioned problems are obviated by providing a silver-receptive stratum consisting of a plurality of layers containing progressively lesser amounts of silver-precipitating nuclei as the distance from the outer surface of the stratum increases, or, stated another way, a progressively greater concentration of such nuclei as the distance from the support increases. While in the preferred embodiment the silver-receptive stratum comprises two such layers, it is contemplated that three or more of these layers may be employed to provide the silver-receptive stratum. Each of these layers is relatively thin, preferably on the order of a micron or less in thickness. The ratio of silver precipitating nuclei in one layer to the next adjacent layer is preferably 2:1 to 50:1, the most preferred ratio being from 5:1 to 15:1. The topmost layer preferably contains silver-precipitating nuclei in an amount on the order of from about 2 to about 25 μg (micrograms) per square foot, the ratio of nuclei in this layer to the hydrophilic matrix material, e.g., colloidal silica, being from about 1:10,000 to about 1:2,000. As used throughout this description, all ratios are by weight.

With reference now to the illustrative drawing, an image receiving element of this invention may comprise support 10 carrying a water-proof subcoat, i.e., a hydrophobic layer 12, layers 14 and 16 comprising the silver receptive stratum and a stripping layer 18.

Support 10 may be any of the materials heretofore mentioned and/or known in the art for such purposes, e.g., coated or uncoated paper, a cellulose ester such as cellulose nitrate, cellulose acetate, cellulose acetate butyrate, cellulose propionate, etc.

Hydrophobic layer 12 may comprise one of the heretofore mentioned class of hydrophobic materials known to adhere well to the silver-receptive stratum and may, for example, be on the order of from 1–2.5 microns thick.

The silver-receptive stratum is shown to comprise a pair of layers 14 and 16, each containing silver-precipitating nuclei dispersed in a suitable matrix, as previously described; preferably each of layers 14 and 16 comprises one of the known heavy metal sulfide silver-precipitating agents in a siliceous matrix. The siliceous material comprising this matrix may contain, in colloidal or finely divided condition, oxides of silicon, particularly those in the form of silica acids like silica aerogel, and mineral silicates such as mica and talc. As examples of useful siliceous materials, mention may be made of "Syton" (trademark of Monsanto Chemical Co. for a milky-white, stable, 15 percent colloidal dispersion of silica in water, sp. gr. 1.10); "San- tocel" (trademark of Monsanto Chemical Co. for a light-weight porous silica aerogel from which the water has been removed by a process that does not destroy the original gel structure, apparent density, 6.5–9.75
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lb./cu. ft.); and “Ludox” (trademark of E. I. duPont de Nemours & Co. for an aqueous colloidal sol containing approximately 30% SiO₂ with less than 0.5% Na₂O as stabilizer, sp. gr. 1.21). Layers 14 and 16 may be made of the same or different materials and preferably are the same, differing only in the concentration of silver-precipitating nuclei present. In accordance with this invention, layer 16 contains the greater concentration of such nuclei and may typically contain on the order of 2–25 µg. per square foot of surface area. Layer 14 preferably contains from one-half to one-fifth the amount of nuclei in layer 16, and preferably contains from one-fifth to one-fifteenth that amount. The ratio of nuclei to matrix material in layer 16, as heretofore noted, is preferably on the order of from about 1:10,000 to about 1:2,000.

Stripping layer 18 may be any of the materials heretofore mentioned which are commonly employed to facilitate a clean separation of a silver print following processing. It preferably has a thickness on the order of at least 1 micron.

The image-receiving elements of this invention may be prepared in accordance with the procedures commonly employed in the preparation of image-receiving elements for use in silver diffusion transfer. Since the procedures for applying the various layers per se are old, being described, for example, in certain of the aforementioned patents, U.S. Pat. No. 2,823,122 issued to Edwin H. Land as well as other patents, they need not be discussed in great detail.

For purposes of illustration, however, they may be prepared by first coating on a suitable support 10 a hydrophilic layer 12. A typical procedure of this nature is to apply by roll-coating on the support, e.g., on the baryta-coated surface of a sheet of baryta paper, a solution of the selected hydrophobic material to provide a layer of the desired thickness. As an example of such a solution, mention may be made of one containing the following proportions of ingredients:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyvinyl butyral</td>
<td>35.0 g</td>
</tr>
<tr>
<td>Isopropyl acetate</td>
<td>525.0 cc</td>
</tr>
<tr>
<td>Methanol</td>
<td>175.0 cc</td>
</tr>
</tbody>
</table>

After drying, layers 14 and 16 comprising the silver-receptive stratum are successively applied. One method for forming these layers is to prepare an aqueous dispersion of the siliceous material, e.g., silica aerogel, to which is added a predetermined desired quantity of one or more soluble salts of the desired heavy metal cation. Thereafter, a substantially lesser molar quantity of a soluble salt of the desired anion is added, e.g., a soluble sulfide such as sodium sulfide. The sulfide anion and the heavy metal cation then combine to form the heavy metal sulfide in situ, thus providing a dispersion of the heavy metal sulfide silver-precipitating agent in the silica matrix. This dispersion is thereafter roll-coated or otherwise applied as a layer upon the surface of layer 12 to provide layer 14. Layer 14 is preferably allowed to dry before layer 16 (prepared in the foregoing manner, but containing a greater concentration of silver-precipitating nuclei) is applied. Further, by way of illustration, each of layers 14 and 16 may be prepared by first forming an aqueous solution containing desired amounts of sodium sulfide and powdered selenium. A coating composition formed by mixing desired amounts of the aforementioned solution, silver nitrate solution, and “Ludox” colloidal silica may then be coated to the desired thickness to in turn provide the particular desired silver-precipitating environment.

As was mentioned previously, it is preferable that the respective layers of the silver-receptive stratum be dried prior to successive coating operations. However, it must be noted that even though each layer is deposited on a dried underlying layer, the interface between contiguous layers may dissipate, particularly where a common matrix material is used for the respective layers. Thus, the interface between the respective layers of the elements of this invention may not be as sharply defined and distinguishable as that shown in the illustrative schematic drawing.

While the presence of a stripping layer is not essential to the practice of this invention, it is preferred that such a layer be included to facilitate separation of the transfer image, and such a layer is accordingly included in the drawing for purpose of illustration. Then layer 18 is applied in the manner previously well known in the art, e.g., by roll-coating against a smooth surface, such as the polished surface of a metal drum, a solution of the desired material to provide layer 18 of the requisite thickness.

The image-receiving elements of this invention, e.g., as described above and shown in the illustrative drawing, are employed to obtain a silver print-inking master in exactly the same way as the prior receiving elements, namely in the manner described in the aforementioned U.S. Pat. No. 3,220,837. Briefly, such procedures may include the steps of exposing a photosensitive element comprising a light-sensitive silver halide layer, e.g., a high speed gelatino silver iodobromide emulsion, to form a developable image; thereafter applying to the thus exposed element an aqueous alkaline processing composition including a silver halide developing agent and a silver halide solvent to develop exposed and developable silver halide and to form from unexposed silver halide an imagesensitive distribution of a soluble silver complex which is transferred, by diffusion, to a superposed image-receiving element of this invention to provide a positive silver transfer image characterized as having image silver deposited primarily at the surface in the aforementioned manner. The processing composition employed in such procedures includes the materials common to silver diffusion transfer, namely an alkaline material such as sodium or potassium hydroxide; at least one silver halide developing agent such as one of the known dihydroxybenzenes, diaminobenzenes or aminophenol developing agents; and at least one silver halide solvent such as sodium or potassium thiosulfate. It may also include various other reagents performing specific desired functions, e.g., a viscous film-forming reagent such as sodium carboxymethyl cellulose or hydroxymethyl cellulose, stabilizers, preservatives and the like. These reagents may be contained initially in the processing composition or, in lieu thereof, any of them may be present initially in one or more layers of the photosensitive and/or image-receiving elements, in which event the desired processing composition is obtained by applying the aqueous medium therefor. In one particularly useful procedure, the processing composition (or at least the aqueous medi-
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um therefor) is contained in a pod or frangible container adapted for spreading its contents between the respective elements when placed in superposition, in accordance with known structures and procedures.

The photomechanical reproductive procedures of this invention may be employed for line copy, or for preparing ink reproductions of exceptional quality of continuous tone subject matter. In the latter processes, the photosensitive element is photoexposed through a halftone screen of the type known in the art, to provide a halftone print which is then employed as an inking master to provide halftone ink reproductions of outstanding fidelity and tonal quality.

In such procedures, the silver print of the subject matter to be reproduced may be employed in conjunction with standard lithographic procedures and printing presses. As an example of such a device, mention may be made of a Multilith Offset Duplicating machine commercially available from Addressograph-Multigraph Corporation. In such conventional procedures, a fountain solution (a solution commonly employed in offset printing machines to enhance selective inking) is typically provided. As an example of such a solution, mention may be made of “Colitho 365 High Speed Solution” (Columbia Ribbon and Carbon, Inc.), a universal plate etch and fountain solution for direct image and sensitized paper, acetate and metal offset plates. The ink form roller of the machine has applied thereto any of the commonly employed greasy inks, e.g., a black ink such as “Formulator No. 71 Black” (Glenn Killian Color Co.). A machine of this type may feed copy paper at a rate of 9,000 sheets per hour; although other known devices which are much faster may also be employed. In this manner, the desired number of ink reproductions are run off.

The following example shows by way of illustration and not by way of limitation the preparation of the novel image-receiving elements of this invention.

EXAMPLE

On a paper base sheet material was coated a layer of polyvinyl butyral. Over this was applied a composition containing silver sulfide dispersed in “Ludox” colloidal silica at a ratio of 0.0256 grams of silver per 1,000 grams of “Ludox” colloidal silica to provide a layer less then one-half micron in thickness having a calculated coverage of about 0.5 micrograms of silver ions per square foot of surface area. When this layer was dry, a second coating composition was applied thereover containing silver sulfide dispersed in “Ludox” colloidal silica at a ratio of 0.256 grams of silver per 1,000 grams of “Ludox” colloidal silica to provide a layer of approximately equal thickness but having approximately 10 times as much silver sulfide per square foot. Finally, a stripping layer of gum arabic was applied to provide an image-receiving element such as is shown in the drawing.

The image-receiving element prepared in the foregoing example was employed to prepare a silver print printing master in accordance with the procedures previously described. When employed as a printing master on a standard offset printing device, no background inking was observed after repeated inking and run-offs, thereby demonstrating the efficacy of the invention in obviating the heretofore mentioned problem of background inking. The ink reproductions obtained in this manner, whether line copy, or halftone reproductions obtained by exposure through a halftone screen, were characterized as excellent. Interestingly, for reasons not clearly understood, a silver transfer print formed on the image-receiving element of this invention was observed to exhibit less tendency for image “rub-off” than do images formed on the aforementioned prior single layer receiving elements, thereby providing a still further advantage over these prior elements.

Since certain changes may be made in the above product and process without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description and shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. An image-receiving element for preparing a silver transfer print comprising a support bearing on one side thereof a plurality of contiguous layers, each of said layers including silver-precipitating nuclei dispersed in a hydrophilic matrix, the concentration of said nuclei in said layers being progressively greater, layerwise, as the distance from said support increases.

2. An element as defined in claim 1 wherein the ratio by weight of silver-precipitating nuclei in one said layer to that in the next adjacent layer is from about 2:1 to about 50:1.

3. An element as defined in claim 1 wherein said nuclei comprise at least one heavy metal sulfide and said matrix comprises colloidal silica.

4. An element as defined in claim 3 wherein the same heavy metal sulfide is contained as silver-precipitating nuclei in each of said layers.

5. An element as defined in claim 1 including a hydrophobic layer disposed between said support and said contiguous layers containing said silver-precipitating nuclei.

6. An element as defined in claim 5 including a stripping layer disposed over said layer containing silver-precipitating nuclei furthest removed from said support.

7. An element for use in preparing a printing master by silver diffusion transfer comprising a support bearing on one side thereof, in order, a layer of a hydrophobic material, a first layer containing silver-precipitating nuclei dispersed substantially uniformly in a hydrophilic siliceous matrix and a second layer containing silver-precipitating nuclei dispersed substantially uniformly in a hydrophobic siliceous matrix, said silver-precipitating nuclei in each of said layers being selected from the group consisting of metallic sulfides, metallic selenides, colloidal metals, thiooxalates and thioacetamides, the ratio by weight of said nuclei in said second layer to said nuclei in said first layer being from about 2:1 to about 50:1.

8. An element as defined in claim 7 wherein said nuclei in each of said layers comprises a heavy metal sulfide.

9. An element as defined in claim 8 wherein the amount of said sulfide in said second layer is from about 2 to about 25 micrograms per square foot of surface area.
10. An element as defined in claim 8 wherein each of said first and second layers contains the same heavy metal sulfide dispersed in a colloidal silica matrix, the ratio by weight of said metal sulfide to said second layer to said metal sulfide in said first layer being from about 5:1 to about 15:1.

11. An element as defined in claim 10 wherein the ratio by weight of said nuclei to said colloidal silica in said second layer is from about 1:2,000 to about 1:10,000.

12. An element as defined in claim 7 wherein said first and second layers containing said nuclei are of substantially the same thickness, each of said layers being less than one micron thick.

13. An element as defined in claim 12 including a stripping layer disposed over said second layer.

14. A printing master consisting essentially of an element comprising a support bearing on one side thereof, in order, a layer of a hydrophobic material, a first layer containing silver-precipitating nuclei dispersed substantially uniformly in a hydrophilic siliceous matrix, and a second layer containing silver-precipitating nuclei dispersed substantially uniformly in a hydrophilic siliceous matrix, said silver-precipitating nuclei in each of said layers being selected from the group consisting of metallic sulfides, metallic selenides, colloidal metals, thiocyanates and thioacetamides, the ratio by weight of said nuclei in said second layer to said nuclei in said first layer being from about 2:1 to about 50:1, said element containing a silver image having image areas containing silver concentrated primarily at the surface of said element in thin but essentially continuous oleophilic dense masses.

15. In a process for forming a silver transfer image useful as a printing master wherein an exposed silver halide layer containing a developable image of the subject matter to be reproduced is contacted with a developing composition to develop said image and to form a silver image by diffusion transfer on a superposed image-receiving element, said silver transfer image having image areas containing silver concentrated primarily at the surface of said image-receiving element in oleophilic dense masses and non-image areas which are hydrophilic; the improvement which comprises employing as said image-receiving element, an element as defined in claim 1.

16. A process as defined in claim 15 wherein said image-receiving element comprises a support bearing on one side thereof, in order, a layer of a hydrophobic material, a first layer containing silver-precipitating nuclei dispersed substantially uniformly in a hydrophilic siliceous matrix and a second layer containing silver-precipitating nuclei dispersed substantially uniformly in a hydrophilic siliceous matrix, said silver-precipitating nuclei in each of said layers being selected from the group consisting of metallic sulfides, metallic selenides, colloidal metals, thiocyanates and thioacetamides, the ratio by weight of said nuclei in said second layer to said nuclei in said first layer being from about 2:1 to about 50:1.

17. A process as defined in claim 16 including the step of applying an oleophilic ink to said silver transfer image, said ink preferentially wetting only said silver image areas.

18. A process as defined in claim 17 including the step of transferring said ink from said inked master to provide an ink reproduction of said original subject matter.