PHOTOMECHANICAL COPY METHOD

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

TRANFERRED STRATUM OF UNEXPOSED PIGMENTED UNTANNED EMULSION

SULFIDE OR EXPOSED AND DEVELOPED OR PIGMENTED EMULSION STRATUM

ABSORBED EMULSION DEVELOPED BY HEAT

UNTANNED EMULSION BEING ABSORBED IN RECEIVING SHEET

STRATUM OF ABSORBED EMULSION

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This invention relates to photography and more particularly to a photomechanical copy method for use in the reproduction of printed matter.

There are a number of well-known photographic methods of reproducing designs such as printed matter on paper or other supports. For instance, by the so-called reflex copy method an emulsion layer is exposed through its support and the printed matter is reproduced as a negative. Or one may print a negative and develop it subsequently by conventional methods. In the photomechanical art a common practice is to expose a suitable photographic element such as a tissue and to transfer the exposed element to a metal plate after which the unexposed emulsion is washed off the plate or the washing off may occur before transfer of the resist to the plate. Similarly, in the Pinatype process after forming a hardened image, colored matter is printed from the unhardened area of the element but the colloid vehicle is not transferred from that area to the printing surface. A limited amount of endeavor which apparently has not been successful has been directed to a process wherein after exposing a dichromated albumen element, the unexposed and unhardened portion of the element is transferred to a second support. We have discovered a simple photographic method not apparent from the prior art teachings, including differentially hardening silver salt emulsion layers and transferring unhardened strata of such layers to a support to obtain useful images. The advantages of our process are at once apparent particularly when considering the relative advantages of dichromated albumen and silver salt emulsion layers. Both materials have reached a high state of development and the latter excel because of the wide range of speed, contrast, density, etc. obtainable therefrom. These advantages, as well as others, as will be apparent, accrue to us by use of silver salt emulsions in our process. A further advantage of our process lies in the fact that we are able to make clean transfers of a stratum at and not just the whole of an unhardened photographic image and thus many prints are obtainable by our process. In addition, by utilizing silver salt emulsions we obtain sensitive products which possess decidedly better keeping properties, and materials through which increases in speed may be effected by means of development rather than exposure alone. We are not aware that silver salt emulsion layers with their attendant advantages, have previously been thus processed to produce direct positive images.

According to the broadest aspect of our invention a silver salt emulsion layer such as gelatin-silver halide, containing pigment or other materials if so desired, is exposed to a suitable subject such as line or half-tone subjects (two-tone subjects) excluding continuous tone subjects, developed in the presence of a tanning type of developer following which the element is squeezed into contact with a second support whereby after drawing off the developed element a stratum of the image of the original subject will have been transferred to the second support.

One object of our invention is to provide a simple photographic process of reproducing a subject such as printed matter by transferring strata of substantially unhardened emulsion to a support. Another object is to provide the materials and photographic and mechanical processes and variations of the same to which our invention is susceptible. Other objects will become apparent from the following description of our invention.

Our invention may be better understood by reference to the accompanying drawings wherein in Fig. 1 shows in cross-sectional view the appearance of a silver halide emulsion-bearing support after exposure to a subject and development in the presence of a tanning developer.

Fig. 2 shows in enlarged cross-sectional view the appearance of the transferred unhardened emulsion image stratum in printing relation to the element of Fig. 1.

Fig. 3 shows in enlarged cross-sectional view a modification of our invention after the transferred image stratum of Fig. 2 has been further treated to increase its optical density.

Fig. 4 is a diagrammatic sectional view of typical apparatus, materials and methods used in our invention.

Our invention will now be described in greater detail with reference to the accompanying drawings.

In the preferred embodiment of our invention we take a substantially unhardened light-sensitive preferably pigmented, gelatin-silver-halide emulsion layer on a film, paper or other support and expose it from the emulsion side, for example, with the emulsion surface in contact with the front of a sheet carrying printed matter. After this the exposed layer is developed in the presence of a tanning developing agent which may have been incorporated into the emulsion layer, of the type and in the manner disclosed in the copending Yackel U. S. patent application Serial Number 783,912, filed concurrently, now Patent No.: 2,592,368, dated April 8, 1953.
which case development is by means of an alkaline solution comprising, for example, a 2% sodium hydroxide or sodium carbonate solution. Examples of tanning developing agents especially useful because of non-wandering characteristics in emulsion layers are those having a solubility of from about .005 to 1.0 gram per 100 cc. of a phosphate-citric acid buffer solution of pH 5.0 prepared from a 1.5% solution of sodium dihydrogen phosphate and sufficient citric acid to bring the pH to 5.0. The preferred developing agents have a solubility of from about .01 to .3 gram per 100 cc. of buffer solution. Developing agents falling within the above classification are, for example, 2,4-dihydroxy diphényl, 2,5-dihydroxy diphényl, 2,3-dihydroxy diphényl, 2,6,7,8-tetrahydroxy naphthoquinone, and 2,3-dihydroxy diphényl. The mentioned diphenyl compounds are preferred because they possess the combination of the common properties, high rate of development, high tanning efficiency, and solubility in the preferred range. Here, and in the appended claims, where the tanning developing agents are mentioned as incorporated in the emulsion, the desired compounds are, for example, those mentioned and having the mentioned characteristics. Otherwise, where tanning developing agents as hydroquinone and pyrocatechol, in absence of sulfite, are used, they are less desirable but useful results may be obtained. Compounds like 2-hydroxy-5-amino diphényl or 3,4-diamin diphényl are not especially useful because of their poor stability or failure to stain. It is, therefore, apparent that after exposure to a subject the differential hardening of the exposed emulsion can take place in the presence of a tanning developing agent and that this includes whether or not the agent is in the emulsion before exposure.

Thus, if there is no developing agent in the emulsion, after exposure we may treat with a solution of tanning developing agent and then a solution of alkali. This process is less preferred because of the tendency for a developing agent, like hydroquinone to transfer and give rise to a stain. Similarly, we can pretreat the exposed sensitive material with a tanning developing agent and place it in contact with the receiving support with a layer of alkali solution between, at which time development starts and when finished the sheets are separated leaving a stratum of the direct positive image on the receiving support. Pigments of the type useful in the emulsion layer are metallic silver, carbon black, dyes, pigments such as Munsell Fast Blue BWD (copper phthalocyanine dye) or other insoluble pigments.

The colloid binder for the emulsion layer is preferably gelatin although other materials such as polyvinyl alcohol, hydroxylmethyl cellulose, and polyethylene glycol which have the property of being hardened with tanning developers locally in the region of the exposed image may be used. After exposure and development in the presence of a tanning developing agent the processed photographic element would appear substantially as shown in Fig. 1 of the drawings, wherein enlarged cross-sectional view layer 10 is a film, paper or other support to which is affixed the exposed and tanned developed silver halide emulsion layer 11 containing the silver and tanned gelatin image 12.

We next place the moist element of Fig. 1 into printing relation to, and the layer 11 in contact with an absorbent support of a sheet of paper or other material such as wood, cloth, etc., and by means of pressure and if desired the application of heat, the unexposed and unhardened portion 16 of layer 11 is caused to adhere to the sheet of paper. Following this the element is stripped off the sheet leaving the transferred unhardened image stratum on the sheet as shown in Fig. 2 wherein layer 13 is the paper sheet which has received the un tainted pigmented images 14. By rewetting the balance of image 15 on support 10 with the alkali solution, the developer is less preferred. Additional transfers may be made. Whether or not pigment has been incorporated into emulsion layer 11 of Fig. 1 prior to exposure, we may next further increase the optical density of images 14 by treatment of the silver halide therein with a sulfide, alkaline thiourea, metal salts and the like, according to well-known toning methods or we may further expose image 14 and treat with a reducing agent or develop in alkali solution which may contain the developing agent in case no developing agent may be stripped off from the emulsion layer. Since appreciable amounts of silver salt, developer and alkali will transfer with image 14, the density may be increased quickly by exposing and heating the print. The transferred image 14 appears as shown in Fig. 3 wherein layer 13 represents the receiving support carrying the darkened images 15. After exposure of image 14, a coupler-developer solution may be used in the manner conventional to present day color photography methods to transform image 14 into a dye image. Similarly, the components of coupler-development may be incorporated together with or instead of pigment into the emulsion layer, or only the coupler may be in the emulsion layer, and darkening of the image is effected by use of a developing agent, the oxidation product of which combines with the coupler. If the color developer is added to the emulsion layer it should be of such character that it does not compete with the tanning developer, e.g., the developing rate should be less. It is also apparent that the color developer or coupler used or both should be relatively non-diffusing in the alkaline bath used for development, in order that they remain in the colloid layer to participate in the transfer process.

The various materials used as above for increasing the optical density of image 14, previous to the transfer operation may have been coated onto the receiving surface 13. Thus, when image 14 contacts a sulfide or thiourea-treated surface the silver halide reacts with the sodium or zinc required to promote development of a developer-containing emulsion may be coated on support 13 prior to the transfer. When the exposed element contacts the surface in the presence of moisture tanning development occurs and the tanned emulsion image 14 is transferred and leaves the uncoated image 13 leaving unainted image. In addition development may be commenced by treating the exposed element with ammonia solution or fuming the element with ammonia. Stripping of the tanned images from the paper may be facilitated by a surfactant applied on the paper, for example, citric acid, and tendency toward staining of the prints on aging can be minimized by pretreating the receiving paper with sulfite, bisulfite or ascorbic acid.

The colloid of the transferred image may be hardened by treatment with alum, chromium salts, etc., if desired. Our invention is further illustrated by consideration of Fig. 4 of the drawings wherein is shown diagrammatically in cross-sectional view the method of producing prints by our process.
The paper base to carrying the tanned negative 12 and untanned emulsion area 15 (see Fig. 1) is shown as supported by the level surface 20. In order to make a print from images 16 the receiving sheet 13 is rolled down by roller 19 onto the surface of images 12 and 16 at point 21 and after contact with sheet 13 for the desired time the sheet is shown being stripped off at point 22 carrying with it the image stratum 14 (see Fig. 2), leaving the residue 23 of image 16. Following this image stratum 14 (containing sensitive silver salt, developing agent, and alkalai) is shown being exposed by exposing light 24 at point 25 and heated by contact with roller 26 resulting in a darkened image 15 (see Fig. 3). It is apparent that if desired, the receiving sheet can be affixed to surface 20 and the processed element rolled down onto the sheet in a similar manner. Further, images 16 can be different subject images as would be present on a roll of exposed film which is to be processed in a continuous processing apparatus.

The following specific examples are given as illustrative of means of carrying out our invention but are to be considered as in no way limiting the scope of our application as defined in the appended claims.

**Example 1**

An emulsion suitable for use in our process can be made by preparing solutions of (A) 25 grams of gelatin in 1 liter of water at 40°C. (B) 100 grams silver nitrate in 500 cc. water at 20°C. and (C) 35 grams of sodium chloride in 500 cc. of water. Solutions B and C are simultaneously run into solution A at a uniform rate while stirring the latter over a period of about 10 minutes; solution B preferably not being allowed to run in faster than C. Thereafter, 180 grams of gelatin in 1500 cc. of water at 40°C are added. The pH of the emulsion may then be adjusted to 5.0.

If the emulsion is to contain a developing agent it is added, for example, as follows: 23 grams of 3,4-dihydroxy phenyl hydride may be added and this composition is coated on a support as paper containing no agent tending to further harden the emulsion. After drying, the product is ready for use. If the emulsion is to contain no developing agent, it is coated as above but the developing agent is omitted.

**Example 2**

The method of using an emulsion made as above and containing a developing agent is as follows: The photographic emulsion is exposed by contact or projection, face to face with the subject. The exposed sheet is placed in a 3% NaCO3 bath for about 15 seconds during which time a negative image is developed in tanned gelatin. The excess alkaline solution is removed from the surface by squeegee. A sheet of bond paper is rolled into contact with the photographic copy and immediately contact with removal a portion of the unhardened emulsion will have been transferred to the bond paper. If it is flashed to light of exposing intensity, it will develop to a positive image. This development is accelerated by heat. Since only a part of the untanned emulsion is used during the first transfer the amount is controlled by pressure, temperature, dryness of the squeegee surface, gelatin softness, etc.). Duplicate images may be made by rewetting the negative with the developer solution for a few seconds, again squeegeeing and transferring to a fresh sheet of paper. Under optimum conditions as many as 8 to 10 satisfactory copies may be made.

**Example 3**

If it is undesirable to incorporate the developer in the emulsion, the exposed sheet may be placed in a 0.1% hydroquinone solution (aqueous) for about 1 minute prior to development in the sodium carbonate solution. Under such conditions it may be necessary, depending upon the developing agent used, to modify the developing bath slightly to obtain optimum results. For example, when hydroquinone is used as a developing agent, a small amount of sodium sulphite (approximately 0.2 to 0.3%) added to the sodium carbonate gives more desirable results.

While in the preferred embodiment of our invention we use a pigment in the emulsion layer to make the stratum of transferred image more visible—we may instead, if so desired, add to the emulsion layer at least one of the well known coupling components of dianthene compounds. After exposure, coupling occurs under influence of alkalai in the subsequently applied developing solution. This dye then is transferred with the untanned image as previously described.

If one diazo component is in the emulsion layer, the other may be carried by the sheet receiving the transferred untanned image and by virtue of alkalai present, coupling will take place to form a dye image which will remain in the transferred area.

When it is desired to make an appreciable number of reproductions from the element of Fig. 1, we can make several good prints of gelatin and pigments as shown in Fig. 2 following which the negative image left on support 10 is treated with a reducing agent such as sodium sulphite, and this is squeegeed into contact with a support carrying a layer of dye bleachable with sulphite, such as Malachite Green Dye. A direct positive image of the original subject in dye thus results. Also we may roll a suitable ink or pigment into the matrix remaining after the soft emulsion has been removed from the image or, if desired, a transfer it in a manner similar to that used when transferring the unhardened emulsion.

The emulsion layer we use in our process can be of the well-known variety of sensitive silver salt compositions, such as silver halide dispersed in a colloidal vehicle such as gelatin or a resin as polyvinyl alcohol or polyacrylamide, capable of being differentially tanned as above mentioned.

The concentration of developing agent in the emulsion is dependent in part upon the result desired but can be of the order of 350 grams of tanning developing agent per kg. of silver nitrate, converted to silver halide, used in making the emulsion, to obtain good density, or about 250 grams per kg. of silver nitrate to obtain adequate density and an emulsion having optimum keeping properties.

It is necessary for the successful operation of the invention that the emulsion layer be not harder than would be the case with gelatin containing 0.02 oz. of formaldehyde (40% diluted 1 to 3 with water) or 0.7 gram of dry formaldehyde per pound, when fresh coated or 0.1 oz. of the solution per pound for a sample aged three to six months. By “substantially unhardened” as
2,596,756

used here, and in the appended claims, it is to be understood that this means a hardness of the order obtained with gelatin treated with formaldehyde under the conditions above. Emulsion layers appreciably harder will not transfer satisfactorily. Similarly, if after development of the tanned image it is found that the layer is too hard, and to accommodate variations in hardness and tanning encountered, we can use variations of temperature or pressure when making a transfer. To this end we ordinarily apply pressure or pressure or both when rolling the developed emulsion down onto the receiving support. With an emulsion which transfers slowly with heat or pressure applied, we can, without use of increased heat or pressure during transfer, make the transfer by treatment of the developed emulsion with solutions having a softening effect upon the colloid vehicle. With a gelatin emulsion the treating solution can contain, for example in addition to alkali, the following compounds in the amounts indicated based on weight of an alkaline developing solution:

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<th>Compound</th>
<th>Per cent</th>
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<tr>
<td>Formamide</td>
<td>2-20</td>
</tr>
<tr>
<td>Ethylene chlorohydrin</td>
<td>5-20</td>
</tr>
<tr>
<td>Urea</td>
<td>2-20</td>
</tr>
<tr>
<td>Sodium nitrate</td>
<td>5-20</td>
</tr>
<tr>
<td>Glycerol</td>
<td>10-20</td>
</tr>
</tbody>
</table>

One feature and advantage of our process which is important, lies in the fact that the images prepared as above are non-smudging in contrast to ordinary printed images.

Our process is adaptable to making prints by means of stencils. We merely coat the emulsion layer on a porous support as cloth, silk or highly porous paper and, after exposure and tanning development, transfer the unhardened image away from the support in one or more transfers as strata until the support becomes pervious to a printing ink in the unhardened area. Prints are then made from the resulting stencil in the usual manner using a low viscosity ink with the result that a large number of positive prints can be made.

In the preferred embodiment of our invention we transfer, at any one time, only a thin stratum of the unhardened and unexposed area of the emulsion to the absorbive receiving support. However, if we so desire, we can transfer substantially all of the unhardened gelatin in one operation. This may be effected by selection or preparation of an emulsion layer of suitable softness or thickness or both, by selection of a suitable temperature or application of suitable pressure during transfer, or a combination of these factors.

It is apparent that our process provides a quick means of making stable negatives; after transfer of the sensitive unexposed emulsion from the positive regions there remains a negative which contains little or no chemicals likely to deteriorate the image on keeping. In the usual processes of photography, unexposed silver halide must be fixed-out and the negative washed by well-known methods to insure preservation.

The advantages of our process are now apparent. We employ in the simplest modification, only an exposure step, a development step and a transfer step, or development and transfer may be combined. No subsequent or intermediary washing steps are required in contrast to most photographic processes. Further, our process is a direct-positive process.

By the term "pigment" as used herein and in the appended claims, it is to be understood that this includes insoluble organic and inorganic materials of nature such that they impart optical densities to the layer of a photographic process. Our process is a direct-positive process. The invention having been described, we have it understood that the disclosure herein is by way of example, and included in the invention are all modifications and equivalents falling within the scope of the appended claims.

1. A method of photographic reproduction which comprises forming by exposure to a two-tone subject and development in a light-sensitive substantially unhardened organic colloid-silver halide emulsion layer, a hardened colloid image and leaving substantially unhardened colloid in the remaining area of said layer, said unhardened layer being not harder than a gelatin layer containing 0.7 gram of formaldehyde per pound of gelatin freshly coated, removing excess water from the surface of said emulsion layer, pressing a sheet having an absorbent surface against said emulsion layer while said emulsion is moist and its surface free of greasy material, to cause only said unhardened colloid portion of said layer to adhere to said sheet, and separating said sheet and said emulsion layer to transfer only a stratum of the unhardened colloid portion of said layer to said sheet.

2. A method of photographic reproduction which comprises forming by exposure to a two-tone subject and development in a light-sensitive substantially unhardened organic colloid-silver halide emulsion layer, in the presence of a tanning developing agent, a hardened colloid image and leaving substantially unhardened colloid in the remaining area of said layer, said unhardened layer being not harder than a gelatin layer containing 0.7 gram of formaldehyde per pound of gelatin freshly coated, removing excess water from the surface of said emulsion layer, pressing a sheet having an absorbent surface against said emulsion layer while said emulsion is moist and its surface free of greasy material, to cause only said unhardened colloid portion of said layer to adhere to said sheet, and separating said sheet and said emulsion layer to transfer only a stratum of the unhardened colloid portion of said layer to said sheet.

3. A method of photographic reproduction which comprises forming by exposure to a two-tone subject and development in a light-sensitive substantially unhardened organic colloid-silver halide emulsion layer containing a tanning developing agent, a hardened colloid image and leaving substantially unhardened colloid in the remaining area of said layer, said unhardened layer being not harder than a gelatin layer containing 0.7 gram of formaldehyde per pound of gelatin freshly coated, removing excess water from the surface of said emulsion layer, pressing a sheet having an absorbent surface against said emulsion layer while said emulsion is moist and its surface free of greasy material, to cause only said unhardened colloid portion of said layer to adhere to said sheet, and separating said sheet and said emulsion layer to transfer only a stratum of the unhardened colloid portion of said layer to said sheet.

4. A method of photographic reproduction which comprises forming by exposure to a two-tone subject and development in a light-sensitive substantially unhardened organic colloid-silver halide emulsion layer containing a tanning developing agent of the class consisting of 3,4-
dihydroxydiphenyl, 2,5-dihydroxydiphenyl, and 2,3-dihydroxydiphenyl, a hardened colloid image and leaving substantially unhardened colloid in the remaining area of said layer, said unhardened colloid containing 0.7 gram of formaldehyde per pound of gelatin freshly coated, removing excess water from the surface of said emulsion layer, pressing a sheet having an absorbent surface against said emulsion layer while said emulsion is moist and its surface free of greasy material, to cause only said unhardened colloid portion of said layer to adhere to said sheet, and separating said sheet and said emulsion layer to transfer only a stratum of the unhardened colloid portion of said layer to said sheet.

5. A method of photographic reproduction which comprises forming by exposure to a two-tone subject and development in a light-sensitive substantially unhardened organic colloidal-silver halide emulsion layer containing a tanning developing agent having a solubility in a phosphate-citric acid buffer solution of pH 5.0, of from .005 to 1.0 gram per 100 cc. of said buffer and containing finely divided pigment particles, a hardened colloid image and leaving substantially unhardened colloid in the remaining area of said layer, said unhardened layer being not harder than a gelatin layer containing 0.7 gram of formaldehyde per pound of gelatin freshly coated, removing excess water from the surface of said emulsion layer, pressing a sheet having an absorbent surface against said emulsion layer while said emulsion is moist and its surface free of greasy material, to cause only said unhardened colloid portion of said layer to adhere to said sheet, and separating said sheet and said emulsion layer to transfer only a stratum of the unhardened colloid portion of said layer to said sheet.

6. A method of photographic reproduction which comprises forming by exposure to a two-tone subject and development in a light-sensitive substantially unhardened organic colloidal-silver halide emulsion layer containing a tanning developing agent having a solubility in a phosphate-citric acid buffer solution of pH 5.0, of from .005 to 1.0 gram per 100 cc. of said buffer and said emulsion containing finely divided pigment particles, a hardened colloid image and leaving substantially unhardened colloid in the remaining area of said layer, said unhardened layer being not harder than a gelatin layer containing 0.7 gram of formaldehyde per pound of gelatin freshly coated, removing excess water from the surface of said emulsion layer, pressing a sheet having an absorbent surface against said emulsion layer while said emulsion is moist and its surface free of greasy material, to cause only said unhardened colloid portion of said layer to adhere to said sheet, and separating said sheet and said emulsion layer to transfer only a stratum of the unhardened colloid portion of said layer to said sheet.

7. A method of photographic reproduction which comprises forming by exposure to a two-tone subject and development in a light-sensitive substantially unhardened organic colloidal-silver halide emulsion layer containing a tanning developing agent having a solubility in a phosphate-citric acid buffer solution of pH 5.0, of from .005 to 1.0 gram per 100 cc. of said buffer and said emulsion containing finely divided pigment particles, a hardened colloid image and leaving substantially unhardened colloid in the remaining area of said layer, said unhardened layer being not harder than a gelatin layer containing 0.7 gram of formaldehyde per pound of gelatin freshly coated, removing excess water from the surface of said emulsion layer, pressing a sheet having an absorbent surface against said emulsion layer while said emulsion is moist and its surface free of greasy material, to cause only said unhardened colloid portion of said layer to adhere to said sheet, and separating said sheet and said emulsion layer to transfer only a stratum of the unhardened colloid portion of said layer to said sheet.

8. A method of photographic reproduction which comprises forming by exposure to a two-tone subject and development in a light-sensitive substantially unhardened organic colloidal-silver halide emulsion layer containing a tanning developing agent having a solubility in a phosphate-citric acid buffer solution of pH 5.0, of from .005 to 1.0 gram per 100 cc. of said buffer and containing finely divided pigment particles, a hardened colloid image and leaving substantially unhardened colloid in the remaining area of said layer, said unhardened layer being not harder than a gelatin layer containing 0.7 gram of formaldehyde per pound of gelatin freshly coated, removing excess water from the surface of said emulsion layer, pressing a sheet having an absorbent surface against said emulsion layer while said emulsion is moist and its surface free of greasy material, to cause only said unhardened colloid portion of said layer to adhere to said sheet, and separating said sheet and said emulsion layer to transfer only a stratum of the unhardened colloid portion of said layer to said sheet.

9. A method of photographic reproduction which comprises forming by exposure to a two-tone subject and development in a light-sensitive substantially unhardened gelatino-silver halide emulsion layer in the presence of a tanning developing agent, a hardened colloid image and leaving substantially unhardened colloid in the remaining area of said layer, said unhardened layer being not harder than a gelatin layer containing 0.7 gram of formaldehyde per pound of gelatin freshly coated, removing excess water from the surface of said emulsion layer, pressing a sheet having an absorbent surface against said emulsion layer while said emulsion is moist and its surface free of greasy material, to cause only said unhardened colloid portion of said layer to adhere to said sheet, and separating said sheet and said emulsion layer to transfer only a stratum of the unhardened colloid portion of said layer to said sheet.

10. A method of photographic reproduction which comprises forming by exposure to a two-tone subject and development in a light-sensitive substantially unhardened gelatino-silver halide emulsion layer containing a tanning developing agent having a solubility in a phosphate-citric acid buffer solution of pH 5.0, of from .005 to 1.0 gram per 100 cc. of said buffer, a hardened colloid image and leaving substantially unhardened colloid in the remaining area of said layer, said unhardened layer being not harder than a gelatin layer containing 0.7 gram of formaldehyde per pound of gelatin freshly coated, removing excess water from the surface of said emulsion layer, pressing a sheet having an absorbent surface against said emulsion layer while said emulsion is moist and its surface free of greasy material, to cause only said unhardened colloid portion of said layer to adhere to said sheet, and separating said sheet and said emulsion layer to transfer only a stratum of the unhardened colloid portion of said layer to said sheet.
portion of said layer to adhere to said sheet, and separating said sheet and said emulsion layer to transfer only a stratum of the unhardened colloid portion of said layer to said sheet.

11. A method of photographic reproduction which comprises forming by exposure to a two-tone subject and development in a light-sensitive substantially unhardened gelatino-silver halide emulsion layer containing a tanning developing agent having a solubility in a phosphate-citrate-saline buffer layer of pH 5.0, of from 0.005 to 1.0 gram per 100 cc. of buffer, a hardened colloid image and leaving substantially unhardened colloid in the remaining area of said layer, said unhardened layer being not harder than a gelatin layer containing 0.7 gram of formaldehyde per pound of gelatin freshly coated, removing excess water from the surface of said emulsion layer, pressing a sheet having an absorbent surface against said emulsion layer while said emulsion is moist and its surface free of greasy material, to cause only said unhardened colloid portion of said layer to adhere to said sheet, and separating said sheet and said emulsion layer to transfer only a stratum of the unhardened gelatin of said layer to said sheet, and thereafter exposing and heating the transferred stratum in the presence of moisture to increase its optical density.

15. A method of photographic reproduction which comprises exposing to a two-tone subject a substantially unhardened gelatino-silver halide emulsion layer containing a gelatin tanning silver halide developing agent, said emulsion layer being not harder than a gelatin layer containing 0.7 gram of formaldehyde per pound of gelatin freshly coated, developing the exposed emulsion layer with an alkaline solution to obtain a hardened gelatin and silver image in the region of exposure and substantially unhardened gelatin and silver halide in the unexposed region of the emulsion layer, pressing a sheet having an absorbent surface against said emulsion layer while said emulsion is moist to cause only said unexposed regions to adhere to said sheet and separating said sheet and emulsion layer to transfer only a stratum of the unexposed portion of the emulsion layer.

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