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PHOTOGRAPHIC COPYING PROCESS

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This invention consists in a photographic copying process, in which a line or half-tone image comprising unhardened gelatine forming part of a silver halide-type photographic emulsion coated on a first support is transferred by contact to a second support after the gelatine comprised by the complementary image has been rendered relatively non-transferring by hardening, after or during exposure to light, in a tanning developer.

The image which is transferred may be a positive or negative, and may or may not have been treated with a non-tanning developer to blacken it, if necessary after or during exposure to light. After transfer, the image on the second support may be hardened and, where it has not already been developed, this may conveniently be effected by treatment, if necessary after or during exposure to light, with a tanning developer.

The first support on which the photographic emulsion is coated is preferably paper, and ordinary unhardened gaslight or bromide paper may be used in the process. A variety of surfaces may be used as the second support, including those of paper, cellulose acetate, cellulose nitrate, glass, wood, synthetic resin and metal; woven fabric such as cotton or linen cloth may also be used where high resolution is not important.

For transferring the non-hardened image from the first to the second support the normal methods of transferring gelatine images may be employed, with the exception that an elevated temperature, preferably of 75–110° F., should be maintained to soften the unhardened gelatine. Where the first support is paper, this may be squeegeed onto the second support, preferably after wiping or blotting off surplus water, heated and then peeled off.

In the application of this invention to the speedy reproduction of documents, tracings and the like, an unhardened silver halide emulsion on a flexible first support such as paper is exposed to the original subject matter to be copied by contact, reflectographic, projection or camera exposure, as appropriate, and the exposed emulsion is developed in a tanning developer, followed by development, if necessary under conditions of bright illumination, or after such illumination, in a non-tanning developer. This results in the formation of complementary black images, one of hardened and the other of unhardened pigmented gelatine and, by pressing the image layer into intimate contact with a second support such as paper and with the application of heat sufficient to soften the unhardened emulsion, the latter can be transferred to the second support. The two supports can then be pulled apart to leave, on the one hand, a negative of the original subject matter on the first support and, on the other hand, a corresponding positive on the second support, neither of which requires fixing by sodium thiosulphate.

The process described in the preceding paragraph can be modified by omitting the treatment of the image layer on the first support with a non-tanning developer. The image transferred to the second support will then comprise silver halide which can be developed in situ, after or during exposure to light, by a developer, which need not be of the selective reducing agent type. Use of a tanning developer would give a hardened image on the second support.

Where the original subject matter copied as described in either of the two preceding paragraphs is a negative, the image transferred to the second support will also be a negative. Sometimes, however, it is desired to provide, on a given support, a positive copy of a negative subject matter or vice versa, and this can easily be effected by reversing the order of treatment with the tanning and non-tanning developers. Thus, the image formed by exposure of the emulsion to the original subject matter is developed in the ordinary way with a non-tanning developer, and then the complementary image is developed in a tanning developer, during or after exposure to light. The transferable image will then be a negative relative to the original subject matter.

In the application of this invention to the production of printing plates including rollers, particularly planographic plates for offset printing, the second support is constituted by a printing plate and the transferred image is hardened. As already mentioned, this hardening can conveniently be effected by transferring the unhardened image in an undeveloped state, and subsequently treating it, after or during exposure to light, with a tanning developer. Alternatively, whether or not the image has been developed before transfer, it may be treated on the second support with a conventional hardening agent such as potash alum, chrome alum or formaldehyde. In either case, the image may be employed as a lithographic ink acceptor or as a resist for etching purposes.

Where the image transferred to the second support is in the form of an undeveloped silver halide emulsion this may, if desired, be freed from silver by hardening and then treating with a silver halide solvent such as an alkali cyanide or thiosulphate. Alternatively, use may be made of toning, colour development, bleaching and a variety of other known treatments to obtain special effects.

In carrying out the process of this invention, the developer used first, whether of the tanning or non-tanning type, will necessarily be of the selective reducing agent type, so that the exposed areas are deplenished in silver halide whilst the complementary areas remain unaffected. Any subsequent development effected with a non-tanning developer, and any effected on the emulsion after transfer may, however, be carried out with a non-selective agent not requiring a second exposure, and references herein to developers should be construed accordingly. Where, on the other hand, the first development does not effect hardening, any subsequent development before transfer is preferably effected with a tanning developer of the selective reducing agent type to avoid the possibility of reaction with undeveloped silver halide which might be left in the previously developed image areas with concomitant hardening of the gelatine it is required to transfer. Thus, in copying a tracing, a contact print on gaslight paper may be treated first with a tanning developer and then with aqueous sodium sulphide, followed by transference, a second exposure being unnecessary.

The following example illustrates one manner of carrying this invention into effect.

A document paper coated with an unhardened silver halide emulsion possessing characteristics suitable for reflectographic printing was held face down in contact with an original document and illuminated from the back of the paper through a yellow filter for approximately 20 seconds using a 100 watt lamp at a distance of 30 inches from the paper. The resulting exposed negative was then developed for 1½–2 minutes in a tanning developer made up from 10 ccs. each of solutions A and B and 230 ccs. of water, the solutions having the following composition:

	Grams
A. Pyrocatechin	50
Potassium bromide	5
Potassium metabisulphite	5
Water to make 500 ccs.	
B. Potassium carbonate	200
Water up to 500 ccs.	

The negative was then washed and developed in a bright light for about 20 seconds in an ordinary metol-quinol non-tanning developer. After a further wash, the negative was wiped free of surplus water, pressed into contact with a sheet of plain paper, heated and peeled off the paper to leave, on the latter, a permanent positive image of the original document.

I claim:

1. A photographic copying process which comprises exposing to subject matter to be copied an unhardened

gelatino silver halide emulsion on a flexible support, to form a latent image of said subject matter therein, developing the said latent image in a non-tanning developer to yield an unhardened negative image, exposing the emulsion to light and developing a complementary latent image on the same support in a tanning developer, transferring the said negative image to a second flexible support by pressing the said image into intimate contact therewith at a temperature at which the unhardened emulsion softens and separating the two supports.

2. A photographic copying process which comprises exposing to subject matter to be copied an unhardened gelatino silver halide emulsion on a flexible support, to form a latent image of said subject matter therein, developing the said latent image in a non-tanning developer to yield an unhardened negative image, exposing the emulsion to light and developing a complementary latent image on the same support in a tanning developer, transferring the said negative image to a second flexible support by pressing the said image into intimate contact therewith at a temperature at which the unhardened emulsion softens and separating the two supports and thereafter hardening the gelatine of the image so transferred.

3. A photographic copying process which comprises

exposing to subject matter to be copied an unhardened gelatino silver halide emulsion on a flexible support, to form a latent image of said subject matter therein, developing the said latent image in a non-tanning developer to yield an unhardened negative image, exposing the emulsion to light and developing a complementary latent image on the same support in a tanning developer, transferring the said negative image to a second flexible support by pressing the said image into intimate contact therewith at a temperature at which the unhardened emulsion softens and separating the two supports and thereafter hardening the gelatine of the image so transferred, the said second flexible support carrying the image so transferred constituting a printing plate.

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