

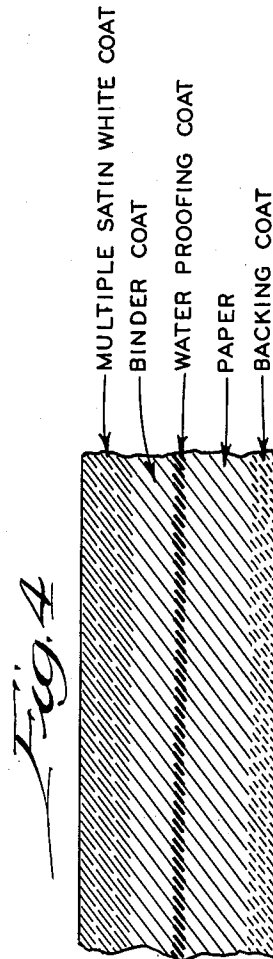
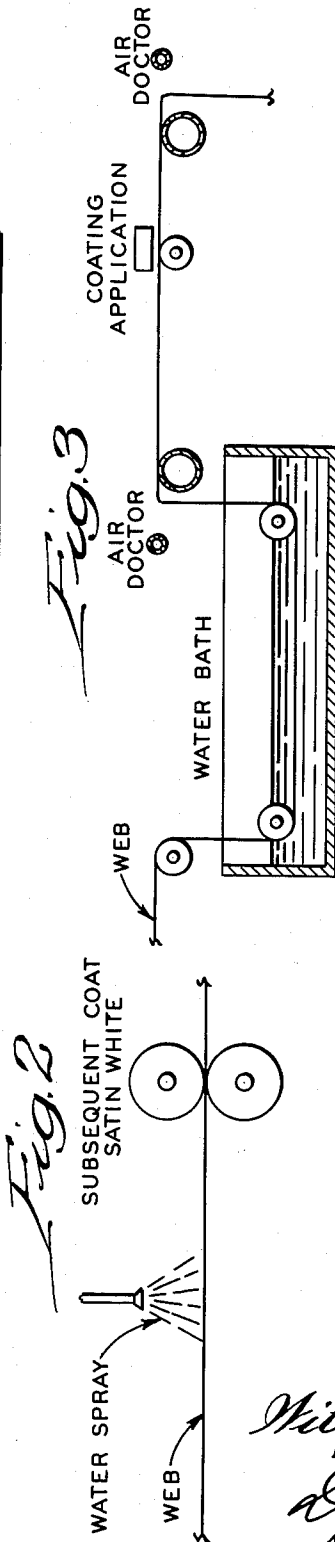
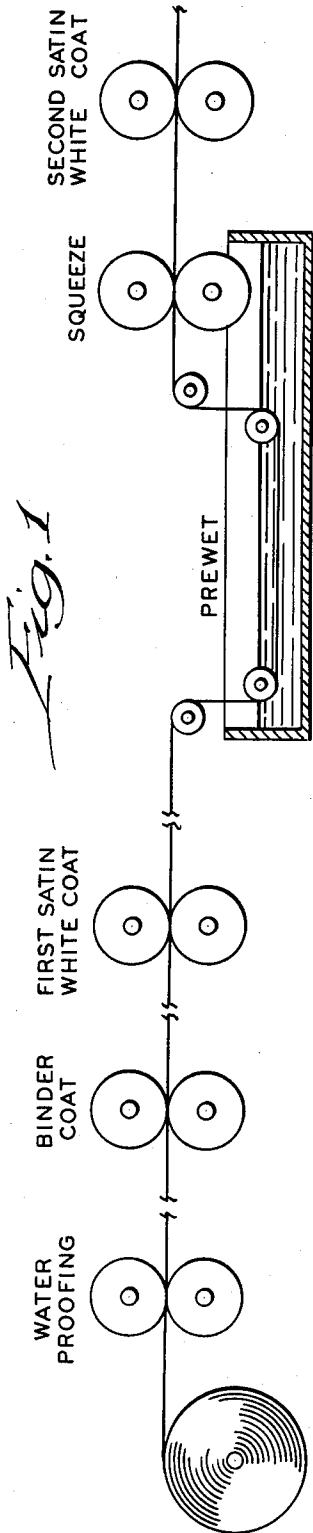
Oct. 25, 1955

W. G. MULLEN

2,721,815

METHOD FOR MANUFACTURING IMPROVED PLANOGRAPHIC PRINTING PLATES

Filed Jan. 19, 1951



INVENTOR:
William G. Mullen,
BY
Dawson & Orma,
ATTORNEYS.

1

2,721,815

METHOD FOR MANUFACTURING IMPROVED PLANOGRAPHIC PRINTING PLATES

William G. Mullen, Winchester, Mass., assignor to A. B. Dick Company, Niles, Ill., a corporation of Illinois

Application January 19, 1951, Serial No. 206,866

3 Claims. (Cl. 117—156)

This invention relates to the manufacture of planographic printing plates, and more particularly to paper plates provided with a surface capable of developing an image thereon for lithographic reproduction by direct or offset methods.

A planographic printing surface of the type produced by this invention is satisfactory for lithographic printing generally and is especially adapted for reproduction by way of "direct images," such as by forming the images on the plate surface with a waxy crayon, typewriter, printing, or by inscribing thereon with an oil, wax, or grease based ink. The planographic surface is also capable of having the printable image developed thereon indirectly by photographic means with light-sensitive material.

In such planographic or lithographic plates, one part of the surface, that is, the printable image, is highly ink receptive so that the grease based ink composition will be preferably attracted thereto. The remainder of the surface is either allowed to remain highly water receptive or else is rendered so by subsequent treatment so that, when the surface is wet by water or repellent, the ink composition will be unacceptable thereto. In operation, water or repellent is applied first onto the plate surface for the purpose of wetting out the hydrophilic or wettable non-printing portion and subsequently the plate is brought into surface contact with an ink-feed system by which ink is transferred only onto the non-wetted, ink-receptive, printable image portion. The ink transfers from the printing portion directly onto copy or onto a blanket for duplication by the offset process.

It is possible to fabricate a planographic printing plate for use in offset or rotary presses and the like by a single-step treatment of a paper base or other thin sheet with a coating composition that develops a surface having lithographic characteristics upon drying. It is preferred, however, to prepare a plate with a number of coatings, each of which imparts characteristics which, in combination, produce a plate that is capable of long runs, little deterioration or distortion under conditions of use, and good copy quality, and which provides for simple, easy and less critical operation under press conditions.

For example, the paper-base fabric may have a first coating applied thereto, hereinafter referred to as a waterproofing coat, to impart strength and water resistance to the fabric so that it will be resistant to the high moisture conditions and stress under which it is continuously subjected in use. A second coating, hereinafter referred to as the binder coat, may be applied onto the first. The purpose of the binder coat is to provide anchorage for the lithographic surface producing coat, hereinafter referred to as the satin white coat, onto the waterproofing coat. Another coat, hereinafter referred to as the backing coat, may be applied onto the back face of the paper sheet to balance the coatings on top so as to minimize or substantially eliminate the tendency towards wrinkling. Finally, the satin white coat, which is capable upon drying of developing the desired lithographic properties on the surface thereof, is applied onto the binder coat. The satin

2

white coat may be further subjected to treatments, which will hereinafter be described, for the purpose of improving the characteristics of the lithographic surface.

Generally, it is preferred to obtain greater weight of the satin white coat than can practically and successfully be applied by a single-coating step. As a result, in practice, two or possibly more satin white coats are usually applied. However, certain difficulties arise from the use of such multiple-coating systems, especially when two or more coatings are formulated of substantially the same materials, such as the two or more satin white coats which together form the lithographic surface.

One such difficulty resides in the problem relating to the anchorage of one coat onto another after the latter has dried so that sufficient integration will be achieved to resist delamination or separation under conditions of use. In the past, it has been the practice to incorporate a fairly large amount of organic solvent (about 10 to 15 percent) in the coating composition in order to permit better integration of the coating composition with the underlying surface. Such usage of solvents have been found to be objectionable because the composition is rendered less stable thereby while the cost is proportionately increased.

A still more important problem resides in the formation of what will be called "pin holes" or "pits" in the surface of the plate. These pin holes or pits appear to accept or collect ink even though they are located in the hydrophilic, non-printing portion of the plate surface. As a result, ink is transferred directly onto the copy or onto the offset blanket whereby it ultimately appears as an undesirable image in the copy. The percentage of plates rejected on account of pin holes or pits has been relatively high, and it is an object of this invention to provide a method for economically and efficiently manufacturing planographic plates wherein pin holes and pits are substantially eliminated or reduced in concentration and size.

Another object is to produce and to provide a method for producing an improved paper-base planographic printing plate suitable for development of the printable image thereon by direct or indirect methods.

A further object is to provide a method for minimizing the formation of pin holes or pits in multiple coatings of resinous or adhesive material.

A still further object is to provide a method for fabricating lithographic plates embodying multiple coatings but in which the amount of solvent required in the coating compositions for the purpose of achieving proper anchorage is markedly reduced or substantially eliminated.

Still another object is to provide a technique for manufacturing an improved planographic printing surface having multiple coatings, which surface is characterized by greater smoothness and substantial freedom from pin holes or pits.

These and other objects and advantages of this invention will hereinafter appear, and for purposes of illustration, but not of limitation, an embodiment of the invention is shown in the accompanying drawing, in which—

Figure 1 is a flow sheet for the manufacture of paper-base lithographic printing plates in accordance with the concepts of this invention;

Figure 2 is directed to a flow sheet of a portion of the process illustrating a modified technique for practicing this invention;

Figure 3 is a flow sheet of a portion of the manufacturing process corresponding to that illustrated in Figure 2 showing a still further modification in the technique for practicing this invention, and

Figure 4 is an enlarged sectional elevational view of a lithographic printing plate of the type capable of being produced by this invention.

Pin holes and pits of the type described are seen to form almost immediately upon application of one coating composition upon a dried underlying coat, or soon thereafter. It is believed that the formation of such pin holes results from the release of air or gas from the surface of the underlying coat upon application of the top coating composition.

In accordance with the practice of this invention, it has been found that pin holes and pits can be substantially eliminated and the lithographic characteristics of the plate surface further improved by introducing an intermediate step of pre-wetting the surface of the underlying coat just prior to the application of the coating composition for forming a top layer.

In the practice of this invention, plain water may be used for pre-wetting or the aqueous medium may be modified with a small amount of wetting agent and/or organic solvent. Wetting agents in amounts ranging from 0.2 percent to 2.0 percent by weight or more may be used, and solvent concentrations of 0.5 percent to 5.0 percent have been found practical. Suitable wetting agents are water-soluble sulfonated alkyl, aromatic and mixed alkyl aromatic compounds and their water-soluble salts, such as sulfonated ethers, sodium alkyl naphthalene sulfonate, sodium monosulfonate of butyl phenyl phenol, sodium lauryl sulfate, dioctyl esters of sodium sulfosuccinate, or quaternary ammonium compounds and their salts or sulfonated polyglycols and their ethers, and the like. Suitable solvents for this purpose are water-miscible organic solvents, such as alcohols of the type propanol, butanol, dibutyl alcohol, glycols and the like, or butyl carbitol, methyl Cellosolve and the like. Although improvement is achieved simply by wetting the surface so that it is damp when the coating composition is applied, it is preferred to extend the wetting step to 5-20 seconds and then to follow the wetting step by means for removing excess moisture from the surfaces, so long as they remain wet, as by passing the wetted sheet between squeeze rolls, wiping rolls, or beneath an air brush or "air doctor." Wetting of the desired character is preferably achieved by immersion of the wetting material, as indicated in Figures 1 and 3, or by flow-coating or spraying the wetting material onto the surface of the plate, as shown in Figure 2.

Improvement by this technique is believed to result from the preferential displacement or expulsion of air or gas by water from the dry surface of the underlying coating. Thus, the factors which are believed heretofore to have caused the formation of pin holes are substantially eliminated. Although it is believed that substantially all of the gases on the surface portion are removed by the wetting step, subsequent operations to remove excess moisture eliminates gas pockets which might remain.

In addition, such pre-wetting apparently prepares the surface for better wetting out by the coating composition to be superposed so that improved adhesion results even though the amount of solvent in the coating composition is markedly reduced. In actual practice, it has been found that the amount of butanol can be reduced from 10 percent in the practice heretofore employed to 2 percent or less in accordance with the present technique with equivalent or even better adhesion between coats.

By way of further possible explanation for the improvement which results from treatment in accordance with the present invention, it appears that the existence of water on the surface of the underlying coat slows the drying or setting of the applied coating composition sufficiently to permit leveling out of the top coat by natural forces before setting. In the past, the surface coat often set so fast that surface roughness could not be eliminated before drying with the result that it became a permanent characteristic thereof. Since wetting in most instances is practiced with coatings applied onto a waterproofed base sheet, it will be apparent that migration of moisture

will occur from the inner regions toward the outer surface so that the inner regions of the plate will dry substantially before the outer surface further to aid the leveling action and the readjustment of the outer coating composition whereby the formation of pin holes and voids is further minimized.

In the manufacture of a planographic printing plate embodying features of this invention, it is preferred to make use of a backing sheet of thin flexible material, such as paper, fiber board, textile fabric, and use can also be made of a thin plastic film or metal sheet. The backing sheet should be sufficiently thin and flexible to permit bending around a typewriter platen and it should have sufficient strength to permit use in the preparation of a large number of copies by conventional offset or rotary press without deterioration or distortion.

It is preferred that the backing sheet be waterproofed, when of fibrous character, by incorporating resinous materials, such as urea formaldehyde, melamine formaldehyde, or other water-resistant resin in the furnish with which the backing sheet is formed, or else by impregnating the prepared sheet with wax, oil varnish, lacquer, resinous material or other water-repellent substance. Suitable waterproofness in the backing sheet may also be achieved by the fabrication of the backing sheet by the lamination of two or more thin sheets of paper with asphalt or other suitable waterproof adhesive. The degree of waterproofness embodied in the plate may vary in accordance with the intended use of the finished plate. For short runs, it is not necessary to make use of a waterproofing treatment, while runs of 1,000 or more copies usually require that the sheet be highly waterproofed to minimize deterioration or distortion upon wetting.

One side or preferably both sides of the backing sheet are coated with a hydrophilic colloid composition (the satin white coat) formed of a substantially water-soluble binder preferably having a filler therein and which dries to a tough, water-insoluble film or coating on the backing sheet. The applied film should be adherent to the backing sheet and sufficiently flexible to permit bending around a typewriter platen without the film composition chipping or flaking off. The application of a composition corresponding to the satin white coat onto the back side of the backing sheet is intended to compensate for the layers built up on the front side and thereby reduces the tendency towards wrinkling.

Various compositions and mixtures have been found to be suitable in the manufacture of the satin white coat. As the binder or hydrophilic colloid, excellent use can be made of casein, zein, glue, albumen, soya protein, polyvinyl alcohol, carboxymethylcellulose, hydroxymethyl cellulose, and corresponding water-soluble resinous materials. Suitable fillers may be selected of clay, silica, titanox, satin white, barium sulphate and the like, alone or in combination. It is preferred that the film be hardened and rendered substantially water-insoluble when in position of use, and for such purpose the satin white coating composition may be formulated with formaldehyde, hexamethylenetetramine, alum, and the like, or else the satin white coating may be exposed to solutions of such compounds for hardening. Although the amount to be used may be greatly reduced in accordance with the practice of this invention, water-miscible organic solvents such as propanol, butanol, methyl Cellosolve, butyl carbitol, and the like may be added to the satin white coating composition for the purpose of further enhancing adhesion to the underlying surface. In the event that the backing sheet is highly waterproofed, as by impregnation or coating with an oil varnish, lacquer or the like, it is preferred to make use of an intermediate binder coat in order to provide for sufficient anchorage of the satin white coat onto the backing sheet. Such intermediate coating may be formed of ester gum and casein, with or without filler.

The following are specific examples of compositions

5

which may be used in the preparation of the satin white coat:

EXAMPLE I

Hydrophilic colloid adhesive.....	Percent	5
Filler	10 to 30	
Organic solvent (when used).....	50 to 85	
Hardening agent.....	up to 4	
	1 to 5	

The above general formula sets forth the solids which may be dispersed in two to six times their weight in water for preparation of a satin white coating composition having consistency suitable for application onto the backing sheet. Application may be made by conventional coating systems, such as by a knife coating process, brush coating process or dip-squeeze process. It is preferred to apply the satin white coating composition with a roller coater followed almost immediately with an air brush or air doctor to smooth and regulate the thickness of the film. In practice, ten to thirty pounds of the coating composition are applied to 1,000 square feet of plate surface.

The following are more specific examples of satin white coating compositions:

EXAMPLE II

Casein	Percent	
Ammonia	16	
Clay	1½	
Satin white.....	60	
Formalin	19½	
Water in amount sufficient to reduce the solids...	3	
	to 30	

EXAMPLE III

Carboxymethyl cellulose.....	Percent	35
Satin white.....	12	
Clay	20	
Alum	60	
Propanol	3	
Water to reduce the solids content.....	2	40
	to 25	

EXAMPLE IV

Zinc caseinate.....	Percent	
Ammonia	18	45
Silica	1	
Clay	15	
Alum	60	
Methyl Cellosolve.....	4	
Water to dilute the solids.....	2	50
	to 35	

It is preferred to apply the satin white coat as two or more separate layers in order to introduce sufficient weight of the material. To improve the planographic characteristics, the satin white coat may be further treated with an acid salt such as aluminum formate, zinc sulphate, magnesium chloride, and the like in amounts ranging up to 5-25 percent by weight in aqueous solution in order to harden and further insolubilize the coating. Following the acid salt treatment, the surface should be desensitized, as by treatment with a 5-10 percent solution of a water-soluble silicate, such as potassium or sodium silicate.

Pre-wetting of the type described is particularly adapted as an intermediate step between applications of satin white coats or similar top coats. It has been found further that numerous advantages are also derived by pre-wetting in the manner described before application of the first satin white coat onto the binder coat or upon application of the satin white coat directly onto the paper-base fabric in the event that no intermediate coats are employed. Pre-wetting may also be employed when only one satin white coat is applied onto the binder coat or else directly onto the paper-base fabric in the manufacture of lower-cost lithographic printing plates.

6

The following examples of the practice of this invention are given by way of illustration but not by way of limitation.

EXAMPLE V

A paper sheet or web, hereinafter referred to as the plate, is waterproofed by impregnation with a 15 percent solvent solution of an oil-resin varnish. When dry, a binder coat formed of a solution of about equal parts ester gum and casein with or without a small amount of ammonia and wetting agent is applied. When dry and properly aged, the first satin white coat, corresponding to Example III, may be applied in amounts to deposit a weight of about 15 pounds coating per 1,000 square feet of plate surface. Application can be made with a doctor blade followed by an air doctor to remove excess and smooth the surface. The first satin white coating may be allowed to air dry at room temperature or forced to dry at elevated temperatures ranging from about 150° to 300° F. Before the second satin white coat is applied, the plate is submerged in a water bath for about ten seconds and then is advanced between squeeze rolls to remove excess moisture. Immediately, or soon thereafter, while the surface coat is still wet, the second satin white coating composition is applied in about the same amount or slightly less than the first and the plate is thereafter allowed to dry out slowly at room or elevated temperature.

The plate can thereafter be hardened, when dry, with aluminum formate (25 percent) and then desensitized, when dry, with sodium silicate (5 percent). Following such treatments, the surface of the plate can be burnished, as by rubbing or brushing, to remove excess salts and to prepare the surface for receiving a planographic printing image and for better wettability by repellent.

A backing coat of casein, with or without filler and hardening agents, may be applied onto the back face of the sheet at any time but it is preferably applied as a final step in plate manufacture. The function of the backing coat is to balance the coats on the opposite side to resist curling.

EXAMPLE VI

A waterproofed plate adapted to receive one or more satin white coats is pre-wet by spraying the surface thereof, as shown in Figure 2, with a 0.5 percent aqueous solution of sodium sulfosuccinate wetting agent. Excess aqueous medium on the surface of the plate is removed by squeeze rolls before the plate is passed between roller coaters for applying the satin white coating composition onto the surface thereof in amounts to deposit a weight of about 30 pounds per 1,000 square feet. Less may be applied in the event that the satin white coat is to be built up with a number of coatings. In that event, one coating is allowed to dry and is pre-wet before application of subsequent coats. Thereafter, treatment may continue as in Example V or modifications thereof may be incorporated, or such subsequent treatments may be eliminated.

EXAMPLE VII

In the manufacture of a low-cost, short-run lithographic printing plate, a web of 40-pound paper may be coated with a single, heavy satin white coat in accordance with this invention by first wetting the surface of the plate with water, squeezing out excess water between squeeze rolls and then applying sufficient satin white coating composition, as by means of a brush coater, to provide a weight of 35 pounds per 1,000 square feet of plate surface.

EXAMPLE VIII

A web having a dried first satin white coat of the type described in Example IV may be submerged in a wetting tank filled with water for about five seconds. Excess water is removed by an air knife or air doctor, as shown in Figure 3, prior to coating the surface with the same satin white coating composition by brush coating followed by treatment with an air doctor.

7

As indicated in Example IV, water-miscible metal salts of casein such as zinc caseinate, ammonium caseinate, and the like, may be used and such usage is often preferred.

It will be understood that a number of changes may be made in the sequence of operations and in the compositions of the treating materials without departing from the spirit of the invention, especially as defined in the following claims.

I claim:

1. In the process of fabricating a paper-base planographic printing plate with two or more superposed hydrophilic colloid coatings, the steps of drying an underlying hydrophilic colloid coating, wetting the surface of the dried coating with water, removing the excess of the aqueous wetting composition, and then applying the colloid coating composition for forming the next coating while the surface of the underlying coating is still wet.

2. The process of fabricating a planographic printing plate as claimed in claim 1 in which the water contains a small amount of an additional wetting agent.

8

3. The process of fabricating a planographic printing plate as claimed in claim 1 in which the water contains less than two percent by weight of a water-miscible organic solvent.

References Cited in the file of this patent

UNITED STATES PATENTS

1,933,963	Bradner	Nov. 7, 1933
2,130,241	MacLaurin	Sept. 13, 1938
2,132,443	Simons	Oct. 11, 1938
2,154,219	Shepherd	Apr. 11, 1939
2,156,100	Simons	Apr. 25, 1939
2,214,565	Montgomery et al.	Sept. 10, 1940
2,311,889	Toland et al.	Feb. 23, 1943
2,378,113	Van de Carr	June 12, 1945
2,419,206	Fisher	Apr. 22, 1947
2,534,650	Worthen	Dec. 19, 1950
2,570,262	Newman	Oct. 9, 1951