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2,361,665

METHOD OF ETCHING PRINTING PLATES

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Fig. 1.

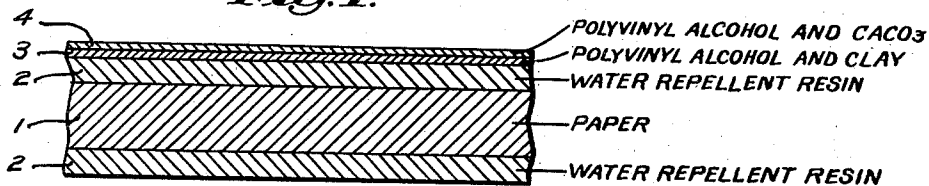


Fig. 2.

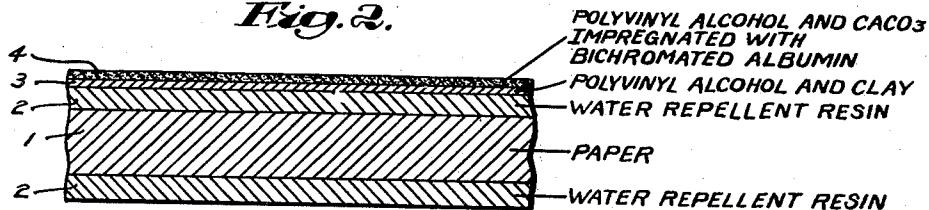


Fig. 3.

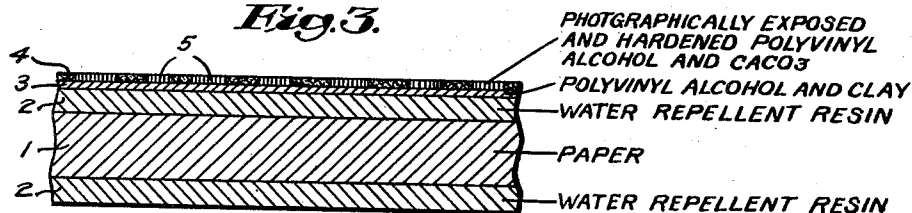
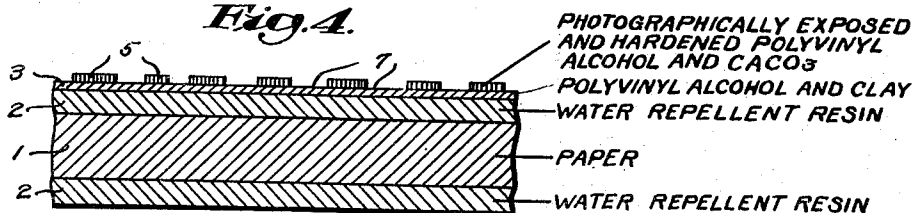


Fig. 4.



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METHOD OF ETCHING PRINTING PLATES

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9 Claims. (Cl. 95—5.4)

This invention relates to printing plates and has for its objects provision of improved accurate, cheap and efficient methods of making printing plates, and in particular planographic printing plates.

The nature of the invention and its objects will be more fully understood from the following description of the drawing and discussion relating thereto.

In the accompanying drawing:

Figure 1 is an enlarged fragmentary cross sectional view illustrating a step in the method of the invention;

Fig. 2 is an enlarged fragmentary cross sectional view illustrating another step in the method;

Fig. 3 is an enlarged fragmentary cross sectional view illustrating still another step; and

Fig. 4 is an enlarged fragmentary cross sectional view illustrating a printing plate finished in accordance with the method of the invention.

In accordance with the method of the invention, we provide a sheet material which includes two different coatings superimposed one upon another. A greasy ink image which is capable of functioning as a resist is selectively applied over the outer coating. Portions of the outer coating not covered by the resist ink image are then dissolved or etched away by subjecting the sheet material to the action of a chemical reagent which does not attack the underlying coating. The underlying coating is of water-receptive character and upon dissolving away parts of the outer coating, there remain ink-receptive areas and water-receptive ink-repellent areas, adapted to constitute respectively printing portions and non-printing portions.

The method of dissolving or etching out portions of the outer coating while maintaining the underlying coating in an unchanged condition is, in a preferred embodiment of the invention, based upon the use of different kinds of fillers and binders for the fillers. With respect to the underlying coating a filler of inert character, not readily attacked by chemical reagents such as mild acids, is held together by means of a colloid binder which is similarly inert and further characterized by the property of water-receptivity. With regard to the outer coating, the filler employed is of a type which enters into reaction with chemical reagents such as mild acids, and ultimately become dissolved away thereby. This second type of filler is held together by any suitable type of binder, which may

be of inert character or otherwise, subject only to the requirement that it will break up and become washed away when etching of the second filler occurs.

- 5 Control of the etching or dissolving away at selected points in the outer coating is effected by making use of the fact that greasy printing inks are somewhat resistant to attack by mild chemical reagents, and therefore when a printing image of such material is applied over the surface of the outer coating, the covered areas will be protected from attack by the chemical reagent along sharply defined outlines corresponding to the outlines of the printing image desired to be formed.

Referring more in detail to the drawing, we have illustrated a preferred embodiment of sheet material, in which numeral 1 indicates a sheet of paper coated at either side thereof with layers of waterproofing resin 2. Bonded to one of the layers 2 is an underlying coating 3, which includes finely divided filler particles of inert character held together by a binder. The filler particles may, for example, be clay or similar substances, and a preferred example of binder is a water-receptive colloid such as cold-water-insoluble water-absorptive polyvinyl alcohol. Gelatin and other colloids may be employed as a binder at this point.

- 30 The underlying coating 3 constitutes a lithographic printing base which is adapted to accept moisture and reject greasy ink in accordance with lithographic printing principles. In some instances, other suitable bases may be employed in place of the waterproofed paper and underlying coating 3, as for example grained metal, lithographic stone, sheet materials carrying resin coatings and the like.

- 40 Numeral 4 denotes an outer coating which includes a second finely divided filler material of a character which is attacked by chemical reagents such as mild acids and the like. An example of a filler of this character is one made up of calcium carbonate. Fillers formed of metal particles as copper and zinc, chemically reactive substances such as sodium silicate, and others may be employed.

- 45 The filler particles in the outer coating 4 are held together by any suitable binder which may consist of a colloidal material such as polyvinyl alcohol already described, or other colloids such as glue, gum, and the like.

- 50 In a preferred method of carrying out the invention, sheets carrying the underlying coating

3 and outer coating 4 are made up and kept on hand until a plate is to be prepared for printing. However, the method of the invention may include the steps of separately applying the coatings one upon another, and then immediately forming printing portions and non-printing portions.

In forming printing portions and non-printing portions on a sheet material which has already been provided with the two coatings 3 and 4, the method of the invention includes steps directed to providing a grease-receptive printing image and etched out water-receptive areas.

A light-sensitive mixture of albumin and ammonium dichromate is spread over the surface of the coating 4, with small amounts of the mixture tending to strike into and impregnate the coating 4, as has been diagrammatically illustrated in Fig. 2 of the drawing.

A photographic negative is laid over the light-sensitive mixture when dried, and the coating 4 with the light-sensitive albumin mixture is exposed to actinic light. This provides relatively hardened areas. The plate is then developed with greasy developing ink and washed under running water. The hardened areas accept and hold the greasy developing ink to form printing portions 5, while unexposed portions remain in an unhardened condition which permits the albumin and ammonium dichromate to become washed away therefrom (Fig. 3).

The surface of the plate is then treated with a chemical reagent, preferably an agent such as a 5% solution of acetic acid or other acids as nitric acid and the like in varying concentrations. The calcium carbonate particles present in the unexposed parts of the coating 4 are attacked and dissolved by the acid reagent. The etching action progresses throughout the thickness of the coating 4 down to the surface of the underlying coating 3 where the inert filler of the coating 3 resists further attack.

As a result of the reaction between the chemical reagent and the calcium carbonate, substantially all of the coating 4 occurring intermediate the printing images 5 becomes dissolved away, with immediately adjacent portions of the binder surrounding the calcium carbonate particles disintegrating and washing away, to leave bare water-receptive non-printing portions 7 of the underlying coating 3.

There is thus provided a planographic printing plate having grease-receptive printing portions 5 and water-receptive non-printing portions 7. The plate may be inked and printed in the usual manner, and the printing images 5 are hard and very firmly fixed in the surface of the plate.

An important feature of the method of the invention relates to the method of removing unhardened portions of the coating containing albumin and ammonium dichromate by a positive etching action.

In the conventional method of dissolving unexposed parts of albumin and ammonium dichromate in water, difficulties are present. The albumin and ammonium dichromate occur in the form of a thin film or coating which overlies the base employed to support them. In addition, in the case of absorbent bases, such as those composed of colloidal materials of which the coating 3 is representative, the albumin and ammonium dichromate also strike into the base and become impregnated in it.

A relatively pronounced degree of hardness in

the portions of the albumin and dichromate which are exposed and not dissolved away is desirable, in order to impart durability to the printing image and thereby permit relatively long printing runs. On the other hand, care must be exercised to prevent too great hardening action from taking place, which would prevent satisfactory separation of unexposed albumin and ammonium dichromate from exposed portions of these materials when held under running water.

If care is not exercised in removing substantially all of the unexposed albumin and ammonium dichromate from all points in the base at which no printing image is to occur, a gradual hardening may take place at those points noted, and subsequently grease-receptive character develops, causing scumming or uncontrolled retention of greasy ink at undesired points.

The etching step of the invention overcomes this difficulty by positively removing small amounts of the unexposed albumin and ammonium dichromate at the time the coating 4 is etched or dissolved away at those points intermediate the hardened printing image. In thus removing the medium in which the albumin and ammonium dichromate are held, the possibility of scumming is completely eliminated. Also, since removal of unexposed albumin and ammonium dichromate in this way is not dependent upon the degree of hardness which has been effected in the exposed portions of the coating 4, a greater degree of hardness in the printing portions, directed to increasing durability, may be imparted to the plate.

A second feature of the method of the invention relates to the fact that the parts of the coating 4 immediately underlying the printing portions 5, when hardened by exposure to ammonium dichromate impregnated therein, develop resist properties with respect to etching reagents. There is thus provided uniform resistance to etching throughout the thickness of the printing portions with the immediate result that substantially no undercutting may occur and a more accurate and durable printing image is provided for.

The etching step of the invention also makes possible more satisfactory use of certain water-receptive binder materials. Reference is had to those binder materials which do not properly dissolve in running water when employed in conventional methods of forming a printing image, for example the albumin process. The degree of solubility in water of the binder is no longer an important consideration since removal is effected by the etching action of the acid instead of washing away under running water. The etching action is to a great extent independent of the binder since by dissolving away the filler, immediately surrounding portions of the binder disintegrate and fall away, to uncover surfaces of the underlying coating 3. As a result, various resins and other colloidal materials not readily soluble in water may be utilized as binders in the formation of photographic plates in this way.

The method of the invention may also be carried out in connection with other procedures for forming printing portions and non-printing portions, as for example in connection with procedures for directly applying a greasy printing image on the surface of the coating 4, as by marking or drawing or otherwise inscribing an image thereon. The greasy ink constituting the directly applied image surface serves as a resist in the same way to prevent etching from occur-

ring at points immediately thereunder, while other points intermediate the areas covered by the printing portions may be etched away in the manner already described.

The method of selectively etching or dissolving away portions of a coating which is supported on a suitable base, is subject to application in connection with the formation of other types of printing plates, such as gravure plates and relief printing plates. For example, a coating such as the coating 4, supported on any suitable base as a sheet of paper, metal or other material, may be selectively covered with a resist ink and etched to provide cavities or spaces in which a gravure ink may be contained. In this type of plate, the unetched parts of the coating would constitute the non-printing portions of the gravure plate, while the spaces resulting from etching the coating would constitute the ink-holding printing portions of the gravure plate.

An opposite result could be obtained by carrying out etching of a coating, such as the coating 4 supported on a suitable base as paper, metal and the like, with the parts of the coating which have not been etched being made to serve as relief printing portions, carrying ink in accordance with the usual custom of relief printing plates, while the etched-out portions may constitute non-printing portions in the conventional manner. Various other changes and modifications may be resorted to.

By the method of the invention, a positive and quick method of developing a lithographic printing plate is made available, and difficulties arising in connection with removing unexposed parts of a sensitized coating are greatly minimized. A wider range of binder materials may be employed, and improved control of the size of printing images in a photolithographic plate, with the absence of undercutting, may be obtained as well as other advantages.

While we have shown a preferred embodiment of our invention, it should be understood that various changes and modifications may be resorted to, in keeping with the spirit of the invention as defined by the appended claims.

We claim:

1. That improved process which comprises coating on a base a mixture of a binder and a filler which is inert, then applying a surface coating of a mixture of a binder and a filler adapted to enter into reaction with a chemical reagent, forming a printing image on the said surface coating, said printing image consisting of a resist material, treating the surface coating with a chemical reagent at points intermediate the printing image, thereby to dissolve portions of the surface coating and to uncover the mixture of binder and inert filler at points intermediate the printing image.

2. That improved process of making a planographic printing plate which comprises providing a base, said base including a substratum of a water-receptive colloid and a finely divided inert filler, said filler being adapted to resist reaction with a chemical reagent, said base further including an outer coating of a water-receptive colloid and a filler which enters into reaction with a chemical reagent, forming a grease-receptive printing image in the said outer coating, treating the coating with a chemical reagent at points intermediate the printing image, thereby to dissolve portions of the outer coating at points intermediate the printing portions and leave non-

printing portions of the water-receptive colloid and filler.

3. That improved process which comprises providing a base which includes a substratum of polyvinyl alcohol and a chemically inert clay and a layer of calcium carbonate and polyvinyl alcohol, forming a printing image on the said layer and then treating the layer with a chemical reagent for the purpose of dissolving parts of the said polyvinyl alcohol and calcium carbonate layer intermediate the printing image to form non-printing portions.

4. That improved process which comprises applying on a suitable base a substratum of a water-receptive colloid and an inert filler, coating the substratum with a colloid and a filler which reacts with a chemical reagent, applying a light-sensitive colloid mixture over the coating, exposing to actinic light, covering with a greasy developing ink, washing under water, and then applying a chemical reagent to the plate at points intermediate the greasy printing portions to remove parts of the coating and uncover surface portions of the substratum, thereby forming non-printing portions.

5. That improved process which comprises applying on a suitable base a substratum of a water-receptive colloid and an inert filler, covering the substratum with a surface coating of a colloid and a filler which reacts with a chemical reagent, impregnating the surface coating with a mixture of a light-sensitive salt and a colloid, selectively exposing the impregnated coating to actinic light passed through a photographic negative, thereby to harden together exposed light-sensitive salt, colloid and adjacent portions of the coating, covering with a greasy developing ink, washing under water to remove developing ink from unexposed parts of the coating, applying a chemical reagent to dissolve parts of the coating occurring intermediate the greasy developing ink thereby forming grease-receptive printing portions and water-receptive non-printing portions.

6. That improved process of making a planographic printing plate which comprises providing a base, said base including a substratum of a water-receptive colloid and a finely divided inert filler, said filler being adapted to resist reaction with a chemical reagent, said base further including an outer coating of a colloid and a filler which enters into reaction with a chemical reagent, applying over the outer coating a mixture of albumin and ammonium dichromate, said mixture being impregnated in the outer coating, exposing the mixture and the impregnated coating to actinic light passed through a photographic negative, thereby to harden together parts of the outer coating and the exposed light-sensitive mixture, applying a greasy ink to the coating, washing to remove greasy ink from unhardened portions of the coating and also to remove unexposed albumin and ammonium dichromate, treating the coating with a chemical reagent at points intermediate the greasy ink to dissolve portions of the outer coating and leave non-printing portions of the water-receptive colloid and filler.

7. As an article of manufacture a sheet material for use in making planographic printing plates, said sheet material including a paper base member which is covered with a water-repellent substance, a substratum located at one side of the base member, said substratum consisting of polyvinyl alcohol and a chemically inert filler, a

surface coating overlying the substratum, said surface coating consisting of a binder and a chemically reactive filler.

8. As an article of manufacture a sheet material for use in making a planographic printing plate element, said sheet material comprising a paper base having a water-repellent substance applied at either side thereof, a substratum located at one side of the base element, said substratum consisting of a binder and a chemically inert filler, a surface coating overlying the substratum, said surface coating including a binder and a chemically reactive filler.

9. As an article of manufacture a sheet material for use in making a planographic printing plate element, said sheet material comprising a flexible base, a substratum located at one side of the base, said substratum consisting of polyvinyl alcohol and a chemically inert filler, a surface coating overlying the substratum, said surface coating including a binder and a chemically reactive filler.

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