

March 16, 1943.

W. C. TOLAND ET AL

2,313,848

PRINTING PLATE

Filed March 27, 1942

Fig. 1.

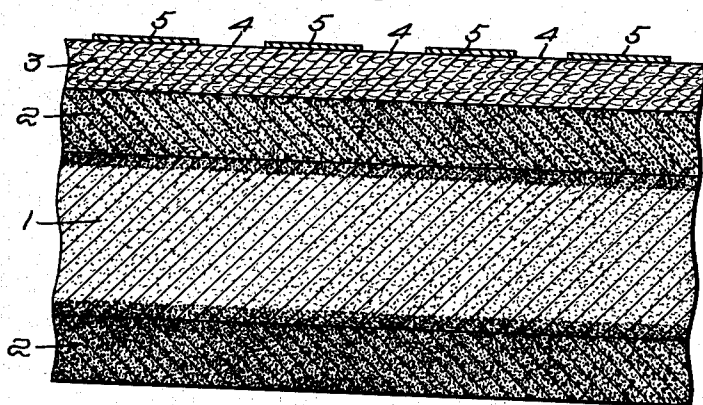
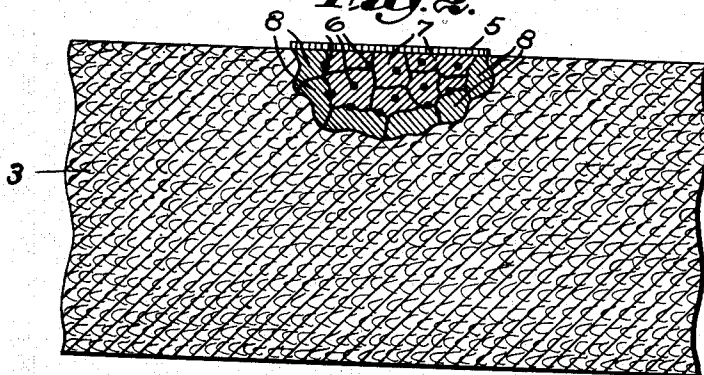


Fig. 2.



Inventors

William C. Toland

by Ellis Bassett & T. Hamilton

Attorney

UNITED STATES PATENT OFFICE

2,313,848

PRINTING PLATE

William Craig Toland and Ellis Bassist, Brookline, Mass., assignors to William Craig Toland, Brookline, Mass., trustee

Continuation of application Serial No. 315,412, January 24, 1940. This application March 27, 1942, Serial No. 436,432

7 Claims. (Cl. 101—149.2)

This invention relates to printing plates and more especially to photolithographic printing plates, and is a continuation of an earlier patent, No. 2,812,852 issued March 2, 1943.

An object of the invention is to improve printing plates and methods of making printing plates, and to devise a photolithographic printing plate which is prepared with the aid of a photosensitive emulsion of the type represented by a silver haloid and gelatin. Another object is to provide a photolithographic printing plate element which is quickly exposed and developed without the use of actinic light or special exposure apparatus. Another object is to provide a photolithographic plate having improved and durable grease-receptive printing portions embedded in a water-receptive colloid base. The invention is also directed to providing a simple, cheap printing plate which is especially characterized by fine printing quality and efficiency.

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:

Fig. 1 is an enlarged fragmentary cross sectional view of the printing plate of the invention; and

Fig. 2 is another enlarged cross sectional view. Referring more in detail to the drawing, numeral 1 denotes a base element consisting of a sheet of tough kraft paper impregnated with a binder as polyvinyl alcohol, rosin and alum, or the like. Paper such as parchment papers, fibre board and others, may also be employed for the base element, and in some instances a plurality of sheets attached to one another may be resorted to.

Overlying the sheet material 1 are water-repellent layers 2 which lightly impregnate either side thereof. The layers 2 may consist of a resin such as an aqueous dispersion of a urea formaldehyde resin glue, as for example "Plaskon," "Casco," or other substances.

The paper and the waterproof coatings combine to provide a base which resists stretching or shrinking when immersed in water, which is flexible, and which is sufficiently tough to withstand being pulled apart by the pull exerted in a printing press. In some instances, other types of bases as, for example, those composed entirely of resin materials may also be employed in forming the printing plate of the invention.

Securely attached to one of the layers 2 is a coating 3 consisting of a finely divided filler,

such as clay, and a colloidal material which will not dissolve in cold water but will absorb cold water. The coating 3 is adapted to function as the water-receptive portions of a planographic printing plate. A preferred example of a material of this character is a water-receptive, water-insoluble polyvinyl alcohol. Water-receptive resins, as for example certain vinyl compounds and others, may also be used.

Numeral 4 denotes areas in the surface of the coating 3 which are water-receptive and which constitute non-printing portions. Adjacent these non-printing portions 4 are printing portions 5 which extend into the coating 3 and which have their outer surfaces covered with a greasy developing material such as developing ink to render them grease-receptive.

The printing portions 5 include metallic grains or particles 6, small hardened masses of gelatin 7, and hardened portions 8 of polyvinyl alcohol and filler. Some of the particles 6 are completely surrounded by hardened gelatin portions 7 which are in turn embedded in hardened polyvinyl alcohol. Others of the particles are partly covered with hardened gelatin 7 and partly covered with the hardened polyvinyl alcohol portions 8. The combination of the hardened masses 7 and 8 provide for the printing portions 5 being of an exceedingly tough durable nature and further being solidly anchored in water-receptive portions of the coating 3.

One suitable method of preparing a plate of this character consists in applying on the coating 3, a photosensitive emulsion of conventional character made up of an aqueous mixture of gelatin and a silver halide, or mixture of silver halides as silver bromide and silver iodide.

The photosensitive material is selectively exposed to light passed through a photographic negative. This provides a gelatin layer containing a latent image made up of exposed portions which are developed by developing agents such as hydroquinone, catechol and the like. Developing changes the exposed silver halide to particles or grains of free silver.

The particles occur all the way through the gelatin layer down to the surface of the coating 3 and may penetrate into the coating 3 in case some of the photosensitive emulsion is absorbed by it. It is pointed out that the presence of the finely divided filler in the coating 3 tends to develop porosity and this porosity in conjunction with the water-absorptive character of the polyvinyl alcohol tends to induce some impregnation of the silver emulsion into the coating 3 and hence

provides for subsequent formation of grains of silver in the coating 3 as well as on its surface.

The gelatin layer is then treated to harden those portions of gelatin and polyvinyl alcohol immediately surrounding the silver particles. One means of obtaining this result consists in subjecting the plate to the action of ammonium dichromate as by immersing it in a bath of this reagent. If desired, other hardening agents may be employed as pyrogallol, ammonium chloride, potassium bromide, and others.

The ammonium dichromate strikes into the gelatin layer and the coating 3, and provides chromic acid ions which contact and react with the silver grains or particles 6 to form silver chromate and free hydrogen according to the equation: $6Ag + 3H_2CrO_4 = 3Ag_2CrO_4 + 6H$.

The hydrogen then reduces the excess of acid to chromium oxide which in the presence of chromic acid becomes chromate of chromium represented by the formula $Cr_2O_2 - CrO_3$. This salt is effective to produce water-insolubilization of gelatin, and creates jackets or globules of hardened gelatin surrounding the grains of silver. Those gelatin masses which lie adjacent the polyvinyl alcohol may have zones of hardness which extend into the polyvinyl alcohol and become embedded therein, as has been diagrammatically illustrated in the drawing.

A further desirable insolubilizing action also takes place. The polyvinyl alcohol is susceptible to hardening by the chromate of chromium in the same way that the gelatin is, which allows jackets or globules of hardened polyvinyl alcohol to be formed around these grains which lie in contact with the polyvinyl alcohol or which are impregnated in it. It will be observed that where hardening occurs from a single grain which is in contact with both alcohol and gelatin, they will be hardened into one another.

It should be observed that the gelatin and silver grains become solidly anchored in the polyvinyl alcohol. Greatly increased toughness and durability are imparted to the grease-receptive gelatin portions 5 so that they are enabled to withstand many printing impressions without substantial deterioration such as commonly occurs with conventional gelatin printing portions. Difficulty heretofore experienced in connection with separation of hardened grease-receptive gelatin portions from relatively less hardened water-receptive gelatin portions is greatly reduced. The polyvinyl alcohol strengthens the gelatin and reduces breaking away or separation of the greasy gelatin printing portions from the rest of the plate. This permits satisfactory use of gelatin which is necessary to form a suitable photosensitive emulsion.

The bonded relation of the gelatin printing portions 7 in the coating 3 is made stronger by the fact that the particles 6 and surrounding gelatin portions 7 may in some cases become relatively deeply embedded in the coating 3. In other cases the water-receptive portions of polyvinyl alcohol swell and become forced up around the gelatin which also tends to hold them.

The method described is simple, cheap and quickly carried out. The silver salt emulsion may be prepared at considerably less cost than a corresponding mixture of albumin and ammonium dichromate, and the use of expensive exposing apparatus such as actinic light equipment is avoided. The plates, prior to exposure, if held in darkness, may be maintained for extended pe-

riods with suitable sensitivity, and may be shipped and stored in this form.

The printing plate obtained by this procedure is characterized by long life, cheapness, durability, and fine quality of printing. The printing image obtained from the silver salt and gelatin emulsion admirably combines with the water-receptive layer to provide a bonded relation which will withstand extended press operations without the occurrence of scumming or without breaking away or deteriorating.

It will be seen that a novel printing member and method of preparation therefor has been provided. A highly desirable combination of gelatin and silver grains with a layer of water-receptive colloidal material has been disclosed. Various savings in time, equipment, and handling are obtained, and an improved planographic printing plate member made available.

While we have shown and described a preferred embodiment of the invention, including specific materials and procedures, it should be understood that various other materials than those noted may be resorted to, and other combinations of light-sensitive salts with a water-soluble colloid coated over a film of a second water-receptive colloid may be resorted to, in keeping with the spirit of the invention as defined by the appended claims.

We claim:

1. As an article of manufacture a photolithographic printing plate which includes a layer obtained from a mixture of water-receptive water-insoluble polyvinyl alcohol and a filler, grease-receptive masses embedded in the layer, said masses including particles of a silver compound surrounded by hardened gelatin and said hardened gelatin extending into the layer and forming relatively hard polyvinyl alcohol portions therein.

2. As an article of manufacture a photolithographic printing plate comprising a base or layer of a water-receptive polyvinyl alcohol and filler, printing portions formed therein, said printing portions including gelatin and particles of a silver compound impregnated in the layer, portions of the layer immediately surrounding the gelatin being hardened to the gelatin.

3. As an article of manufacture a photolithographic printing plate comprising a base, a layer of a water-receptive material superimposed on the base, said layer including non-printing portions and grease-receptive printing portions, said printing portions formed of particles of a silver compound, a hardened colloid surrounding the particles, and said layer further having hardened portions occurring adjacent the hardened colloid portions.

4. As an article of manufacture a planographic printing plate comprising a base, a layer of a water-receptive polyvinyl alcohol on the base, printing portions formed in the layer of polyvinyl alcohol, said printing portions including gelatin and particles of a silver compound attached to the layer, and said layer occurring in a water-swollen condition in which it partially surrounds the printing portions.

5. As an article of manufacture a planographic printing plate comprising a base, a layer of polyvinyl alcohol and a filler superimposed on the base, said layer presenting water-receptive non-printing portions and grease-receptive printing portions, said printing portions including hardened polyvinyl alcohol, hardened gelatin and particles of a silver compound.

6. As an article of manufacture a planographic printing plate comprising a base, a layer of water-receptive polyvinyl alcohol superimposed on the base, grease-receptive printing portions including a hardened gelatin and particles of a silver compound, portions of the polyvinyl alcohol occurring adjacent the gelatin and particles being hardened together with the gelatin to anchor the printing portions solidly in the layer of polyvinyl alcohol.

5

10

7. As an article of manufacture a planographic printing plate which includes a layer of water-receptive material adapted to form non-printing portions, grease-receptive printing portions embedded in the layer, said grease-receptive printing portions including a silver compound, and a hardened colloid surrounding the silver compound.

WILLIAM CRAIG TOLAND.
ELLIS BASSIST.