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PLANOGRAPHIC PLATE AND METHOD

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The present invention relates to planographic printing surfaces and more particularly to flexible composite planographic printing plates adapted for use in lithography, either offset or direct, and to methods of making the same.

The planographic printing surfaces provided by my invention, while satisfactory for planographic and lithographic printing generally, are more particularly suitable for the reproduction of what is known to the art as "direct images", such as wax crayon drawings, typewriting, etc., which may be placed directly upon the printing surface without the intervention of any photographic process. The printing surfaces of this invention are also suitable for use where photographic methods are employed, providing that the customary photosensitizing coatings are neutral or acid in reaction instead of alkaline as in common practice.

It is an object of this invention to provide an improved planographic printing surface which will be suitable for use with both photographic and hand transfer (direct) methods of application of the image. It is a further object of the invention to provide a composite lithographic plate of sufficient flexibility so that it may be used directly in the typewriter for application of direct images.

Planographic printing, as is well known, comprises printing from a smooth surface containing areas which are covered with ink and areas which remain blank.

In the course of the printing operation the ink on the printing or image areas must be periodically renewed, usually after each successive copy is printed. However, it is impracticable to apply ink with any mechanical device to a planographic printing image without having the inking device also come in contact with the blank areas, and it is therefore necessary in planographic printing to provide means whereby the original blank areas will remain blank and continuously refuse to take up any ink from the inking devices on the printing press. At the same time, any such means so provided must not interfere with the continuous application to and retention of ink by the printing or image areas.

Stone, zinc, and aluminum are the most commonly used materials for planographic printing and the division of the printing art which uses these three materials is commonly known as lithography or lithographic printing. The essential features of lithographic printing are first the provision of a plane surface which is inherently attractive to printing ink and to greasy and oily

marking materials in general; secondly, the provision in this surface of the additional property of becoming "desensitized" or repellent to printing ink and other greasy materials when such surfaces are chemically treated by methods which have been developed in the art over a long period of years. In stone, these two properties are a natural function of the porosity, absorbency, and surface texture or "grain" of the stone itself. In zinc and aluminum, the first of these properties,—attraction for ink,—is an inherent quality of metals, while the second property is partly due to artificially "graining" the surface by light abrasion and partly due to the chemical reactivity of the metals. The use of stone, zinc, and aluminum surfaces in lithography, therefore, includes the application of a greasy image to such a "grained" or "matte" surface either directly or by the use of photography, which step is followed by a treatment of the remainder of the surface with certain chemical reagents such as gum arabic, phosphoric acid, etc., so to change the character of the metal or stone that printing ink will no longer adhere to it if any traces of water are present. Those skilled in the art refer to this chemical treatment as "desensitizing" or "counter-etching". By the foregoing means, planographic printing surfaces are provided which can be used for printing in special presses where the printing surface is alternately contacted with an inking device and with a moistening device. During the printing operations the printing plates so prepared continually take up ink on the image areas and transfer it to the print, while the blank areas take up water from the moistening device and likewise transfer it to the print. As printing inks and water are mutually immiscible, there is no encroachment of one upon those portions of the plate occupied by the other.

As a further precaution to aid in keeping the blank areas blank, the press operator may add to the water used in the printing press moistening device a small amount of the same or similar chemicals as were used in the "counter-etch" or "desensitizing" operation. Glycerine has also been used as a further adjuvant to maintain the blank areas of the plates thoroughly wettable by water and therefore ink-repellent.

As a matter of clearness, the moistening fluid used in the printing press will be hereafter referred to as the "repellent" whether it comprises plain water, or water to which gum arabic, phosphoric acid, glycerine, ammonium salts, etc. have been added. Similarly, the chemicals or solu-

tions used in the original treatment of the blank areas of the plate to render them water-retentive and ink-repellent will be referred to as "desensitizers".

5 I have discovered that silica, freshly precipitated in a thin film under certain conditions, forms an excellent lithographic surface, having the necessary attractiveness to ink and greasy materials in general, as well as the ability to become desensitized.

10 In the preferred practice of my invention, I first provide a sheet of flexible material, which may for example be paper, paper board, fibre, or suitable textile fabric. The sheet is preferably sufficiently thin and flexible to bend around a typewriter platen, but it should have the necessary strength for use on offset or rotary presses.

15 This flexible sheet is preferably waterproofed, for example by varnishing or by impregnation with any convenient wax or resin composition. I may also use two or more plies of thin material such as paper stuck together with asphalt or other suitable waterproof adhesive.

20 The degree of waterproofing may vary with the proposed use for the finished plate. For short runs of low quality printing it is not essential to achieve perfect waterproofing, while for longer runs of high quality work the base should be sufficiently waterproof to prevent misregister due to expansion.

30 To the flexible sheet provided as above described, I apply a coating of some acid substance, preferably an acid salt, which will act as a precipitant for alkali metal silicate. For example, I may coat the sheet with a 10% solution of aluminum formate. Alternatively, I may use zinc sulphate, magnesium chloride or like substances, the main essential being that such substance shall have an acid reaction in water solution.

40 It is sometimes difficult to prepare or apply a coating of such acid salts in such a manner as will insure satisfactory adhesion to the waterproofed sheet, especially if the latter has been very thoroughly waterproofed. In this case, I prefer to apply an intermediate coating which will adhere to the base sheet and which in turn offers satisfactory anchorage for the acidic coating. Such an intermediate coating may comprise casein dissolved in an alkali, either with or without an added pigment filler, such as is commercially used for coating book papers and the like. Or I may use a thin coating of glue, plasticized by the addition of glycerine and hardened by treatment with formaldehyde. It is advantageous to use a coating which includes a white pigment, as this gives the finished product a desirable high white color.

55 It is also advantageous to use in such coatings a binder, for example casein, which will be hardened or insolubilized by the acid salt afterwards applied. In this case the aluminum formate or other acid salt coating has two functions, that of insolubilizing the intermediate coating and that of furnishing an acidic substratum for the subsequent precipitation of silica in the final step.

60 Having provided a coating of an acid substance, preferably an acid salt, either directly upon the flexible sheet or upon an intermediate coating thereon, I then treat the acid coating in the following manner.

70 A thin coating of a solution of alkali metal silicate, for example a dilute solution of sodium silicate such as may be prepared by diluting commercial sodium silicate solution with ten vol-

umes of water, is applied over the acid coating by any convenient method such as dipping, brushing, spraying or spreading. This solution is allowed to stand in contact with the acidic substratum for a brief interval, sufficient for chemical interaction between the acidic coating and the silicate coating to take place to a certain extent, whereby the precipitation of silica and/or silicic acid begins.

10 At this point the silicious coating is subjected to rapid and thorough agitation, for example by brushing or scrubbing, so as to maintain the freshly precipitated silica and/or silicic acid in finely divided form during the final stages of precipitation and drying. As the precipitation of silicic acid continues, the original thin film of liquid sodium silicate assumes a pasty consistency and finally hardens. As this surface film thus hardens under agitation, it acquires a porous texture similar to the "grain" of other lithographic materials. After a brief period of drying either at room temperature or higher, the lithographic surface or plate so prepared is ready for use.

20 Alternatively to the sodium silicate mentioned in the foregoing example, I may use other alkali metal silicates, such as potassium silicate or mixtures of sodium and potassium silicates. Such mixtures may be desirable for special purposes as modifying slightly the type of "grain" or surface produced.

I claim:

30 1. A lithograph plate comprising a backing sheet composed of paper which is non-stretching when subjected to the lithographing process, said paper coated with a flexible base coating firmly adhering thereto, and a surface film of precipitated silica over said base coating.

40 2. A lithograph plate comprising a backing sheet composed of paper which is non-stretching when subjected to the lithographing process, said paper coated with a base coating comprising casein and a pigment filler, and a surface film of precipitated silica over said base coating.

45 3. A lithograph plate comprising a backing sheet composed of paper which is substantially waterproof and non-stretching when subjected to the lithographing process, said paper coated with a base coating comprising casein and a metallic hardening agent, and a surface film of precipitated silica over said base coating.

50 4. A process of preparing a lithograph plate which comprises providing a backing sheet composed of a material which is non-stretching when subjected to the lithographing process, applying over said backing sheet a coating having a plastic silicious surface, imparting lithographic properties to said surface by agitating the same while in a plastic condition, and then drying.

55 5. A process of preparing a planographic printing plate which comprises providing a backing sheet composed of a material which is substantially non-stretching when subjected to the planographic printing process, applying over said backing sheet a coating of an acidic substance, applying over said coating a second coating comprising an alkali metal silicate and agitating while in a plastic condition.

60 6. A process of preparing a planographic printing plate which comprises providing a backing sheet composed of a material which is substantially non-stretching when subjected to the planographic printing process, applying over said backing sheet a coating of a salt which has an acid reaction in water solution, applying over said coating a second coating comprising an al-

kali metal silicate and then agitating the same while in a plastic condition.

7. In a process of preparing a lithograph plate, the steps which comprise applying to a backing material a coating which will adhere tenaciously to said material, then applying over said coating a second coating of a salt which in water solution gives an acid reaction, then applying over said second coating a third coating of a material comprising an alkali metal silicate.

8. In a process of preparing a plate for use in lithography, the steps which comprise applying to a backing material a coating which will adhere tenaciously to said material, said coating comprising a binder which is insolubilized by metallic salts, applying over said first coating a second coating comprising a metallic salt capable of insolubilizing the binder and also capable of giving an acid reaction in aqueous solution, then applying a third coating which contains alkali metal silicate.

9. In a process of preparing a lithographic plate, the steps which comprise providing a flexible backing sheet which is substantially non-stretching when subjected to the lithographing process, applying over said backing sheet a coating comprising a salt which in aqueous solution will give an acid reaction, applying over said coating a coating comprising sodium silicate, imparting lithographic properties to the surface of the coating by roughening the same while in a plastic condition, and drying the coating.

10. A process of preparing a lithographic plate which comprises applying to a backing material a base coating which will adhere tenaciously to said material, applying over said base coating a second coating comprising a salt which will give an acid reaction in aqueous solution, applying over said second coating a third coating comprising sodium silicate, and agitating the surface of the resulting structure.

11. A lithograph plate comprising a backing sheet composed of paper which is substantially waterproof and non-stretching when subjected to the lithographing process, said paper coated with a base coating comprising casein, and a surface film of precipitated silica over said base coating.

12. A lithograph plate comprising a backing sheet composed of paper which is substantially waterproof and non-stretching when subjected to the lithographing process, said paper coated with a base coating comprising an acidic substance, and a surface film of precipitated silica over said base coating.

13. A process of preparing a planographic printing plate which comprises providing a backing sheet composed of a material which is substantially non-stretching when subjected to the planographic printing process, applying over said backing sheet a coating of an acidic substance, and applying over said coating a second coating comprising an alkali metal silicate.

14. In a process of preparing a lithographic plate, the steps which comprise providing a flexible backing sheet which is substantially non-stretching when subjected to the lithographing process, applying over said backing sheet a coating comprising a salt which in aqueous solution will give an acid reaction, applying over said coating a coating comprising sodium silicate and drying the coating.

15. A process of preparing a lithographic plate which comprises applying to a backing material a base coating which will adhere tenaciously to said material, applying over said base coating a second coating comprising a salt which will give an acid reaction in aqueous solution and applying over said second coating a third coating comprising sodium silicate.

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