Oct. 14, 1941. W. N. MISURACA 2,258,956

STEEL PLATE FOR LITHOGRAPHIC PRINTING

Filed Sept. 14, 1938

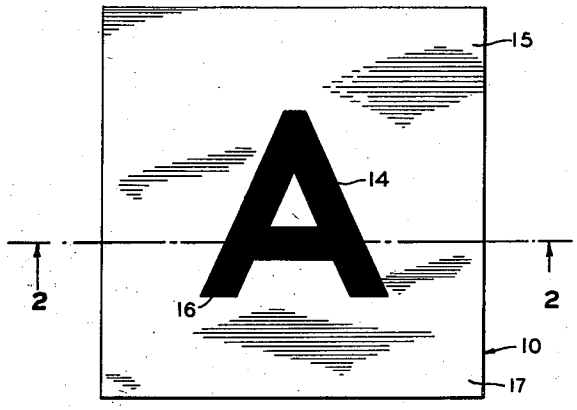

FIG. 1

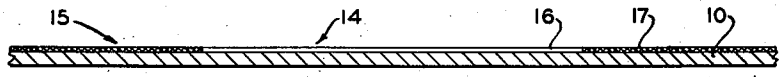

FIG. 2

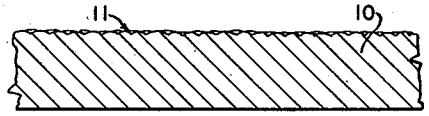

FIG. 3

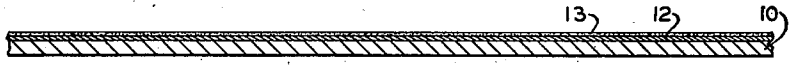

FIG. 4

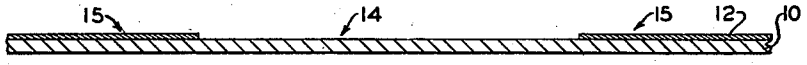

FIG. 5

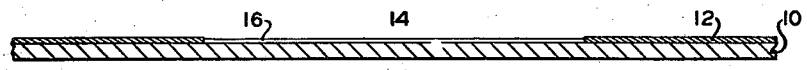

FIG. 6

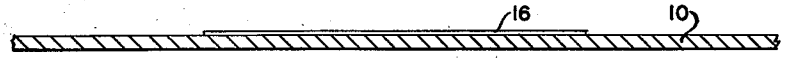

FIG. 7

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STEEL PLATE FOR LITHOGRAPHIC PRINTING

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Application September 14, 1938, Serial No. 229,809

4 Claims. (Cl. 41—41.5)

This invention relates to the art of lithographic printing and particularly to lithographic plates having greatly improved wearing qualities, and to methods of making such plates.

It is generally known that lithographic or planographic printing utilizes plates having the printing and non-printing areas in the same plane, and is based on the theory or principle that water and grease are ordinarily immiscible. The design or printing area of a lithographic plate is formed of a substance having a definite affinity for grease or a greasy type of marking material, while the non-printing areas of the plate are prepared to accept water so as to restrict the application of the greasy marking material to the printing areas only. At present, the only metals that have been successfully used for lithographic printing plates are zinc and aluminum. Although there are many ways in which such plates are prepared for printing, one method which is widely used includes the following steps: (1) Making a print on a grained zinc or aluminum plate sensitized with a dichromated colloid; (2) developing the print to expose the metal surface in the printing areas; (3) etching if desired, and treating the printing areas with an ink receptive substance; (4) removing the dichromated colloid coating from the non-printing areas; (5) treating the bare metal non-printing areas with a desensitizing acid solution so as to make such areas receptive to water and, hence, repellant to grease.

When plates prepared in this manner, or one of the many modifications thereof, are used in printing, difficulties are encountered in retaining the grease repellant properties of the non-printing areas of the plate and in preventing the wearing away of the greasy design portions. Retention of the grease repellant properties of the non-printing areas is difficult because of the comparatively short life of the grained surface of the soft zinc and aluminum plates, which grained surface facilitates the retention of water. The wearing away of the design or printing areas is probably due both to friction and to the fact that the plate surface is grained or roughened. Such wearing is also increased by the fact that the greasy base of the design is not entirely resistant to the corrosive action of the acids usually added to the dampening water applied in the press.

I have discovered that the above and other difficulties encountered in the use of prior lithographic plates may be overcome by providing a metal plate which is harder or has greater wear resistance than zinc and aluminum and has the design or printing areas thereof coated with a material having substantially as great a wearing life as the harder or more wear-resistant metal, and the non-printing areas treated with a desensitizing solution which will adhere to the harder metal.

In accordance with my invention a grained plate comprising a metal harder or more wear-resistant than zinc and aluminum is first coated with a light sensitive solution and exposed to the light through a positive or negative film. The exposed plate is then developed so as to eliminate the coating from the unexposed printing areas of the plate. Following this I coat the plate with a resinous material which, when baked at a relatively high temperature, will polymerize to form an extremely hard film; and then remove both the light-hardened sensitive solution and the resinous material from the non-printing areas of the plate so as to leave the resinous material adhering only to the printing or work areas. In this condition the plate is baked at a suitable temperature to polymerize the resinous material and render it hard and highly resistant to the chemical action of acids and alkalies. Finally the plate is made ready for printing by applying to the bare metal non-printing portions a solution which will thoroughly desensitize these portions so that they will repel grease and retain water. The finished printing member then comprises a metal plate having a hard polymerized resinous coating on the printing areas thereof and having the exposed metal non-printing areas treated so that they will retain water.

The above and other features and objects of the invention will become apparent upon consideration of the following description and the accompanying drawing, in which:

Fig. 1 is a plan view of a finished lithographic plate embodying my invention;

Fig. 2 is an enlarged vertical sectional view taken substantially along the line 2—2 of Fig. 1, the thickness of the various layers applied to the plate being exaggerated for the sake of clarity;

Fig. 3 is a greatly enlarged vertical section through a portion of a grained plate prior to treatment; and

Figs. 4, 5, 6 and 7 are enlarged sectional views, similar to Fig. 2, showing the plate during certain stages of its production.

Referring now to the drawing, it will be noted that in Fig. 3 I have shown an enlarged section through a portion of a plate 10 the upper surface of which has been roughened or grained, as

indicated at 11, by the use of an abrasive which covers the entire surface with microscopic scratches in a well known manner. The plate used in practicing my invention comprises a metal or alloy such as stainless steel, Monel metal, copper and other special alloys all of which are harder or more wear-resistant than either zinc or aluminum, so that the grained surface, which is necessary for the retention of water on the non-printing areas and for the adhesion of the various coatings applied during the course of preparation to both printing and non-printing areas, will have a considerably longer wearing life than any lithographic plate that has heretofore been successfully used. The metal employed should also preferably be of a type that will not oxidize readily when subjected to water.

After graining the plate in the usual manner, the grained surface thereof is coated with a light sensitive colloidal solution. The colloids usually employed are egg albumen, animal glue, gum arabic, etc., and these are treated with a soluble bichromate or other salt which is light-sensitive so as to render the colloid substantially insoluble in water after exposure. Such a solution is suitably spread over the surface, as by whirling, to form a thin uniform layer 12 (Fig. 4) which is free from spots and streaks. When the coating 12 is dry, it is exposed to light through a positive (or negative) film 13 (Fig. 4). This is generally done by placing the plate 10 in a printing frame or photocomposing machine and printing with the positive film 13 in good contact with the sensitized layer 12. In this manner, the sensive coating 12 is exposed to light only in those areas which correspond with the clear portions of the positive (or negative) film. Following the printing, the exposed plate is developed in any suitable manner so that those parts of the design which have become hardened by the light will adhere firmly to the surface of the plate and the coating on those portions which have not been exposed to light will wash away, leaving the original metal exposed. In Fig. 5 I have shown the plate 10 at this stage of the preparation and it will be observed that the coating 12 has been removed from a portion 14 but is left on the remaining areas 15 of the plate. The portion 14 is a part of the design or printing area of the plate and is additionally treated in the novel manner now to be described.

When the developed plate has been properly dried, I coat at least the printing area 14 thereof with a thin layer 16 of a heat reactive synthetic resinous composition having the property of polymerizing into a hard film which is resistant to strong acids and alkalis when the film is baked at an elevated temperature. Such a solution may comprise a suitable phenolic resin varnish, for example, so that it may be applied with a brush, spray or any other suitable coating device in the desired thin layer 16. The following are typical examples of compositions which may be used to advantage in practicing this phase of my invention:

Example I

	Parts by weight
Heat reactive phenol formaldehyde resin	35
Drying oil acid modified glycerol phthalate resin	10
Solvent naphtha	15
Butyl acetate	15
Ethyl acetate	15
Butyl alcohol	10

This material will form a hard film satisfactory for the purposes of my invention by baking it at a temperature of about 375° F. for about 22 minutes.

Example II

	Parts by weight
Heat reactive phenol formaldehyde resin	35
Butyl acetate	25
Ethyl acetate	25
Butyl alcohol	15

This composition forms a hard film when baked at a temperature of about 380° F. for about 40 minutes.

Example III

	Per cent
Vinylite H	12.2
Vinylite N. 35% toluol	2.3
Arochlor 1242	10.9
Tri-cresyl phosphate	1.9
Methyl salicylate	10.8
Refined ketones	46.7
Methyl cyclohexanone	10.1
Hi-flash naphtha	5.1

This material also will form a suitable hard film when baked for about 25 minutes at a temperature of about 325° F.

I have also found that urea formaldehyde resins, plasticized with alkyd resins, and other similar heat hardenable compositions may be satisfactorily used for the layer 16.

The next step in the preparation of the plate is to eliminate all coating material from the non-printing portions 15 of the plate so as to leave only the thin resinous layer 16 on the printing area 14. To accomplish this, I find it desirable to heat the plate slightly so as to dry the layer 16 sufficiently that it will adhere to the surface of the plate when said plate is washed and brushed in the usual manner with a solution in which the light sensitive layer 12 is soluble. After the grained surface on the non-printing portions 15 of the metal plate has been exposed, the plate is baked in a suitable oven to polymerize the resin completely and render the film 16 on the printing area 14 hard and alkali and acid resistant. Such a hardened film will have a wearing quality substantially equal to that of the grained surface of a stainless steel plate. The plate in this condition is shown in Fig. 7. Because of the baking necessary to render the film 16 hard and resistant to acids and alkalis, care should be taken to avoid the use of metals which crystallize or become otherwise unsuitable as printing members when subjected to such treatment. The common harder metals mentioned above do not exhibit any detrimental change of structure when baked at the necessary temperature.

Finally, the plate may be completely prepared for printing by applying to the bare metal non-printing portions 15 a thin layer 17 (Fig. 2) of a solution which will thoroughly desensitize these parts so that they will retain water and repel grease. A solution which I have found exceptionally desirable for desensitizing all metals harder than zinc and aluminum is a composition comprising chrome alum and gum arabic as disclosed in my copending application Ser. No. 194,075, filed March 5, 1938. As explained in that application, the chrome alum acts as a hardener for the gum arabic so as to render it insoluble without exposure or further treatment.

When the finished lithographic printing member consists of a plate of one of the harder met-

als mentioned above, and particularly stainless steel or Monel metal, it is often difficult to grain the plate and at the same time retain the original shape thereof. The graining operation has a tendency to distort the surface of the plate so that it is impossible to coat it properly with a sensitized solution, or to mount it properly on the printing cylinder. I have found, however, that if both sides of the plate are grained, instead of graining only the printing surface as is customary in prior metal plates, these difficulties may be obviated; and I consider this a part of my present invention.

From the foregoing description, it will be understood that the lithographic plate embodying my invention will have harder printing and non-printing areas and consequently a longer useful life than lithographic plates heretofore known. Moreover, various changes may be made in the construction and preparation of the plate and certain features thereof may be employed without others, without departing from my invention or sacrificing any of its advantages.

What I claim is:

1. A method of preparing a lithographic printing member, which comprises graining the surface of a thin steel plate, applying a light sensitive film to the grained surface, exposing said film to light through a film having a design thereon, developing the exposed plate to eliminate the sensitive film from the unexposed printing areas, coating at least the bare printing areas with a heat reacting synthetic resinous composition which may be converted to the insoluble state at a temperature above 300° F., removing all coating material from the non-printing areas of the plate, and applying a desensitizing solution including gum arabic and chrome alum to the non-printing areas of the plate.

2. A lithographic printing member, comprising a stainless steel plate having a grained surface including printing and non-printing areas, said printing areas being coated with a hard set film of resin which does not attack the stainless steel, and said non-printing areas being treated with a solution including gum arabic and chrome alum.

3. A lithographic printing member comprising a stainless steel plate both surfaces of which are grained by covering said surfaces with a plurality of microscopic scratches, one of said surfaces having printing and non-printing areas thereon, said printing surfaces being coated with a hard set film of resin of the group consisting of phenol-formaldehyde, urea formaldehyde and vinyl resins, and said non-printing areas being treated with a solution including gum arabic and chrome alum.

4. A method of preparing a lithographic printing member, which comprises graining the surface of a thin steel plate; applying a light sensitive film to the grained surface; exposing said film to light through a film having a design thereon; developing the exposed plate to eliminate the sensitive film from the unexposed printing areas; coating at least the bare printing areas with a resinous composition from the group consisting of phenol-formaldehyde, urea-formaldehyde and vinyl resins; removing all coating material from the printing areas of the plate; and applying a desensitizing solution including gum arabic and chrome alum to the non-printing areas of the plate.

WILLIAM N. MISURACA.