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W. C. TOLAND ET AL
LITHOGRAPHIC PRINTING PLATE

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Fig. 1.

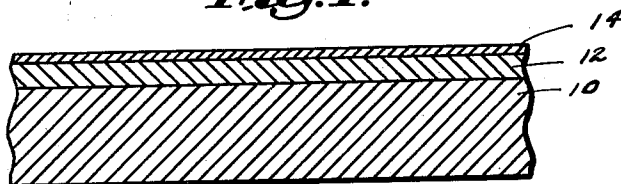
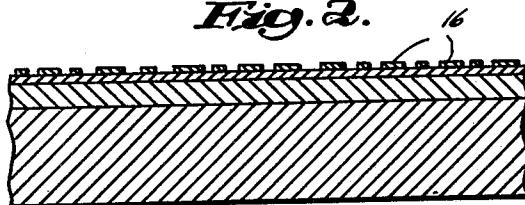


Fig. 2.



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LITHOGRAPHIC PRINTING PLATE

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4 Claims. (Cl. 101—149.2)

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This invention relates to lithographic printing plates. More particularly the invention is concerned with lithographic printing plates having an improved colloid-type coating. The term "colloid-type coating" as employed throughout the specification refers to a coating which is readily wettable by water and especially one which is adapted to swell in water and thus develop desirable hydrophilic properties.

In one specific aspect the invention deals with a printing plate of the class commonly referred to as a "direct image" or "duplicating" plate. A distinguishing characteristic of such plates is that grease-retentive images or characters, instead of being photolithographically formed, are applied directly to the plate surface, usually by means of a greasy typewriter ribbon or greasy crayon.

In making a plate which is to print only a few impressions, it is relatively easy to provide a base element having a colloid or colloid-type coating on which a typewritten image may be satisfactorily affixed. However, there has developed a requirement for a direct-image type of plate which can be easily and quickly prepared with a minimum of lithographic equipment and yet which is capable of printing several hundred impressions of relatively high quality.

For these requirements, the greasy printing image must be very firmly anchored in the colloid surface of the base element in order to avoid becoming displaced or worn away. Practically the only way to secure better retention of the image has been to chemically harden the colloid surface of the base element, thus making it more sharply grease-retentive. This automatically reduces the ability of the plate to swell and maintain hydrophilic character, which is what enables the plate to repel ink in the areas surrounding the printing image.

An object of the invention therefore is to provide an improved planographic printing plate of the direct-image type, and to devise a direct-image type of plate which is easy to prepare and use; which is capable of providing a relatively large number of impressions; and which is substantially free from faulty ink repelling in its non-printing areas.

Another object is to produce a base element, suitable for use in making a planographic plate and having a colloid-type coating in which means are provided for insuring proper retention of a printing image, when applied by a typewriter, without reducing too greatly the ability of the surface to form hydrophilic non-printing areas at points intermediate the greasy image.

Still another object is to provide improved

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methods of preparing planographic printing materials and especially to provide an improved method of hardening a colloid-type coating. Other objects will appear from the following description of the invention.

We have discovered that we may improve the image retaining properties of a colloid-type coating, reference being had especially to the requirements of a direct-image type of plate, by incorporating in the coating a melamine-formaldehyde resin. We also employ with the melamine-formaldehyde resin a finely divided acidic material. Both the resin and acid material are dispersed throughout the colloid-type coating. The resin in the presence of this acidic material is cured to form hard, water-impervious masses distributed throughout the coating and especially at its surface. The coating thus presents on the one hand a multiplicity of highly grease-retentive anchor points to which a greasy type written image or character may be very firmly attached; and on the other hand, tiny intermediate areas of water-swollen colloid which if first moistened will hold water and repel greasy ink subsequently applied against the surface of the plate.

In the accompanying drawings:

Fig. 1 is a cross-sectional view diagrammatically illustrating the composite base element of the invention; and

Fig. 2 is another cross-sectional view showing a printing plate of the direct-image type formed from the base element indicated in Fig. 1.

The printing elements illustrated in the drawings are intended to represent preferred embodiments of the invention. However, the invention is not limited to the particular structures described, and may be modified in various respects as explained below.

Considering the preferred base element illustrated in Fig. 1 of the drawings, numeral 10 denotes a water-repellent paper. Numeral 12 denotes an intermediate layer of a colloidal mixture, and numeral 14 indicates a colloidal surface coating having limited hydrophilic character such as noted above.

The layer 14 preferably includes water-swelling polyvinyl alcohol, fillers such as clay and Blanc Fixe, oxalic acid and melamine-formaldehyde resin. These materials may for example be combined in the following proportions:

100 lbs. polyvinyl alcohol
250 lbs. clay
750 lbs. Blanc Fixe
25 lbs. oxalic acid
12½ lbs. melamine-formaldehyde resin

In preparing these materials, the polyvinyl

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alcohol is soaked in cold water for a short period and then dissolved by heating for example to a temperature of 180° F. Thereafter a slurry of the Blanc Fixe and clay in water is slowly mixed with the alcohol and the batch allowed to cool. To this is added a mixture of oxalic acid and melamine-formaldehyde resin made by dissolving the oxalic acid in warm water (90-100° F.) and then dissolving the melamine-compound in this acid solution.

In dissolving the melamine-formaldehyde resin, it is customary to employ an acid such as dilute hydrochloric acid. However, the oxalic acid in the formula takes the place of the hydrochloric acid, thus aiding in dissolving the resin.

The coating mixture obtained by mixing the material noted is preferably applied while still warm (temperatures of 120° F. to 140° F.). The resulting coating is then heated at higher temperatures such as temperatures of 180-230° F. At these temperatures, the melamine-formaldehyde resin is converted to a cured resin. This process of curing requires the presence of an acid catalyst. Oxalic acid in the mixture functions as a suitable acid catalyst, thus performing a further desirable and necessary function at this point.

The melamine-formaldehyde resin, incorporated in the manner described, becomes intimately dispersed throughout the polyvinyl alcohol and oxalic acid, with tiny portions of the resin occurring throughout the coating and especially at its surface. The masses of cured resin are characterized by a hard impenetrable nature common to all resins of the thermosetting type, and thus presents highly grease-retentive water-repellent anchor points for holding a greasy image. Tiny portions of polyvinyl alcohol, occurring intermediate the masses of resin, are thus reinforced by the masses without too great loss of water-receptivity or water-swelling ability.

Limited reduction of water-receptive or hydrophilic character throughout the colloid surface is thus obtained. This, combined with the provision of more positive grease-retentive areas, is especially important in forming a planographic printing plate of the direct-image type. It is pointed out that in applying a printing image such as a letter impressed by type, a relatively solid ink impression is desired, and the impression should present clearcut edges. At all other points hydrophilic character is desired. This differs from the requirements of a halftone type of plate where tiny water-swollen areas and ink areas are intermingled in great detail, in close proximity to one another, throughout the surface. The direct-image plate requires less sensitive water control. This permits a relatively stronger grease-retentive property to be imparted. Such properties are secured by the use of the cured resin and this tends to promote the adhesion and maintenance of greasy ink in a solid body wherever the typewritten character has been applied. Where no ink is applied, however, appreciable water-retentive character remains to form non-printing portions.

The oxalic acid also performs still another important function. It dissociates to provide a source of hydrogen ions. This is believed to be due to the fact that the acid, present in the coating as a finely divided solid, is gradually dissolved in water supplied by the fountain roller. In dissolving, the acid releases hydrogen ions. Some of these ions by diffusion pass out to the

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surface of the plate and thereby furnish a constant source of hydrogen ions maintained at the surface of the plate. This condition is highly beneficial in preventing ink emulsification, and controlling swell of the colloid.

The intermediate colloidal layer 12 is useful in several connections. It can be applied as a separate coating over a web of paper just after the web has been covered with a water-repellent resin such as Plaskon and while the latter is in a partially dried condition. This aids bonding since the layer 12 lying in contact with the resin as it sets becomes more firmly united to it and thereafter presents a water-wettable surface to which the surface coating 14 may be very conveniently applied. The layer 12 may also be calendered to further strengthen the body and to fill the paper so as to avoid tiny holes or pockets in which greasy ink might collect to cause scumming. On this filled surface it is possible to apply the coating 14 in a relatively thin state. This relatively thin coating is more quickly and thoroughly dried and therefore is desirable from a manufacturing point of view. Also by first applying an intermediate layer of water-swella-
ble material and then combining with it a relatively thin top coating, it is possible to build up sharper grease-sensitivity at the surface of the thin coating and still have a reservoir of moisture from both the intermediate layer and the top coating.

The intermediate layer 12 may for example be prepared from a mixture such as the following:

1 part polyvinyl alcohol (5% solution)
1/3 part formaldehyde (30% solution)
3 parts Blanc Fixe
1 part clay

Although we have obtained good results making use of the layer 12 prepared in this way, the portions noted may be varied and we may also desire to employ the coating 14 independently of layer 12 by applying the coating 14 directly on the base. In connection with the mixture from which the coatings are obtained we may also wish to use other water-receptive materials such as natural colloids as gelatin, glue, gum arabic, Irish moss and the like. Similarly we may substitute for oxalic acid other dissociable polybasic carboxylic acids such as fumaric acid, succinic acid, tartaric acid, and others; also acid salts of these and other compounds. Various other changes may also be carried out.

From the foregoing it will be apparent that we have provided a novel and highly desirable method of hardening colloid materials, thus better adapting them to lithographic printing requirements. The combination of colloid or colloid-like material with a finely divided acid and melamine-formaldehyde resin produces a coating for a printing plate base element which is satisfactory for firmly receiving and holding a typewritten image and maintaining this image in proper condition to carry out several hundred printing impressions.

While we have shown and discussed preferred embodiments of our invention, it should be understood that various changes and modifications may be resorted to, within the scope of the invention as defined by the appended claims.

We claim:

1. A lithographic printing plate comprising a base, a water-swella-
ble coating on the base, greasy
image portions fixed to the coating, said coating
including a water-swella-
ble material, melamine-

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formaldehyde resin and a water-soluble dibasic acid, said acid being dispersed throughout the coating in a finely divided solid state.

2. A lithographic printing plate comprising a base, a water-swellable coating on the base, greasy image portions fixed in the coating, said coating including water-swellable polyvinyl alcohol, melamine-formaldehyde resin and a water-soluble dibasic acid dispersed throughout the coating in a finely divided solid state.

3. A lithographic printing plate comprising a base, a water-swellable coating on the base, greasy image portions fixed in the coating, said coating including water-swellable polyvinyl alcohol, melamine-formaldehyde resin and a water-soluble dicarboxylic acid dispersed throughout the coating in a finely divided solid state.

4. A lithographic printing plate comprising a base, a water-swellable coating on the base, greasy

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image portions fixed in the coating, said coating including water-swellable polyvinyl alcohol, melamine-formaldehyde resin and oxalic acid dispersed throughout the coating in a finely divided solid state.

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