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2,134,165

PLANOGRAPHIC PRINTING PLATE

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Fig. 1

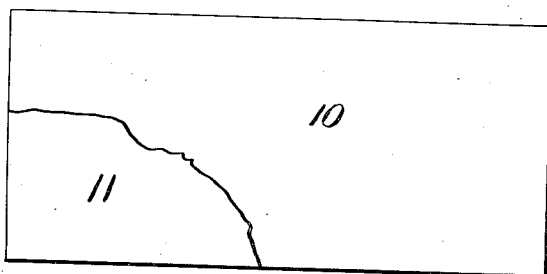


Fig. 2

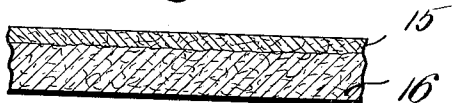


Fig. 3

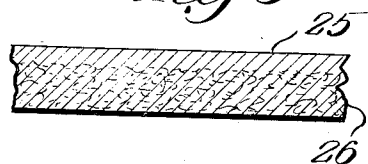


Fig. 4

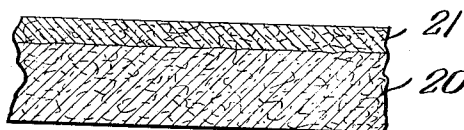
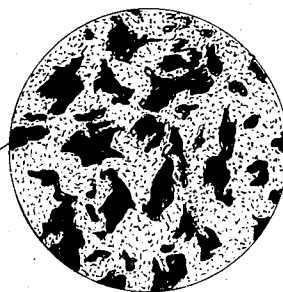


Fig. 5



Fig. 6



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UNITED STATES PATENT OFFICE

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PLANOGRAPHIC PRINTING PLATE

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4 Claims. (Cl. 41—41.5)

This invention relates to cellulosic planographic printing plates and to a method of preparing the same for printing, and it comprises: a planographic printing plate characterized by a printing face of unified cellulosic material comprising essentially an insoluble water-absorptive cellulose derivative overlaying and bonding at least the superficial fibers of a cellulosic web as fabric or paper, all as more fully hereinafter described and claimed.

The art of planographic printing depends, as does the older art of lithographic printing, upon the immiscibility of oil and water. Heretofore only such surfaces as were or could be rendered preferentially wettable by grease and, subsequent to the delineation of a greasy image thereon, could be rendered preferentially wettable by water were considered adapted to this process.

The older lithographic process makes use of a dressed surface of absorbent stone and the younger related planographic process has heretofore made use of variously treated metal surfaces. I am aware that it has been proposed to condition celluloid for use as a planographic printing surface by delineating a greasy image thereon and subsequently treating the non-printing areas thereof with caustic soda whereby the celluloid in those areas is said to be rendered preferentially water-wettable. And I am also aware that greasy images delineated on paper have been transferred by pressure contact to usual planographic printing surfaces.

This invention rests upon my discovery that certain cellulosic materials, which are highly absorptive of moisture and readily wettable by water, are nevertheless, and even though saturated with water, capable of retaining a greasy printing image directly impressed thereon and integrated therewith while substantially dry against the image-displacing tendency of usual dampening solutions under printing conditions and that the non-image areas of printing plates faced with these materials are rendered highly grease repellent by said solutions when wet therewith.

It is an object of the invention, based on said discovery, to provide a planographic printing plate having a cellulosic printing face particularly adapted to the reception and retention of a greasy printing image directly impressed thereon, as by typewriting for instance. It is another object to provide a highly flexible planographic printing plate having a cellulosic printing face adapted to be directly typewritten upon and upon which erasures and corrections can be made in

the manner commonly employed by typists, or preferably and more simply, by swabbing the script to be deleted with a solvent for the image-forming material.

Another object is to provide a method of integrating an impressed greasy printing image with the printing face of a cellulosic printing plate whereby the displacement of said image by dampening solution applied to and absorbed by said printing face is substantially avoided.

Still another object is to provide a planographic printing plate having a printing face comprising essentially a unified water-absorptive cellulosic material and a flexible supporting body for said printing face comprising a substantially non-absorptive waterproofed web of cellulose fibers.

Yet another object is to provide a composite planographic printing plate having a substantially non-extensible backing and a water-absorptive printing face characterized by the fact that swelling of said printing face resulting from adsorption of water therein is substantially confined to a direction normal to said face whereby lateral distortion of said plate and a printing image carried thereon is substantially avoided.

It is paradoxically one of the advantages of the cellulosic printing plates of this invention that they are relatively insensitive to superficially contacted usual image-forming materials and hence erasures and corrections may be made without the exercise of that high degree of skill required to successfully make deletions and corrections on stone and metal plates. Moreover the said plates are, by reason of said relative insensitiveness, less readily damaged by handling than are the more highly grease-sensitive metal plates.

Another advantage is that, when a direct image has been satisfactorily delineated upon the printing face of the plates of this invention, the image-forming substance can be firmly "anchored" thereto or integrated therewith by a to-be-described simple expedient. Another advantage is that the plates of this invention are not objectionably embossed by being typed upon as are the usual thin sheet metal or metal foil-faced plates and moreover the type face of the typewriter need not be in such perfect adjustment as is required for good impressions on metal plates.

Among the other advantages of the plates of this invention may be briefly mentioned—light weight, freedom from such cutting edges as have thin sheet metal and metal foil-faced plates, and very low cost. Other objects and advantages

will become apparent as the description proceeds.

Reference is had to the drawing in which

Fig. 1 is a plan view, wherein 10 indicates the printing face and 11 the backing thereof, partly broken away, of a plate of this invention;

Fig. 2 is an enlarged schematic representation of a preferred embodiment of a plate of this invention in side elevation;

Figs. 3 and 4 are enlarged schematic representations of other embodiments of this invention in side elevation;

Fig. 5 is a plan view of a much magnified small surface areas of one embodiment of this invention; and

Fig. 6 is a similar view of another embodiment of said invention.

Reference is also made to my copending application Serial No. 70,763, in which is described and claimed a method of mounting composite or non-metallic planographic printing plates on the impression element of a printing press.

The expression "planographic printing" is used herein to denote that printing process in which the surface of the printing element is substantially plane and in which the printing image is substantially in the plane of the printing surface. That is to say, the printing image is neither raised appreciably above nor sunk below the plane of the printing surface as in printing from type or a deep-etched plate on the one hand or from an engraved or intaglio plate on the other.

The expression "substantially plane" is used to denote a surface which, though minutely pitted or porous, is macroscopically though not necessarily nor desirably microscopically smooth, and one in which variations from the mean due to the said pits are microscopically small.

The expression "impression element" is used to denote a substantially non-distensible and preferably metallic member to which the cellulosic plate is adherently attached and through which pressure is applied to yield an impression of the printing image either on the paper being printed, as in direct-printing, or on the offset blanket in offset-printing. The impression element may be the platen or impression cylinder of the press, though it may be and preferably is a thin sheet metal plate adapted to be detachably fastened under tension to said platen or impression cylinder.

The expression "reticulate cellulosic structure" is used to denote a paper-web or fibrous fabric structure in which the fibers are bonded together by a bonding agent which coats the individual fibers, and is substantially continuous from fiber to adjacent fiber at their contacts, but need not necessarily be present in amount sufficient to completely fill all of the fiber interstices.

The expression "minutely pitted" is used to denote the surface porosity of a unified reticulate cellulosic material particularly adapted to the purpose of this invention, and the expression is thought apt because the component bonding agent, in joining adjacent fibers at their contact or crossing points, leaves minute voids or pits which are microscopically, though not macroscopically, visible.

The expression "unified cellulosic material" is used to denote any sheet material consisting essentially of cellulose and characterized by high internal cohesion and resistance to disintegration by water. The actual printing surface of printing plates of this invention consists of "uni-

fied cellulosic material" and may or may not comprise cellulose fibers.

Not all "unified cellulosic material" is suitable for the purposes of this invention, but any unified cellulosic surface which fulfills the criteria hereinafter cataloged is suitable for the said purposes.

The general criteria of suitability for the purposes of this invention are:—

- (1) The cellulosic material must be so unified as to be resistant to disintegration by water;
- (2) It must be water-absorptive;
- (3) It must be retentive of greasy image-forming material directly impressed thereon while substantially dry; and
- (4) When without other preparatory treatment than thoroughly dampening with water, it must be resistant to greasy inks.

The expression "surface" is used herein in a broadly inclusive three-dimensional sense, as commonly used, and not in the strictly two-dimensional sense, as used in scientific reference to molecular surface phenomena for instance. It is believed that the printing utility of the materials herein described depends less upon adsorption on a surface than upon absorption in the material of the surface.

As the art of treating fibrous structures as paper or cellulose fabric which cellulose derivatives and waterproofing compositions is well known, no further description of said treatment is deemed necessary.

Because not all cellulose derivatives and fibrous structures treated therewith are suitable for the purposes of this invention, and because it is not feasible to distinguish in terms of composition the useful from those which are not suitable, it is thought expedient to provide simple tests by which those products which are useful for the said purposes may be readily distinguished from those which are not.

The particular criteria and specific tests of suitability of cellulosic materials for the printing surface are as follows:

(1) Only such cellulosic materials as are resistant to disintegration by water are suitable. The resistance to disintegration by water may be tested by immersing a sample of the material in question in water at room temperature for one hour and then spreading the sample on a smooth hard surface, as a glass for instance, and removing the superficial water with absorbent material, as blotting paper; and then rubbing the surface with the ball of the thumb under heavy pressure. If the sample withstands five passes of the thumb under these conditions without observable attrition of the surface, it is suitable in this respect.

(2) Only such cellulosic materials as are readily wet by and absorptive of water are suitable. The usual method of determining the moisture content of papers may be used for determining the absorptivity of the cellulosic material in question. If the difference between the dry state and the damp state shows an increment of weight of two per centum or more, the product is suitable in this respect.

(3) Only such cellulosic materials as are free from any component more readily wet by grease than by water are suitable.

(4) Only such cellulosic materials as are more readily wet by grease than by water when substantially dry and such as are substantially free from any component more readily wet by grease when already wet with water are suitable. That

is to say, grease contacted with the dry material should not be readily displaced by water later applied; whereas grease contacted with the material after dampening the latter with water without other preparatory treatment should be readily displaced by water.

The relative wettability of cellulose material by grease and water may be tested by applying greasy lithographic printing ink to a limited area of the material when substantially dry, (i. e., when the material is in moisture equilibrium with the atmosphere at ordinary relative humidities) and then wetting the non-inked areas with water and, after the material in these areas has become thoroughly saturated, removing the superficial water with blotting paper or the like, and then immediately rolling up the wetted area with the printing ink. If the surface has been insufficiently freed of water, it may refuse ink and if so further contact with dry clean blotting or other bibulous paper should be made. When and as soon as the area to be tested accepts ink, the inking brayer should be repeatedly rolled across it in several directions, preferably at right angles to each other, until the inked area is rolled up solid or completely covered with ink. A pool of the etching solution described in my United States Patent No. 2,003,268, dated May 28, 1935, comprising ammonium dihydrogen phosphate, nickel or cobalt nitrate, glycerin and water is then poured upon the inked area and allowed to stand undisturbed for ten minutes or so. If the material under test is suitable in respect of its ability to repel ink when wet, it will then be found to be free or substantially free from ink in those portions of the areas covered by the pool of etch which were not inked while dry.

If the material under test is suitable in respect of its ability to retain grease applied thereto when dry, it will be found at the completion of the above test that the ink on the originally inked area has remained substantially unchanged and has not been appreciably disturbed by the etching solution.

It has been found by experience that printing images directly impressed on cellulosic surfaces characterized by minute pits or microporosity have longer printing life than have images impressed on non-pitted or non-porous cellulosic surfaces, and hence the former surfaces are preferred.

As the plates of this invention are particularly useful for the reception of direct typewriting, it is desirable that they be highly flexible; and to this end plates of between five and ten thousandths of an inch in thickness are preferred.

An unsized sheet of paper 15 of about 25 lbs. ream weight saturated with a cellulose derivative as gelatinized cellulose, amyloid cellulose or regenerated cellulose and in adherent combination with a sheet of paper 16 of about 35 lbs. weight impregnated with a waterproof thermoplastic adhesive yields a plate of satisfactory thickness. (See Fig. 2.) Such a plate may be adhesively united, after the printing image has been delineated thereon, to a backing adapted to be attached to the impression cylinder of the press.

It is sometimes desirable to incorporate in the plate a tension element capable of standing the tension strain exerted by the plate-holding means of the usual impression cylinder. In this case the backing 20 for the printing surface 21 should be of greater weight than that above-mentioned. A paper of 60 to 80 lbs. impregnated

with a flexible waterproof resinoid is recommended. (See Fig. 4.)

Cellulosic materials suitable for the printing surface of the plates of this invention must be water absorptive, as stated, and are distensible by such absorption. In general, it is highly desirable that the dimensions of the printing image as applied should remain substantially unchanged under printing conditions; that is to say, when the printing surface is saturated with the dampening solution. In the preferred embodiments of the plates of this invention the distention of the cellulosic material constituting the printing face is restricted to a direction normal to the printing surface whereby the dimensional configuration of the printing image is maintained substantially unchanged. This resistance to lateral distention is obtained either by incorporating in the plate structure a non-distensible supporting base for the printing surface or adherently attaching the sheet material constituting the printing surface to a non-distensible impression element.

It will be obvious to any one skilled in the art that the plates of this invention may be modified in various ways. Thus, for instance, they may comprise a filmiform layer of suitable unified cellulosic material adherently attached to any flexible fibrous base, as paper or fabric, or the said cellulosic material may bond all or at least the surface fibers of said base, and the back of the base may be waterproofed by a coating or an impregnation of a suitable waterproofing and bonding agent which may be a thermoplastic adhesive for effecting adhesion to an impression element as described in my copending application Serial No. 70,763.

As stated a printing surface characterized by minute pits or microporosity is desirable. A convenient way of obtaining such a surface is to have cellulose fibers extend to the surface (as in Fig. 2) rather than to have a continuous filmiform layer 25 of cellulose derivative overlay the fibrous base 26 (as in Fig. 3).

The preferred printing surface may be obtained by saturating a fibrous structure with a cellulose derivative, as when a cellulose derivative is produced in situ by the action of sulphuric acid on the cellulose fibers of paper or fabric in known manner.

The pits in the reticulate structure of a fibrous body saturated with a cellulose derivative suitable for the purpose of this invention are shown as 30 in Figs. 5 and 6, and the fibers are shown as 31 in Fig. 5.

Fig. 6 represents a surface of the same structure as that illustrated by Fig. 5 after it has been subjected to attrition by a fine emery cloth. Such abrasive attrition destroys the surface identity of the individual fibers and renders the surface microscopically homogeneous and more nearly plane. It also provides a surface with more minute pits than were present before such abrasive treatment, and this is of advantage. Another advantage of such treatment is that images typed on surfaces which have been both abraded thereby and subsequently abraded, as by a rubber eraser in deleting an image, are indistinguishably comparable to images typed upon surfaces not subjected to the secondary abrasive action of an eraser; whereas there is a distinguishable difference between images typed on non-abraded surfaces and those typed on an erased but otherwise like surface.

As stated, I am aware that images have been transferred from paper to planographic printing

surfaces, but such papers were always so far as I am aware coated with albumenoids or other non-cellulosic materials, and it is no doubt true that almost any paper of appreciable wet strength may be wetted, subsequent to the delineation of a greasy image thereon, said greasy image thereafter inked up and one or even several impressions transferred therefrom; but this is not planographic printing in the sense of this invention. To have printing utility and to be commercially practical, a planographic printing plate must be capable of yielding at least several hundred copies without suffering appreciable disintegration and/or degradation of its printing image. I have discovered, as stated, that papers or fabric unified by or coated with a cellulose derivative and having the reticulate cellulosic structure described are, when of sufficient weight and wet strength, capable of yielding commercially practical results under planographic printing conditions.

As the practical printing life of a cellulosic printing plate of this invention is proportional to its resistance frictional disintegration when wet, it is possible to predetermine the suitability of any unified cellulosic material for the purpose of this invention by the simple test above-described. It is not thus possible however to foretell with accuracy the length of a printing edition obtainable therefrom which depends in part on a number of unrelated variables, as the nature of the image-forming material, the character of the printing ink, and above all on the adjustment of the press upon which the friction exerted against the plate depends.

It has been found that the length of printing life of images delineated in usual greasy image-forming materials may be advantageously increased by the expedient of integrating the said materials with the cellulosic printing plate by warming the latter after the image has been delineated thereupon. This "setting" or integration of the image-forming material by heat is conveniently accomplished coincidentally with the attachment of the plate to the impression element when the former is provided with a thermoplastic adhesive. Thermoplastic adhesives having a softening or melting point in the range of 80° to 100° C. may be used and the effect of heating the image between these temperatures for 15 to 30 seconds suffices to set or integrate the image-forming material. If the plate is not heated, it has been found in practice that the elapse of an hour or so between the delineation of the image and the subsequent wetting of the plate will accomplish a like effect.

While plates of this invention are particularly useful for direct image planographic printing, they may be used for photoplanography as well.

This is of advantage particularly when it is desired to provide a half tone illustration with directly compressed type script or free-hand decoration.

I claim:

1. The method of making a planographic printing plate having a printing face of unified cellulosic material comprising the steps of directly impressing greasy image-forming material upon the face when substantially dry, integrating the material with the face and thoroughly dampening the face to render the non-image-forming areas hydrophilic.

2. The method of making a planographic printing plate having a printing face of unified cellulosic material comprising the steps of directly impressing greasy image-forming material upon the face when substantially dry, heating the plate to integrate the material with the printing face, and thoroughly dampening the face to render non-image-forming areas hydrophilic.

3. A composite planographic printing plate comprising a non-extensible backing and a printing surface united thereto, said printing surface comprising water absorptive fibrous cellulose material and non-fibrous cellulose derivative with fibres of the cellulose material extending to the printing surface, the water-absorptive printing surface so formed being capable of retaining a greasy image-forming material directly impressed thereon while substantially dry, and resistant to greasy inks when thoroughly dampened with water, whereby the swelling of said face resulting from absorption of water therein, is substantially confined to a direction normal to said face, and lateral distention of said plate and distortion of a printing image carried thereon is substantially avoided.

4. A composite planographic printing plate comprising a non-extensible backing and a printing surface united thereto, said printing surface comprising water absorptive fibrous cellulose material and non-fibrous cellulose derivative with fibres of the cellulose material extending to the printing surface, the water-absorptive printing surface so formed being capable of retaining a greasy ink image-forming material directly impressed thereon while substantially dry and resistant to greasy inks when thoroughly dampened with water, said printing surface being mounted upon the non-extensible backing by means of a waterproof adhesive, so that any swelling of the printing face resulting from absorption of water therein, is substantially confined to a direction normal to said face, and any lateral distention of said plate and consequent distortion of a printing image carried thereon, is substantially avoided.

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